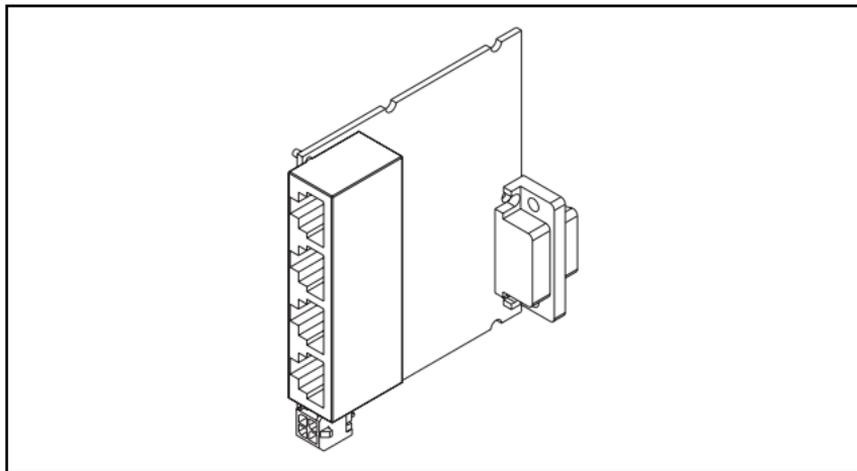


# OPERATING INSTRUCTIONS AND SPECIFICATIONS

# NI 9871E

## 4-Port, RS485/RS422 Serial Module



This document describes how to use the National Instruments 9871E and includes dimensions, pin assignments, and specifications for the NI 9871E. Visit [ni.com/info](http://ni.com/info) and enter `rdsoftwareversion` to determine which software you need for the modules you are using. For information about installing, configuring, and programming the system, refer to the system documentation. Visit [ni.com/info](http://ni.com/info) and enter `cseriesdoc` for information about C Series documentation.



**Caution** National Instruments makes no electromagnetic compatibility (EMC) or CE marking compliance claims for the NI 9871E. The end-product supplier is responsible for conformity to any and all compliance requirements.



**Caution** The NI 9871E must be installed inside a suitable enclosure prior to use. Hazardous voltages may be present.

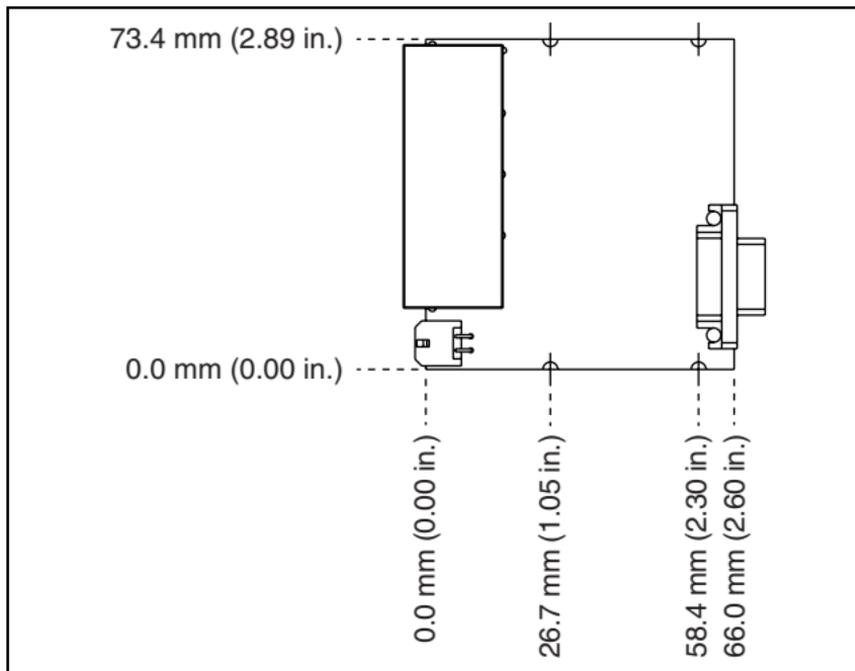
## NI 9871E Hardware Overview

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The NI 9871E 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.

# NI 9871E Dimensions

The following figure shows the dimensions of the NI 9871E.

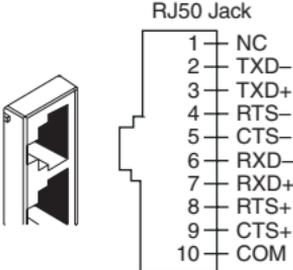


**Figure 1.** NI 9871E Dimensions in Millimeters (Inches)

# Connecting the NI 9871E

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

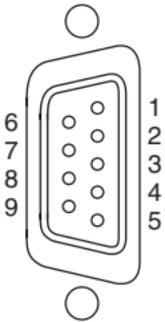
**Table 1.** NI 9871E Pin Assignments

Connector	RJ-50 Pin	Signal Name*
 <p>RJ50 Jack</p> <ul style="list-style-type: none"><li>1 — NC</li><li>2 — TXD-</li><li>3 — TXD+</li><li>4 — RTS-</li><li>5 — CTS-</li><li>6 — RXD-</li><li>7 — RXD+</li><li>8 — RTS+</li><li>9 — CTS+</li><li>10 — COM</li></ul>	1	No Connect
	2	TXD-
	3	TXD+
	4	RTS-
	5	CTS-
	6	RXD-
	7	RXD+
	8	RTS+
	9	CTS+
	10	COM

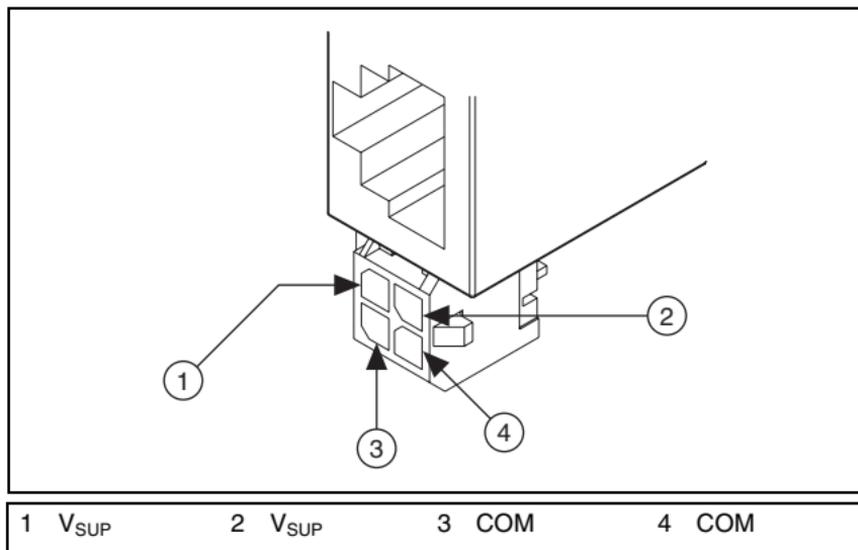
\* These signals are shared by all four RJ-50 connectors on the NI 9871E.

The cables included with your kit convert the RJ-50 pinout to the standard NI pinout, as shown in Table 2.

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

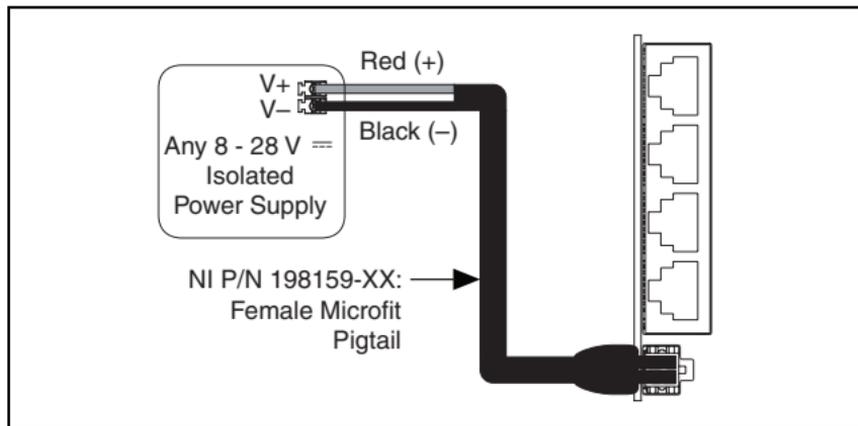
Connector	Pin	Signal
	1	COM
	2	CTS+
	3	RTS+
	4	RXD+
	5	RXD-
	6	CTS-
	7	RTS-
	8	TXD+
	9	TXD-

You must connect an external power supply to the NI 9871E. 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 2 lists the connections between an external voltage source (of +8 V to +28 V) and the NI 9871E.



**Figure 2.** Four-Position External Power Connector

Figure 3 shows the method of power connection to the NI 9871E module. Attach an isolated power supply to the  $V_{sup}$  and COM terminals using the included pigtail.

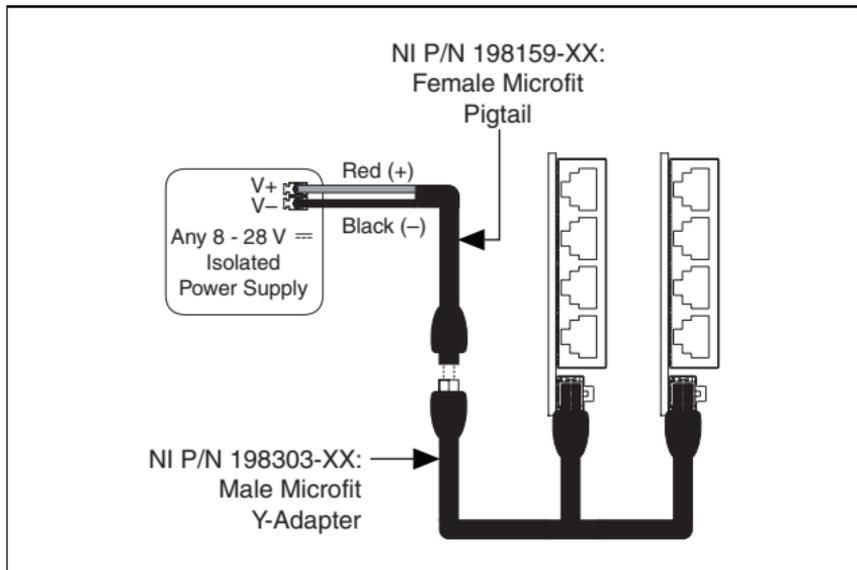


**Figure 3.** Powering the NI 9871E from an Isolated Power Source

Figure 4 shows how to use the optional y-adapter (available at [ni.com/serial](http://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.



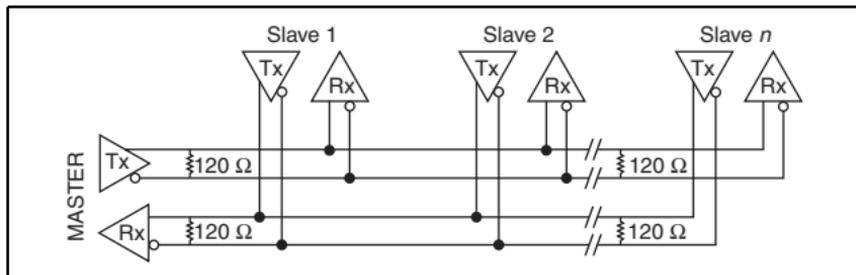
**Caution** All connections must be made before power is applied.



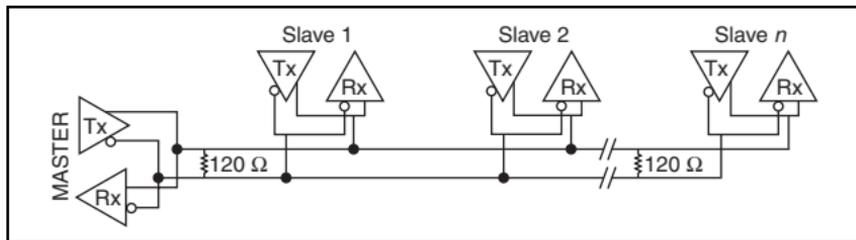
**Figure 4.** Powering Multiple Modules from a Single Power Supply

## RS485 Bus Topology and Termination

Refer to Figure 5 and Figure 6 for an overview of 4-wire and 2-wire RS485 bus topologies and termination.



**Figure 5.** 4-Wire Full-Duplex Multidrop Network Using Terminating Resistors



**Figure 6.** 2-Wire Multidrop Network Using Terminating Resistors

RS485 terminators are available at [ni.com/serial](http://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#

## Sleep Mode

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This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis that the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit [ni.com/info](http://ni.com/info) and enter `cseriesdoc` for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

# Specifications

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The following specifications are typical for the range –40 to 85 °C internal to any enclosures unless otherwise noted.

## Input/Output Characteristics

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  $\mu$ W max

Thermal dissipation (at 70 °C)

Active mode ..... 1.5 W max

Sleep mode ..... 55 mW max

Required external supply

voltage range ( $V_{SUP}$ ) ..... +8 to +28 VDC

Power supply consumption from external supply  $V_{SUP}$

Typical ..... 1 W

Maximum ..... 3.5 W

## Physical Characteristics

Use a dry, low-velocity stream of air to clean the module. If needed, use a soft-bristle brush for cleaning around components.

Weight ..... Approx. 54 g (1.9 oz)

# Safety

## Maximum Voltage<sup>1</sup>

Connect only voltages that are within the following limits.

RS485/RS422 Port-to-COM..... –8 to +13 VDC max,  
Measurement Category I

V<sub>SUP</sub>-to-COM ..... ±28 V max,  
Measurement Category I

### Isolation

#### Port-to-earth ground

Continuous ..... 60 VDC,  
Measurement Category I,  
(Double insulation)

Withstand ..... 1000 V<sub>rms</sub>, verified by a  
dielectric withstand test, 5 s

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

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

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

The NI 9871E is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use when installed in a suitable enclosure:

- 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.

## 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](http://ni.com/certification), search by module number or product line, and click the appropriate link in the Certification column.

## Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. 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 to 85 °C

Storage temperature

(IEC 60068-2-1, IEC 60068-2-2) ..... -40 to 85 °C

Operating humidity

(IEC 60068-2-56)..... 10 to 90% RH,  
noncondensing

Storage humidity

(IEC 60068-2-56)..... 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 to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://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 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](http://ni.com/environment/weee.htm).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 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 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

## Where to Go for Support

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The National Instruments Web site is your complete resource for technical support. At [ni.com/support](http://ni.com/support) you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at [ni.com/support](http://ni.com/support) and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,  
Canada 800 433 3488, China 86 21 5050 9800,  
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,  
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,  
Germany 49 89 7413130, India 91 80 41190000,  
Israel 972 3 6393737, Italy 39 02 41309277, Japan 0120-527196,

Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,  
Malaysia 1800 887710, Mexico 01 800 010 0793,  
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,  
Norway 47 (0) 66 90 76 60, Poland 48 22 328 90 10,  
Portugal 351 210 311 210, Russia 7 495 783 6851,  
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,  
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,  
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,  
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Turkey 90 212 279 3031, United Kingdom 44 (0) 1635 523545

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