NI-9870 Getting Started

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Contents

Before You Begin

Read the **NI 9870 Safety, Environmental, and Regulatory Information** and complete the software and hardware installation procedures in your chassis documentation.

Safety Guidelines

> **Caution** Observe all instructions and cautions in the user documentation. Using the product in a manner not specified can damage the product and compromise the built-in safety protection.

> **Attention** Suivez toutes les instructions et respectez toutes les mises en garde de la documentation d'utilisation. L'utilisation du produit de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée.

Safety Guidelines for Hazardous Locations

The NI 9870 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nA IIC T4 Gc and Ex nA IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9870 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.

> **Caution** Do not disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.

> **Caution** Do not remove modules unless power has been switched off or the area is known to be nonhazardous.

Caution Substitution of components may impair suitability for Class I, Division 2, or Zone 2.

Caution The system must be installed in an enclosure certified for the intended hazardous (classified) location, having a tool secured cover/door, where a minimum protection of at least IP54 is provided.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9870 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 07ATEX 0626664X and is IECEx UL 14.0089X certified. Each NI 9870 is marked Ex II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of -40 °C ≤ Ta ≤ 70 °C. If you are using the NI 9870 in Gas Group IIC hazardous locations, you must use the device in an NI chassis that has been evaluated as Ex nC IIC T4, Ex IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.

Caution Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value of 85 V at the supply terminals to the equipment.

Caution The system shall only be used in an area of not more than Pollution Degree 2, as defined in IEC/EN 60664-1.

Caution The system shall be mounted in an ATEX/IECEx-certified enclosure with a minimum ingress protection rating of at least IP54 as defined in IEC/EN 60079-15.

Caution The enclosure must have a door or cover accessible only by the use of a tool.

Special Conditions for Marine Applications

Some products are approved for marine (shipboard) applications. To verify marine approval certification for a product, visit ni.com/product-certifications, search by model number, and click the appropriate link.

> **Notice** In order to meet the EMC requirements for marine applications, install the product in a shielded enclosure with shielded and/or filtered power and input/output ports. In addition, take precautions when designing, selecting, and installing measurement probes and cables to ensure that the desired EMC performance is attained.

Wiring the NI 9870

The NI 9870 has four RJ-50 receptacles that provide connections for four RS232 devices.

	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.		

Table 1. RS232 Port Pinout

The cables included with your kit convert the RJ-50 pinout to the standard NI pinout on a DB-9 male connector, as shown in Table 2.

Connector	RJ-50 Pin	Signal Name
	1	DCD

Connector	RJ-50 Pin	Signal Name
Object Missing TRISOFT This object is not available in the repository.	2	RXD
	3	TXD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS
	9	RI

Table 2. Pin Assignments for RS232 DB-9 Male Connector

You must connect an external power supply to the NI 9870. This power supply provides the power for the RS232 transceivers on the module. You can use the included female four-position pigtail to connect to an external voltage source. Figure 1 lists the connections between an external voltage source (of +8 V to +28 V) and the NI 9870.

> **Caution** To ensure the specified EMC performance, do not connect the power input to a DC mains supply or to any supply requiring a connecting cable longer than 30 m (100 ft). A DC mains supply is a local DC electricity supply network in the infrastructure of a certain site or building.

Figure 1. Four-Position External Power Connector

Figure 2 shows the method of power connection to the NI 9870 module. Attach an isolated power supply to the V_{SUP} and COM terminals using the included pigtail.

Figure 2. Powering the NI 9870 from an Isolated Power Source

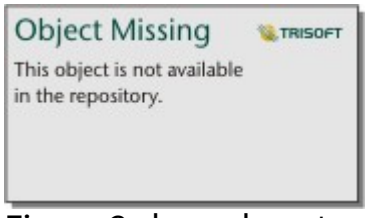

Figure 3 shows how to use the optional Y-adapter (available at ni.com/serial) to connect power to more than one module using the same power source. One Y-adapter is needed for each additional module. Ensure that the power supply can handle maximum power requirements for all modules connected.

> **Caution** Make all connections before applying power.

Figure 3. Powering Multiple Modules from a Single Power Supply

NI 9870 Hardware Overview

The NI 9870 has four full-featured, independent RS232 DTE ports that are isolated from the other modules in the system. Each port is fully compatible with the ANSI/EIA/TIA-232 standard.

Sleep Mode (CompactRIO Only)

You can enable sleep mode for the CompactRIO system in software. In sleep mode, the system consumes less power and may dissipate less heat. Typically, when a system is in sleep mode, you cannot communicate with the modules. Refer to the **Specifications** section for more information about power consumption and thermal dissipation.

Specifications

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

Maximum baud rate	921.6 kbps
Maximum module throughput	1.28 Mbps
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 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
Sleep mode	0.5 W max

Required external supply voltage range (V_{SUP})	+8 to +28 VDC

Power supply consumption from external supply V_{SUP}

Typical	0.5 W
Maximum	2 W

Physical Characteristics

Dimensions	Visit ni.com/dimensions and search by module number.
Weight	Approx. 154 g (5.4 oz)

Safety

Maximum Voltage The maximum voltage that can be applied or output without creating a safety hazard.

Connect only the 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

Measurement Category I is for measurement 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 included 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.

Port-to-earth ground

Continuous	60 VDC, Measurement Category I up to 5,000 m in altitude

Withstand

up to 2,000 m in altitude	1000 V_{rms} verified by a 5s dielectric withstand test
up to 5,000 m in altitude	500 V_{rms} verified by a 5s dielectric withstand test

Safety Compliance and Hazardous Locations Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1
- EN 60079-0, EN 60079-7
- IEC 60079-0, IEC 60079-7
- UL 60079-0, UL 60079-7
- CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-7

> **Note** For safety certifications, refer to the product label or the Product Certifications and Declarations section.

Hazardous Locations

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

Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP 30
Operating humidity (IEC 60068-2-56)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-56)	5% RH to 95% RH, noncondensing
Pollution degree	2
Maximum altitude	2,000 m

Indoor use only.

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration	
Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions

- ICES-001: Class A emissions

> **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 product according to the documentation.

CE Compliance CE

- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

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 to the environment and to NI customers.
For additional environmental information, refer to the **Engineering a Healthy Planet** 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.

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国 RoHS）

- **中国 RoHS**— NI 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 NI 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

NI Services

Visit ni.com/support to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit ni.com/services to learn about NI service offerings such as calibration options, repair, and replacement.

Visit ni.com/register to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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