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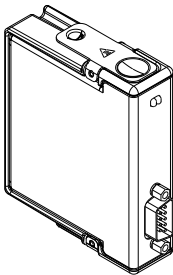
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**NI-9866**

## GETTING STARTED GUIDE

# NI 9866

1-Port, LIN Module



This document explains how to connect to the NI 9866.

The NI 9866 module requires the latest software to be installed.  
The latest version of the software is at [ni.com/downloads](http://ni.com/downloads).





**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 9866. 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

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Operate the NI 9866 only as described in this document.



**Caution** Do not operate the NI 9866 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 NI for repair.

## Safety Guidelines for Hazardous Locations

The NI 9866 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 9866 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 LIN signals and the NI 9866 LIN pins. The device must prevent the LIN Port-to-COM voltage from exceeding 55 V if there is a transient overvoltage condition.



**Caution** For Division 2 and Zone 2 applications, install a protection device between the external power supply and the Vsup pin. The device must prevent the Vsup-to-COM voltage from exceeding 50 V if there is a transient overvoltage condition.

## Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9866 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 07 ATEX 0626664X and is IECEx UL 14.0089X certified. Each NI 9866 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 9866 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.

## Wiring the NI 9866

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The NI 9866 has one 9-pin male D-Sub connector that provides connections to a LIN bus.

The port has two common pins (COM) that are internally connected to the module's isolated reference and serve as the reference ground for LIN signal. You can connect the LIN bus reference ground to one or both COM pins. The port also has an

optional shield pin, SHLD, that you can connect to a shielded LIN cable. Connecting SHLD may improve signal integrity and EMC performance in a noisy environment.



**Caution** You must use a UL listed ITE power supply marked LPS with the NI 9866.

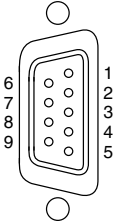
The NI 9866 requires an external power supply of +8 to +18 V to operate. Supply power to the NI 9866  $V_{SUP}$  pin from the LIN bus.



**Note** Power on  $V_{SUP}$  is required for LIN operation.

The NI 9866 pinout is listed in Table 1.

**Table 1. Pin Assignments for the NI 9866**

<b>Connector</b>	<b>Pin</b>	<b>Signal Name</b>
	1	No Connection (NC)
	2	NC
	3	COM
	4	NC
	5	SHLD
	6	COM
	7	LIN
	8	NC
	9	$V_{SUP}$



## Cabling Requirements for the NI 9866

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This section deals with cabling specifications, termination resistors, cable lengths, and the number of LIN nodes that can exist in a system.

### Cable Specifications

LIN cables should meet the physical medium requirement of a bus RC time constant of 5  $\mu$ s. For detailed formulas for calculating this value, refer to the *Line Characteristics* section of the LIN specification. Belden cable (3084A) and other unterminated CAN/Serial quality cables meet these requirements and should be suitable for most applications.

### Cable Lengths

The maximum allowable cable length is 40 m, per the LIN specification.

### Number of LIN Devices

The maximum number of devices on a LIN bus is 16, per the LIN specification.

## Termination Resistors

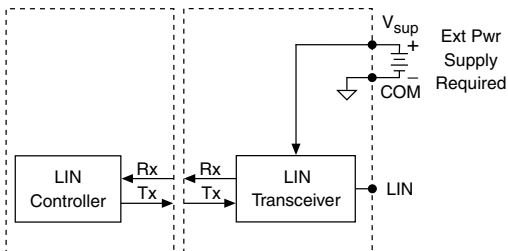
LIN cables require no termination, as nodes are terminated at the transceiver. Slave nodes typically are pulled up from the LIN bus to VBat with a 30 k $\Omega$  resistance and a serial diode. This termination usually is integrated into the transceiver package. The master node requires a 1 k $\Omega$  resistor and serial diode between the LIN bus and VBat. On NI-XNET LIN products, master termination is software selectable; you can enable it in the API with the NI-XNET Session Interface:LIN:Termination property.

## NI 9866 Hardware Overview

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The NI 9866 has one full-featured LIN port that is isolated from the other modules in the system. The port has a LIN controller that is fully compliant with the LIN 1.3/2.0/2.1/2.2 Specification. The port also has an NXP TJA1028 LIN transceiver that is fully compatible with the LIN 1.3/2.0/2.1/2.2 and SAE J2602 standard and supports baud rates up to 20 kbps.

**Figure 1. NI 9866 Hardware Overview**



## NI 9866 Specifications

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

## LIN Characteristics

Transceiver	NXP TJA1028
Max baud rate	20 kbps
LIN bus lines voltage	-40 to +40 VDC
Supply voltage range ( $V_{SUP}$ )	+8 to +18 VDC normal operation, -0.3 to +40 V absolute limits
MTBF	Contact NI for Bellcore MTBF or MIL-HDBK-217F specifications

## Power Requirements

Power consumption from chassis	1 W max (active mode)
Thermal dissipation (at 70 °C)	1.25 W max (active mode)

## Physical Characteristics

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

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Weight	Approx. 144 g (5.0 oz)
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## Safety

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

Connect only the voltages that are within these limits.

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Port-to-COM	-40 to +40 VDC max, Measurement Category I
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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,

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

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

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### Port-to-earth ground

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Withstand	500 V <sub>rms</sub> verified by a 5s dielectric withstand test
Continuous	60 VDC, Measurement Category I

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## 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
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP40
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-78)	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.

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### Operating vibration

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Random (IEC 60068-2-64)	5 g <sub>rms</sub> , 10 Hz to 500 Hz
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Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz to 500 Hz
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Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations
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## 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](https://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](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 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](http://ni.com/environment/weee).

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A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting [ni.com/certification](https://ni.com/certification). If your product supports calibration, you can obtain the calibration certificate for your product at [ni.com/calibration](https://ni.com/calibration).

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