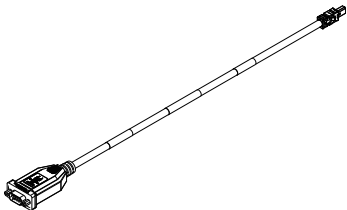


GETTING STARTED GUIDE

NI-XNET LIN Transceiver Cable



This document explains how to connect to the NI-XNET LIN Transceiver Cable.



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-XNET LIN Transceiver Cable. 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-XNET LIN Transceiver Cable only as described in this document.



Caution Do not operate the NI-XNET LIN Transceiver Cable 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 Guidelines for Hazardous Locations

The NI-XNET LIN Transceiver Cable 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-XNET LIN Transceiver Cable in a potentially explosive environment. Not following these guidelines may result in serious injury or death.



Caution Do not disconnect bus-side connector unless power has been switched off or the area is known to be nonhazardous.



Caution Do not unplug transceiver cable 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 Zone 2 applications, install a protection device between the LIN bus and the NI-XNET LIN Transceiver Cable LIN pins. The device must prevent the LIN 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-XNET LIN Transceiver Cable has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 12 ATEX 1202658X and is IECEx UL 14.0089X certified. Each NI-XNET LIN Transceiver Cable is marked  II 3G and is suitable for use in Zone 2 hazardous locations.



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.



Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories. Do not use unshielded cables or accessories unless they are installed in a shielded enclosure with properly designed and shielded input/output ports and connected to the product using a shielded cable. If unshielded cables or accessories are not properly installed and shielded, the EMC specifications for the product are no longer guaranteed.

Mounting the NI-XNET LIN Transceiver Cable



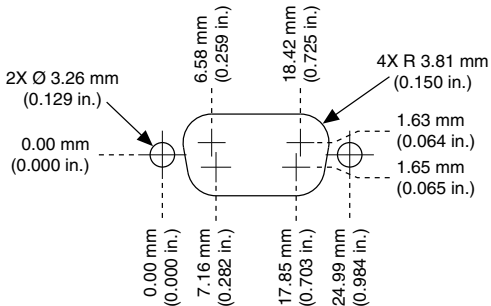
Caution The NI-XNET LIN Transceiver Cable is a thermally active device that dissipates heat. Refer to the user manual of the host this device directly connects to for specific information regarding thermal management. Not following mounting requirements may affect the system ambient temperature and/or the measurement accuracy of modules in the system.

You can route and strain relieve the Transceiver Cable similarly to ordinary cables. You also can panel mount it using its removable jackscrews. An accessory bracket (NI part number 784501-01) allows for screw or zip tie mounting methods.

Panel Mounting the Transceiver Cable

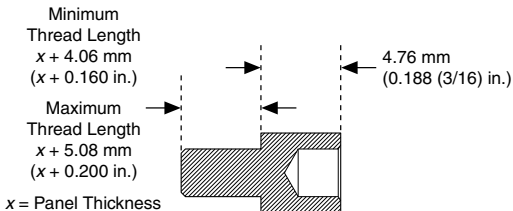
The recommended cutout dimensions are shown below.

Figure 1. Recommended Cutout Dimensions



Different panel thicknesses require different sizes of jackscrews according to the following formulas; x is the panel thickness.

Figure 2. Jackscrew Thread Lengths



Caution Do not violate the minimum or maximum male thread length.

The included jackscrews have a male thread length of 5.08 mm (0.200 in.), so the maximum panel thickness (x) the default jackscrews can accommodate is 1.02 mm (0.040 in.). You can accommodate panel thicknesses between 1.03 mm (0.041 in.) and 1.83 mm (0.072 in.) by sourcing other jackscrews. Panel thicknesses greater than 1.83 mm (0.072 in.) are not allowed.

Jackscrew specifications:

- 4-40 male-to-female
- Steel or stainless steel
- 3/16 in. hex
- Torque: 0.56 N · m (5.0 lb · in.)



Caution Do not use jackscrews made of brass, aluminum, or other materials. Do not exceed the recommended torque.

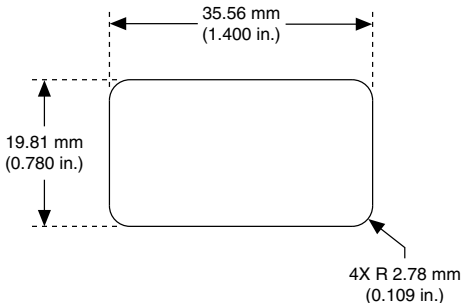
The following table lists the minimum and maximum panel thicknesses that commonly available jackscrews can accommodate:

Male Thread Length	Minimum Panel Thickness	Maximum Panel Thickness
4.78 mm (0.188 (3/16) in.)	0.0 mm (0.000 in.)	0.69 mm (0.027 in.)
5.08 mm (0.200 in.) (included)	0.0 mm (0.000 in.)	1.02 mm (0.040 in.)
6.35 mm (0.250 (1/4) in.)	1.27 mm (0.050 in.)	1.83 mm (0.072 in.)

If your panel is thicker than the maximum allowed panel thickness, you can mill out a recessed pocket for the Transceiver Cable.

The following figure shows the recommended pocket dimensions.

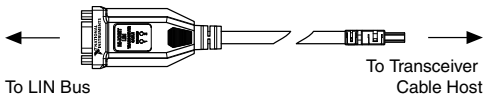
Figure 3. Recommended Pocket Dimensions



Wiring to the NI-XNET LIN Transceiver Cable

The NI-XNET LIN Transceiver Cable is used with a compatible NI-XNET Transceiver Cable host port.

Figure 4. NI-XNET LIN Transceiver Cable Connections



The NI-XNET LIN Transceiver Cable has one 9-pin male D-Sub connector that provides connections to a LIN bus.

The port has two common pins (COM) that are internally connected to the transceiver cable's isolated reference and serve as the reference ground for the LIN signal. You can connect the LIN bus reference ground to one or both COM pins.

The D-Sub connector shell connects through the NI-XNET LIN Transceiver Cable shielding to the connector on the host port end. The shielding does not electrically connect to the COM signals.

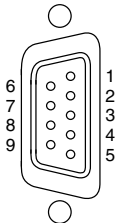


Caution When connecting the D-Sub connector shell, do not exceed the maximum jackscrew torque of $0.56 \text{ N} \cdot \text{m}$ ($5.0 \text{ lb} \cdot \text{in.}$).

The NI-XNET LIN Transceiver Cable gets power from the XNET host port but also requires an external power supply of +8 V to +18 V to operate. Supply power to the NI-XNET LIN Transceiver Cable V_{SUP} pin from the LIN bus.

The NI-XNET LIN Transceiver Cable pinout is listed in the following table.

Table 1. Pin Assignments for the NI-XNET LIN Transceiver Cable

Connector	Pin	Signal Name
	1	No Connection (NC)
	2	NC
	3	COM
	4	NC
	5	NC
	6	COM
	7	LIN
	8	NC
	9	V _{SUP}

Cable Specifications

LIN cables should meet the physical medium requirement of a bus RC time constant of 5 μ s. For detailed formulas for calculating this value, refer to the *Line Characteristics* section of the LIN specification. Belden cable (3084A) and other unterminated CAN/Serial quality cables meet these requirements and should be suitable for most applications.

Cable Lengths

The maximum allowable cable length is 40 m, per the LIN specification.

Number of LIN Nodes

The maximum number of devices on a LIN bus is 16, per the LIN specification.

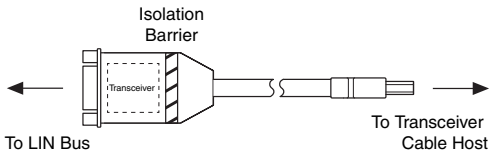
Termination Resistors

LIN cables require no termination, as nodes are terminated at the transceiver. Slave nodes typically are pulled up from the LIN bus to V_{SUP} with a 30 k Ω resistance and a serial diode. This termination usually is integrated into the transceiver package. The master node requires a 1 k Ω resistor and serial diode between the LIN bus and V_{SUP} . On NI-XNET LIN products, master termination is software selectable; you can enable it in the API with the NI-XNET Session Interface:LIN:Termination property.

NI-XNET LIN Transceiver Cable Hardware Overview

The NI-XNET LIN Transceiver Cable has one full-featured LIN port that is isolated from the host it is plugged into. The port has an NXP TJA1028 LIN transceiver that is fully compatible with the LIN 1.3/2.0/2.1/2.2 and SAE J2602 standards and supports baud rates up to 20 kbps.

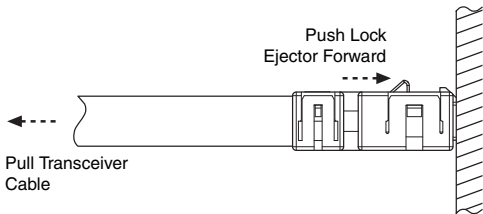
Figure 5. NI-XNET LIN Transceiver Cable Hardware Overview



Inserting and Removing the NI-XNET LIN Transceiver Cable

The NI-XNET LIN Transceiver Cable connects to a host device with an active latching connector. To connect the NI-XNET LIN Transceiver Cable to a host device, push the connector assembly into the host receptacle until the internal latch snaps into position. The latch emits an audible click when engaged. To remove the NI-XNET LIN Transceiver Cable, push the lock ejector forward to disengage the latch and simultaneously pull the NI-XNET LIN Transceiver Cable, as shown in the following figure.

Figure 6. Inserting and Removing the NI-XNET LIN Transceiver Cable



NI-XNET LIN Transceiver Cable LEDs

NI-XNET Transceiver Cables include two LEDs per port to help you monitor hardware and bus status. LED 1 primarily indicates whether the hardware is currently in use. LED 2 primarily indicates the activity information of the connected bus. Each LED can display two colors (red or green), which display in the following four patterns:

Table 2. LED Pattern Definitions

Pattern	Meaning
Off	No LED illumination
Solid	LED fully illuminated
Blink	Blinks at a constant rate of several times per second
Activity	Blinks in a pseudo-random pattern

Table 3. LED Pattern Indications

Condition/State	LED 1	LED 2
Port identification	Blinks green	Blinks green
NI-XNET catastrophic error	Blinks red	Blinks red
No open session on hardware	Off	Off

Table 3. LED Pattern Indications (Continued)

Condition/State	LED 1	LED 2
Open session on hardware, port is properly powered, and hardware is not communicating	Solid green	Off
Open session on hardware, port is missing power	Solid red	Off
Hardware is communicating	Solid green	Activity green (returns to idle/off one second after last TX or RX)

NI-XNET LIN Transceiver Cable Specifications

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

LIN Characteristics

Transceiver	NXP TJA1028
Max baud rate	20 kbps
LIN bus lines voltage	-40 VDC to +40 VDC
Supply voltage range (V_{SUP})	+8 VDC to +18 VDC normal operating; -0.3 VDC to +40 VDC absolute limits
MTBF	Contact NI for Bellcore MTBF specifications at other temperatures or MIL-HDBK-217F specifications.

Power Requirements

Thermal dissipation (at 70 °C)	650 mW max (active mode); 330 mW typical (active mode)
Power consumption from NI-XNET Transceiver Cable host	330 mW max (active mode); 150 mW typical (active mode)
LIN bus (V_{sup})	320 mW max; 180 mW typical

Physical Characteristics

To clean the transceiver cable, wipe it with a dry towel.

Weight	Approx. 65 g (2.3 oz)
Length	450.85 mm to 463.55 mm (17.75 in. to 18.25 in.)
D-Sub connector jackscrew maximum torque	0.56 N · m (5.0 lb · in.)

Safety

Maximum Voltage¹

Connect only the voltages that are within these limits.

Port-to-COM	-40 VDC to +40 VDC max, Measurement Category I
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Measurement Category I is for measurement performed on circuits not directly connected to the electrical distribution system

¹ The maximum voltage that can be applied or output without creating a safety hazard.

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.



Note Measurement Categories CAT I and CAT O (Other) 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, and CAT IV.

Isolation Voltage

Port-to-earth ground

Continuous

60 VDC, Measurement
Category I



Note The NI-XNET LIN Transceiver Cable COM signals are not connected to the host port ground. This isolation is intended to prevent ground loops and does not meet UL ratings for safety isolation.

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.

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

Environmental

Refer to the manual for the host you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C ² to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C ² to 85 °C
Ingress protection	IP40
Operating humidity (IEC 60068-2-56)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-56)	5% RH to 95% RH, noncondensing
Pollution Degree (IEC 60664)	2
Maximum altitude	5,000 m

Indoor use only.

² Similar to other standard PVC cables, this product's cable becomes less ductile at low temperatures. Preroute and secure the cable while flexible to avoid premature failure.

Shock and Vibration

To meet these specifications, you must securely mount your transceiver cable and ensure all cables and connectors have proper strain relief.

Operating vibration

Random (IEC 60068-2-64)	5 g _{rms} , 10 Hz to 500 Hz
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Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz 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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Electromagnetic Compatibility

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

- EN 61326-1 (IEC 61326-1): Class A emissions; Industrial immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions

- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.



Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.



Note For EMC declarations and certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance

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.

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.

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.

电子信息产品污染控制管理办法（中国 RoHS）



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