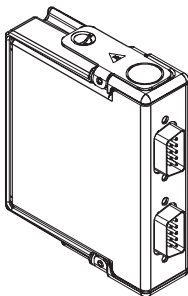


OPERATING INSTRUCTIONS

NI 9852

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



These operating instructions describe how to use the National Instruments (NI) 9852 module. For information about installing, configuring, and programming your system, refer to your system documentation. The NI 9852 module requires the NI 985x software (version 1.2 or higher) to be installed. The latest version of the NI 985x software is located at ni.com/downloads.



Note The safety guidelines and specifications in this document are specific to the NI 9852. The other components in your system may not meet the same safety ratings and specifications. Refer to the documentation for each component in your system to determine the safety ratings and specifications for the entire system.

Safety Guidelines

Operate the NI 9852 only as described in these operating instructions.



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

Safety Guidelines for Hazardous Locations

The NI 9852 is suitable for use in Class I, Division 2, Groups A, B, C, D, and T4 hazardous locations; Class 1, Zone 2, AEx nA II T4 and Ex nA II 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.



Caution For Zone 2 applications, install the CompactRIO system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.



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

This equipment has been evaluated as EEx nA II T4 equipment under DEMKO Certificate No. 03 ATEX 0324020X. Each module is marked Ex II 3G and is suitable for use in Zone 2 hazardous locations.

Wiring the NI 9852

The NI 9852 has two 9-pin male D-Sub connectors that provide 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. These signals should be connected using twisted-pair cable.

Each port has two isolated common pins (COM) that are internally connected to the isolated reference of the module and serve as the reference ground for CAN_H and CAN_L. Connect the CAN bus reference ground (sometimes referred to as CAN_V-) to the COM pin. Each port also has an optional shield pin, SHLD, that can be connected 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 V to +36 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 Table 1 and Table 2.

Table 1. Pin Assignments for CAN0

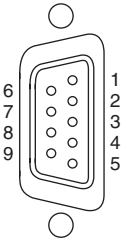
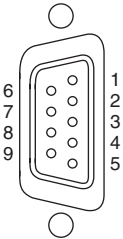
Connector	Pin	Signal
	1	No Connection (NC)
	2	CAN_L
	3	COM0
	4	NC
	5	SHLD
	6	COM0
	7	CAN_H
	8	NC
	9	V_{SUP0}

Table 2. Pin Assignments for CAN1

Connector	Pin	Signal
	1	No Connection (NC)
	2	CAN_L
	3	COM1
	4	NC
	5	SHLD
	6	COM1
	7	CAN_H
	8	NC
	9	V _{SUP1}

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. 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.

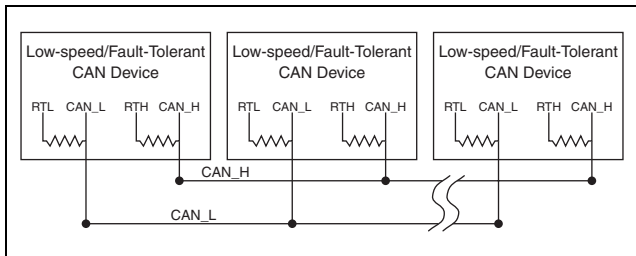


Figure 1. CAN Bus Topology and Termination Resistor Locations

Connecting a CAN Bus to the NI 9852

Each port of the NI 9852 can be connected to any location on a CAN bus. Figure 2 shows one example of the connection of CAN0 of 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.

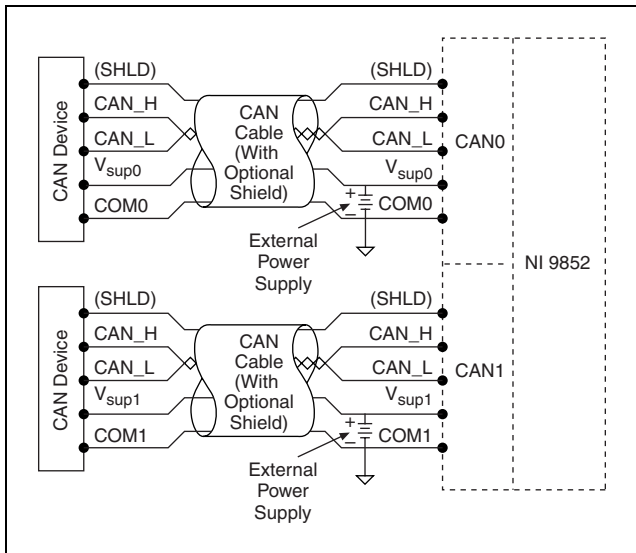


Figure 2. Connecting Both Ports of the NI 9852 to CAN Buses

Cabling Requirements for NI 9852

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

Cable Specifications

Cables should meet the physical medium requirements specified in ISO 11898, shown in Table 3. Belden cable (3084A) meets all of those requirements, and should be suitable for most applications.

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

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

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 k Ω or 5 k Ω .

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.

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 of the NI 9852 has a Philips SJA1000 CAN controller that is CAN 2.0B-compatible and fully supports both 11-bit and 29-bit identifiers. Each port also has a Philips TJA1054A Low-Speed/Fault-Tolerant CAN that is fully compatible with the ISO 11898 standard and supports baud rates up to 125 Kbps.

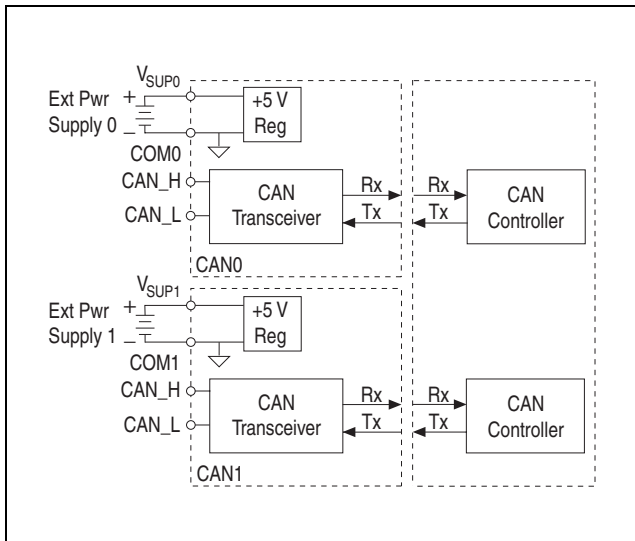


Figure 3. NI 9852 Hardware Overview

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.

This system sleep mode should not be confused with the NI 9852 Transceiver Mode Sleep property, which sets only the CAN port to sleep mode. Refer to the *FPGA Module* topic in *LabVIEW Help* for more information on the Transceiver Mode property.

Specifications

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

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}	$1.11\text{ k}\Omega \pm 0.5\%$ or $4.99\text{ k}\Omega \pm 0.5\%$
R_{RTL}	$1.11\text{ k}\Omega \pm 0.5\%$ or $4.99\text{ k}\Omega \pm 0.5\%$
MTBF	1,052,836 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

Transmitting..... 400 mW max

Receiving 400 mW max

Sleep mode 25 μ W max

Thermal dissipation (at 70 °C)

Active mode 1.5 W max

Sleep mode 1.2 W max

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

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

Safety

Maximum Voltage¹

Connect only voltages that are within these limits.

Port-to-COM..... –27 to +40 VDC max,
Measurement Category I

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

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.

Isolation Voltages

Port-to-port

Withstand.....	500 V _{rms} , 5 s
Continuous	60 VDC, Measurement Category I

Port-to-earth ground

Withstand.....	500 V _{rms} , 5 s
Continuous	60 VDC, Measurement Category I

Safety Standards

The NI 9852 is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- 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 visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA II T4
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nA II T4
Europe (DEMKO).....	EEx nA II T4

Environmental

CompactRIO modules are intended for indoor use only. For outdoor use, mount the CompactRIO system in a suitably rated enclosure. Refer to the installation instructions for the chassis you are using for more information about meeting these specifications.

Operating temperature	-40 to 70 °C
Storage temperature	-40 to 85 °C
Ingress protection.....	IP 40
Operating humidity	10 to 90% RH, noncondensing

Storage humidity.....	5 to 95% RH, noncondensing
Maximum altitude.....	2,000 m
Pollution Degree (IEC 60664).....	2

Shock and Vibration

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

Operating vibration, random (IEC 60068-2-64)	5 g _{rms} , 10 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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Operating vibration, sinusoidal (IEC 60068-2-6)	5 g, 10 to 500 Hz
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Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



Note For EMC compliance, operate this device according to product documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain 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

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* 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 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.

电子信息产品污染控制管理办法（中国 RoHS）



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National Instruments Contact Information

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 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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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 3390150,
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