PSH32-TC6 Shielded Cable with Thermocouple Miniconnectors Installation Guide

This installation guide describes how to install and connect thermocouples and digital I/O signals to the PSH32-TC6 shielded cable with thermocouple miniconnectors for use with the NI PCMCIA-4350.

Introduction

The PSH32-TC6 shielded cable with thermocouple miniconnectors consists of a pod with six miniconnectors that connect the thermocouples to the NI PCMCIA-4350. This pod connects to the NI PCMCIA-4350 input/output (I/O) connector with a shielded cable. You also can access the four digital I/O (DIO) lines and digital ground of the NI PCMCIA-4350 using the detachable screw terminal connector located on the pod.

This cable is designed specifically for ease of use with thermocouples. The cable features isothermal construction to minimize the temperature gradients across the thermocouple junctions and a high-accuracy thermistor cold-junction temperature sensor.

The pod provides connections to all NI PCMCIA-4350 DIO lines and to all but two analog input channels (CH). CH0 is dedicated to the cold-junction sensor, and CH1 is dedicated to auto-zeroing circuitry. Refer to the *NI 435X User Manual* for further details about these two channels.

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NATIONAL INSTRUMENTS

Conventions

The following conventions are used in this guide:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
	This icon denotes a note, which alerts you to important information.
	This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. When this symbol is marked on the product, refer to the *Read Me First: Safety and Radio-Frequency Interference* document, shipped with the product, for precautions to take.
italic	Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.
NI 435*X*	Refers to all devices in the National Instruments 4350 and 4351 families.

What You Need to Get Started

You need the following items to set up and use the PSH32-TC6:

- ❑ PSH32-TC6 shielded cable with thermocouple miniconnectors
- ❑ *PSH32-TC6 Shielded Cable with Thermocouple Miniconnectors Installation Guide*
- ❑ NI PCMCIA-4350 and documentation
- ❑ *Read Me First: Safety and Radio-Frequency Interference*
- ❑ Thermocouple with a miniconnector
- ❑ 1/8 in. flathead screwdriver
- ❑ Wire cutter

- ❑ Wire insulation stripper
- ❑ Adhesive hook-and-loop fastener strip

Connecting the Signals

Refer to the *NI 435X User Manual* for signal connection examples.

Connecting Thermocouples

Caution Refer to the *Read Me First: Safety and Radio-Frequency Interference* document before removing equipment covers or connecting/disconnecting any signal wires.

Insert the thermocouple miniconnector to the mating miniconnector on the thermocouple pod, as shown in Figure 1. Each miniconnector is keyed; that is, it has two spades of different widths so that you can insert the thermocouple in only one way.

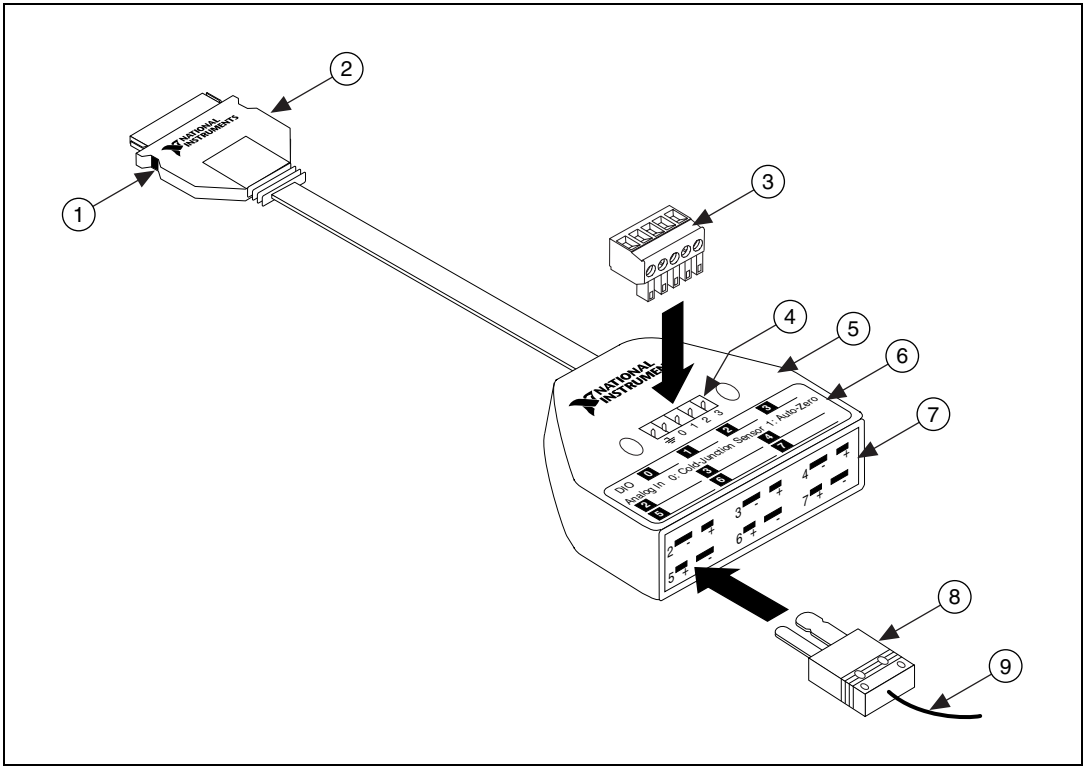
Do not force the miniconnector; if you encounter difficulty while inserting the miniconnector, check whether the polarity is correct.

Connecting DIO Signals

Refer to Figure 1 as you complete the following steps to connect the digital signals to the PSH32-TC6:

1. Use a wire cutter and wire insulation stripper to strip the wire ends as necessary to connect them to the screw terminals.
2. Loosen the screws in the screw terminals with the 1/8 in. flathead screwdriver.
3. Insert the stripped wires into the screw terminals. Tighten the screws with the 1/8 in. flathead screwdriver.

The wires should be firmly connected.



1	Ejector Ears	4	Screw Terminal Receptacle	7	Miniconnector Receptacles
2	NI PCMCIA-4350 Connector	5	Thermocouple Pod	8	Miniconnector
3	Screw Terminals for DIO	6	Label	9	Thermocouple

Figure 1. PSH32-TC6 Parts Locator Diagram

Connecting to the PSH32-TC6 to the NI PCMCIA-4350

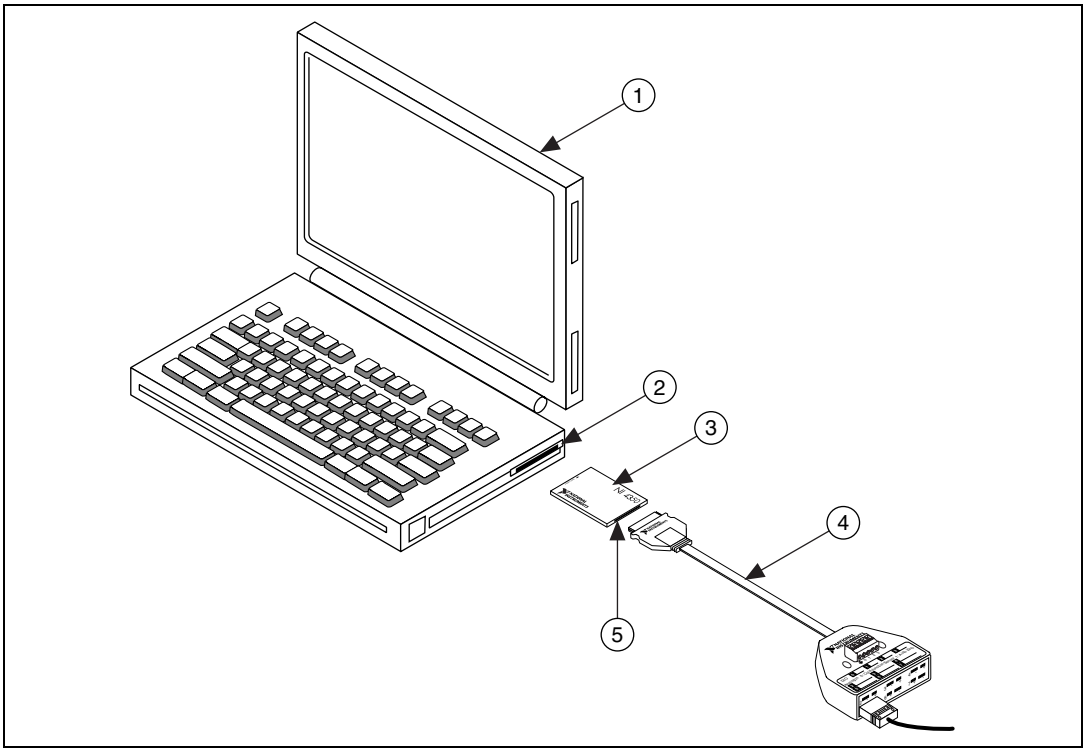
Attach the connector end of the PSH32-TC6 cable to the NI PCMCIA-4350 I/O connector, as shown in Figure 2. The two connectors should snap together.

To disconnect the cable from the NI PCMCIA-4350, press inward on the two ejector ears on the cable backshell and gently pull on the backshell. The cable should pop out. Do not pull the cable.

You can use the adhesive hook-and-loop fastener to attach the thermocouple receptacle end of the cable to any flat surface.

Note To minimize the temperature gradient inside the thermocouple pod and maintain its isothermal nature for accurate cold-junction compensation, place the PSH32-TC6 away from extreme temperature differentials.

Caution The connectors of both the NI PCMCIA-4350 and the PSH32-TC6 are keyed. You can attach them in only one way. Do *not* force the cable when inserting it into or removing it from the NI PCMCIA-4350 connector. If you encounter difficulty, check whether the polarity is correct.



1	Portable Computer	3	NI PCMCIA-4350	5	NI PCMCIA-4350 I/O Connector
2	PCMCIA Slot	4	PSH32-TC6 Shielded Cable		

Figure 2. Connecting the Cable Assembly to the NI PCMCIA-4350

Cold-Junction Temperature Sensor

The PSH32-TC6 cold-junction temperature sensor consists of a precision thermistor excited by the 25 µA current source on the NI PCMCIA-4350. At 25 °C, the resistance of the thermistor is 5,000 Ω. The thermistor resistance varies from 16,305 to 1,492 Ω over the 0 to 55 °C temperature range. The corresponding sensor output voltage varies from 408 to 37 mV over this temperature range.

To select and measure the temperature sensor, refer to the data acquisition software documentation for programming information.

Alternatively, you can use the following formulas to convert the cold-junction sensor voltage to cold-junction temperature:

$$T(°C) = T_K - 273.15$$

where T_K is the temperature in Kelvin.

$$T_K = \frac{1}{a + b \bullet lnR_T + c \bullet (ln\ R_T)^3}$$

$a = 1.295361 \times 10^{-3}$

$b = 2.343159 \times 10^{-4}$

$c = 1.018703 \times 10^{-7}$

R_T = resistance of the thermistor in ohms

$$T(°F) = \frac{T(°C) \bullet 9}{5} + 32$$

where $T(°F)$ and $T(°C)$ are the temperature readings in degrees Fahrenheit and degrees Celsius, respectively.

Note When you have configured the NI 435*X* device with the correct accessory in Measurement & Automation Explorer (MAX), NI-DAQ can automatically perform cold-junction compensation on measurements taken on thermocouple channels.

Specifications

Cold-junction sensor accuracy[1] .....0.06 °C from 15 to 35 °C;
0.2 °C from 0 to 15 °C
and 35 to 55 °C

Maximum working voltage[2]
(signal plus common mode) .....Each input should remain
within ±42 V of ground

[1] Includes only the thermistor accuracy. The combined effects of the temperature sensor accuracy, as well as the current source accuracy due to tolerances in all components in the NI PCMCIA-4350, the effects caused by temperature and loading, and self-heating and current leakage are discussed in the *NI 435X User Manual*.

[2] Refer to the NI PCMCIA-4350 maximum working voltage specification in Appendix A, *Specifications*, of the *NI 435X User Manual*; use the lower number of the two.

Technical Support Resources

NI Web Support

NI Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of `ni.com`.

Worldwide Support

NI has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of `ni.com`. Branch office Web sites provide up-to-date contact information, support phone numbers, email addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or NI corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 03 9879 5166, Austria 0662 45 79 90 0, Belgium 02 757 00 20,
Brazil 55 11 3262 3599, Canada (Calgary) 403 274 9391,
Canada (Montreal) 514 288 5722, Canada (Ottawa) 613 233 5949,
Canada (Québec) 514 694 8521, Canada (Toronto) 905 785 0085,
China 86 21 6555 7838, Czech Republic 02 2423 5774,
Denmark 45 76 26 00, Finland 09 725 725 11, France 01 48 14 24 24,
Germany 089 741 31 30, Greece 01 42 96 427, Hong Kong 2645 3186,
India 91 80 4190000, Israel 03 6393737, Italy 02 413091,
Japan 03 5472 2970, Korea 02 3451 3400, Malaysia 603 9596711,
Mexico 001 800 010 0793, Netherlands 0348 433466,
New Zealand 09 914 0488, Norway 32 27 73 00, Poland 22 3390 150,
Portugal 210 311 210, Russia 095 238 7139, Singapore 65 6 226 5886,
Slovenia 3 425 4200, South Africa 11 805 8197, Spain 91 640 0085,
Sweden 08 587 895 00, Switzerland 056 200 51 51,
Taiwan 02 2528 7227, United Kingdom 01635 523545