GETTING STARTED GUIDE

PXIe-1487

FlexRIO GMSL Interface Module

This document explains how to install and configure the following variants of the PXIe-1487:

- PXIe-1487 FlexRIO GMSL Interface Deserializer
- PXIe-1487 FlexRIO GMSL Interface Serializer
- PXIe-1487 FlexRIO GMSL Interface SerDes

After completing the tasks described in this document, you will have a hardware and driver setup that allows you to design and test your software application.

Note If you purchased the PXIe-1487 as part of an NI system, refer to your system documentation for application-specific instructions for using the PXIe-1487.

Contents

FlexRIO Documentation and Resources

Use the following resources to find more information about the PXIe-1487.

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

Table 1. FlexRIO Documentation and Resources

Document	Contents
PXIe-1487 Getting Started Guide (this document)	• Installation instructions • Basic programming instructions
PXIe-1487 Specifications	• Operating environment requirements • IO specifications • Clocking specifications • Physical and mechanical specifications
PXIe-1487 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
NI-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
FlexRIO product page	• Product information • Data sheets

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.

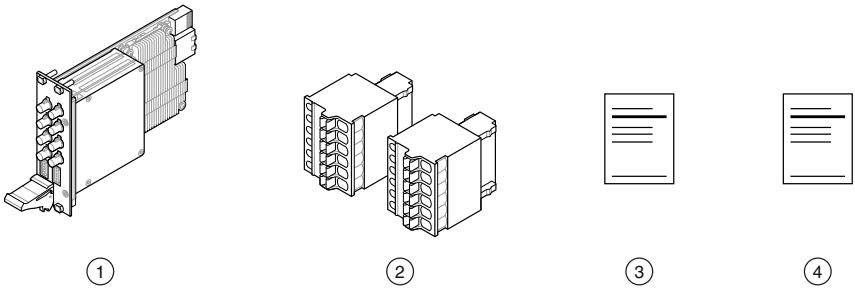
3. Unpack any other items and documentation from the kit.

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-1487 kit.

Figure 1. Kit Contents



1. PXIe-1487 Module
2. Terminal blocks
3. PXIe-1487 Safety, Environmental, and Regulatory Information
4. PXIe-1487 Getting Started Guide (This Document)

System Components

The PXIe-1487 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)

- Engine 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
- FAKRA Female Code Z to FAKRA Female Code Z Cable(s)

Note See the *PXIe-1487 Specifications* for detailed information on compatible serial devices, chassis, copper connector wire, and other system components.

Prerequisites

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/manuals*, for more information about minimum system requirements, recommended system, and supported application development environments (ADEs).

Installing the Software

Download the following software from *ni.com/downloads*.

Note NI software includes NI Package Manager to handle the installation. Refer to the NI Package Manager Manual at *ni.com/r/nipmmanual* for more information about installing, removing, and upgrading NI software using NI Package Manager.

- LabVIEW
- LabVIEW FPGA Module
- FlexRIO

Installing the PXIe-1487

For instructions on how to install your PXIe-1487 into the chassis, refer to your chassis documentation, available at *ni.com/manuals*.

Cabling the PXIe-1487

Complete the following steps to connect your PXIe-1487 to other system components.

1. Connect your chassis to a power source as described in the chassis Getting Started Guide.

2. Connect serial device(s) and ECU(s) as required for your application.
   a) For Deserializer or SerDes modules, use a FAKRA cable to connect serial device(s) to the PXIe-1487 serial input (SI) connector(s).
   b) For Serializer or SerDes modules, use a FAKRA cable to connect ECU(s) to the PXIe-1487 serial output (SO) connector(s).

   Note Serial output and serial input coaxial connectors on the PXIe-1487 are physically identical. They can be differentiated by their labels. Serial output channels are labeled SO and serial input connectors are labeled SI.
3. Connect the terminal blocks included in your kit to the AUX power connectors on the PXIe-1487.
4. (Optional) Connect power sink(s) or power source(s) to the AUX power connectors as required for your application.
   a) 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.

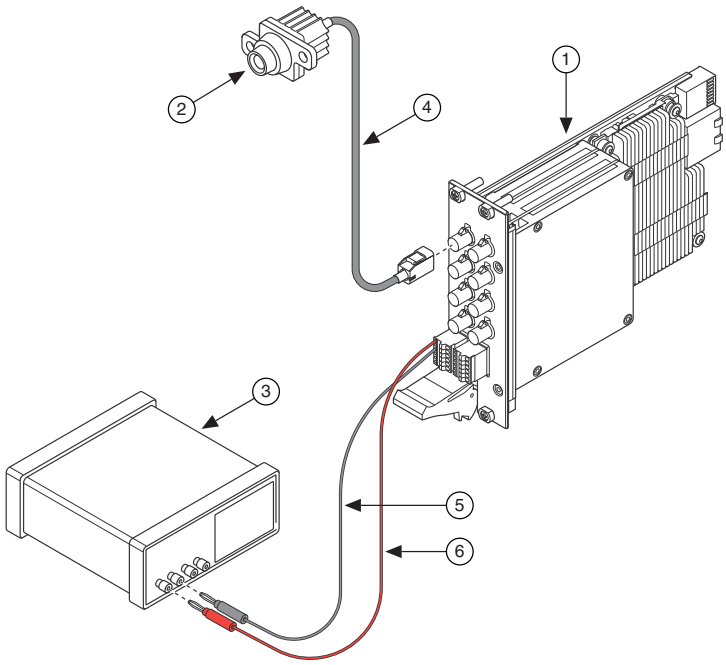
      This allows you to supply external power. If you do not connect an external power source, devices connected to PXIe-1487 can be powered by the chassis backplane.
   b) For Serializer or SerDes modules, use a copper conductor wire to connect a power sink to the serial output channel's corresponding pin 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.

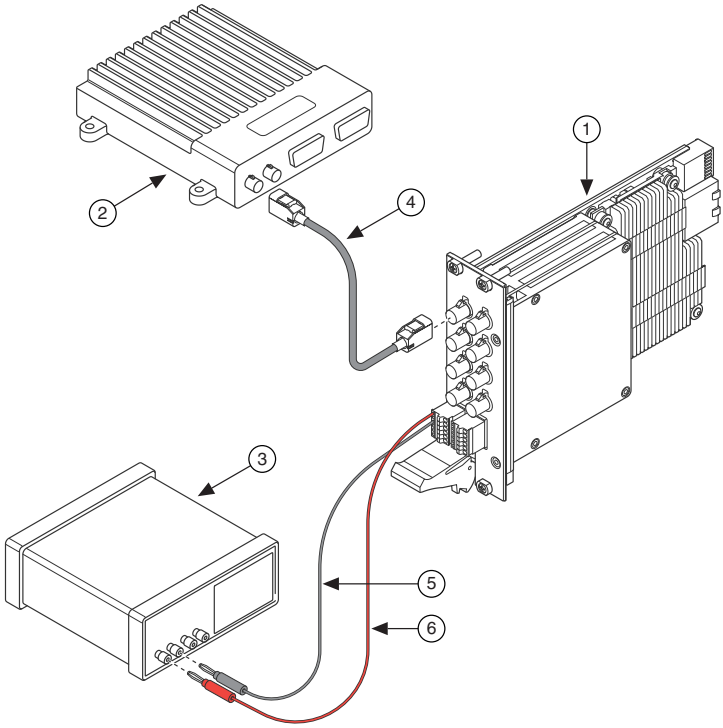
Refer to the following diagrams for examples of cabled configurations.

Figure 2. PXIe-1487 Deserializer



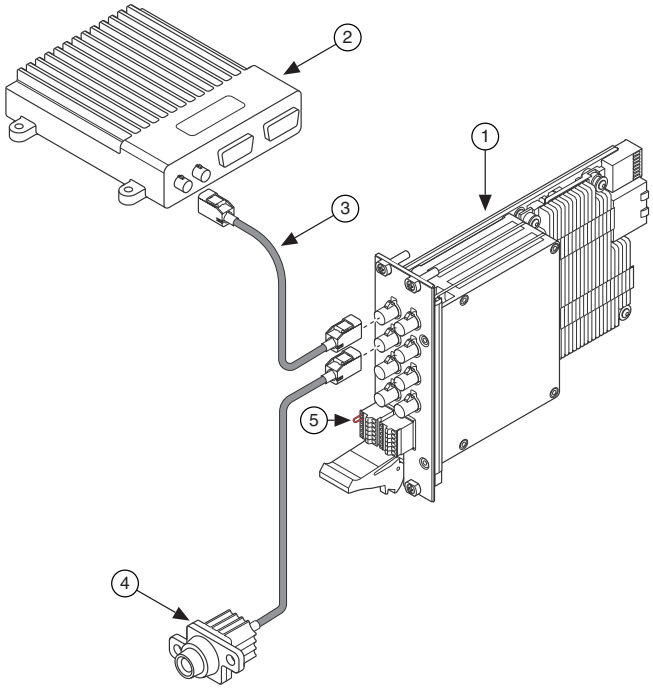
1. PXIe-1487 Deserializer Module
2. Camera or Serial Device
3. Power Source
4. FAKRA Female Code Z to Serial Device Connector Cable
5. Power Connector Wire, Grounding
6. Power Connector Wire, Positively Charged

Figure 3. PXIe-1487 Serializer



1. PXIe-1487 Serializer Module
2. Engine Control Unit (ECU)
3. Power Sink
4. FAKRA Female Code Z to FAKRA Female Code Z Cable
5. Power Connector Wire, Grounding
6. Power Connector Wire, Positively Charged

Figure 4. PXIe-1487 SerDes



1. PXIe-1487 SerDes Module
2. Engine Control Unit (ECU)
3. FAKRA Female Code Z to FAKRA Female Code Z Cable
4. Camera or Serial Device
5. Power Connector Wire, Positively Charged

Note In the PXIe-1487 SerDes module configuration shown, the power connector wire allows the ECU to power the camera or serial device.

Related Information

PXIe-1487 Deserializer Front Panel, Connectors, and Block Diagram on page 11

PXIe-1487 Serializer Front Panel, Connectors, and Block Diagram on page 14

PXIe-1487 SerDes Front Panel, Connectors, and Block Diagram on page 17

Configuring the PXIe-1487 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-1487.
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.

Accessing FlexRIO with Integrated I/O Examples

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

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 will open.
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 this 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.com/examples*.

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 the use of the Vivado Project Export feature.
- `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-1487 ships with socketed CLIP items that add module I/O to the LabVIEW project.

Front Panels, Connectors, and Block Diagrams

PXIe-1487 Deserializer Front Panel, Connectors, and Block Diagram

Figure 5. PXIe-1487 Deserializer Front Panel

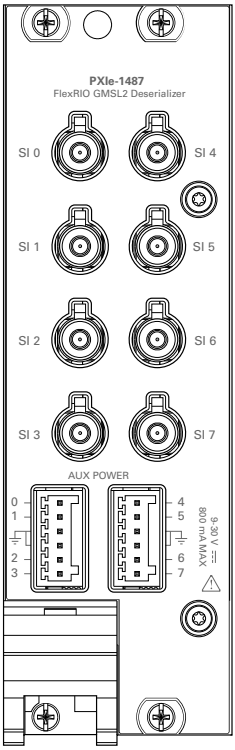


Table 2. PXIe-1487 Deserializer Front Panel Connectors Signal Descriptions

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

Table 2. PXIe-1487 Deserializer Front Panel Connectors Signal Descriptions (Continued)

Signal Name	Description	FlexRIO Terminal Name
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 6. PXIe-1487 Deserializer AUX Power Connectors

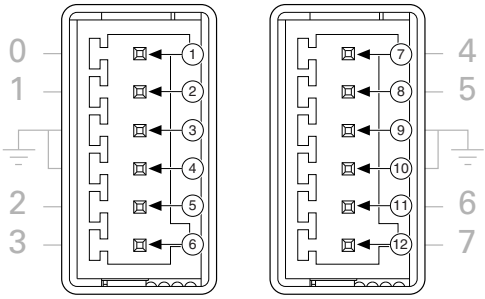


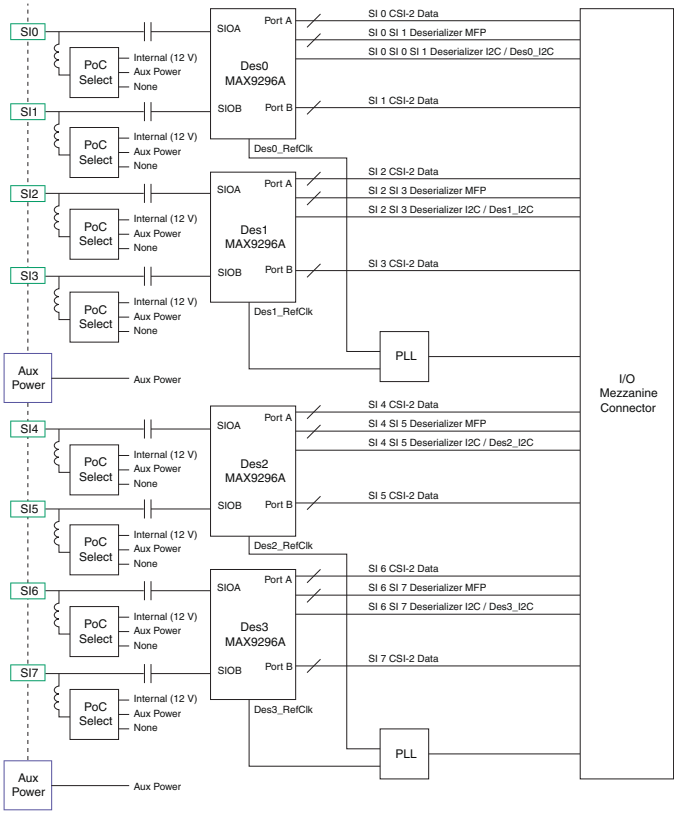
Table 3. PXIe-1487 Deserializer AUX Power Connectors Signal Descriptions

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
8	Power supply for channel SI 5
9	Digital/chassis grounding
10	Digital/chassis grounding

Table 3. PXIe-1487 Deserializer AUX Power Connectors Signal Descriptions (Continued)

Signal Pin	Description
11	Power supply for channel SI 6
12	Power supply for channel SI 7

Figure 7. PXIe-1487 Deserializer I/O Block Diagram



PXIe-1487 Serializer Front Panel, Connectors, and Block Diagram

Figure 8. PXIe-1487 Serializer Front Panel

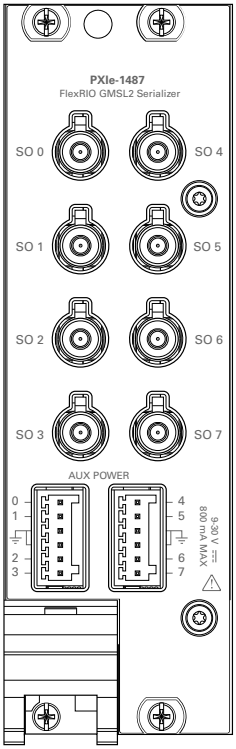


Table 4. PXIe-1487 Serializer Front Panel Connectors Signal Descriptions

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

Table 4. PXIe-1487 Serializer Front Panel Connectors Signal Descriptions (Continued)

Signal Name	Description	FlexRIO Terminal Name
SO 6	Serial output from internal serializer	SO6
SO 7	Serial output from internal serializer	SO7

Figure 9. PXIe-1487 Serializer AUX Power Connectors

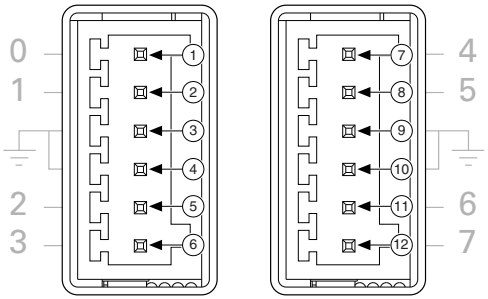
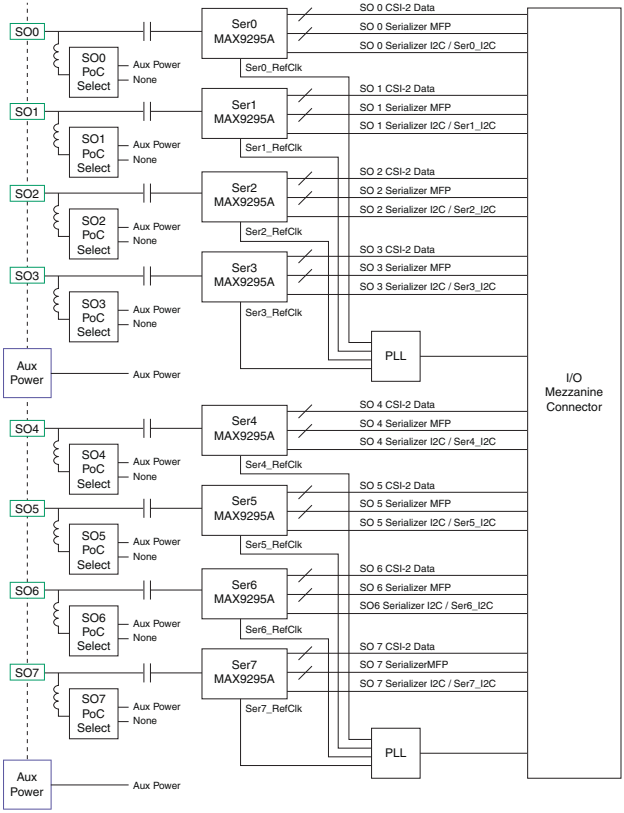


Table 5. PXIe-1487 Serializer AUX Power Connectors Signal Descriptions

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
11	Power sink for channel SO 6
12	Power sink for channel SO 7

Figure 10. PXIe-1487 Serializer I/O Block Diagram



PXIe-1487 SerDes Front Panel, Connectors, and Block Diagram

Figure 11. PXIe-1487 SerDes Front Panel

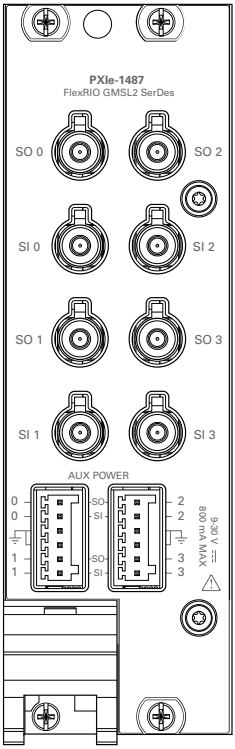


Table 6. PXIe-1487 SerDes Front Panel Connectors Signal Descriptions

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

Table 6. PXIe-1487 SerDes Front Panel Connectors Signal Descriptions (Continued)

Signal Name	Description	FlexRIO Terminal Name
SO 3	Serial output from internal serializer	SO3
SI 3	Serial input to internal deserializer	SI3

Figure 12. PXIe-1487 SerDes AUX Power Connectors

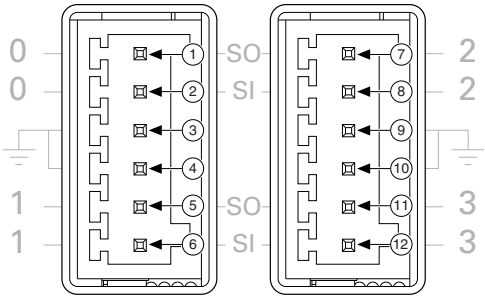
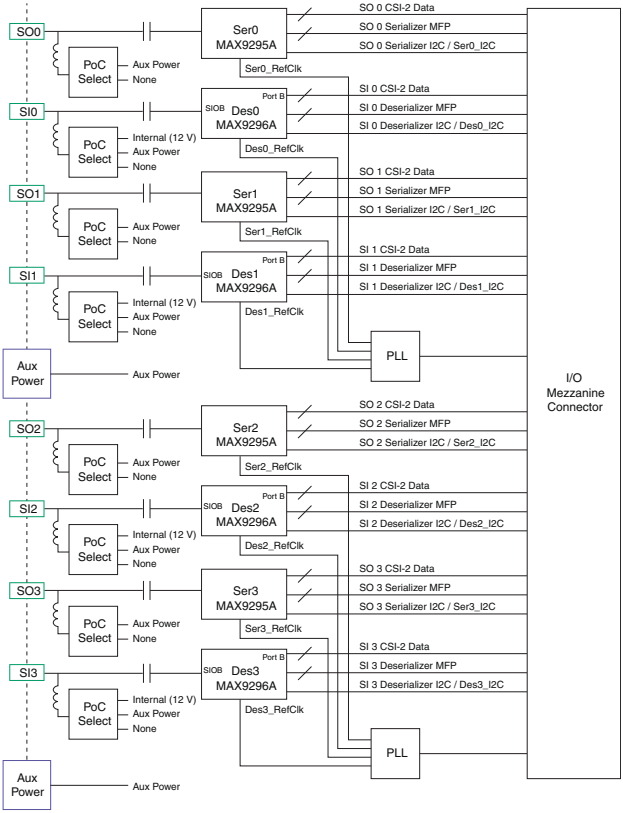


Table 7. PXIe-1487 SerDes AUX Power Connectors Signal Descriptions

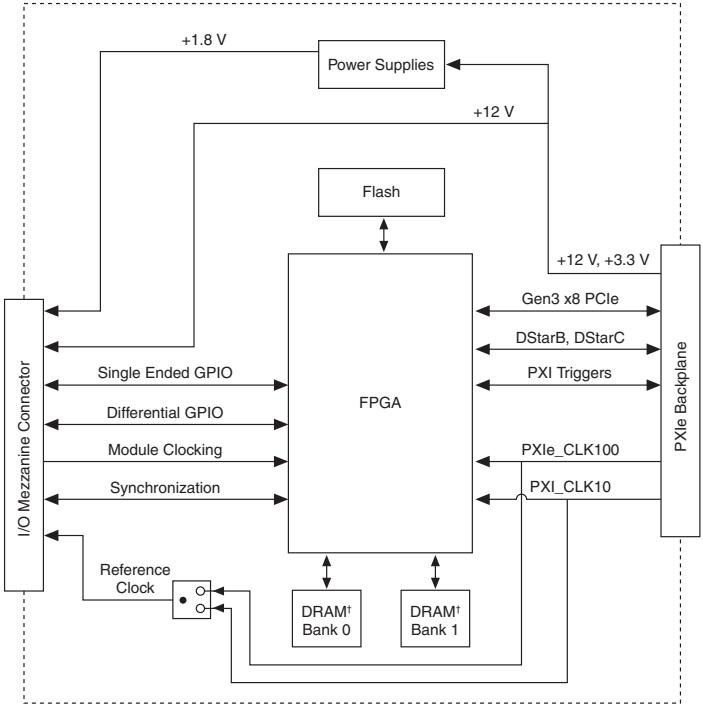
Signal Pin	Description
1	Power sink for channel SO 0
2	Power supply for channel SI 0
3	Digital/chassis grounding
4	Digital/chassis grounding
5	Power sink for channel SO 1
6	Power supply for channel SI 1
7	Power sink for channel SO 2
8	Power supply for channel SI 2
9	Digital/chassis grounding
10	Digital/chassis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

Figure 13. PXIe-1487 SerDes I/O Block Diagram



FPGA Carrier Block Diagram

Figure 14. PXIe-1487 FPGA Block Diagram



Where to Go Next

Before you can use your system, you need to configure the connection between the serial device and the PXIe-1487, build your application, then test and troubleshoot your application.

Contact NI for more information about developing the software resources to operate your system. See *FlexRIO Documentation and Resources* for additional information.

NI Services

Visit *ni.com/support* to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit *ni.com/services* to learn about NI service offerings such as calibration options, repair, and replacement.

Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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