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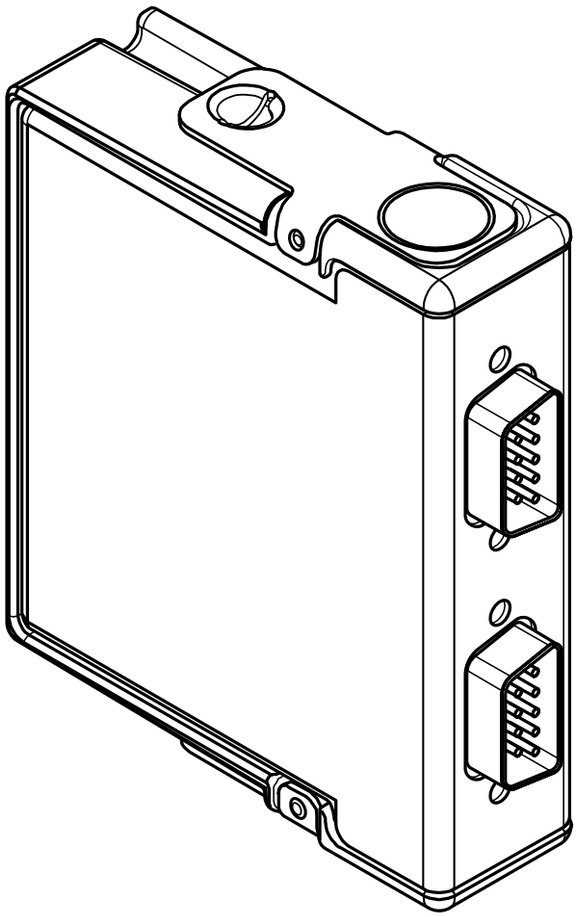
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Find the *National Instruments NI 9852* at our website: ***Click HERE***

GETTING STARTED GUIDE

NI 9852

2-Port, Low-Speed/Fault-Tolerant CAN Module



NATIONAL INSTRUMENTS™

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This document explains how to connect to the NI 9852.

The NI 9852 module requires the latest NI 985x software to be installed. The latest version of the NI 985x software is at *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 9852. 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 9852 only as described in this document.



Caution Do not operate the NI 9852 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection

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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 9852 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 9852 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.

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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 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.

Caution For Zone 2 applications, install a protection device between the CAN signals and the NI 9852 CAN pins. The device must prevent the CAN Port-to-COM voltage from exceeding 55 V if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9852 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 03 ATEX 0626664X and is IECEx UL 14.0089X certified. Each NI 9852 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 9852 in Gas Group IIC hazardous locations, you must use the

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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 9852

The NI 9852 has two 9-pin male D-Sub connectors that provides connections to a CAN bus. Each port on the NI 9852 has pins for CAN_H and CAN_L, to which you connect the CAN bus signals. Connect these signals using twisted-pair cable.

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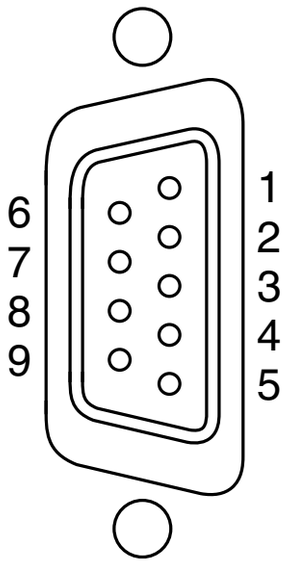
Each port has two isolated common pins (COM) that are internally connected to the module's isolated reference and serve as the reference ground for CAN_H and CAN_L. You can connect the CAN bus reference ground (sometimes referred to as CAN_V-) to one or both COM pins. The port also has an optional shield pin, SHLD, that you can connect to a shielded CAN cable. Connecting SHLD may improve signal integrity and EMC performance in a noisy environment.

Both of the ports on the NI 9852 require an external power supply of +8 to +25 V to operate. Supply power from the CAN bus to the V_{SUP0} pin on CAN0, and the V_{SUP1} pin on CAN1.

Pinouts for CAN0 and CAN1 of the NI 9852 are listed in Tables 1 and 2.

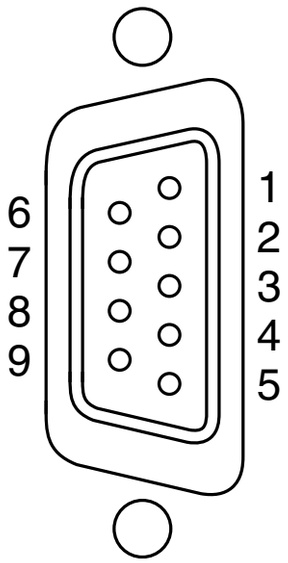
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Table 1. Pin Assignments for CAN0

Connector	Pin	Signal
	1	No Connection (NC)
	2	CAN_L
	3	COM0
	4	NC
	5	SHLD
	6	COM0
	7	CAN_H
	8	NC
	9	V_{SUP0}

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Table 2. Pin Assignments for CAN1

Connector	Pin	Signal
	1	No Connection (NC)
	2	CAN_L
	3	COM0
	4	NC
	5	SHLD
	6	COM0
	7	CAN_H
	8	NC
	9	V_{SUP0}

CAN Bus Topology and Termination

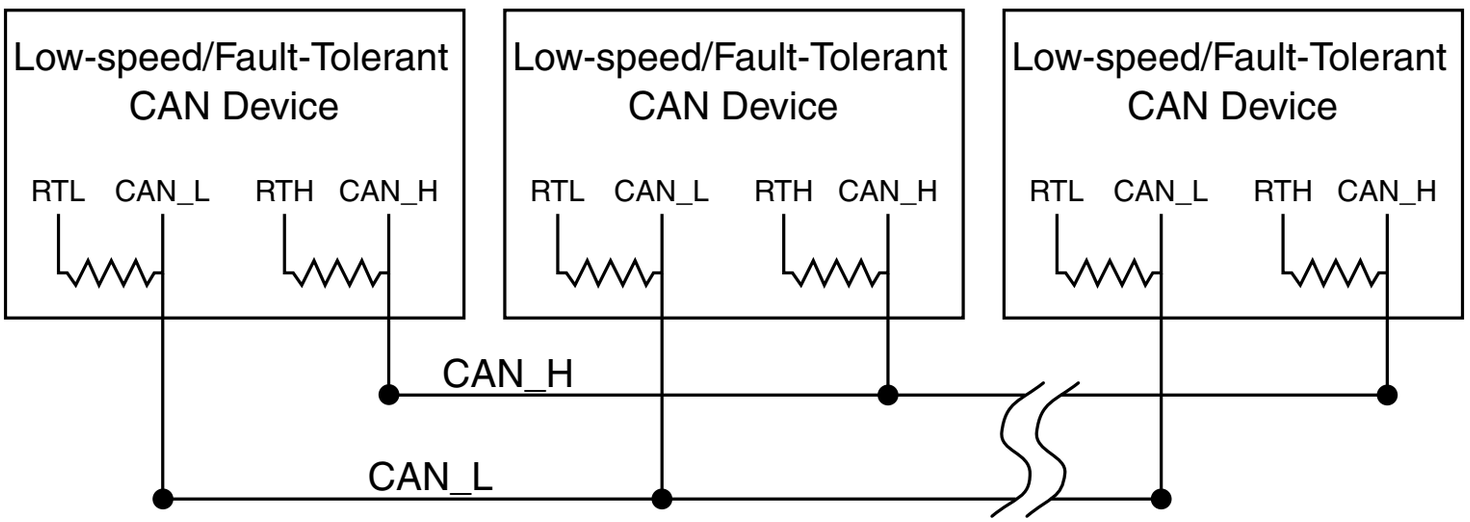
A CAN bus consists of two or more CAN nodes cabled together. The CAN_H and CAN_L pins of each node are connected to the

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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. Every device on a low-speed/fault-tolerant CAN network requires a termination resistor for each CAN data line: R_{RTH} for CAN_H and R_{RTL} for CAN_L.

Figure 1 shows a simplified diagram of a low-speed/fault-tolerant CAN bus with termination resistor placements.

Figure 1. CAN Bus Topology and Termination Resistor Locations



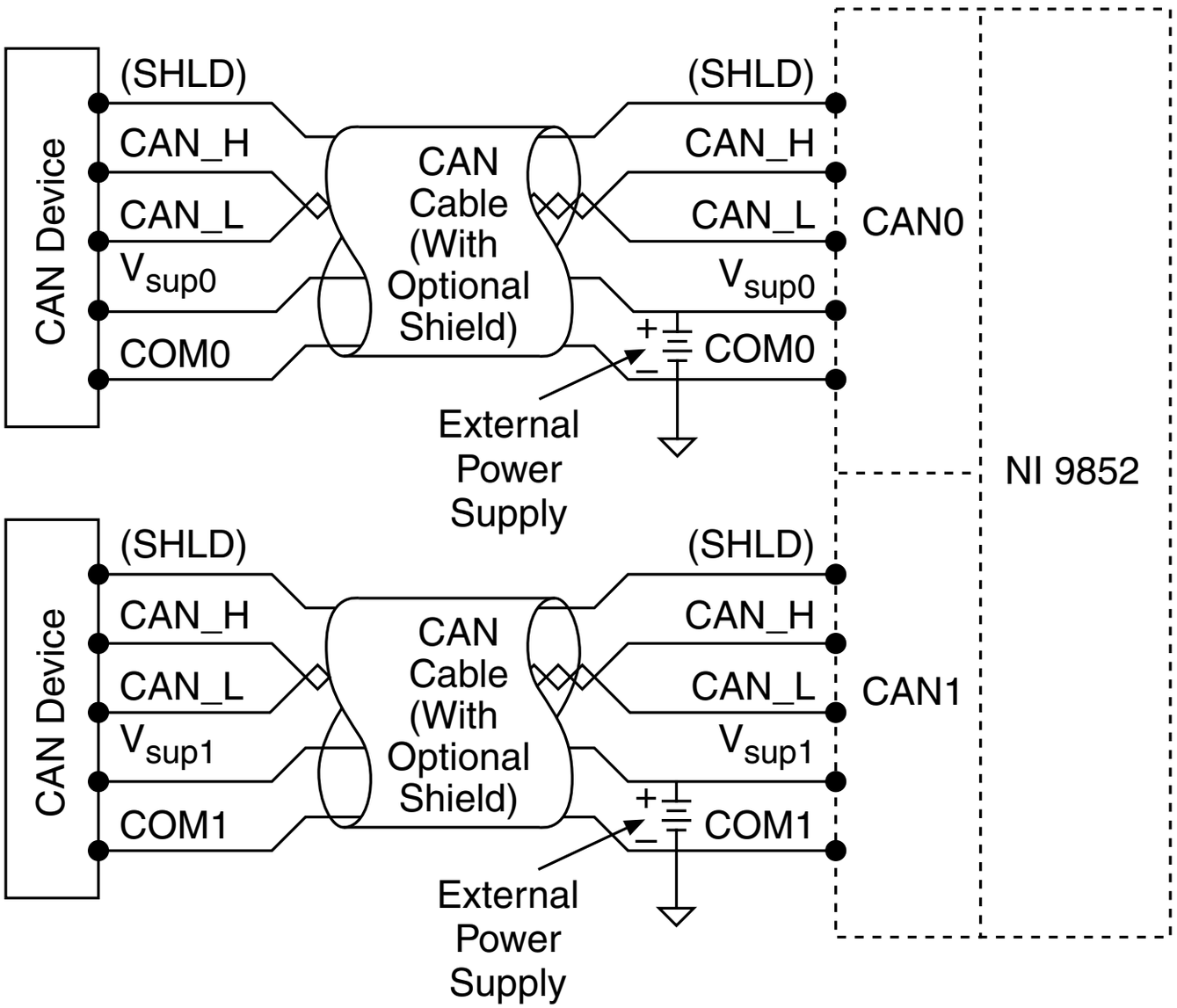
Connecting a CAN Bus to the NI 9852

You can connect each port of the NI 9852 to any location on a CAN bus. Figure 2 shows one example of connecting CAN0 of

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the NI 9852 directly to one CAN node, and CAN1 directly to another CAN node. CAN0 and CAN1 require an external power supply on the CAN bus.

Figure 2. Connecting Both Ports of the NI 9852 to CAN Buses



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Cabling Requirements for the NI 9852

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.

Table 3. ISO 11898 Specifications for Characteristics of a CAN_H and CAN_L Pair of Wires

Characteristic	Value
Length-related resistance	90 mΩ/m nominal
Length-related capacitance: CAN_L and ground, CAN_H and ground, CAN_L and CAN_H	30 pF/m nominal

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Determining the Necessary Termination Resistance for the Board

Unlike High-Speed CAN, Low-Speed/Fault-Tolerant CAN requires termination at the Low-Speed/Fault-Tolerant CAN transceiver instead of on the cable itself. Termination requires two resistors, RTH for CAN_H and RTL for CAN_L. This configuration allows the Philips Fault-Tolerant CAN transceiver to detect and recover from bus faults. It is important to determine the overall termination of the existing network, or the termination of the individual device, before connecting it to a Low-Speed/Fault-Tolerant port. Philips recommends an overall RTH and RTL termination of 100 to 500 Ω (each) for a properly terminated low-speed network.

Termination on the low-speed/fault-tolerant ports of the NI 9852 is set through the NI 985x software to either 1 kΩ or 5 kΩ.

Number of CAN Nodes

The maximum number of nodes depends on the electrical characteristics of the nodes on the network. If all of the nodes meet the requirements of Low-Speed/Fault-Tolerant CAN, up to 32 nodes may be connected to the bus.

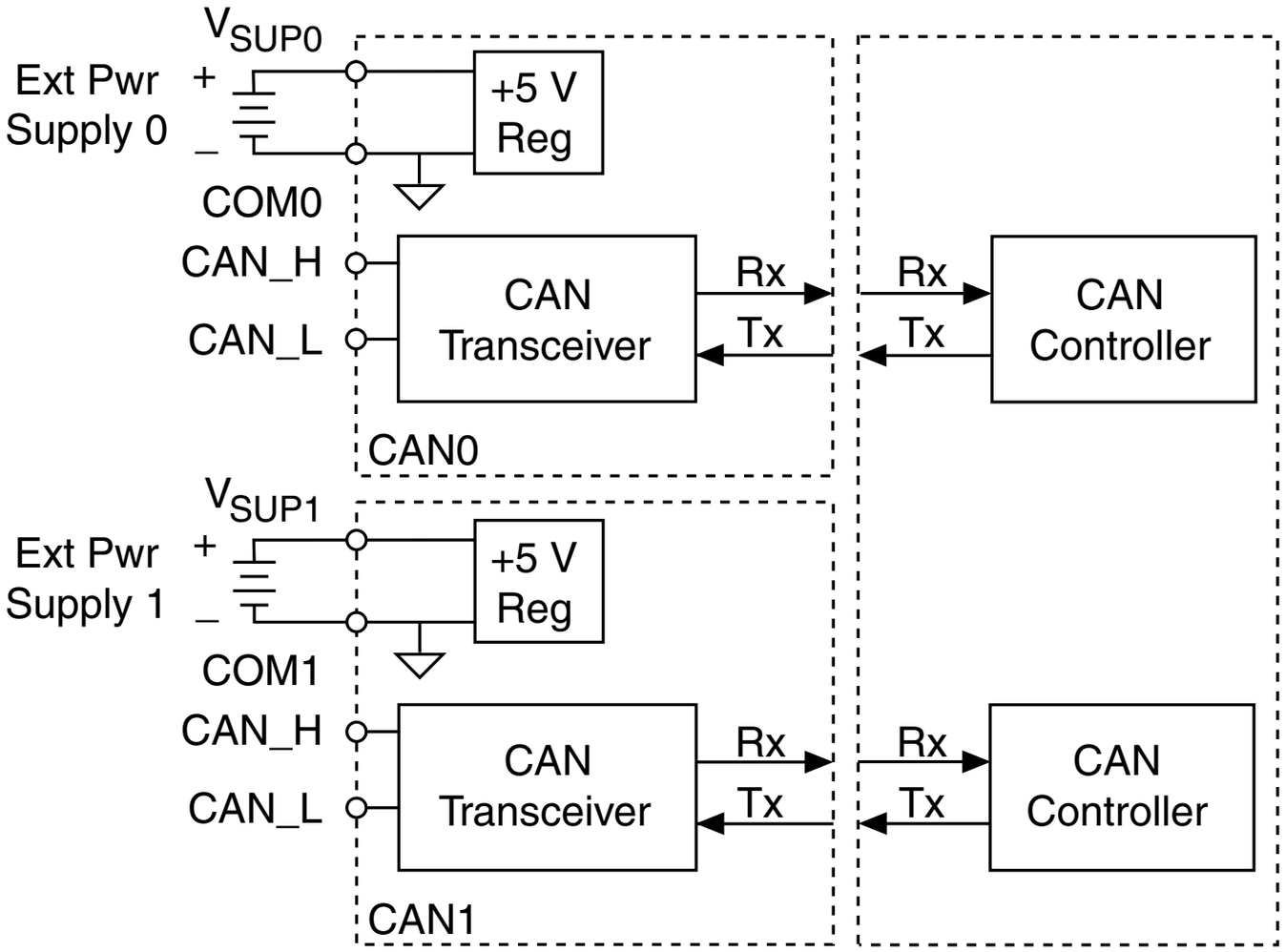
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NI 9852 Hardware Overview

The NI 9852 has two full-featured, independent CAN ports that are isolated from each other, and from the other modules in the system. Each port on the NI 9852 has a Philips SJA1000 controller that is CAN 2.0B-compatible and fully supports both 11-bit and 29-bit identifiers. The port also has a Philips TJA1054A Low-Speed/Fault-Tolerant CAN transceiver that is fully compatible with the ISO 11898 standard and supports baud rates up to 125 Kbps.

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Figure 3. NI 9852 Hardware Overview



NI 9852 Specifications

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

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Low-Speed/Fault Tolerant CAN Characteristics

Transceiver	Philips TJA1054A
Max baud rate	125 Kbps
CAN_H, CAN_L bus lines voltage	-27 to +40 VDC
Supply voltage range (V_{SUP0}/V_{SUP1})	
CAN0	+8 to +36 VDC
CAN1	+8 to +36 VDC
R_{RTH}	1.11 kΩ ± 0.5% or 4.99 kΩ ± 0.5%
R_{RTL}	1.11 kΩ ± 0.5% or 4.99 kΩ ± 0.5%
MTBF	1,052,836 hours at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method

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Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis	
Active Mode	
Transmitting	400 mW max
Receiving	400 mW max
Sleep mode	25 µW max
Thermal dissipation (at 70 °C)	
Active mode	1.5 W max
Sleep mode	1.2 W max

Physical Characteristics

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

Weight	Approx. 144 g (5.0 oz)

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Safety

Connect only voltages that are within the following limits:

Maximum Voltage[1]	
Port-to-COM	-27 to +40 VDC max, Measurement Category I
Isolation	
Port-to-port	
Continuous	60 VDC, Measurement Category I up to 5,000 m altitude
Withstand	500 V_{rms}, verified by a 5 s dielectric withstand test

[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.

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Port-to-earth ground	
Continuous	60 VDC, Measurement Category I up to 5,000 m altitude
Withstand	500 V_{rms}, verified by a 5 s dielectric withstand test

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 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 the NI 9852 to signals or use for measurements within Measurement Categories II, III, or IV.

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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.

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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

Electromagnetic Compatibility

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

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

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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 device with shielded cables.

CE Compliance CE

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.

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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

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

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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.

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.

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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*.

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Worldwide Support and Services

The NI website is your complete resource for technical support. At *ni.com/support*, you have access to everything from

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troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

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

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*. If your product supports calibration, you can obtain the calibration certificate for your product at *ni.com/calibration*.

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ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

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