CALIBRATION PROCEDURE

CAL-4353

This document contains information about verifying and adjusting National Instruments NI PXIe-4353 modules using NI-DAQmx 9.3 and later. It also contains information about verifying systems that include both the NI PXIe-4353 and TB-4353. For more information about calibration, visit `ni.com/calibration`.

Contents

Software

Install NI-DAQmx 9.3 or later on the calibration computer. NI-DAQmx includes high-level function calls to simplify the task of writing software to calibrate modules. You must have the proper module driver installed on the calibration system before calibrating the module.

Note NI recommends that you install the NI-DAQmx driver software before physically installing the NI PXIe-4353. NI-DAQmx, available at `ni.com/downloads`, configures and controls the NI PXIe-4353.

NI-DAQmx supports a number of programming languages, including LabVIEW, LabWindows™/CVI™, C/C++, C#, and Visual Basic .NET.

You can access the NI-DAQmx header file, `NIDAQmx.h`, like any standard library. You can find examples of how to use the NI-DAQmx driver by entering the Info Code `NIDAQmxExLoc` at `ni.com/info` there you will find the topic *Where Can I Find NI-DAQmx Examples?*

NATIONAL INSTRUMENTS™

Documentation

The following documents are your primary references for writing your calibration utility with NI-DAQmx. You can download the latest version of these documents from the NI Web site at `ni.com/manuals`.

- The *NI SC Express 4353 Installation Guide and Terminal Block Specifications* provides instructions for installing and configuring the NI PXIe-4353 module and TB-4353 accessory.

- The *NI PXIe-4353 User Manual* describes how to use the NI PXIe-4353.

- The *NI PXIe-4353 Specifications* lists the specifications for the NI PXIe-4353.

- The *CAL-4353 Specifications* lists the specifications for the CAL-4353.

- The *NI-DAQmx Help* includes information about creating applications that use the NI-DAQmx driver.

- The *NI-DAQmx C Reference Help* includes information about the functions in the driver.

Calibration Interval

National Instruments recommends a calibration interval of one year for the CAL-4353. You should adjust the recommended calibration interval based on the measurement accuracy demands of your application.

Test Equipment

National Instruments recommends that you use the products in Table 1 for calibrating a CAL-4353 module.

Table 1. Recommended Equipment

Equipment	Recommended Model	Requirements
DMM	NI PXI-4070	If this instrument is unavailable, use a DMM with better than 0.1 Ω accuracy in the 100 Ω range when used with lead-wire resistance compensation.
PXI Express chassis	NI PXIe-1062Q	—
Calibration accessory	CAL-4353	This accessory is used for module verification and adjustment.
Connecting wires	Banana-jack terminated copper wire	Copper wire is used for validating the voltage accuracy and adjustment of the analog input channels. Copper wire is also used for validating the resistance accuracy and calibration of the CJC resistance input channels.

Note: When connecting the resistance calibrator, keep the lead wires 1.0 Ω less than the maximum lead compensation specification of the resistance calibrator. When using the Fluke 5520A, keep the lead wires <1.1 Ω.

Test Conditions

The following setup and environmental conditions are required to ensure the module meets published specifications.

- Keep connections to the module as short as possible. Long cables and wires act as antennas, picking up extra noise that can affect measurements.

- Use shielded wire for all cable connections to the module. Use twisted-pair wire to eliminate noise.

- Maintain an ambient temperature of 23 °C ±5 °C. The module temperature will be greater than the ambient temperature.

- Keep relative humidity below 80%.

- Allow a warm-up time of 15 minutes to ensure that the measurement circuitry of the NI PXIe-4353 and CAL-4353 are at a stable operating temperature.

- Ensure that the PXI Express chassis fan speed is set to HIGH, that the fan filters are clean, and that the empty slots contain filler panels. For more information, refer to the *Maintain Forced-Air Cooling Note to Users* document available at `ni.com/manuals`.

CAL-4353 Verification Procedure

The verification procedure verifies the resistance for R_1 through R_5 as shown in Figure 1. The values must be less than the Upper Limit found in Table 2. If the value is not less than the Upper Limit a false failure can result for the NI PXIe-4353 calibration.
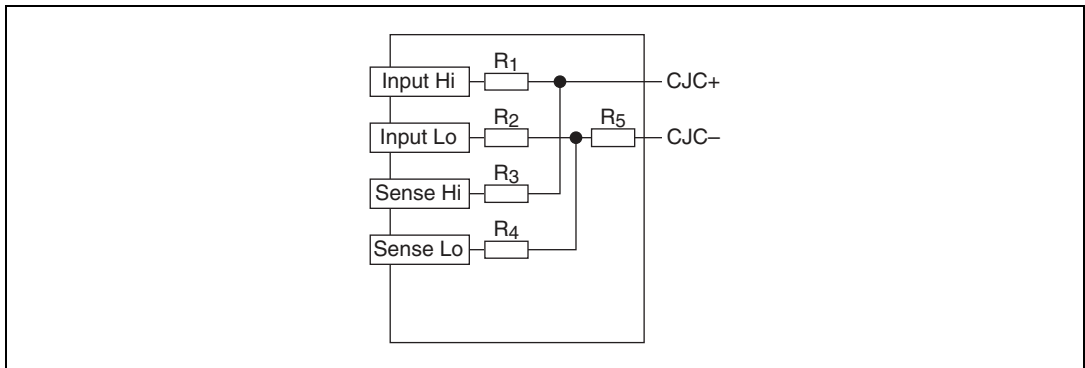

Figure 1. CAL-4353 in CJC Mode

National Instruments recommends that you use the products in Table 1 for calibrating a CAL-4353.

Note For specification information, refer to the *CAL-4353 Specifications* document.

This section provides instructions for verifying the CAL-4353 specifications. To verify the specifications, complete the following steps:

1. Loosen the cover screws and remove the cover from the CAL-4353 terminal block while referring to Figure 2.
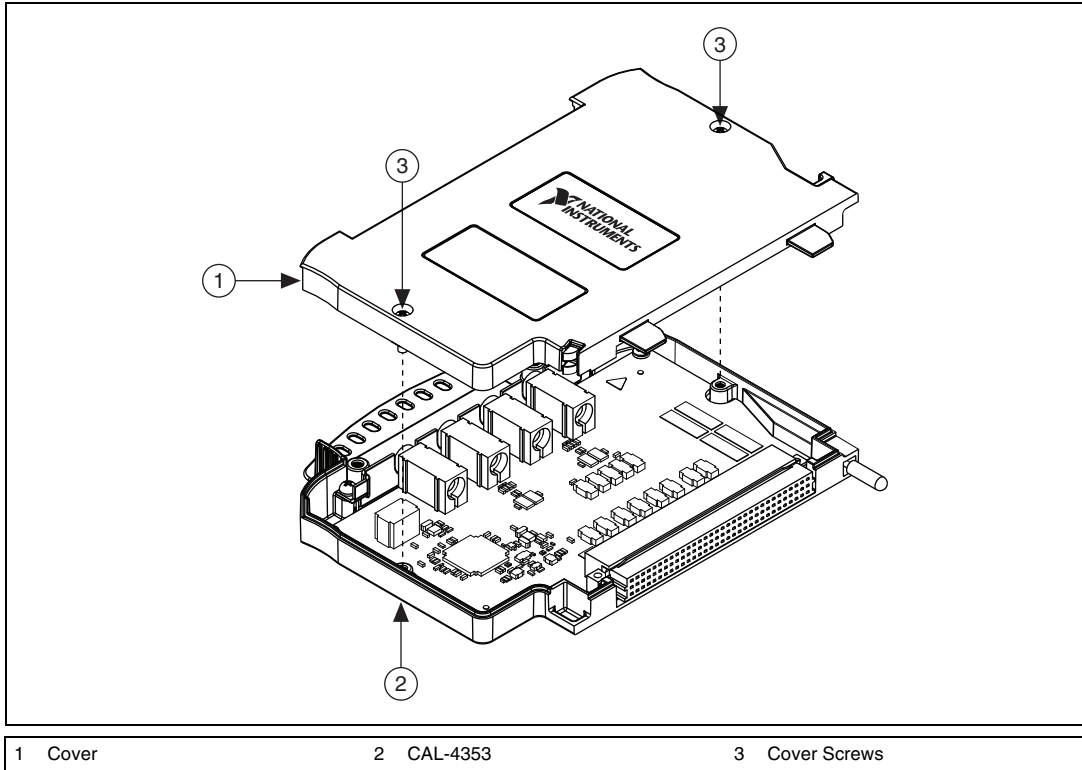

| 1 | Cover | 2 | CAL-4353 | 3 | Cover Screws |

Figure 2. CAL-4353 Parts Location Diagram

2. Connect the CAL-4353 to a NI PXIe-4353 that is installed in a PXI Express chassis.
3. Power on the PXI Express chassis if it is not already powered on.
4. Open a NI-DAQmx calibration session on your device.

5. Call the DAQmx Connect SC Express Calibration Accessory Channels VI. Configure the CAL-4353 by setting the connection to `_cjc_calibration` and physical channels to the CJC channel indicated in Table 2 while referring to Figure 1.

Note Qualify the CJC channel name by the device name. For example, the physical channel name must be in the following format: `Dev1/_cjtemp0`.

**Table 2.** Test Points for the verification of CAL-4353

Test Point	Active CJC Channel	Probe Location 1	Probe Location 2	Upper Limit
1	_cjtemp0	Input Hi terminal	K5, pin 4	4.2 Ω
2	_cjtemp0	Input Lo terminal	K4, pin 4	4.2 Ω
3	_cjtemp0	Sense Hi terminal	K5, pin 4	3.5 Ω
4	_cjtemp0	Sense Lo terminal	K4, pin 4	3.5 Ω
5	_cjtemp0	K4, pin 4	K6, pin 4	0.7 Ω
6	_cjtemp1	K4, pin 4	K7, pin 4	0.7 Ω
7	_cjtemp2	K4, pin 4	K8, pin 4	0.7 Ω
8	_cjtemp3	K4, pin 4	K9, pin 4	0.7 Ω
9	_cjtemp4	K4, pin 4	K10, pin 4	0.7 Ω
10	_cjtemp5	K4, pin 4	K11, pin 4	0.7 Ω
11	_cjtemp6	K4, pin 4	K12, pin 4	0.7 Ω
12	_cjtemp7	K4, pin 4	K13, pin 4	0.7 Ω

6. Using the lead wire compensated DMM, make a measurement of resistance between the two probe locations indicated in Table 2 while referring to Figures 3 and 4.
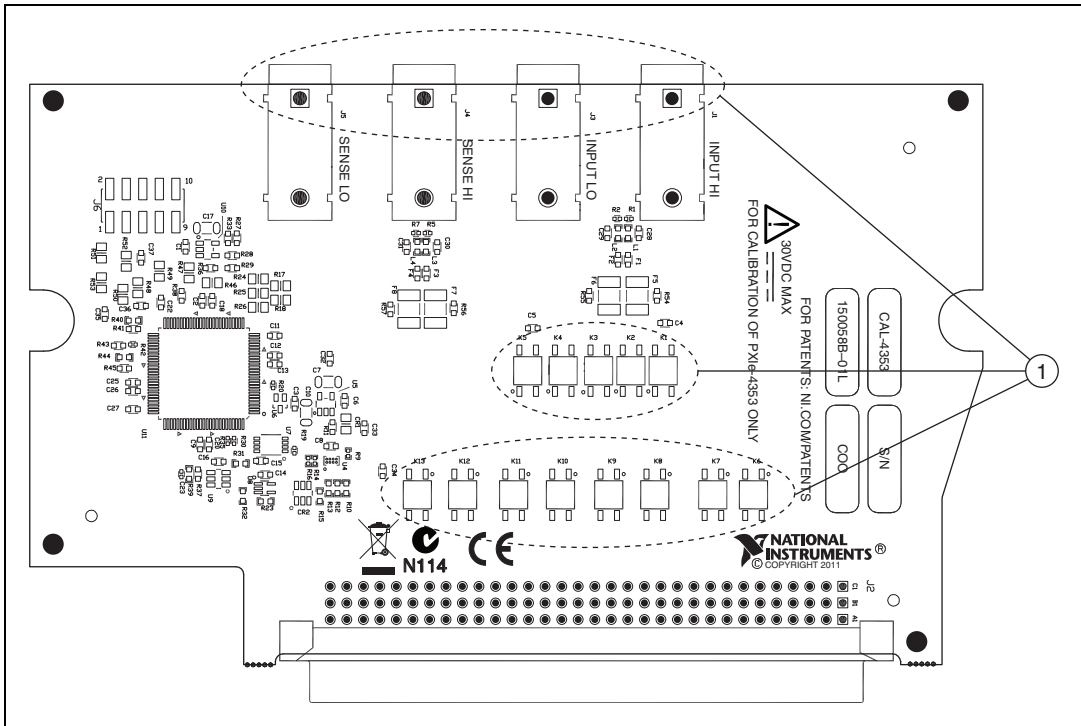
| 1 | Test Point Component Locations |

Figure 3. Test Point Component Location Diagram
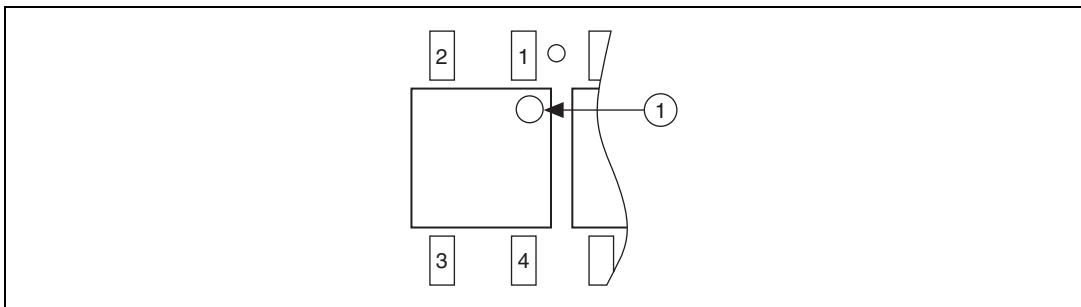
| 1 | This dot designates the location of Pin 1 regardless of the orientation on the circuit board |

Figure 4. Pin 4 Location Diagram

7. Compare the result to the Upper Limit value in Table 2. If the result is less than the upper limit, the test point passes.

8. Close the NI-DAQmx calibration session.

9. Repeat steps 4 through 8 for all test points in Table 2.

10. Reinstall the CAL-4353 cover and tighten the cover screws.

If the verification procedure determines that the CAL-4353 is outside of the specifications, refer to *Where to Go for Support* for assistance in returning it to NI.

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, visit the Worldwide Offices section of `ni.com/niglobal` to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

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