
NI-9862 Getting Started

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This document explains how to connect to the NI-9862.

The NI-9862 module requires the latest NI-XNET software to be installed. The latest version of the NI-XNET software is at ni.com/downloads.



Note Before you begin, read the **NI-9862 Safety, Environmental, and Regulatory Information** and complete the software and hardware installation procedures in your chassis documentation.



Note The guidelines in this document are specific to the NI-9862. 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



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-9862 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 Gc hazardous locations;

and nonhazardous locations only. Follow these guidelines if you are installing the NI-9862 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-9862 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 07ATEX 0626664X and is IECEx UL 14.0089X certified. Each NI-9862 is marked Ⓜ II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of $-40\text{ °C} \leq T_a \leq 70\text{ °C}$. If you are using the NI-9862 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.

Wiring the NI-9862

The NI-9862 has one 9-pin male D-Sub connector that provides connections to a CAN bus. The NI-9862 has pins for CAN_H and CAN_L, to which you connect the CAN bus signals. Connect these signals using twisted-pair cable.

The port has two common pins (COM) that are internally connected to the module's isolated reference and serve as the reference ground for CAN_H and CAN_L. You can connect the CAN bus reference ground (sometimes referred to as CAN_V-) to one or both COM pins. The port also has an optional shield pin, SHLD, that you can connect to a shielded CAN 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-9862.

The NI-9862 requires an external power supply of +9 to +30 V to operate. Supply power to the NI-9862 V_{SUP} pin.

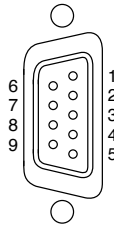


Note Power on V_{SUP} is required for CAN operation.

The NI-9862 pinout is listed in the table below.

The NI-9862 features software-selectable bus termination for High-Speed CAN transceivers. On the NI-9862, you can enable 120 Ω termination resistors between CAN_H and CAN_L through an API call. The **Termination Resistor Specification** table lists recommended termination resistor values.

Figure 1. NI-9862 Pinout



Pin	Signal
1	No Connection (NC)
2	CAN_L
3	COM
4	NC
5	SHLD
6	COM
7	CAN_H
8	NC
9	V _{SUP}

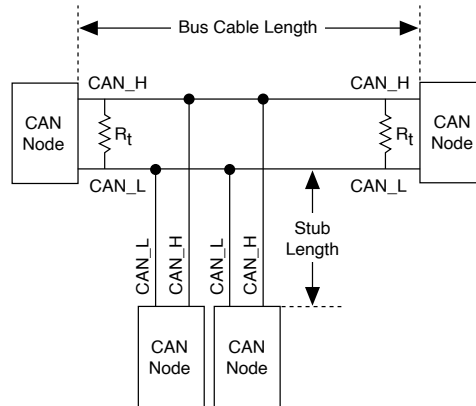
Table 1. Pin Assignments for the NI-9862

CAN Bus Topology and Termination

A CAN bus consists of two or more CAN nodes cabled together. The CAN_H and CAN_L pins of each node are connected to the main CAN bus cable through a short connection known as a “stub.” The pair of signal wires, CAN_H and CAN_L, constitutes a transmission line. If the transmission line is not terminated, each signal change on the bus causes reflections that may cause communication errors. Because the CAN bus is bidirectional, both ends of the cable must be terminated. However, this requirement does not mean that every node on the bus should have a termination resistor; only the two nodes at the far end of the cable should have termination resistors.

The following figure shows a simplified diagram of a CAN bus with multiple CAN nodes and proper termination resistor (R_t) locations.

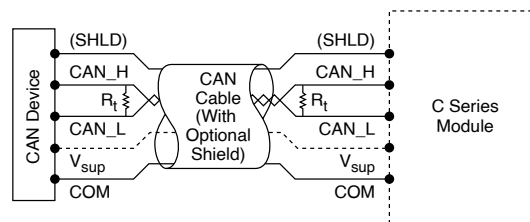
Figure 2. CAN Bus Topology and Termination Resistor Locations



Connecting a CAN Bus to the NI-9862

You can connect the NI-9862 port to any location on a CAN bus. The following figure shows one example of connecting the NI-9862 directly to one CAN node.

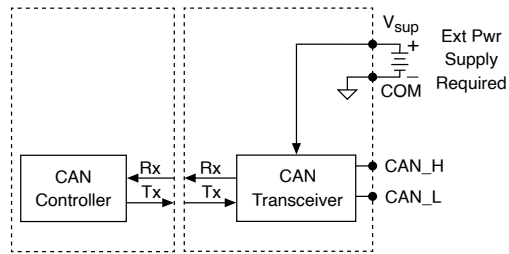
Figure 3. Connecting the NI-9862 to a CAN Device



NI-9862 Hardware Overview

The NI-9862 has one full-featured CAN port that is isolated from the other modules in the system. The port has a Bosch DCAN CAN controller that is CAN 2.0B-compatible and fully supports both 11-bit and 29-bit identifiers. The port also has an NXP TJA1041AT High-Speed CAN transceiver that is fully compatible with the ISO 11898 standard and supports baud rates up to 1 Mbps.

Figure 4. NI-9862 Hardware Overview



NI-9862 Specifications

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

High-Speed CAN Characteristics

Transceiver	NXP TJA1041AT
Max baud rate	1 Mbps
CAN_H, CAN_L bus lines voltage	-27 to +40 VDC
CAN Supply voltage range (V_{SUP})	+9 to +30 VDC
MTBF	Contact NI for Bellcore MTBF or MIL-HDBK-217F specifications.

Power Requirements

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

Physical Characteristics

Dimensions	Visit ni.com/dimensions and search by module number.
Weight	Approximately 144 g (5.0 oz)

Safety Voltages

Connect only voltages that are within the following limits:

Maximum voltage^[1]	
Port-to-COM	-27 V DC to +40 V DC maximum, Measurement Category I
External power supply (Vsup)	+9 V DC to +30 V DC
Isolation	
Port-to-earth ground	
Continuous	60 V DC, Measurement Category I
Withstand	500 V RMS, verified by a 5 s 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 Gc
Europe (DEMKO)	Ex nA IIC T4 Gc

Electromagnetic Compatibility

- EN 61326 (IEC 61326): Class A emissions; Industrial immunity

CE Compliance

- 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.

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

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 60068-2-30)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-30)	5% RH to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m


Indoor use only.

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.)

¹ The maximum voltage that can be applied or output between any port or V_{sup} terminal and a COM terminal without creating a safety hazard.

Cabling Requirements for the NI-9862

Cable Specifications

Cables should meet the physical medium requirements specified in ISO 11898, shown in the following table. Belden cable (3084A) meets all these requirements and should be suitable for most applications.

Characteristic	Value
Impedance	95 Ω min,
	120 Ω nominal,
	140 Ω max
Length-related resistance	70 m Ω /m nominal
Specific line delay	5 ns/m nominal

Table 2. ISO 11898 Specifications for Characteristics of a CAN_H and CAN_L Pair of Wires

Termination Resistors

The termination resistors (R_t) should match the nominal impedance of the CAN cable and therefore comply with the values in the following table. The onboard, software-selectable termination has a nominal value of 120 Ω . If you are not using the onboard termination, use the values listed in the following table.

Characteristic	Value	Condition
Termination resistor, R_t	100 Ω min,	Minimum power dissipation: 220 mW
	120 Ω nominal,	
	130 Ω max	

Table 3. Termination Resistor Specification

Cable Lengths

The cabling characteristics and desired bit transmission rates affect the allowable cable length. You can find detailed cable length recommendations in the ISO 11898, CiA DS 102, and DeviceNet specifications.

ISO 11898 specifies 40 m total cable length with a maximum stub length of 0.3 m for a bit rate of 1 Mb/s. The ISO 11898 specification says that significantly longer cable

lengths may be allowed at lower bit rates, but you should analyze each node for signal integrity problems.

Number of CAN Nodes

The maximum number of nodes depends on the electrical characteristics of the nodes on the network. If all nodes meet the ISO 11898 requirements, you can connect at least 30 nodes to the bus. You can connect higher numbers of nodes if the nodes' electrical characteristics do not degrade signal quality below ISO 11898 signal level specifications.

The NI-9862 electrical characteristics allow at least 110 CAN ports on a network.