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Technical Sales

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Requirements and Compatibility | Ordering Information | Detailed Specifications
For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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NI 9159



- 14-slot reconfigurable FPGA chassis that accepts CompactRIO I/O modules
- Xilinx Virtex-5 LX110 reconfigurable I/O (RIO) FPGA core for ultimate processing power
- High-throughput, software-transparent, MXI-Express x1 interface based on PCI Express
- 19 in. rack (2U), desktop, DIN-rail, and panel mounting options
- Daisy chain multiple chassis from PXI controllers, industrial PCs, and laptops
- 0 to 55 ºC operating temperature range

Overview

The NI 9159 MXI-Express RIO expansion chassis is a cabled reconfigurable I/O (RIO) target for high-performance applications. It features a high-performance Virtex-5 LX110 FPGA and a high-throughput cabled connection with theoretical data rates up to 250 MB/s, which is 20 times greater throughput than Ethernet or EtherCAT expansion chassis offer.

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Requirements and Compatibility

OS Information

- Linux®
- PharLap
- Windows

Driver Information

- NI-RIO

Software Compatibility

- LabVIEW
- LabVIEW FPGA Module
- LabVIEW Professional Development System
- LabVIEW Real-Time Module

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Comparison Tables

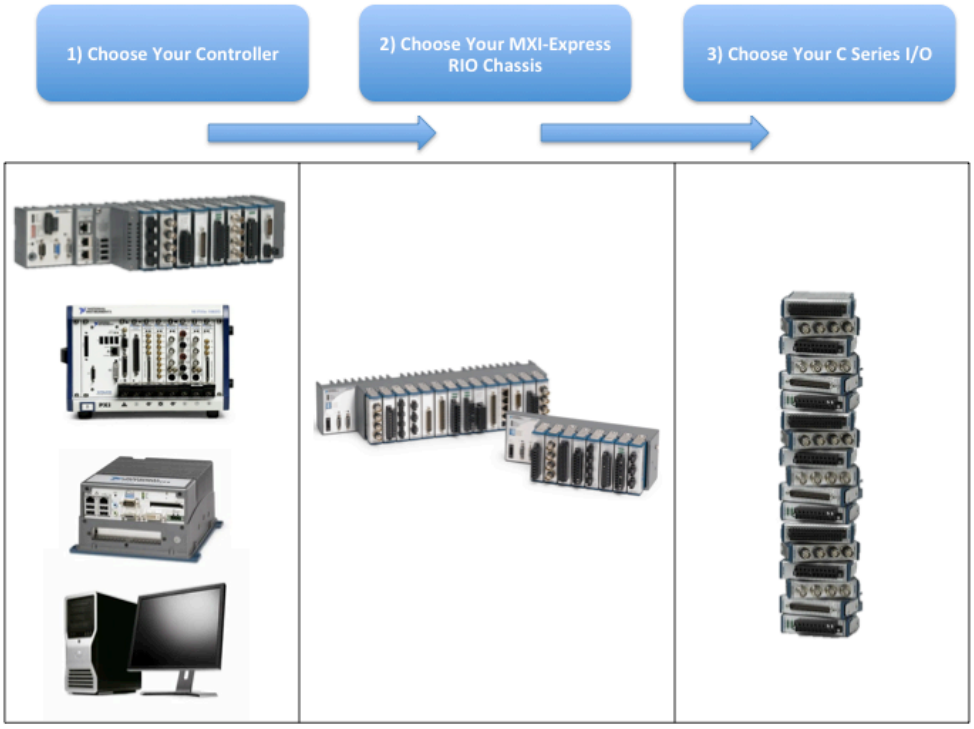
Chassis	Number of Slots	FPGA
NI 9154	8	Virtex-5 LX50
NI 9157	14	Virtex-5 LX85
NI 9159	14	Virtex-5 LX110

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Application and Technology

The NI 9159 MXI-Express RIO expansion chassis offers a high-performance solution for applications that require high-channel counts, custom signal processing and control algorithms, and mixed-signal conditioned I/O. It features 14 C Series I/O module slots and a best-in-class Virtex-5 LX110 FPGA. You can daisy chain up to six chassis and communicate to a host controller over a cabled PCI Express x1 link for 20 times greater throughput than Ethernet or EtherCAT expansion chassis provide. This cabled design allows for connection to dual- and quad-core PC, PXI, and industrial controllers running a LabVIEW Real-Time or Windows OS for the highest performance RIO system available.

You can connect the NI 9159 to a variety of hosts and directly connect it to a multicore CompactRIO controller or an NI industrial controller. You can also use ExpressCard adapters, PXI/PXI Express to MXI-Express adapters, or PCI Express to MXI-Express adapters to connect the NI 9159 to industrial PCs or PXI embedded controllers.



MXI-Express RIO System Setup

Combining a high-performance processor and an FPGA over a high-throughput connection makes the NI 9159 ideal for applications that require the following:

High-Channel-Count Streaming: The MXI-Express bus is essentially a x1 PCI Express link (250 MB/s theoretical) that provides the ability to stream data at high rates both upstream and downstream. It features eight slots, and you can daisy chain up to six chassis and connect up to eight chains to the same controller to offer over 600 slots of C Series I/O.

Customizable Mixed I/O: The C Series platform provides flexible, signal conditioned I/O. Each module contains its own signal conditioning and terminal block for efficient connectivity to signals close to their sources. Featuring over 100 modules, the C Series platform offers the ability to mix and match I/O in a standard chassis for flexible, mixed I/O systems.

Intensive Deterministic Processing: Equipped with an onboard LX110 FPGA, the NI 9159 is well suited for applications that require intensive deterministic calculations. With the high-performance FPGA, you can offload processing from the controller, implement system-critical functionality, and customize I/O interfaces in hardware.

System Flexibility: The NI 9159 is compatible with a variety of controllers. Combine it with a multicore CompactRIO controller for a rugged system that meets extended temperature, shock, and vibration standards. Use the NI 9159 with a PXI controller to provide C Series expansion I/O in a PXI-based system with a powerful multicore processor and the choice of a Windows or real-time OS. Pair the NI 9159 with an industrial controller or an NI Embedded Vision System for a compact, rugged system to address vision or motion I/O needs. Or connect the NI 9159 to a desktop PC or laptop with a MXI-Express interface for a flexible I/O extension to your development environment for testing and prototyping.

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Ordering Information

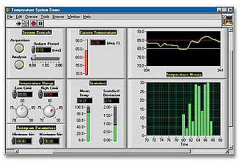
For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
MXI-Express RIO Chassis (14-Slot)			
NI 9159 MXI-Express RIO	781315-01	No accessories required.	
NI 9157 MXI-Express RIO	781316-01	No accessories required.	
MXI-Express RIO Chassis (8-Slot)			
NI 9154 MXI-Express RIO	782457-01	No accessories required.	

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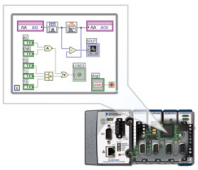
Software Recommendations

LabVIEW Professional Development System for Windows



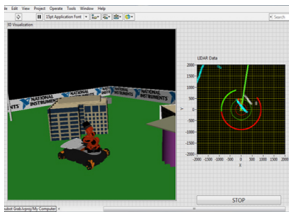
- Advanced software tools for large project development
- Automatic code generation using DAQ Assistant and Instrument I/O Assistant
- Tight integration with a wide range of hardware
- Advanced measurement analysis and digital signal processing
- Open connectivity with DLLs, ActiveX, and .NET objects
- Capability to build DLLs, executables, and MSI installers

NI LabVIEW FPGA Module



- Create your own I/O hardware without VHDL coding or board design
- Graphically configure FPGAs on NI reconfigurable I/O (RIO) hardware targets
- Define your own control algorithms with loop rates up to 300 MHz
- Execute multiple tasks simultaneously and deterministically
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx CORE Generator functions

NI LabVIEW Robotics Module



- Graphical and textual programming environment
- I/O connectivity for desktop, real-time systems, and FPGAs
- Inherent parallelism for concurrent tasks
- Hardware abstracted I/O layer for simulated and real sensors and actuators
- 3D physics-based robotics simulation environment for designing and prototyping algorithms
- Tools for importing existing code from C/C++ and VHDL

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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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Detailed Specifications

Reconfigurable Embedded Chassis with Integrated MXI-Express (x1)	

The following specifications are typical for the 0 to 55 °C operating temperature range unless otherwise noted. These specifications are for the NI 9157/9159 reconfigurable embedded chassis only. For I/O module specifications, refer to the module operating instructions.

MXI-Express	
Maximum cable length	7 m

Reconfigurable FPGA	
NI 9157	
FPGA type	Virtex-5 LX85
Number of flip-flops	51,840
Number of 6-input LUTs	51,840
Number of DSP48 slices (25 × 18 multipliers)	48
Embedded block RAM	3,456 kbits
NI 9159	
FPGA type	Virtex-5 LX110
Number of flip-flops	69,120
Number of 6-input LUTs	69,120
Number of DSP48 slices (25 × 18 multipliers)	64
Embedded block RAM	4,608 kbits
Timebases	40, 80, 120, 160, or 200 MHz
Accuracy	±100 ppm (max)
Frequency dependent jitter (peak-to-peak)	
40 MHz	250 ps
80 MHz	422 ps
120 MHz	422 ps
160 MHz	402 ps
200 MHz	402 ps

Power Requirements	

Caution You must use the NI 9157/9159 with a 9 to 30 VDC output, UL Listed, limited power source (LPS) supply. The power supply must bear the UL Listed and LPS marks. The power supply must also meet any safety and compliance requirements for the country of use.

Recommended power supply	55 W, 30 VDC max
Voltage requirement	9 to 30 V
Chassis power consumption/dissipation	
NI 9157	
With no I/O modules	15.2 W (max)
With 14 I/O modules	31.6 W (max)

NI 9159	
With no I/O modules	15.6 W (max)
With 14 I/O modules	32 W (max)

Note The power consumption specifications in this document are maximum values for a LabVIEW FPGA application compiled at 80 MHz. Your application power requirements may be different. To calculate the power requirements of the NI 9157/9159, add the power consumption/dissipation for the chassis and the I/O modules you are using. Keep in mind that the resulting total power consumption is a maximum value and that the NI 9157/9159 may require less power in your application. For more information about the I/O module power requirements, refer to the module operating instructions.

Physical Characteristics

If you need to clean the chassis, wipe it with a dry towel.	
Screw-terminal wiring	12–18 AWG copper conductor wire with 10 mm (0.39 in.) of insulation stripped from the end
Torque for screw terminals	0.5 to 0.6 N · m (4.4 to 5.3 lb · in.)
Chassis weight	2,231 g (78.7 oz)

Environmental

The NI 9157/9159 is intended for indoor use only.	
Operating temperature (IEC-60068-2-1 and IEC-60068-2-2)	0 °C to 55 °C

Note Refer to the mounting instructions in the Operating Instructions and Specifications for the NI 9157/9159. Failure to follow the mounting instructions can cause temperature derating. For more information about mounting configurations and temperature derating, go to ni.com/info and enter the info code *criomounting*.

Storage temperature (IEC-60068-2-1 and IEC-60068-2-2)	– 40 °C to 85 °C
Ingress protection	IP 40
Operating humidity (IEC-60068-2-56)	10 to 90% RH, noncondensing
Storage humidity (IEC-60068-2-56)	5 to 95% RH, noncondensing
Maximum altitude	2,000 m
Pollution Degree (IEC 60664)	2

Shock and Vibration

To meet these specifications, you must panel mount the chassis and affix ferrules to the ends of the terminal lines.	
Operating vibration, random (IEC 60068-2-64)	5 grms, 10 to 500 Hz
Operating vibration, sinusoidal (IEC 60068-2-6)	5 g, 10 to 500 Hz
Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine, 50 g, 3 ms half sine, 18 shocks at 6 orientations

Safety

Safety Voltages

Connect only voltages that are within these limits.	
V-to-C	30 V max, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

Caution Do not connect to signals or use for measurements within Measurement Categories II, III, or IV.

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification, search by module number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit ni.com/environment/weee.htm.

电子信息产品污染控制管理办法 （中国 RoHS）



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