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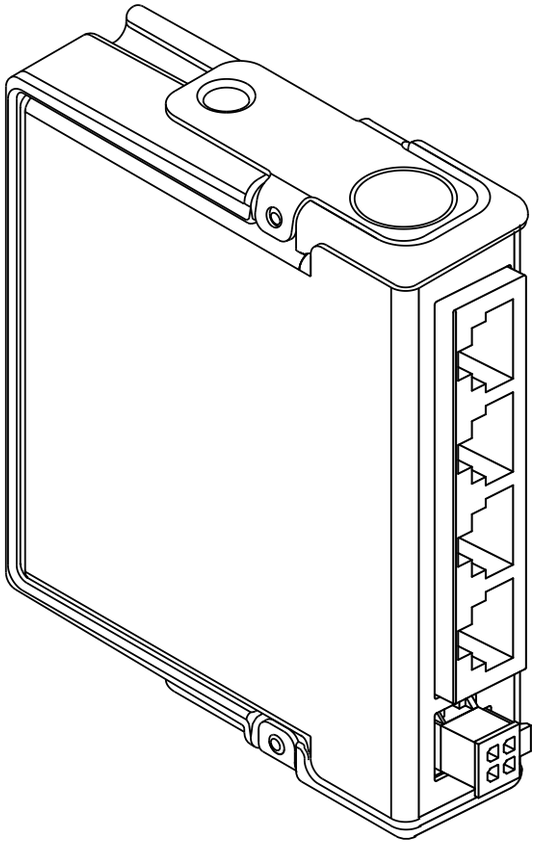
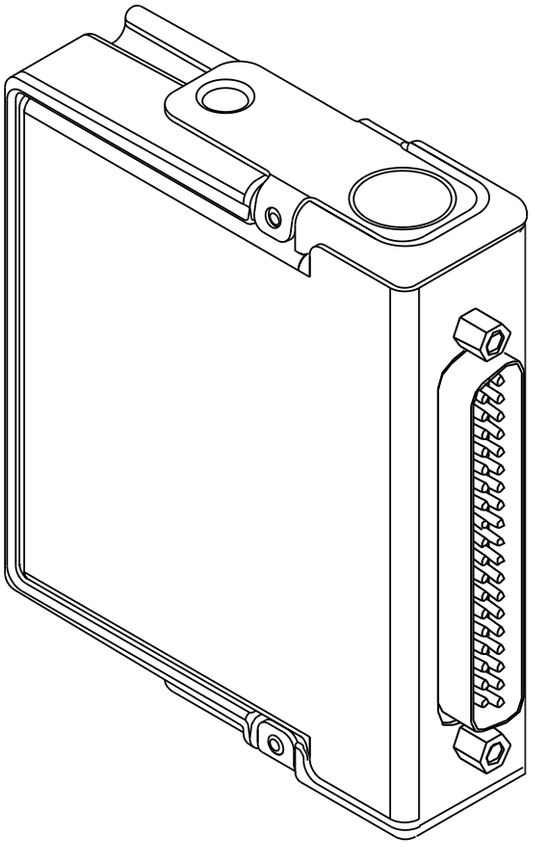
GETTING STARTED GUIDE

NI 9237

4 AI, ±25 mV/V, 24 Bit, 50 kS/s/ch Simultaneous, Bridge Completion





NATIONAL INSTRUMENTS™

This document explains how to connect to the NI 9237. In this document, the NI 9237 with RJ-50 and the NI 9237 with DSUB are referred to inclusively as the NI 9237.

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 9237. 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 9237 only as described in this document.

Caution Do not operate the NI 9237 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 Voltages

Connect only voltages that are within the following limits.

Between any two pins	±30 V maximum
Isolation, channel-to-channel	None
Isolation, channel-to-earth ground	
Up to 3,000 m	
Continuous	60 VDC, Measurement Category I
Withstand	1,000 Vrms, verified by a 5 s dielectric withstand test
Up to 5,000 m	
Continuous	60 VDC, Measurement Category I
Withstand	860 Vrms, 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 9237 to signals or use for measurements within Measurement Categories II, III, or IV.

Note Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Safety Guidelines for Hazardous Locations

The NI 9237 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 9237 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 Division 2 and Zone 2 applications, connected signals must be within the following limits.

Capacitance	0.2 µF maximum
Inductance	80 mH maximum

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9237 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 9237 is marked Ⓔx 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 9237 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.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.

Special Conditions for Marine Applications

Some products are Lloyd's Register (LR) Type Approved for marine (shipboard) applications. To verify Lloyd's Register certification for a product, visit *ni.com/certification* and search for the LR certificate, or look for the Lloyd's Register mark on the product.

Caution In order to meet the EMC requirements for marine applications, install the product in a shielded enclosure with shielded and/or filtered power and input/output ports. In addition, take precautions when designing, selecting, and installing measurement probes and cables to ensure that the desired EMC performance is attained.

Preparing the Environment

Ensure that the environment in which you are using the NI 9237 meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude	5,000 m

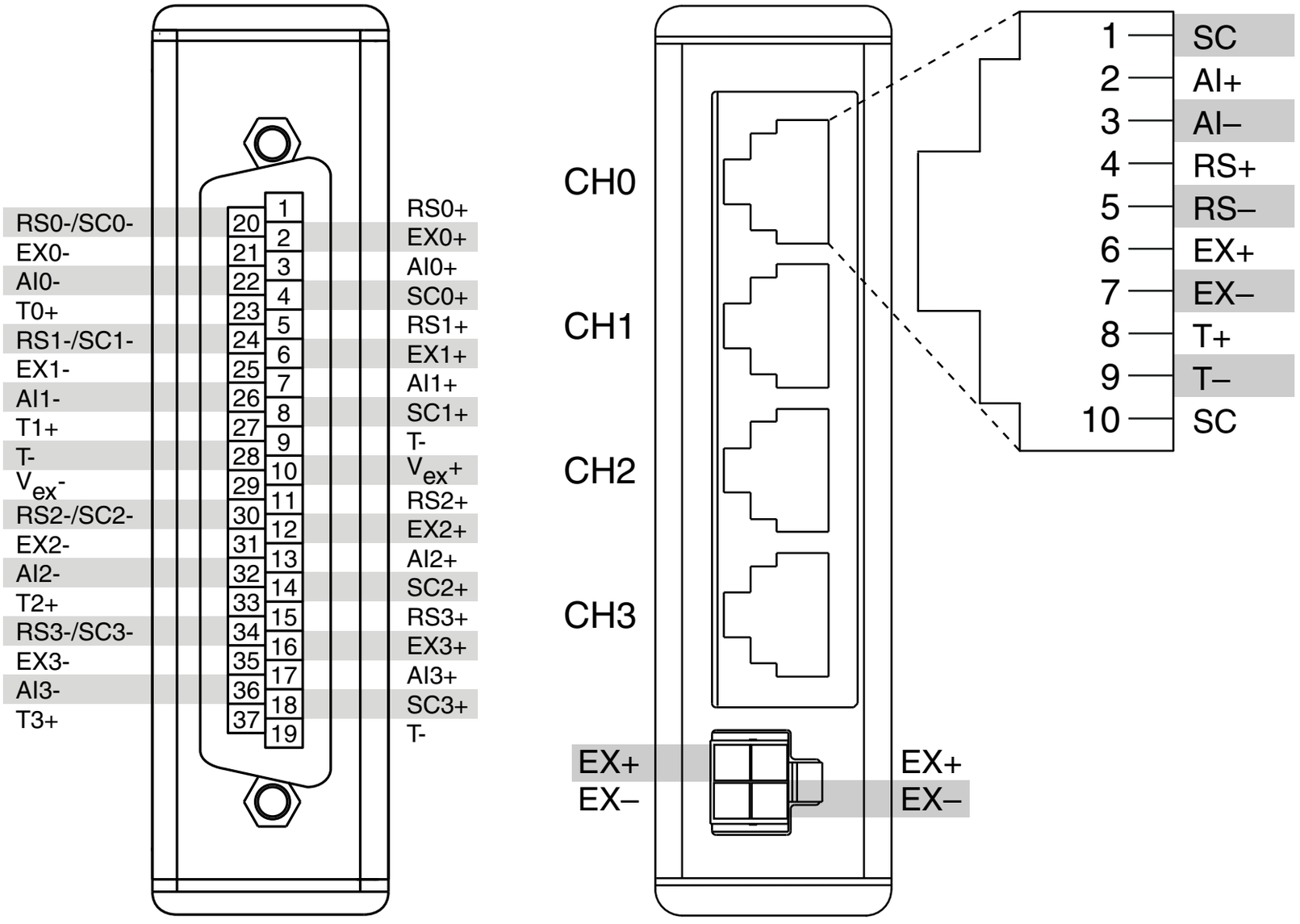
Indoor use only.

Note Refer to the device datasheet on *ni.com/manuals* for complete specifications.

Connecting the NI 9237

The NI 9237 provides connections for four half or full bridges, and an external excitation voltage source.

Figure 1. NI 9237 Pinout



Caution Do not use RJ-45 cables with the NI 9237 with RJ-50. RJ-45 cables damage the RJ-50 connector,

permanently disabling the shunt calibration, regardless of which connector you use.

Signal Descriptions

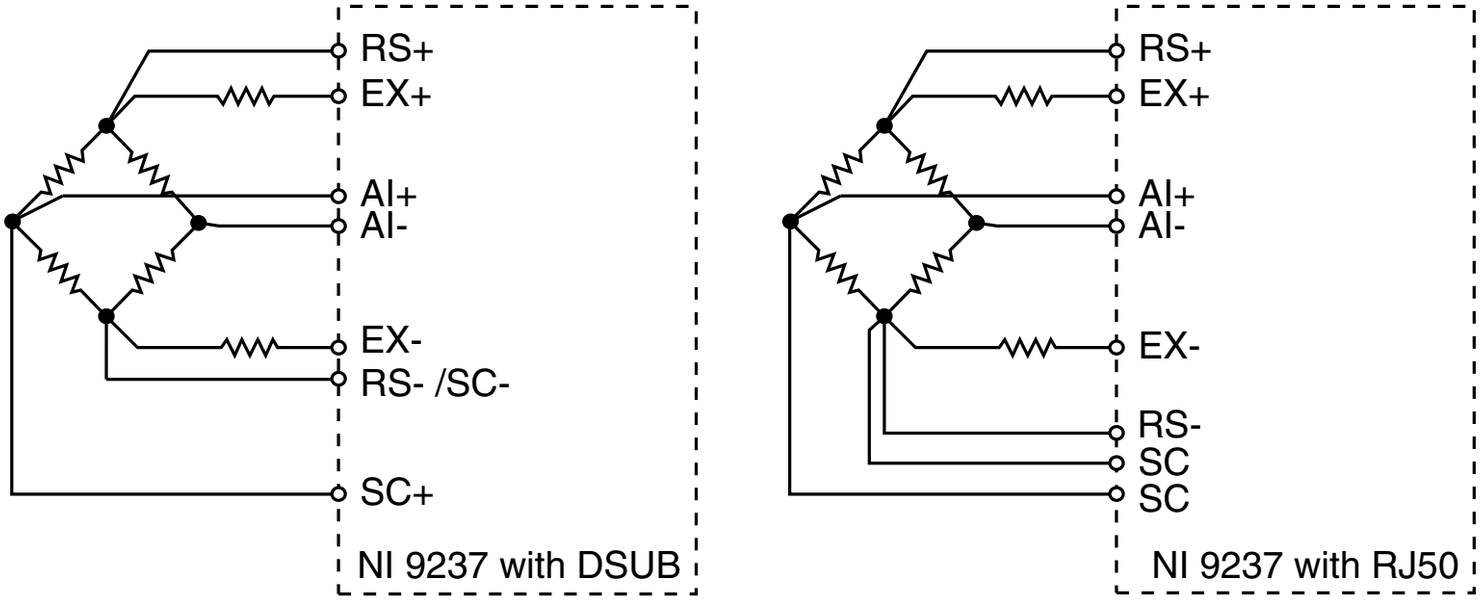
Table 1. NI 9237 Signal Descriptions

Signal Name	Description
AI+	Positive analog input signal connection
AI-	Negative analog input signal connection
RS+	Positive remote sensing connection
RS-	Negative remote sensing connection
EX+	Positive sensor excitation connection
EX-	Negative sensor excitation connection
T+	TEDS data connection
T-	TEDS return connection
SC	Shunt calibration connection

Connecting a Full Bridge

You can connect a full bridge to the NI 9237.

Figure 2. Connecting a Full Bridge to the NI 9237

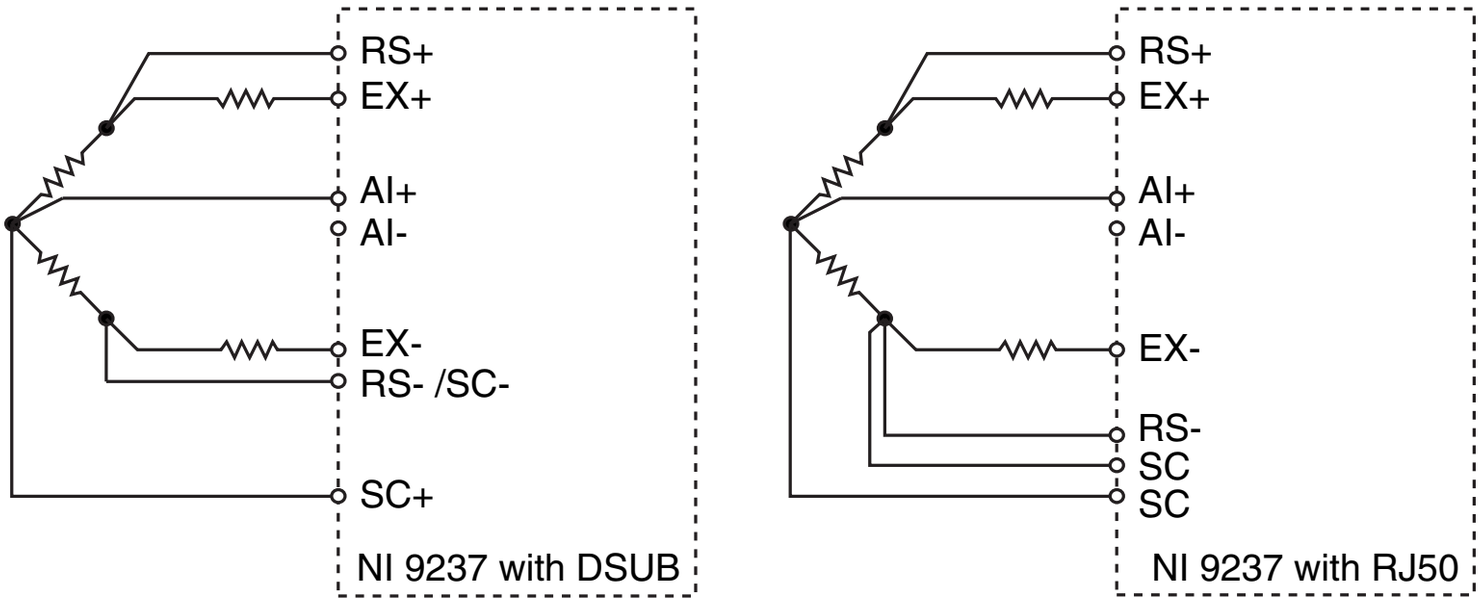


You also can connect floating signals to the NI 9237. If you connect floating signals to the NI 9237, NI recommends connecting the EX- signal to the earth ground or shield for better noise rejection.

Connecting a Half Bridge

You can connect a half bridge to the NI 9237.

Figure 3. Connecting a Half Bridge to the NI 9237



You also can connect floating signals to the NI 9237. If you connect floating signals to the NI 9237, NI recommends connecting the EX- signal to the earth ground or shield for better noise rejection.

Bridge Calibration

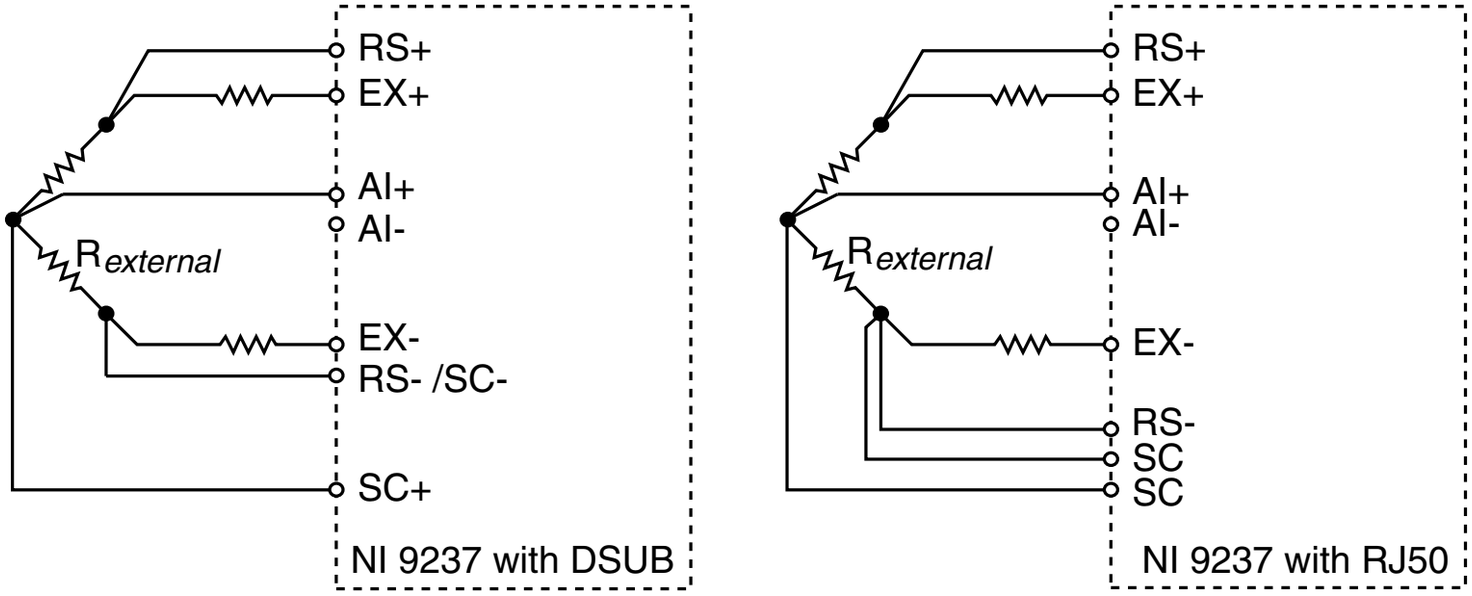
When you insert or remove a new sensor from the NI 9237, slight changes in the excitation voltages can cause a mismatch between the internal half-bridge completion resistors and the half-bridge sensors, which results in a change in the measurement offsets. NI recommends performing bridge calibrations of quarter- or half-bridge sensors after connecting all sensors to the NI 9237 and

after removing or attaching any additional sensor. For more information about changes in voltage offsets in the NI 9237, visit *ni.com/info* and enter the Info Code `rdw9237`.

Connecting a Quarter Bridge

You can connect a quarter bridge to the NI 9237 by adding a resistor externally to create a half bridge.

Figure 4. Connecting a Quarter Bridge to the NI 9237

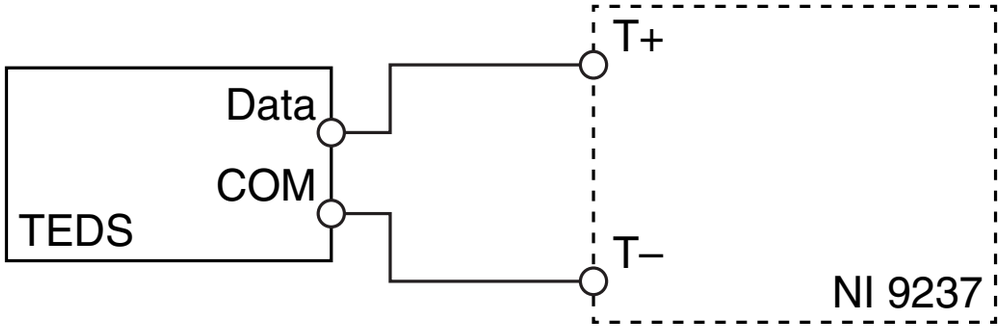


You also can use a quarter bridge with the NI 9237 with RJ-50 if you use the NI 9944 or NI 9945 Quarter Bridge Completion Accessory.

Connecting TEDS Sensors

You can connect TEDs sensors to the NI 9237.

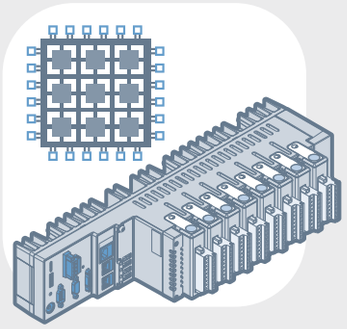
Figure 5. Connecting TEDS Sensors to the NI 9237



Ensure that neither the TEDS data (T+) nor the TEDS return (T-) signal is tied in common to any AI signals on the NI 9237. The NI 9237 connects all the T- signals together internally. The NI 9237 with DSUB has only three T- pins. To connect four TEDS sensors to the NI 9237 with DSUB, wire the TEDS return signals of two of the sensors to one of the T- pins.

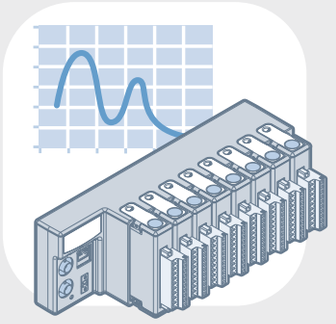
Where to Go Next

CompactRIO



- *NI 9237 Datasheet*
- *NI-RIO Help*
- *LabVIEW FPGA Help*

NI CompactDAQ



- *NI 9237 Datasheet*
- *NI-DAQmx Help*
- *LabVIEW Help*

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Visit *ni.com/services* for NI Factory Installation Services, repairs, extended warranty, and other services.

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*.

NI corporate headquarters is located at
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