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NI-9871

GETTING STARTED GUIDE

NI 9871

4-Port, RS485/RS422 Serial Module

Français

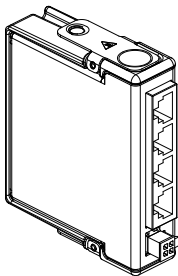
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This document explains how to connect to the National Instruments 9871.



Note Before you begin, complete the software and hardware installation procedures in your chassis documentation.



Note The guidelines in this document are specific to the NI 9871. The other components in the system might not meet the same safety ratings. Refer to the documentation for each component in the system to determine the safety and EMC ratings for the entire system.

Safety Guidelines

Operate the NI 9871 only as described in this document.



Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.



Caution Do not operate the NI 9871 in a manner not specified in this document. Product misuse can result in

a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to National Instruments for repair.

Safety Guidelines for Hazardous Locations

The NI 9871 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 and Ex nA IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9871 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.



Caution For Division 2 and Zone 2 applications, install the system in an enclosure rated to at least IP54 as defined by IEC/EN 60079-15.




Caution For Zone 2 applications, install a protection device between the RS232 signal cables and the NI 9871 RJ-50 jacks (ports 1 to 4). The device must prevent the RS232 signal-to-signal or signal-to-COM voltage from exceeding 35 V if there is a transient overvoltage condition.



Caution For Zone 2 applications, install a protection device between the external power supply and the NI 9871 V_{sup} and COM pins. The device must prevent the V_{sup} -to-COM voltage from exceeding 39 V if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9871 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 07 ATEX 0626664X and is IECEx 14.0089X certified. Each NI 9871 is marked  II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of $-40\text{ }^{\circ}\text{C} \leq T_a \leq 70\text{ }^{\circ}\text{C}$. If you are using the NI 9871

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 You must make sure that transient disturbances do not exceed 140% of the rated voltage.



Caution The system shall only be used in an area of not more than Pollution Degree 2, as defined in IEC 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 Lloyd's Register (LR) Type Approved for marine (shipboard) applications. To verify Lloyd's Register certification for a product, visit [ni.com/certification](https://www.ni.com/certification) and search for the LR certificate, or look for the Lloyd's Register mark on the product.

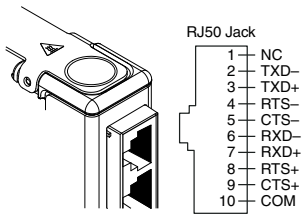


Caution In order to meet the EMC requirements for marine applications, install the product in a shielded enclosure with shielded and/or filtered power and input/output ports. In addition, take precautions when designing, selecting, and installing measurement probes and cables to ensure that the desired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

Wiring the NI 9871

The NI 9871 has four RJ-50 receptacles that provide connections for four RS485/RS422 devices.

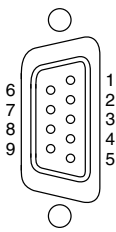
Table 1. RS485/RS422 Port Pinout

	RJ-50 Pin	Signal Name*
	1	No Connect
	2	TXD-
	3	TXD+
	4	RTS-
	5	CTS-
	6	RXD-
	7	RXD+
	8	RTS+
	9	CTS+
	10	GND

*These signals are shared by all four RJ-50 connectors on the NI 9871.

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.

Table 2. Pin Assignments for RS485/RS422 DB-9 Male Connector

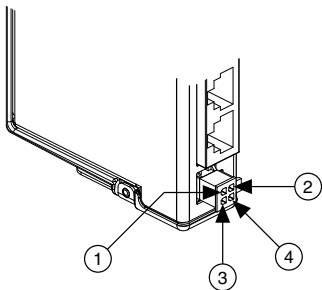
Connector	RJ-50 Pin	Signal Name
	1	GND
	2	CTS+
	3	RTS+
	4	RXD+
	5	RXD-
	6	CTS-
	7	RTS-
	8	TXD+
	9	TXD-

You must connect an external power supply to the NI 9871. This power supply provides the power for the RS485/RS422 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 9871.



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



1. V_{SUP}

2. V_{SUP}

3. COM

4. COM

Figure 2 shows the method of power connection to the NI 9871 module. Attach an isolated power supply to the V_{SUP} and COM terminals using the included pigtail.

Figure 2. Powering the NI 9871 from an Isolated Power Source

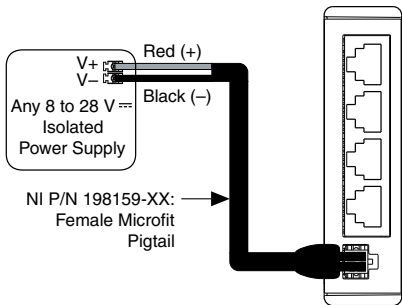
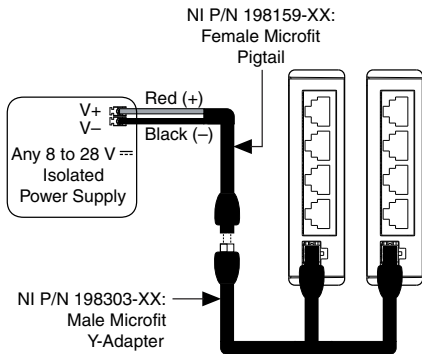


Figure 3 shows how to use the optional Y-adapter (available at ni.com/serial) to connect power to more than one module using the same power source. One Y-adapter is needed for each additional module. Ensure that the power supply can handle maximum power requirements for all modules connected.



Caution Make all connections before applying power.

Figure 3. Powering Multiple Modules from a Single Power Supply



RS485 Bus Topology and Termination

Refer to Figure 4 and Figure 5 for an overview of 4-wire and 2-wire RS485 bus topologies and termination.

Figure 4. 4-Wire Full-Duplex Multidrop Network Using Terminating Resistors

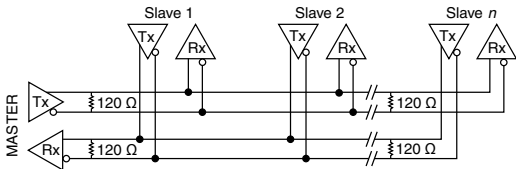
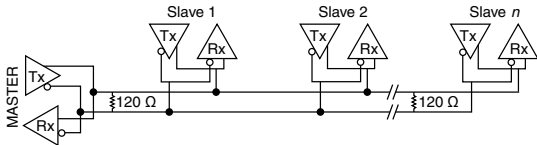


Figure 5. 2-Wire Multidrop Network Using Terminating Resistors



The driver directly supports 4-wire full-duplex operation on peer-to-peer RS-485 networks. Multidrop RS-485 networks require additional software development.

RS485 terminators are available at ni.com/serial.

RS485 Transceiver Control

Refer to Table 3 for a listing of TX and RX enable conditions for the different RS485 transceiver control modes.

Table 3. Transceiver Control Pin Conditions

Enable	4-Wire	2-Wire		
		DTR/Echo	DTR/No Echo	Auto
TX	On	DTR	DTR	TX
RX	On	On	DTR#	TX#

NI 9871 Hardware Overview

The NI 9871 has four independent RS485/RS422 ports that are isolated from the other modules in the system. Each port is fully compatible with the ANSI/EIA/TIA-485 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	3.6864 Mbps
Maximum module throughput	1.28 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 MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

Active mode	0.5 W max
Sleep mode	50 μ W max

Thermal dissipation (at 70 °C)

Active mode	1.5 W max
Sleep mode	55 W max

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

Typical	1 W
Maximum	3.5 W

Physical Characteristics

To clean the module, wipe it with a dry towel.

Weight	Approx. 153 g (5.4 oz)
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Safety

Maximum Voltage¹

Connect only the voltages that are within these limits.

RS485/RS422 Port-to-COM	-8 to +13 VDC max, Measurement Category I
V_{SUP} -to-COM	±28 V max, Measurement Category I

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

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.

Isolation Voltages

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 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 61010-1
- EN 60079-0:2012, EN 60079-15:2010
- IEC 60079-0: Ed 6, IEC 60079-15; Ed 4
- UL 60079-0; Ed 5, UL 60079-15; Ed 3
- CSA 60079-0:2011, CSA 60079-15:2012



Note For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.

Hazardous Locations

U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4
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
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Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
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Ingress protection	IP 30
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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	5,000 m

Indoor use only.

Shock and Vibration

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

Operating vibration	
Random (IEC 60068-2-64)	5 g _{rms} , 10 Hz to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz 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

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

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 94/9/EC; Potentially Explosive Atmospheres (ATEX)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. 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.

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 *Minimize Our Environmental Impact* 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)



EU Customers 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）



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