Technical Sales

(866) 531-6285
orders@ni.com

Requirements and Compatibility | Ordering Information | Detailed Specifications | Pinouts/Front Panel Connections

For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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NI 9870, NI 9871

- 4 RS232 (TIA/EIA-232) or 4 RS485/RS422 serial ports for CompactRIO
- Baud rates from 14 bit/s to 921.6 kbit/s
- Individual 64 B UART FIFO buffers per port
- Data bits: 5, 6, 7, 8; Stop bits: 1, 1.5, 2; Flow control: XON/OFF, RTS/CTS, None
- 8 to 28 VDC externally powered; PC-MF4-PT cable included
- -40 to 70 °C operating range

Overview

The NI 9870 and NI 9871 C Series serial modules add four RS232 or RS485/RS422 serial ports, respectively, to NI CompactRIO systems. Using an NI LabVIEW FPGA API, you can access the four ports directly from the CompactRIO field-programmable gate array (FPGA) to achieve flexibility in communicating with serial devices. The modules have individual 64 B buffers on every port that save CompactRIO FPGA space and simplify programming. These C Series modules support standard start bit, stop bit, and handshaking settings and feature baud rates up to 921.6 kbit/s per port. You can pass up to 2 Mbit/s of data between these modules and CompactRIO.

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Requirements and Compatibility

OS Information

- Linux®
- Mac OS X
- Windows
- Windows 7
- Windows Vista
- Windows XP

Driver Information

- C-Series Serial
- NI-RIO

Software Compatibility

- LabVIEW Development System
- LabVIEW FPGA Module
- Visual C#
- Visual C++

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Application and Technology

NI C Series Chassis

NI CompactDAQ Platform

NI CompactDAQ delivers the simplicity of USB to sensor and electrical measurements on the benchtop, in the field, and on the production line. By combining the ease of use and low cost of a data logger with the performance and flexibility of modular instrumentation, NI CompactDAQ offers fast, accurate measurements in a small, simple, and affordable system. Flexible software options make it easy to use NI CompactDAQ to log data for simple experiments or to develop a fully automated test or control system. The modular design can measure up to 256 channels of electrical, physical, mechanical, or acoustical signals in a single system. In addition, per-channel ADCs and individually isolated modules ensure fast, accurate, and safe measurements.

Figure 1. NI CompactDAQ Platform

NI CompactRIO Platform

When used with the small, rugged CompactRIO embedded control and data acquisition system, C Series analog input modules connect directly to reconfigurable I/O (RIO) field-programmable gate array (FPGA) hardware to create high-performance embedded systems. The reconfigurable FPGA hardware within CompactRIO provides a variety of options for custom timing, triggering, synchronization, filtering, signal processing, and high-speed decision making for all C Series analog input modules. For instance, with CompactRIO, you can implement custom triggering for any analog sensor type on a per-channel basis using the flexibility and performance of the FPGA and the numerous arithmetic and comparison function blocks built into the NI LabVIEW FPGA Module.

Figure 2. NI CompactRIO Platform

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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
NI 9870 Serial Module			
NI 9870 4-Port RS232 Serial Module	779891-02	No accessories required.	
NI 9871 Serial Module			
NI 9871 4-Port RS485 Serial Module	779892-02	No accessories required.	

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Software Recommendations

NI LabVIEW Full Development System for Windows

- Fully integrated graphical system design software
- Support for a wide range of measurement hardware, I/O, and buses
- Custom, event-driven user interfaces for measurement and control
- Extensive signal processing, analysis, and math functionality
- Advanced compiler to ensure high-performance execution and code optimization

NI LabVIEW FPGA Module

- Design FPGA applications for NI reconfigurable I/O (RIO) hardware targets
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms

Includes SSP for professional technical support, online training, and software upgrades

- Incorporate existing HDL code and third-party IP including Xilinx CORE Generator functions
- Included in the LabVIEW Embedded Control and Monitoring Suite

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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.

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

The following specifications are typical for the range –40 to 70 °C unless otherwise noted.

NI 9870	
Maximum baud rate	921.6 kbps
Maximum cable length	250 pF equivalent

Note Cable capacitance greater than 250 pF may adversely affect the maximum baud rate and thermal dissipation.	
Maximum RS232 Receive signal (RXD, CTS, DSR, DCD, RI) Continuous Voltage	±8 V
Note Continuous RS232 input voltages in excess of ±8 V may cause excessive thermal dissipation.	
Data line ESD protection (human body model)	±15 kV
MTBF	448,008 hours at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method
Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.	
NI 9871	
Maximum baud rate	3.6864 Mbps
Maximum cable length	1.2 km (4,000 ft.)
Data line ESD protection (human body model)	±15 kV
MTBF	514,016 hours at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method
Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.	

Power Requirements

Power consumption from chassis	
Active mode	0.5 W max
Sleep mode	50 µW max
Thermal dissipation (at 70 °C)	
Active mode	1.5 W max
NI 9870 Sleep mode	0.5 W max
NI 9871 Sleep mode	55 mW max
Required external supply voltage range (V_{SUP})	+8 to +28 VDC
Power supply consumption from external supply V_{SUP}	
NI 9870	
Typical	0.5 W
Maximum	2 W
NI 9871	
Typical	1 W
Maximum	3.5 W

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.	
Weight	Approx. 154 g (5.4 oz)

Safety

NI 9870 Maximum Voltage [1]	
Connect only voltages that are within these limits.	
RS232 Receive Signal-to-COM (RXD, CTS, DSR, DCD, RI)	±25 V max, Measurement Category I
RS232 Transmit Signal-to-COM (TX, RTS, DTR)	±13.2 V max, Measurement Category I
V_{SUP}-to-COM	±28 V max, Measurement Category I
NI 9871 Maximum Voltage [1]	
RS485/RS422 Port-to-COM	–8 to +13 VDC max, Measurement Category I
V_{SUP}-to-COM	±28 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.

Isolation Voltages	
Port-to-earth ground	
Withstand	1000 V_{rms}, verified by a dielectric withstand test, 5 s
Continuous	60 VDC, Measurement Category I

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)	Ex nA IIC T4

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 the *Online Product Certification* section.

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

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

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

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

To obtain product certifications and 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.

Shock and Vibration	
To meet these specifications, you must panel mount the CompactRIO system.	
Operating vibration, random (IEC 60068-2-64)	5 g_{rms}, 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

Environmental	
CompactRIO modules are intended for indoor use only. For outdoor use, mount the CompactRIO system in a suitably rated enclosure. Refer to the installation instructions for the chassis you are using for more information about meeting these specifications.	
Operating temperature	–40 to 70 °C
Storage temperature	–40 to 85 °C
Ingress protection	IP 30
Operating humidity	10 to 90% RH, noncondensing
Storage humidity	5 to 95% RH, noncondensing
Maximum altitude	2,000 m
Pollution Degree (IEC 60664)	2

Environmental Management

NI 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)

[1] The maximum voltage that can be applied or output without creating a safety hazard.

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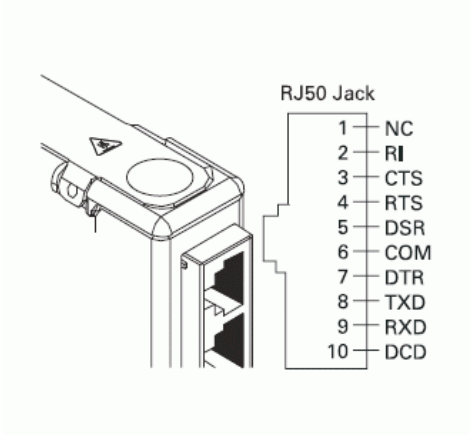
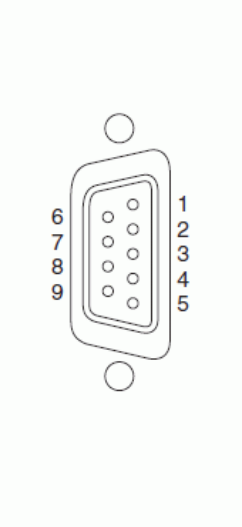
Pinouts/Front Panel Connections



RS232 Port Pinout

RJ-50 Pin	Signal Name*
1	No Connect
2	RI
3	CTS
4	RTS
5	DSR
6	GND
7	DTR
8	TXD
9	RXD
10	DCD
* These signals are shared by all four RJ-50 connectors on the NI 9870.	



Pin Assignments for RS232 DB-9 Male Connector

Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

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