

Components of an NI FlexRIO System

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Overview

NI FlexRIO instruments consist of FPGA modules that you can program with the NI LabVIEW FPGA Module and adapter modules that provide high-performance analog and digital I/O. The adapter modules are interchangeable and define the I/O available in the LabVIEW FPGA programming environment.

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Figure 1. NI FlexRIO instruments combine FPGA modules and adapter modules.

1. NI FlexRIO FPGA Modules

NI FlexRIO FPGA modules feature PXI and PXI Express devices with Xilinx Kintex-7 FPGAs, onboard DRAM, high-performance NI application-specific integrated circuits (ASICs), and an interface to NI FlexRIO adapter modules that provide I/O to the FPGA. The adapter module interface consists of 132 lines of general-purpose digital I/O directly connected to FPGA pins, in addition to the power, clocking, and supplementary circuitry necessary to define the interface. You can configure these 132 lines for single-ended operation at rates of up to 400 Mbit/s and differential operation at rates of up to 1 Gbit/s for a maximum I/O bandwidth of 66 Gbit/s (8.25 GB/s). All lines are routed with controlled-impedance, matched-length traces, and the differential pairs are routed together.

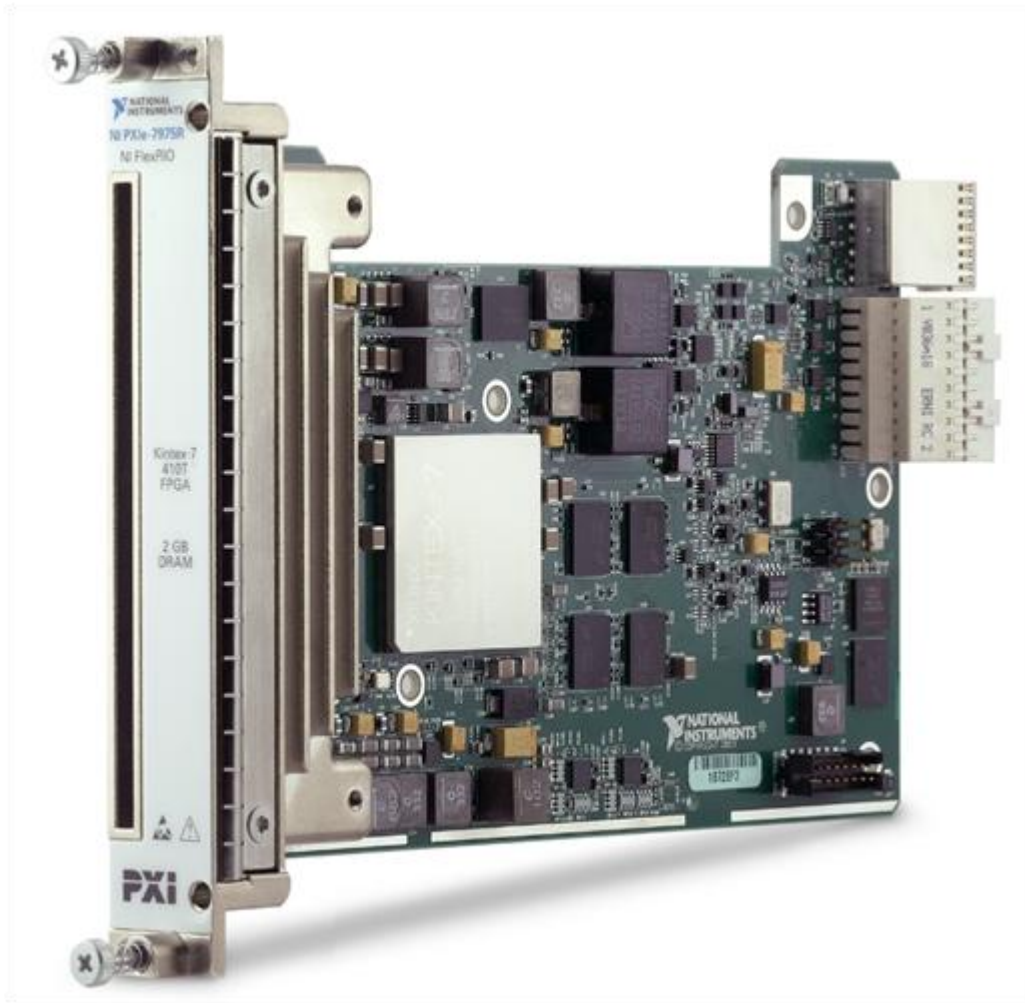


Figure 2. NI FlexRIO FPGA modules offer peer-to-peer data streaming technology.

A unique feature of PXI Express NI FlexRIO FPGA modules is that they are capable of streaming data between modules at rates of 3 GB/s without routing data through the host chipset. Up to 16 such streams are supported, simplifying complex multi-FPGA communication schemes without taxing host CPU resources. For more information on this technology, refer to the white paper titled [An Introduction to Peer-to-Peer Data Streaming](#).

Table 1 shows the different bus, FPGA, and memory options for the NI FlexRIO FPGA modules.

Model	Bus/Form Factor	FPGA	FPGA Slices	FPGA DSP Slices	FPGA Memory (Block RAM)	Onboard Memory (DRAM)
NI PXIe-7966R	PXI Express	Virtex-5 SX95T - 2	14,720	640	8,784 kbits	512 MB
NI PXIe-7965R	PXI Express	Virtex-5 SX95T	14,720	640	8,784 kbits	512 MB
NI PXIe-7962R	PXI	Virtex-5	8,160	288	4,752 kbits	512 MB

	Express	SX50T				
NI PXIe-7961R	PXI Express	Virtex-5 SX50T	8,160	288	4,752 kbits	0 MB
NI PXI-7954R	PXI	Virtex-5 LX110	17,280	64	4,608 kbits	128 MB
NI PXI-7953R	PXI	Virtex-5 LX85	12,960	48	3,456 kbits	128 MB
NI PXI-7952R	PXI	Virtex-5 LX50	7,200	48	1,728 kbits	128 MB
NI PXI-7951R	PXI	Virtex-5 LX30	4,800	32	1,152 kbits	0 MB

Table 1. NI FlexRIO FPGA Module Comparison

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2. NI FlexRIO Adapter Modules

Adapter modules from NI, National Instruments Alliance Partners, and third parties interface with NI FlexRIO FPGA modules through a card-edge connector that routes the necessary FPGA signals to the adapter module. You also can build your own adapter modules with the NI FlexRIO Adapter Module Development Kit (MDK).



Figure 3. NI, National Instruments Alliance Partners, and third parties offer adapter modules that interface with NI FlexRIO FPGA modules.

NI FlexRIO Adapter Modules From National Instruments

NI FlexRIO adapter modules from National Instruments provide general-purpose I/O that you can use to customize your instrumentation without building custom hardware. They feature a simple FPGA-based programming interface that does not require HDL design knowledge, along with LabVIEW FPGA examples to get up and running quickly. View a full list of [NI FlexRIO adapter modules](#).

Third-Party Adapter Modules for NI FlexRIO

Third-party adapter modules for NI FlexRIO expand the breadth of I/O in the product family and allow LabVIEW FPGA to enter a wider variety of application areas. These modules are both custom and application-specific. View a full list of [third-party adapter modules for NI FlexRIO](#).

Custom NI FlexRIO Adapter Module Development

With the NI FlexRIO Adapter Module Development Kit (MDK), you can build your own NI FlexRIO adapter modules that are exactly tailored to your application. This process requires electrical, mechanical, analog, digital, firmware, and software design considerations. In addition to the interface described above, NI FlexRIO adapter modules are supplied with approximately 6 W of power, feature an onboard EEPROM for self-identification, and support the following I/O standards. Learn more about the [NI FlexRIO Adapter Module Development Kit](#).

	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V
LVTTL	—	—	—	—	✓
LVCMOS	✓	✓	✓	✓	✓
LVDCI	—	✓	✓	✓	✓
LVDS	—	—	—	✓	—

Table 2. Supported I/O Standards on the NI FlexRIO Adapter Module Interface

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3. Related Resources

- [NI FlexRIO Family](#)
- [NI FlexRIO Frequently Asked Questions](#)
- [Introduction to NI FlexRIO Webcast](#)
- [FPGA Technology Information](#)
- [NI FlexRIO Adapter Modules](#)
- [Third-Party Adapter Modules for NI FlexRIO](#)
- [Purchase the NI FlexRIO Adapter Module Development Kit](#)