

# CompactRIO Real-Time Embedded Controllers

## NI cRIO-900x

- Small, rugged, high-reliability embedded real-time processor for intelligent stand-alone operation
- Executes powerful floating-point algorithms with deterministic real-time performance
- Low power consumption with dual DC supply inputs for redundancy
- 10/100BaseT Ethernet port with built-in LabVIEW remote panel Web server and FTP file sharing server
- RS232 serial port for peripheral devices

### Operating System

- LabVIEW Real-Time (ETS)

### Development Environment

- LabVIEW Full or Professional Development System for Windows
- LabVIEW Reconfigurable I/O Software Development Kit (includes LabVIEW Real-Time and LabVIEW FPGA modules and developer toolkits)

### Driver Software

- NI-RIO for reconfigurable embedded systems



Product	DRAM Memory (MB)	Internal Nonvolatile Storage (MB)	10/100BaseTX Ethernet Port	RS232 Serial Port	LEDs	DIP Switches	Power Supply Input Range	Power Consumption	Backup Power Input	Remote Panel Web Server	FTP Server
cRIO-9002	32	64	✓	✓	4	5	9 to 35 VDC	7 W max	✓	✓	✓
cRIO-9004	64	512	✓	✓	4	5	9 to 35 VDC	7 W max	✓	✓	✓

Table 1. cRIO-900x Selection Guide

## Overview and Applications

National Instruments cRIO-900x real-time embedded controllers offer powerful stand-alone embedded execution for deterministic LabVIEW Real-Time applications. The NI cRIO-9002 includes 32 MB of DRAM memory and 64 MB of nonvolatile flash storage for file storage. The cRIO-9004 includes 64 MB of DRAM memory and 512 MB of nonvolatile flash storage for data-logging applications. Both controllers are designed for extreme ruggedness, reliability, and low power consumption with dual 9 to 35 VDC supply inputs that deliver isolated power to the CompactRIO chassis/modules and a -40 to 70 °C temperature range. A 195 MHz industrial processor balances low power consumption with powerful real-time floating-point signal processing and analysis capabilities for deterministic control loops exceeding 1 kHz.

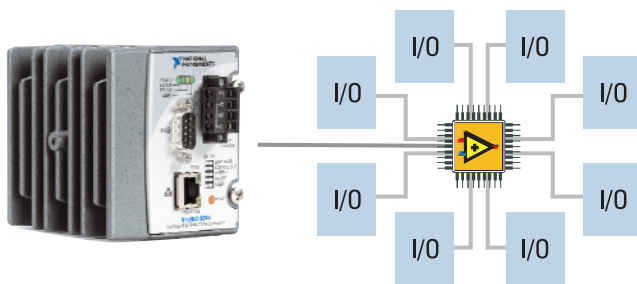


Figure 1. CompactRIO Hardware Architecture

## System Configuration

The CompactRIO real-time controller connects to any 4- or 8-slot CompactRIO reconfigurable chassis. The user-defined FPGA circuitry in the chassis controls each I/O module and passes data to the controller through a local PCI bus, using built-in communication functions.

## Embedded Software

You can synchronize embedded code execution to an FPGA-generated interrupt request (IRQ) or an internal millisecond real-time clock source. The LabVIEW Real-Time ETS OS provides reliability and simplifies the development of complete embedded applications that include time-critical control and acquisition loops in addition to lower-priority loops for postprocessing, data logging, and Ethernet/serial communication. Built-in elemental I/O functions such as the FPGA Read/Write function provide a communication interface to the highly optimized reconfigurable FPGA circuitry. Data values are read from the FPGA in integer format, and then converted to scaled engineering units in the controller.

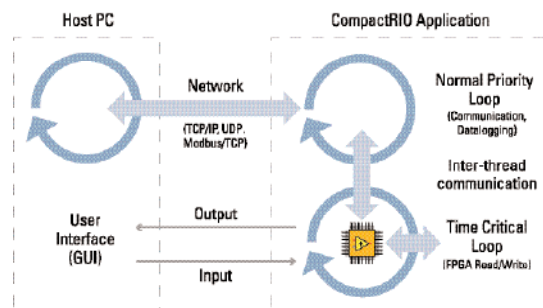


Figure 2. CompactRIO Software Architecture



## CompactRIO Real-Time Embedded Controllers

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### Built-In Servers

In addition to programmatic communication via TCP/IP, UDP, Modbus/TCP, IrDA, and serial protocols, the CompactRIO controllers include built-in servers for Virtual Instrument Software Architecture (VISA), HTTP, and FTP. The VISA server provides remote download and communication access to the reconfigurable I/O (RIO) FPGA over Ethernet. The HTTP server provides a Web browser user interface to HTML pages, files, and the user interface of embedded LabVIEW applications through a Web browser plug-in. The FTP server provides access to logged data or configuration files.

### Ordering Information

NI cRIO-9002 .....	779000-01
NI cRIO-9004 .....	779055-01

### Accessories

NI 9937 4-pos controller power supply plugs (quantity 10) .....	779106-01
NI 9938 4-pos strain relief and high voltage screw-terminal connector kit .....	192665-01

### **BUY NOW!**

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to [ni.com/compactrio](http://ni.com/compactrio).

**BUY ONLINE** at [ni.com](http://ni.com) or **CALL 800 813 3693 (U.S.)**

# CompactRIO Real-Time Embedded Controllers

## Specifications

### Network

Network interface .....	10BaseT and 100BaseTX Ethernet
Compatibility .....	IEEE 802.3
Communication rates .....	10 Mb/s, 100 Mb/s, autonegotiated
Maximum cabling distance.....	100 m/segment

### Memory

cRIO-9002	
Nonvolatile .....	64 MB
DRAM .....	32 MB
cRIO-9004	
Nonvolatile .....	512 MB
DRAM .....	64 MB

### Power Requirements

You must use a National Electric Code (NEC) Class 2 power source with the cRIO-900x controllers.

Recommended power supply.....	48 W secondary, 18 to 24 VDC
Power consumption	
Controller only .....	7 W max
Controller supplying power to 8 CompactRIO modules.....	17 W
Power supply	
On power-up .....	9 to 35 V
After power-up .....	6 to 35 V

### Physical Characteristics

Screw-terminal wiring .....	12 to 24 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.)
Weight.....	Approx. 488 g (17.2 oz)

### Safety

#### Safety Voltages

Connect only voltages that are within these limits.

V-to-C .....	30 V max, Installation Category I
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#### Safety Standards

cRIO-900x controllers are designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- EN 61010-1, IEC 61010-1
- UL 61010-1, CSA 61010-1

#### Hazardous Locations

U.S. (UL) .....	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4
Canada (C-UL) .....	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nC IIC T4
Europe (DEMKO) .....	EEx nC IIC T4

### Environmental

cRIO-900x controllers are intended for indoor use only. For outdoor use, mount the CompactRIO system in a suitably rated enclosure.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2) .....	-40 to 70 °C
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**Note:** To meet this operating temperature range, follow the guidelines in the installation instructions for your CompactRIO system.

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

### Shock and Vibration

To meet these specifications, you must panel mount the CompactRIO system and affix ferrules to the end of the terminal wires.

Operating vibration, random (IEC 60068-2-64) .....	5 grms, 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
Operating vibration, sinusoidal (IEC 60068-2-6) .....	5 g, 10 to 500 Hz

### Electromagnetic Compatibility

Emissions .....	EN 55011 Group1, Class A at 10 m FCC Part 15A above 1 GHz
Immunity.....	Industrial levels per EN 61326:1997 + A2:2001, Table A.1
EMC/EMI .....	CE, C-Tick, ICES, and FCC Part 15 (Class A) Compliant

**Note:** For EMC compliance, operate this device with shielded cabling.

### FCC Compliance

Go to [ni.com/info](http://ni.com/info) and enter **rdcriofcc** for information on using this product in compliance with FCC regulations.

### CE Compliance

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

Low-voltage directive (safety) .....	73/23/EEC
Electromagnetic compatibility directive (EMC) .....	89/336/EEC

**Note:** Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, and for UL and other safety certifications, visit [ni.com/certification](http://ni.com/certification).

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integrators. Services range from start-up assistance to turnkey system integration. Visit [ni.com/alliance](http://ni.com/alliance).



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## Hardware Services

### NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with [ni.com/pxiadvisor](http://ni.com/pxiadvisor).

### Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

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