PXIe-1488 Getting Started

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Contents

PXIe-1488 Getting Started

The PXIe-1488 FlexRIO FPD-Link Interface Module provides a high-speed digital interface for using and testing modern advanced driver assistance systems (ADAS) and autonomous drive (AD) camera sensors and electronic control units (ECUs).

The PXIe-1488 includes the following variants:

- PXIe-1488 FlexRIO FPD-Link IV Deserializer
- PXIe-1488 FlexRIO FPD-Link IV Serializer
- PXIe-1488 FlexRIO FPD-Link IV SerDes

Install and configure the PXIe-1488 to develop a hardware and driver setup that allows you to design and test your software application.

Note If you purchased the PXIe-1488 as part of an NI system, refer to your system documentation for application-specific instructions for using the PXIe-1488.

FlexRIO Documentation and Resources

Use the following resources to find more information about the PXIe-1488.

All product documentation can be found at ni.com/docs or in LabVIEW by clicking **Help**.

Table 1. FlexRIO Documentation and Resources

Document	Contents
PXIe-1488 Getting Started Guide (this document)	• Installation instructions • Basic programming instructions
PXIe-1488 Specifications	• Operating environment requirements • IO specifications • Clocking specifications • Physical and mechanical specifications
PXIe-1488 Safety, Environmental, and Regulatory Information	• Safety and compliance information • Environmental information
LabVIEW FPGA Module Help	• Basic functionality of the FPGA module • Instructions for developing and debugging custom hardware logic
FlexRIO Readme	• Minimum system requirements • Supported Application Development Environments (ADEs) • Known issues and bug fixes • Recent updates
FlexRIO Help	• Hardware reference information • Programming instructions • I/O Component Level IP (CLIP) development information
LabVIEW Examples	• Examples showing how to run FPGA VIs on your device • How showing how to run host VIs on your device

Document	Contents
FlexRIO product page	• Product information • Data sheets
PXIe-148X Programming Examples Explained	• Detailed tutorials that are maintained by NI in GitHub™ for FlexRIO automotive vision modules

Related information:

- NI Example Programs
- PXIe-148X Programming Examples Explained

Preparing the System Components

Unpacking the Kit

> **Notice** To prevent electrostatic discharge (ESD) from damaging the device, 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 device from the package and inspect the device for loose components or any other sign of damage.

   > **Notice** Never touch the exposed pins of connectors.

   > **Note** Do not install a device if it appears damaged in any way.

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

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

Verifying the Kit Contents

Verify that the following items are included in the PXIe-1488 kit.

- PXIe-1488 Module
- Terminal blocks
- PXIe-1488 Safety, Environmental, and Regulatory Information

System Components

The PXIe-1488 is intended for use with the following system components.

Required System Components

- PXIe chassis with slot cooling capacity ≥58 W
- Camera or serial device (for Deserializer or SerDes modules)
- Electronic control unit (for Serializer or SerDes modules)
- PXI Express embedded controller or PC with MXI controller system

Optional System Components

- Power source (for Deserializer or SerDes modules)
- Power sink (for Serializer or SerDes modules)
- Copper power connector wire
- HFM Female Code Z to HFM Female Code Z Cable(s)
- HFM Female Code Z to FAKRA Female Code Z Cable(s)

Note See the ***PXIe-1488 Specifications*** for detailed information on compatible serial devices, chassis, copper connector wire, and other system components.

Verifying the System Requirements

To use the FlexRIO instrument driver, your system must meet certain requirements.

Refer to the product readme, which is available online on the driver software download page or at ni.com/docs, for more information about minimum system requirements, recommended system, and supported application development environments (ADEs).

Related information:

- FlexRIO Release Notes

Installing and Connecting

Installing the Software

Download the following software from ni.com/downloads.

Note Refer to Package Manager for more information about installing, removing, and upgrading NI software using Package Manager. Installation of all NI software also automatically installs Package Manager.

- LabVIEW
- LabVIEW FPGA Module
- FlexRIO

Related information:

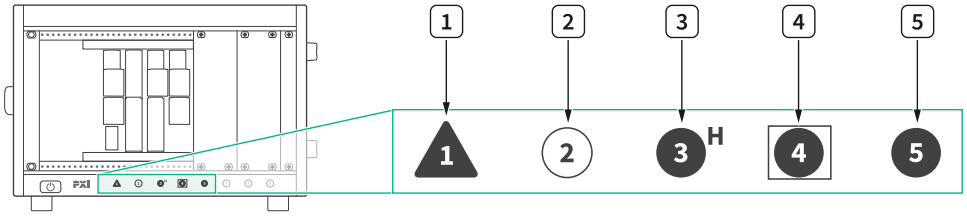
- Installing, Updating, Repairing, and Removing NI Software

Installing the PXIe-1488

Notice To prevent damage to the PXIe-1488 caused by ESD or contamination, handle the module using the edges or the metal bracket.

1. Ensure the AC power source is connected to the chassis before installing the module.
   The AC power cord grounds the chassis and protects it from electrical damage while you install the module.
2. Power off the chassis.
3. Inspect the slot pins on the chassis backplane for any bends or damage prior to installation. Do not install a module if the backplane is damaged.
4. Remove the black plastic covers from all the captive screws on the module front panel.
5. Identify a supported slot in the chassis. The following figure shows the symbols that indicate the slot types.

Figure 1. Chassis Compatibility Symbols

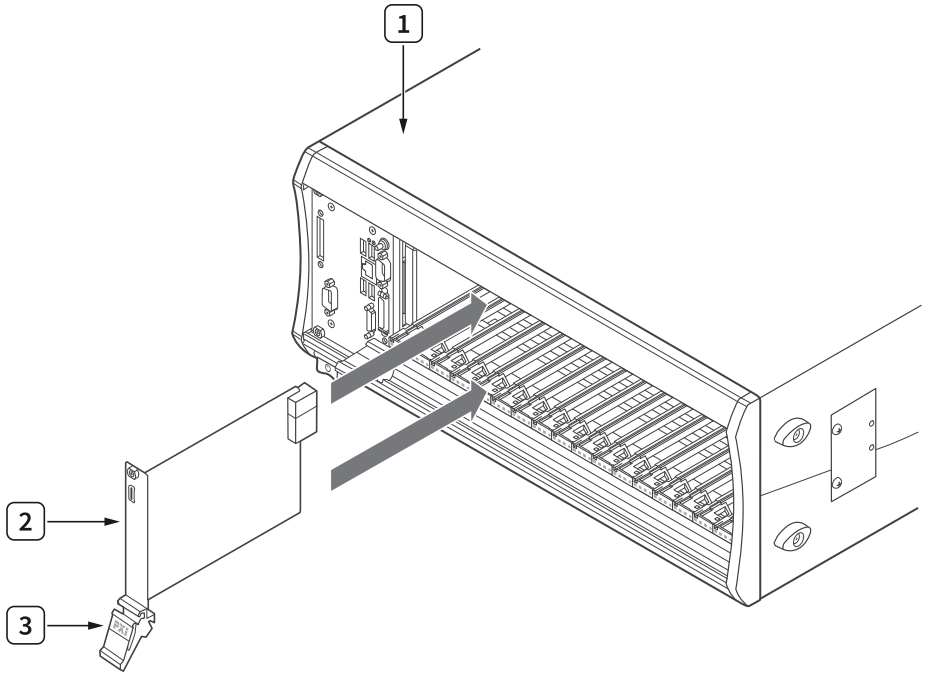


1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

PXIe-1488 modules can be placed in PXI Express peripheral slots, PXI Express hybrid peripheral slots, or PXI Express system timing slots.

6. Touch any metal part of the chassis to discharge static electricity.
7. Ensure that the ejector handle is in the downward (unlatched) position.

Figure 2. Module Installation



1. Chassis
2. Hardware Module
3. Ejector Handle in Downward (Unlatched) Position

8. Place the module edges into the module guides at the top and bottom of the chassis. Slide the module into the slot until it is fully inserted.
9. Latch the module in place by pulling up on the ejector handle.
10. Secure the module front panel to the chassis using the 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.

11. Cover all empty slots using either filler panels (standard or EMC) or slot blockers with filler panels, depending on your application.

> **Note** For more information about installing slot blockers and filler panels, go to ni.com/r/pxiblocker.

12. Power on the chassis.

Cabling the PXIe-1488

Complete the following steps to connect your PXIe-1488 to other system components.

1. Connect your chassis to a power source as described in the chassis getting started documentation.
2. Connect serial device(s) and ECU(s) as required for your application.
   - For Deserializer or SerDes modules, use a HFM cable to connect serial device(s) to the PXIe-1488 serial input (SI) connector(s).
   - For Serializer or SerDes modules, use a HFM cable to connect ECU(s) to the PXIe-1488 serial output (SO) connector(s).

> **Note** Serial output and serial input coaxial connectors on the PXIe-1488 are physically identical. They can be differentiated by their labels. Serial output connectors are labeled SO and serial input connectors are labeled SI.

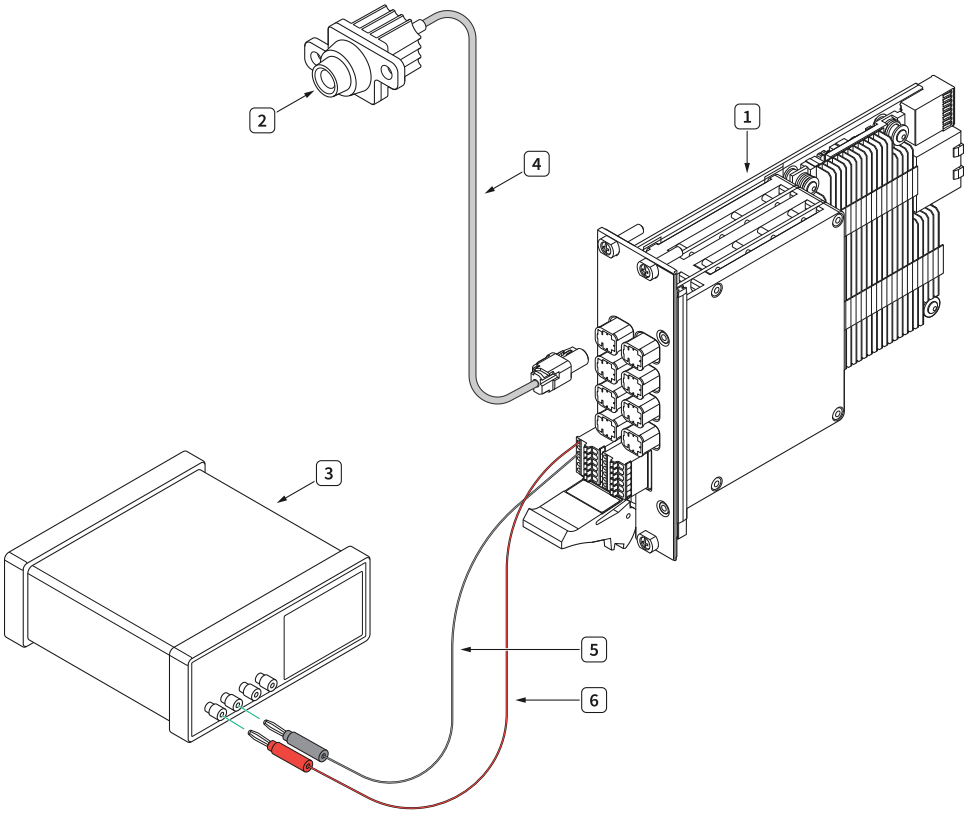
> **Notice** Do not plug or unplug devices while power over coax is enabled on serial channels as this may damage your device. Always set the power over coax to disabled and wait for the power to be fully disabled before plugging and unplugging devices.

3. Connect the terminal blocks included in your kit to the AUX power connectors on the PXIe-1488.
4. (Optional) Connect power sink(s) or power source(s) to the AUX power connectors as required for your application.
   - For Deserializer or SerDes modules, use a copper conductor wire to connect a power source to the serial input channel's corresponding pin on the AUX power connector. This allows you to supply external power. If you do not connect an external power source, devices connected to PXIe-1488 can be powered by the chassis backplane.
   - For Serializer or SerDes modules, use a copper conductor wire to connect a power sink to the serial output channel's corresponding pin on the AUX power connector. This allows you to simulate an additional load.

> **Note** AUX power connector pins map to serial input and serial output connectors one to one.

Refer to the following diagrams for examples of cabled configurations.

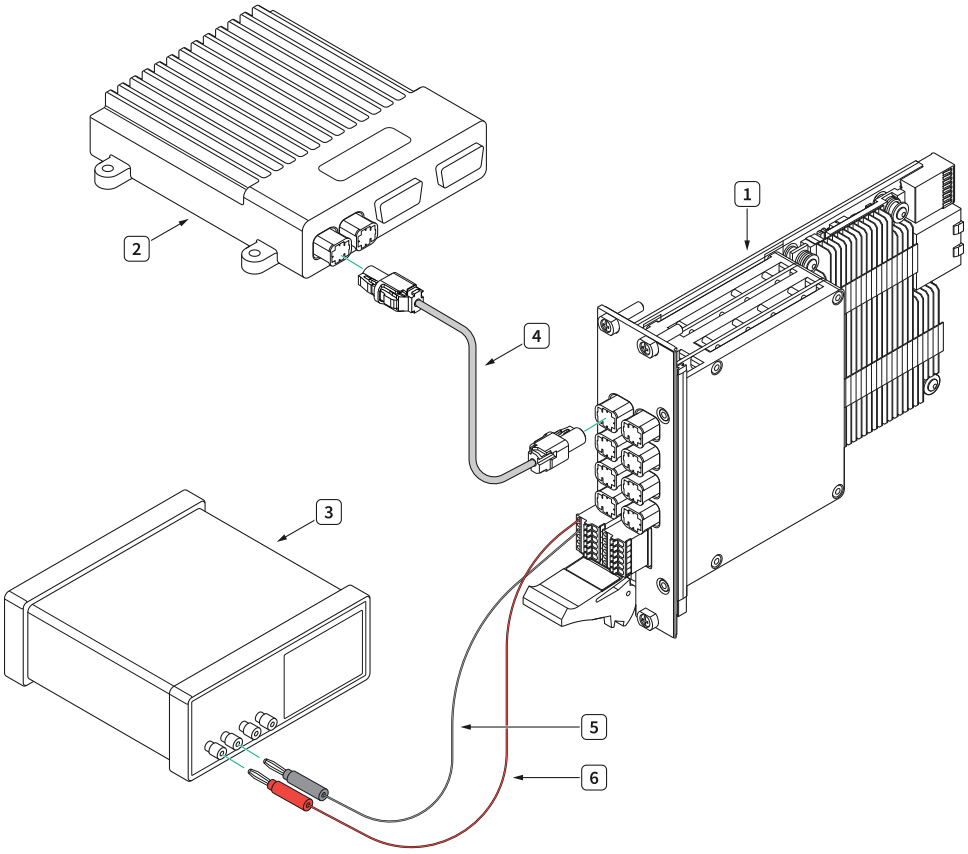
Figure 3. PXIe-1488 Deserializer



1. PXIe-1488 Deserializer Module

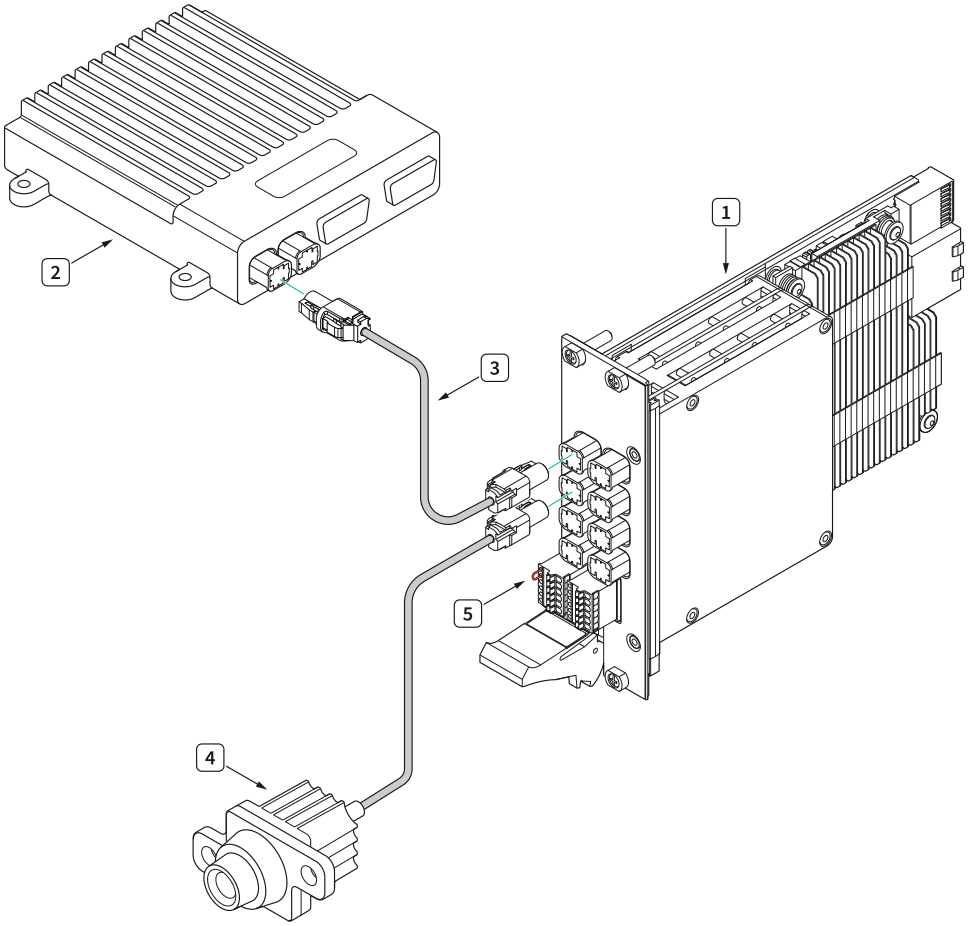
2. Camera or Serial Device
3. Power Source
4. HFM Female Code Z to Serial Device Connector Cable
5. Power Connector Wire, Grounding
6. Power Connector Wire, Positively Charged

Figure 4. PXIe-1488 Serializer



1. PXIe-1488 Serializer Module
2. Electronic Control Unit (ECU)
3. Power Sink
4. HFM Female Code Z to HFM Female Code Z Cable or HFM Female Code Z to FAKRA Female Code Z Cable, depending on the ECU connector type
5. Power Connector Wire, Grounding
6. Power Connector Wire, Positively Charged

Figure 5. PXIe-1488 SerDes



1. PXIe-1488 SerDes Module
2. Electronic Control Unit (ECU)
3. HFM Female Code Z to HFM Female Code Z Cable or HFM Female Code Z to FAKRA Female Code Z Cable, depending on the ECU connector type
4. Camera or Serial Device
5. Power Connector Wire, Positively Charged

Note In the PXIe-1488 SerDes module configuration shown, the power connector wire allows the ECU to power the camera or serial device.

Related reference:

- Serializer Connectors

Verifying the Installation 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-1488.
5. Self-test the hardware by selecting the item in the configuration tree and clicking **Self-Test** in the MAX toolbar.
   MAX self-test performs a basic verification of hardware resources.

Accessing FlexRIO with Integrated I/O Examples

The FlexRIO driver includes several example applications for LabVIEW. These examples serve as interactive tools, programming models, and as building blocks in your own applications. To access all FlexRIO with Integrated I/O getting started examples, complete the following steps.

Note

1. In LabVIEW, click **Help** » **Find Examples**.
2. In the NI Example Finder window that opens, click **Hardware Input and Output** » **FlexRIO** » **Integrated IO** » **Getting Started**.
3. Double click `Getting Started with FlexRIO Integrated IO.vi`.

   The FlexRIO with Integrated IO Project Creator window opens.

4. Select the example that corresponds to the name of your FlexRIO module. The Description window includes a short description of the getting started example for your device. Rename the project, select a location for the project, and click **OK**. The Project Explorer window for your new project opens.

Online examples are also available to demonstrate FlexRIO basics, such as using DRAM, acquiring data, and performing high throughput streaming. To access these examples, search `FlexRIO examples` in the **Search the community** field at ***NI Example Programs***. For tutorial guidance on FlexRIO examples, access NI-maintained GitHub™ content at ***PXIe-148X Programming Examples Explained***.

Related information:

- NI Example Programs
- PXIe-148X Programming Examples Explained

Common FlexRIO with Integrated I/O Examples

In addition to the examples within the FlexRIO with Integrated IO Project Creator, NI provides several examples that apply to all FlexRIO with Integrated I/O modules to help you perform common tasks.

The following examples can be found in the NI Example Finder:

- `Show All FlexRIO with Integrated IO Hardware.vi` queries and displays a set of hardware properties from all FlexRIO with Integrated I/O devices in a chassis.
- `Vivado Export Getting Started Ultrascale.lvproj` demonstrates how to export your LabVIEW FPGA project into Vivado in order to develop your FPGA design in the Vivado ADE.
- `Read-Write Calibration Data.vi` demonstrates how to read and write calibration data and metadata into the storage space of FlexRIO with Integrated I/O devices.

Component-Level Intellectual Property (CLIP)

The LabVIEW FPGA Module includes component-level intellectual property (CLIP) for HDL IP integration. FlexRIO devices support two types of CLIP: user-defined and socketed.

- ***User-defined CLIP*** allows you to insert HDL IP into an FPGA target, enabling VHDL code to communicate directly with an FPGA VI.
- ***Socketed CLIP*** provides the same IP integration of the user-defined CLIP, but it also allows the CLIP to communicate directly with circuitry external to the FPGA. Adapter module socketed CLIP allows your IP to communicate directly with both the FPGA VI and the external adapter module connector interface.

The PXIe-1488 ships with socketed CLIP items that add module I/O to the LabVIEW project.

PXIe-1488 Front Panel and Connector Diagrams

Deserializer Connectors

Figure 6. Deserializer Front Panel

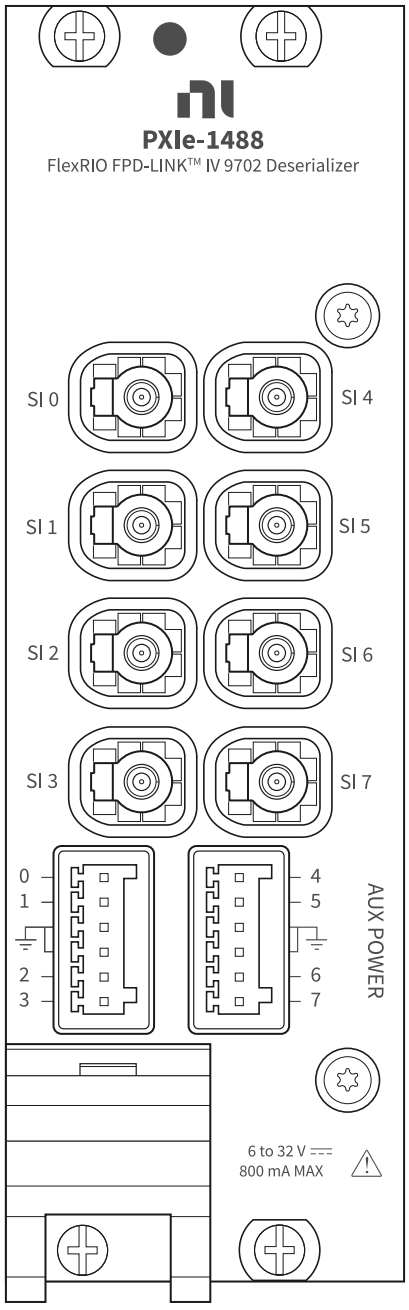


Table 2. Deserializer Front Panel Connectors Signal Descriptions

Signal Name	Description	FlexRIO Terminal Name
SI 0	Serial input to internal deserializer	SI0
SI 1	Serial input to internal deserializer	SI1
SI 2	Serial input to internal deserializer	SI2
SI 3	Serial input to internal deserializer	SI3
SI 4	Serial input to internal deserializer	SI4
SI 5	Serial input to internal deserializer	SI5
SI 6	Serial input to internal deserializer	SI6
SI 7	Serial input to internal deserializer	SI7

Figure 7. Deserializer AUX Power Connectors

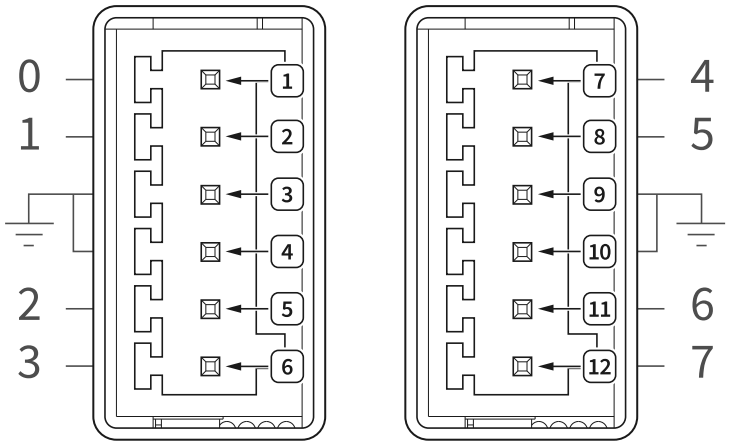


Table 3. Deserializer AUX Power Connectors Signal Descriptions

Signal Pin	Description
1	Power supply for channel SI 0
2	Power supply for channel SI 1
3	Digital/chassis grounding
4	Digital/chassis grounding
5	Power supply for channel SI 2
6	Power supply for channel SI 3
7	Power supply for channel SI 4

Signal Pin	Description
8	Power supply for channel SI 5
9	Digital/chassis grounding
10	Digital/chassis grounding
11	Power supply for channel SI 6
12	Power supply for channel SI 7

Related tasks:

- Cabling the PXIe-1488

Serializer Connectors

Figure 8. Serializer Front Panel

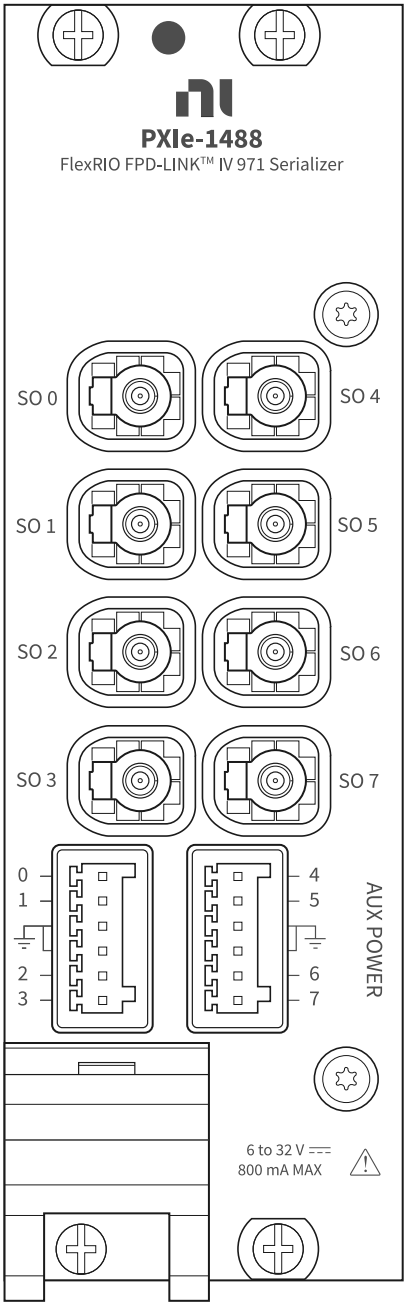


Table 4. Front Panel Connectors Signal Descriptions

Signal Name	Description	FlexRIO Terminal Name
SO 0	Serial output from internal serializer	SO0
SO 1	Serial output from internal serializer	SO1

Signal Name	Description	FlexRIO Terminal Name
SO 2	Serial output from internal serializer	SO2
SO 3	Serial output from internal serializer	SO3
SO 4	Serial output from internal serializer	SO4
SO 5	Serial output from internal serializer	SO5
SO 6	Serial output from internal serializer	SO6
SO 7	Serial output from internal serializer	SO7

Figure 9. Serializer AUX Power Connectors

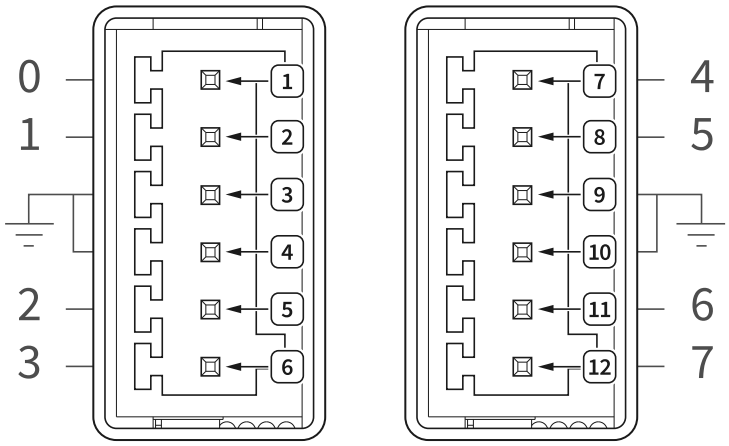


Table 5. AUX Power Connectors Signal Descriptions

Signal Pin	Description
1	Power sink for channel SO 0
2	Power sink for channel SO 1
3	Digital/chassis grounding
4	Digital/chassis grounding
5	Power sink for channel SO 2
6	Power sink for channel SO 3
7	Power sink for channel SO 4
8	Power sink for channel SO 5
9	Digital/chassis grounding
10	Digital/chassis grounding

Signal Pin	Description
11	Power sink for channel SO 6
12	Power sink for channel SO 7

SerDes Connectors

Figure 10. SerDes Front Panel

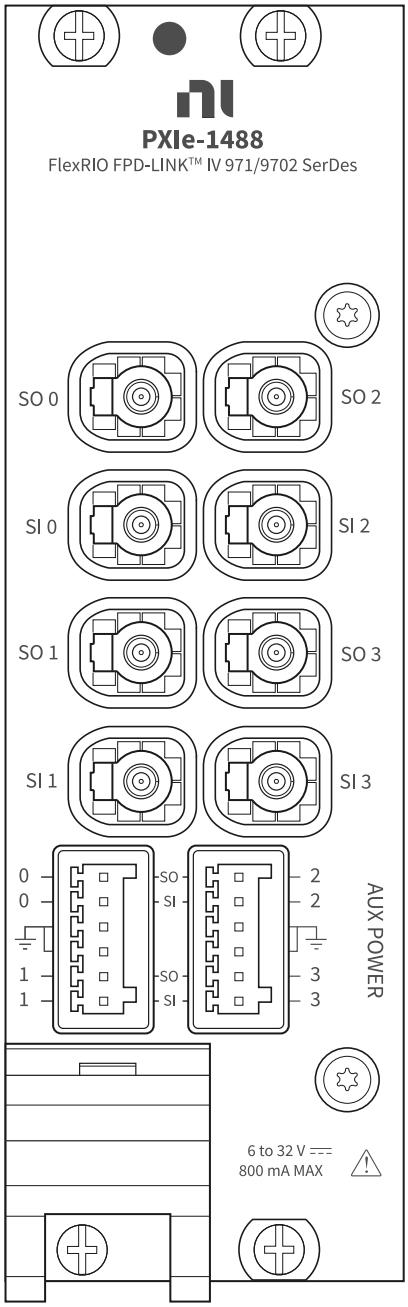


Table 6. Front Panel Connectors Signal Descriptions

Signal Name	Description	FlexRIO Terminal Name
SO 0	Serial output from internal serializer	SO0
SI 0	Serial input to internal deserializer	SI0
SO 1	Serial output from internal serializer	SO1
SI 1	Serial input to internal deserializer	SI1
SO 2	Serial output from internal serializer	SO2
SI 2	Serial input to internal deserializer	SI2
SO 3	Serial output from internal serializer	SO3
SI 3	Serial input to internal deserializer	SI3

Figure 11. SerDes AUX Power Connectors

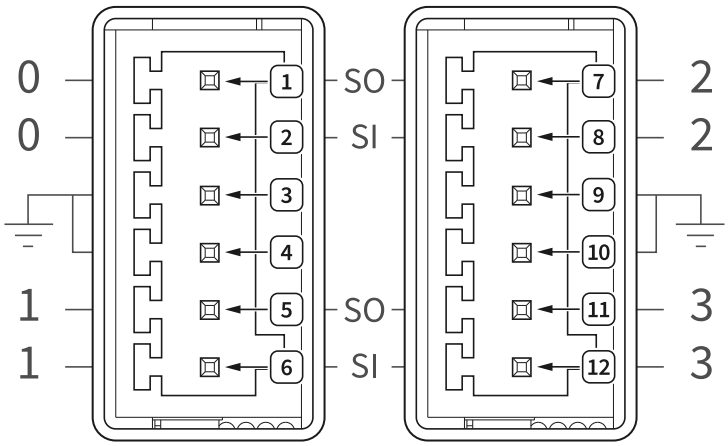


Table 7. AUX Power Connectors Signal Descriptions

Signal Pin	Description
1	Power sink for channel SO 0
2	Power supply for channel SI 0
3	Digital/chassis grounding
4	Digital/chassis grounding
5	Power sink for channel SO 1
6	Power supply for channel SI 1
7	Power sink for channel SO 2

Signal Pin	Description
8	Power supply for channel SI 2
9	Digital/chassis grounding
10	Digital/chassis grounding
11	Power sink for channel SO 3
12	Power supply for channel SI 3

Related tasks:

- Cabling the PXIe-1488

PXIe-1488 Block Diagrams

PXIe-1488 Module Block Diagrams

Figure 12. Deserializer Block Diagram

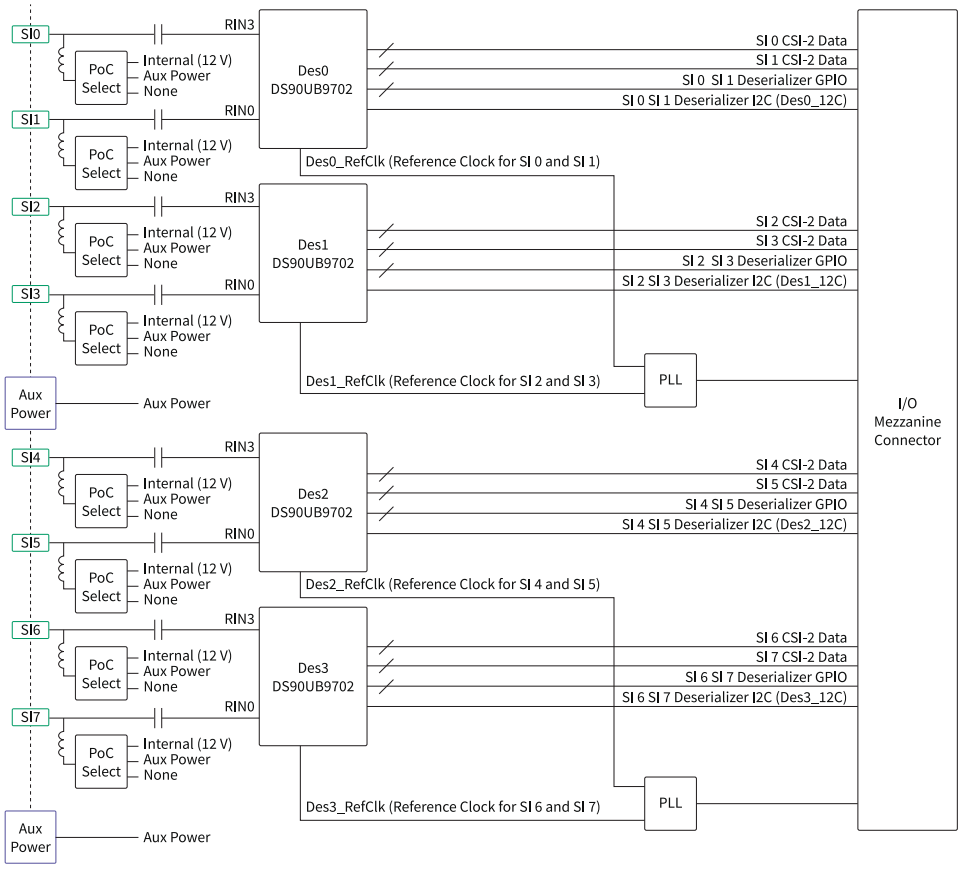


Figure 13. Serializer Block Diagram

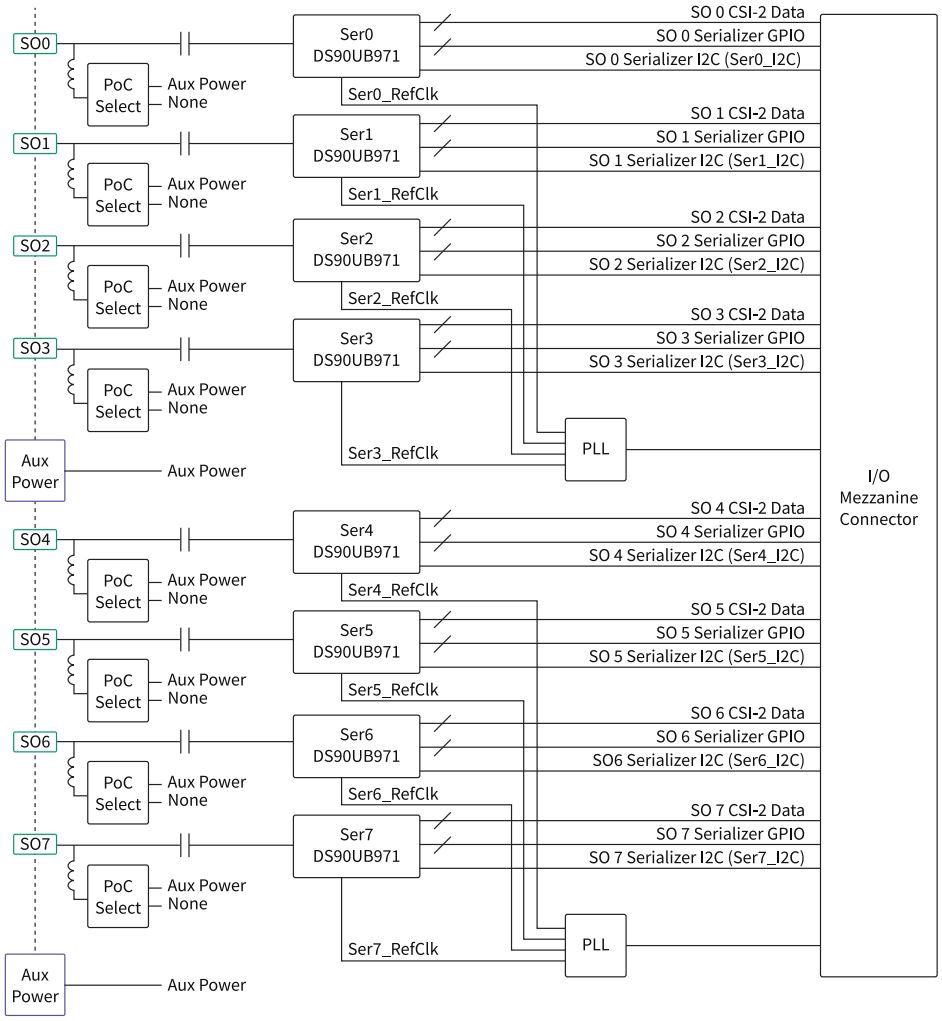
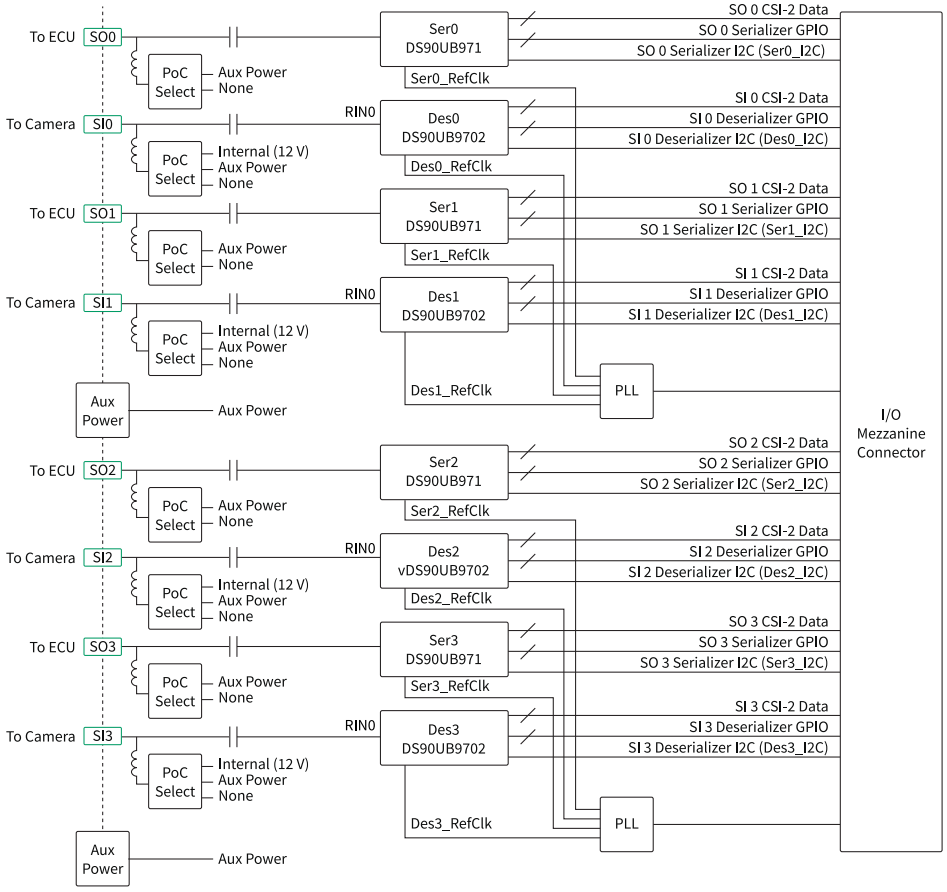


Figure 14. SerDes Block Diagram



FPGA Carrier Block Diagram

Figure 15. PXIe-1488 FPGA Block Diagram