CompactRIO High-Performance Real-Time Controllers

NI cRIO-9012, NI cRIO-9014 NEW!

- Small and rugged embedded real-time controllers
- Execution target for NI LabVIEW Real-Time applications
- Reliable and deterministic operation for stand-alone control, monitoring, and logging
- 400 MHz Freescale MPC5200 real-time processor
- -40 to 70 °C operating temperature range

Operating System
- LabVIEW Real-Time (VxWorks)

Driver Software
- NI-RIO for reconfigurable embedded systems

Overview and Applications

The National Instruments cRIO-901x controllers feature an industrial 400 MHz Freescale MPC5200 real-time processor for deterministic and reliable real-time applications. Both embedded 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 operating temperature range. The cRIO-901x controllers accept 9 to 35 VDC power supply inputs on power-up and 6 to 35 VDC power supply inputs during operation, so they can function for long periods of time in remote applications using a battery or solar power.

With the 10/100 Mb/s Ethernet and serial ports, you can communicate via TCP/IP, UDP, Modbus/TCP, and serial protocols. The cRIO-901x controllers also feature built-in Web (HTTP) and file (FTP) servers. For additional storage capability, cRIO-901x controllers have a full-speed USB host port to which you can connect external USB-based storage media (flash drives and hard drives) for embedded logging applications requiring additional storage. Also, there is a fault-tolerant file system embedded in cRIO-901x controllers that provides increased reliability for data logging.

CompactRIO real-time controllers connect to any 4 or 8-slot cRIO-910x reconfigurable chassis. The embedded FPGA in the chassis controls each I/O module and passes data to the controller through a local PCI bus using built-in communications functions.

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<tbody>
<tr>
<td>cRIO-9012</td>
<td>64</td>
<td>128</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>4</td>
<td>9 to 35 VDC</td>
<td>6 W max</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>cRIO-9014</td>
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<td>2000</td>
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<td>9 to 35 VDC</td>
<td>6 W max</td>
<td>✓</td>
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Embedded Software

The cRIO-901x controllers run the National Instruments LabVIEW Real-Time Module on the Wind River VxWorks real-time operating system (RTOS) for extreme reliability and determinism. You can now use the leading VxWorks RTOS technology to quickly design, prototype, and deploy a customizable COTS embedded system using NI LabVIEW graphical programming tools.

Ordering Information

NI cRIO-9012 .......................................................... 779563-01
NI cRIO-9014 .......................................................... 779564-01

Accessories

NI 9978 (4-pos screw-terminal power supply plugs, quantity 5) ......................................................... 196938-01
NI 9979 (strain relief kit for 4-pos power connector) ........ 196939-01

BUY NOW!

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

Minimum Software Support Information

<table>
<thead>
<tr>
<th>CompactRIO Real-Time Controller</th>
<th>Minimum Version of LabVIEW Real-Time Module</th>
<th>Minimum Version of NI-RIO Driver</th>
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<tbody>
<tr>
<td>cRIO-9012</td>
<td>8.2</td>
<td>2.1</td>
</tr>
<tr>
<td>cRIO-9014</td>
<td>8.2.1</td>
<td>2.1.3</td>
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Specifications subject to change without notice. The following specifications are typical for the range -40 to 70 °C unless otherwise noted.

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

SMB Connector

Output Characteristics

- Logic high: 3.3 V
- Logic low: 0 V
- Driver type: CMOS
- Sink/source current: ±50 mA
- 3-state output leakage current: ±5 µA

Input Characteristics

- Minimum input level: -500 mV
- Maximum input low level: 990 mV
- Minimum input high level: 2.31 V
- Maximum input level: 5.5 V
- Input capacitance: 2.5 pF
- Resistive strapping: 1 kΩ to 3.3 V

USB Port

- Maximum data rate: 12 Mb/s
- Maximum current: 500 mA

Memory

Use the following formula to determine the minimum life span in years of the nonvolatile storage of your cRIO-901x controller:

Minimum life span in years = \[
\frac{\text{Amount of memory in controller (MB) \times 100,000}}{\text{file size (MB) \times write rate (per day)}}\]

Power Requirements

Caution: You must use a National Electric Code (NEC) UL Listed Class 2 power supply with cRIO-901x controllers.

Recommended power supply: 48 W secondary, 18 to 24 VDC

Power consumption

- Controller only: 6 W
- Controller supplying power to eight CompactRIO modules: 20 W

Power supply

- On power-up: 9 to 35 V
- After power-up: 6 to 35 V

Note: The cRIO-901x controllers are guaranteed to power up when 9 V is applied to V and C. After power-up, it can operate on as little as 6 V.

Physical Characteristics

If you need to clean the controller, wipe it with a dry towel.

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 Voltages

Connect only voltages that are within these limits.

V-to-C: 35 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.

Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

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

Note: For UL and other safety certifications, refer to the product label or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.
Electromagnetic Compatibility
This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:
- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note: For EMC compliance, operate this device according to product documentation.

CE Compliance
This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:
- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)

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

Waste Electrical and Electronic Equipment (WEEE)
EU Customers: At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.

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

Environmental
The cRIO-901x controllers are intended for indoor use only. For outdoor use, mount the CompactRIO system in a suitably rated enclosure.

Operating temperature ....................... -40 to 70 °C (meets IEC 60068-2-1, IEC 60068-2-2)

Note: To meet this operating temperature range, follow the guidelines in the installation instructions for your CompactRIO system.

Storage temperature ....................... -40 to 85 °C (meets IEC 60068-2-1, IEC 60068-2-2)
Ingress protection ......................... IP 40
Operating humidity ....................... 10 to 90% RH, noncondensing (meets IEC 60668-2-56)
Storage humidity ......................... 5 to 95% RH, noncondensing (meets IEC 60668-2-56)
Maximum altitude ......................... 2,000 m
Pollution degree ......................... 2 (meets IEC 60664)

Shock and Vibration
To meet these specifications, you must panel mount the CompactRIO system, affix ferrules to the ends of the terminal wires, and install a tie wrap on the USB cable for strain relief. You can use the tie wrap to attach the USB cable to the Ethernet cable.

Operating vibration, random ............... 5 g rms, 10 to 500 Hz (meets IEC 60068-2-64)
Operating shock .......................... 30 g, 11 ms half sine 50 g, 3 ms half sine, 18 shocks at 6 orientations (meets IEC 6068-2-27)
Operating vibration, sinusoidal ........... 5 g, 10 to 500 Hz (meets IEC 6068-2-6)
NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit ni.com/services.

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NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit ni.com/training.

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Our Professional Services Team is composed of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

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We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit ni.com/ssp.

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.

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.

Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit ni.com/services.