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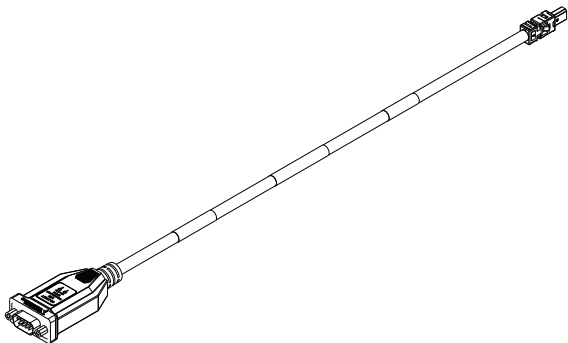
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**TRC-8546**

OPERATING INSTRUCTIONS

# NI-XNET LIN Transceiver Cable



These operating instructions describe how to use the NI-XNET LIN Transceiver Cable. For information about installing, configuring, and programming your system, refer to your system documentation. The transceiver cable requires the latest NI-XNET software to be installed. The latest version of the NI-XNET software is at [ni.com/downloads](http://ni.com/downloads).



**Note** The safety guidelines and specifications in this document are specific to the NI-XNET LIN Transceiver Cable. 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

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Operate the NI-XNET LIN Transceiver Cable 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.



**Caution** Do *not* operate the NI-XNET LIN Transceiver Cable in a manner not specified in these operating instructions. 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 National Instruments 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 IP 54 as defined by IEC 60529 and EN 60529.



**Caution** For Division 2 and 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 Safe Use in Europe

This equipment has been evaluated as Ex nA IIC T4 equipment under DEMKO Certificate 12 ATEX Number (1202658X). Each 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 be mounted in an ATEX certified enclosure with a minimum ingress protection rating of at least IP54 as defined in IEC/EN 60529 and used in an environment of not more than Pollution Degree 2.



**Caution** The enclosure must have a door or cover accessible only by the use of a tool.

## Mounting the NI-XNET LIN Transceiver Cable

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**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.

The Transceiver Cable is intended to be routed and strain relieved similar to other cables, and does not require a special mounting accessory.

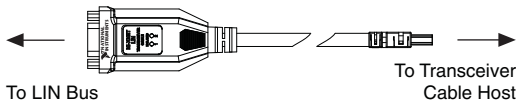
## Wiring to the NI-XNET LIN Transceiver Cable

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

**Figure 1.** NI-XNET LIN Transceiver Cable Connections

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

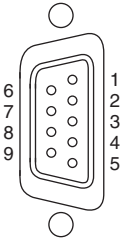
The port has two common pins (COM) that are internally connected to the transceiver cable's isolated reference and serve as the reference ground for the LIN signal. You can connect the LIN bus reference ground to one or both COM pins.

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.

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

The NI-XNET LIN Transceiver Cable pinout is listed in Table 1.

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

Connector	Pin	Signal
	1	No Connection (NC)
	2	NC
	3	COM
	4	NC
	5	NC
	6	COM
	7	LIN
	8	NC
	9	Vsup



# Cabling Requirements to the NI-XNET LIN Transceiver Cable

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

## Cable Specifications

LIN cables should meet the physical medium requirement of a bus RC time constant of 5  $\mu$ 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 $\Omega$  resistance and a serial diode. This termination usually is integrated into the transceiver package. The master node requires a 1 k $\Omega$  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.

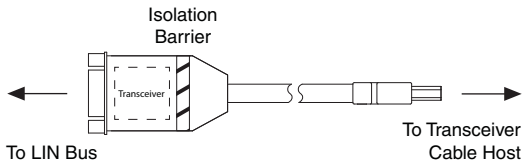
## NI-XNET LIN Transceiver Cable Hardware Overview

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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 2. NI-XNET LIN Transceiver Cable Hardware Overview**

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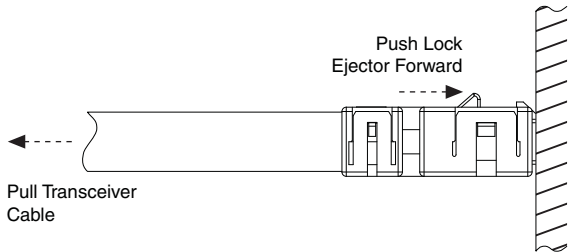
## Inserting and Removing the NI-XNET LIN Transceiver Cable

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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 Figure 3.

**Figure 3.** Inserting and Removing the NI-XNET Transceiver Cable

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## NI-XNET LIN Transceiver Cable LEDs

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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

<b>Pattern</b>	<b>Meaning</b>
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

<b>Condition/State</b>	<b>LED 1</b>	<b>LED 2</b>
Port identification	Blinks green	Blinks green
NI-XNET catastrophic error	Blinks red	Blinks red
No open session on hardware	Off	Off
Open session on hardware, port is properly powered, and hardware is not communicating	Solid green	Off

**Table 3.** LED Pattern Indications (Continued)

<b>Condition/State</b>	<b>LED 1</b>	<b>LED 2</b>
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)

## Specifications

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

### LIN Characteristics

Transceiver..... NXP TJA1028  
Max baud rate ..... 20 kbps  
LIN bus lines voltage..... -40 to +40 VDC

Supply voltage range (Vsup) .....	+8 to +18 VDC normal operating -0.3 to +40 VDC absolute limits
MTBF .....	Contact NI for Bellcore MTBF 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 (Vsup) .....

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)

# Safety

## Maximum Voltage<sup>1</sup>

Connect only voltages that are within these limits.

Port-to-COM..... -40 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 the NI-XNET LIN Transceiver Cable to signals or use for measurements within Measurement Categories II, III, or IV.

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<sup>1</sup> The maximum voltage that can be applied or output between any port and a COM terminal without creating a safety hazard.





**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 Standards

This product meets 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

- 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 installation instructions for the host you are using for more information about meeting these specifications.

### Operating temperature

(IEC 60068-2-1, IEC 60068-2-2) ..... -40<sup>1</sup> to 70 °C

### Storage temperature

(IEC 60068-2-1, IEC 60068-2-2) ..... -40<sup>1</sup> to 85 °C

Ingress protection..... IP 40

### Operating humidity

(IEC 60068-2-56)..... 10 to 90% RH,  
noncondensing

### Storage humidity

(IEC 60068-2-56)..... 5 to 95% RH,  
noncondensing

Pollution Degree (IEC 60664)..... 2

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<sup>1</sup> 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.

Maximum altitude<sup>1</sup> ..... 5000 m

Indoor use only.

## 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<sub>rms</sub>, 10 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

Operating vibration,  
sinusoidal (IEC 60068-2-6) ..... 5 g, 10 to 500 Hz

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<sup>1</sup> 60 V CAT I, 1000 V Withstand up to 3000 m; 60 V CAT I, 860 V Withstand from 3001 to 5000 m.

## Electromagnetic Compatibility

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

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



**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 product according to the documentation.

## CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; 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](http://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](http://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 products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

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