NI-9862

Getting Started

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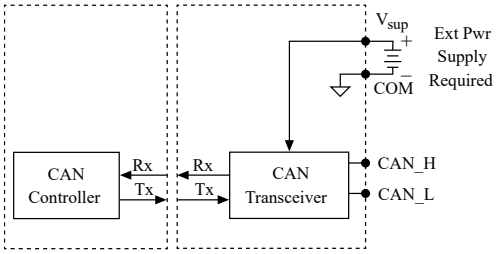
NI-9862 Block Diagram

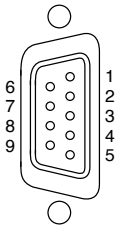
The NI-9862 has one full-featured CAN port that is isolated from the other modules in the system. The port has a Bosch DCAN CAN controller that is CAN 2.0B-compatible and fully supports both 11-bit and 29-bit identifiers. The port also has an NXP TJA1041AT High-Speed CAN transceiver that is fully compatible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

Figure 1. NI-9862 Hardware Overview



NI-9862 Pinout

Pin assignments for the NI-9862.

Connector	Pin	Signal
	1	No Connection (NC)
	2	CAN_L
	3	COM
	4	NC
	5	SHLD
	6	COM
	7	CAN_H
	8	NC

Connector	Pin	Signal
	9	V_{SUP}

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 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.

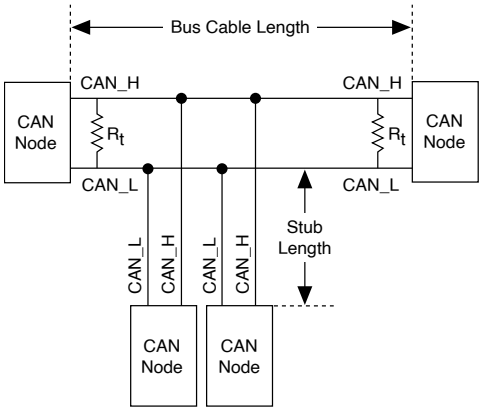
CAN Bus Topology and Termination

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.

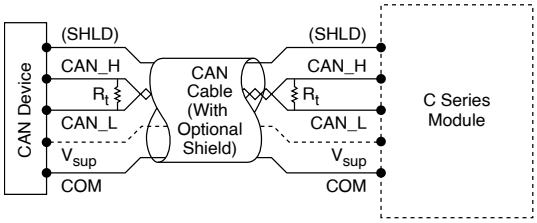
Figure 2. CAN Bus Topology and Termination Resistor Locations



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



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

Characteristic	Value
Impedance	95 Ω minimum 120 Ω nominal
	140 Ω maximum
Length-related resistance	70 mΩ/m nominal
Specific line delay	5 ns/m nominal

Termination Resistor Requirements

The termination resistors (R_t) should match the nominal impedance of the CAN cable and therefore comply with the values in the following table.

Table 2. Termination Resistor Requirements

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

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 up to 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 up to at least 110 CAN ports on a network.