

CompactRIO

Build And Deploy Real-Time Applications



Use CompactRIO for:

- Real-time processing needs
- Industrial monitoring and control
- Deterministic control and long-term field testing
- Validating embedded control in HIL
- Machine vision, image processing & motion control

Popular Features

Ihr NI-Partner:



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Integration
Partner

SYSTEM INTEGRATOR

Real-time

NI Linux Real-Time OS
Reliable, secure &
deterministic

FPGA

User-programmable.
No HDL expertise.
No control latency.

I/O Options

High breadth and quality,
with over 100 I/O modules

Rugged

-40°..70° C Temp range
50g shock



What Is CompactRIO?

CompactRIO systems provide high-performance processing capabilities, sensor-specific conditioned I/O, and an integrated software toolchain- ideal for Industrial Internet of Things, monitoring, and control applications. The real-time processor offers reliable, predictable behavior, while the FPGA excels at smaller tasks that require high-speed logic and precise timing.

Flexible Development Options

Abstract low-level code and use a single toolchain to build and deploy time-critical applications using LabVIEW.

Long-Term Data Acquisition

Utilize the integrated controller running a Linux Real-Time OS and sensor-specific I/O modules to build and deploy robust applications.



Combined DAQ and Control

Take advantage of the user-programmable FPGA and integrate existing intellectual property (IP) when you need to acquire high-quality data and process and respond to it in real time.

Open, Secure Platform

Harness the openness of the NI Linux Real-Time OS through thousands of open-source applications, IP, and examples, while collaborating with an active community of users and developers.

Chassis and Controller



Options

- Ethernet: 4 slot or 8 slot
- Processor: Dual or Quad core (1.3- 1.91 GHz) Intel Atom
- FPGA: Artix-7 and Kintex-7 options
- NI-DAQmx compatibility

Features

- -40-70C Operating temperature
- 50g/5gRMS Operational shock and vibration
- Conformal coating options
- NI Linux Real-Time OS

Modules



Measurement Options

- Voltage input/output
- Digital input/output
- Thermocouples and RTDs
- Accelerometers and microphones
- Strain gages
- Load cells, pressure transducers, torque cells
- Over 100 modules available!

Choose Your Modules!

CompactRIO Modules connect to many sensors or buses and provide analog and digital I/O, machine vision, and image processing, motion control, and more. Designed for harsh environments, use them in your control and monitoring systems.

Signal Type	Channel Count	Measurement Types	Max Sample Rate	Special Features	Example Models
Analog Input¹					
Voltage	2, 3, 4, 8, 16, 32	± 200 mV, ± 500 mV, ± 1 V, ± 5 V, ± 10 V, ± 60 V, $3 V_{rms}$, $400 V_{rms}$, $800 V_{rms}$, $300 V_{rms}$	20 MS/s/ch	Up to channel-channel isolation, anti-aliasing and configurable filtering	NI-9205, NI-9220, NI-9215, NI-9223
Current	3, 4, 8, 16	± 20 mA, $0-5 A_{rms}$, $0-20 A_{rms}$, $0-50 A_{rms}$	200 kS/s	Up to channel-channel isolation, built-in channel diagnostics	NI-9203, NI-9208
Voltage and Current	16	± 20 mA and ± 10 V	500 S/s	channel-earth isolation, built-in noise rejection	NI-9207
Universal	2, 4	V, mA, TC, RTD, Strain, Ω , IEPE	51.2 kS/s/ch	Up to channel-channel isolation, bridge completion, anti-aliasing filters, built-in shunt resistors, amplification	NI-9219
Thermocouple	4, 8, 16	J, K, T, E, N, B, R, and S types	95 S/s/ch	Up to channel-channel isolation, amplification, filtering, CJC	NI-9213, NI-9214
RTD	4, 8	100 Ω , 1000 Ω	400 S/s	50/60 Hz filtering, bank isolation	NI-9216
Strain/Bridge Based	4, 8	$\frac{1}{4}$, $\frac{1}{2}$, full bridge (120 or 350 Ω)	50 kS/s/ch	External excitation, bridge completion, anti-aliasing filters	NI-9237, NI-9235
Sound and Vibration	2, 3, 4, 8	± 5 V, ± 30 V	102.4 kS/s/ch	IEPE, anti-aliasing filters	NI-9234, NI-9232
Analog Output					
Voltage ¹	2, 4, 6, 16	$3 V_{rms}$, ± 10 V, ± 40 V (stacked)	1 MS/s/ch	Up to bank isolation	NI-9264, NI-9263
Current ²	4, 8	± 20 mA	100 kS/s/ch	Channel-earth isolation, built-in open-loop detection	NI-9265
Digital I/O					
Input/Output	4, 6, 8, 16, 32	TTL (3.3 V or 5 V) RS422, 5 V, 12 V, 24 V, 48 V, 72 V, 96 V, 120 V AC, 120 V DC, 240 V AC, 240 V DC	55 ns	Up to channel-channel isolation, sinking or sourcing input, bidirectional channel options	NI-9375, NI-9421, NI-9472
Relay Output	4, 8	60 V DC, 30 Vrms, 250 Vrms	1 op/s	Up to channel-channel isolation, SPST or SSR relays	NI-9482
Communication Buses					
CAN	1	HS/FD, LS/FT CAN	1 Mb/s	—	NI-9861, NI-9862
LIN	1	LIN	20 kb/s	—	NI-9866
Serial Interface	4 ports	RS232, RS485/RS422	921.6 kb/s	—	NI-9870, NI-9871

¹Up to 24-bit resolution

²Up to 16-bit resolution

Call your distributor for a full list!



Develop Your System Faster with LabVIEW



LabVIEW is a graphical programming environment engineers use to develop automated research, validation, and production test systems.

Maximize Productivity with LabVIEW

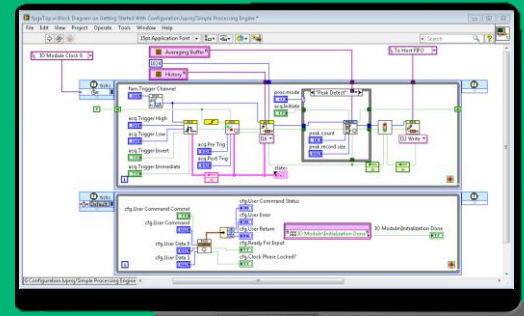
- **Graphical Programming**—Visualize your application with a natural flowchart-like data flow.
- **Customizable User Interfaces**—Create custom user interfaces with pre-built objects for real-time data display, user input, and interactive analysis.
- **Code Re-Use**—Call existing IP written in Python, C, MATLAB®, and .NET from your LabVIEW code.

Program CompactRIO Intuitively

- **A single software toolchain** — Use LabVIEW Real-time and FPGA modules to program both the processor and user-programmable FPGA.
- **LabVIEW FPGA Module**—LabVIEW reduces complexity by abstracting difficult concepts. Program with little knowledge of HDLs like VHDL or Verilog.
- **Distributed Measurement and Control**—with network-based time synchronization and deterministic communication.
- **Cloud Compile**—Leverage NI online service support to reduce code compile time.
- **Boost Security**—Increase reliability with native support for Security-Enhanced Linux.

Connect to the Outside World

- **Create an industrial gateway** and connect to a variety of devices and infrastructures with native support for industrial protocols like PROFINET, OPC UA, and EtherCAT.
- **Design interactive, feature-rich GUIs** and connect to local, remote, or mobile HMIs for data visualization and operator interfaces.
- **Control Third-Party Hardware**—Connect directly to industrial cameras and motors to create custom image processing and motion control algorithms.



"Not only is the CompactRIO-based Aston Martin Racing measurement system reliable and high-precision, it was deployed at a significantly lower cost than other fixed-functionality systems on the market".

- Paul Riley

Computer Controlled Solutions Ltd



Getting Started with CompactRIO



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