

COMPREHENSIVE SERVICES

We offer competitive repair and calibration services, as well as easily accessible documentation and free downloadable resources.

SELL YOUR SURPLUS

We buy new, used, decommissioned, and surplus parts from every NI series. We work out the best solution to suit your individual needs.

 Sell For Cash  Get Credit  Receive a Trade-In Deal

OBSOLETE NI HARDWARE IN STOCK & READY TO SHIP

We stock **New**, **New Surplus**, **Refurbished**, and **Reconditioned** NI Hardware.



Bridging the gap between the manufacturer and your legacy test system.

 1-800-915-6216

 www.apexwaves.com

 sales@apexwaves.com

All trademarks, brands, and brand names are the property of their respective owners.

Request a Quote

 **CLICK HERE**

PXIe-4300

CALIBRATION PROCEDURE

NI PXIe-4300

Français	Deutsch	日本語	한국어	简体中文
ni.com/manuals				

This document contains information about verifying and adjusting National Instruments NI PXIe-4300 modules using NI-DAQmx 9.1 and later. For more information about calibration, visit ni.com/calibration.

Contents

Software	1
Documentation	1
Calibration Interval	2
Test Equipment	2
Test Conditions	2
Verification and Adjustment Procedure	3
Initial Setup	3
Self-Calibration	3
Checking Device Temperature Changes	4
Verification Procedure	4
Adjustment Procedure	7
Where to Go for Support	8

Software

Verification and adjustment requires NI-DAQmx 9.1 or later. You can download NI-DAQmx 9.1 from ni.com/downloads. NI-DAQmx supports a number of programming languages, including LabVIEW, LabWindows™/CVI™, C/C++, C#, and Visual Basic .NET. When you install NI-DAQmx, you only need to install support for the ADE that you intend to use.

Documentation

The following documents are your primary references for writing verification and adjustment procedures 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 4300 Installation Guide and Terminal Block Specifications* provides instructions for installing and configuring the NI PXIe-4300 module and TB-4300 and includes terminal block specifications.
- The *NI PXIe-4300 User Manual* describes how to use the NI PXIe-4300.
- The *NI PXIe-4300 Specifications* lists the specifications for the NI PXIe-4300.
- 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 NI PXIe-4300. Adjust and verify at the recommended interval based on the measurement accuracy demands of your application.

Test Equipment

National Instruments recommends that you use the instruments in Table 1 for adjusting and verifying an NI PXIe-4300 module.

Table 1. Recommended Equipment

Equipment	Recommended Model	Requirements
Calibrator	Fluke 5700A	If this instrument is unavailable, use a high-precision voltage source with an accuracy of at least 10 ppm for adjustment and at least 40 ppm for verification. The source needs an output impedance of less than or equal to 50 Ω .
PXI Express Chassis	NI PXIe-1062Q	—
Connection Accessory	TB-4300	Screw terminal accessory (10 V) for the NI PXIe-4300.

Test Conditions

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

- Keep connections to the device as short as possible. Long cables and wires can act as antennae, which can pick up extra noise that affects measurements.
- Use shielded copper wire for all cable connections to the device. Use twisted-pair wire to eliminate noise and thermal offsets.
- Maintain the ambient temperature between 18 °C and 28 °C.
- For valid test limits, maintain the device temperature within ± 1 °C from the last self-calibration and ± 10 °C from the last external calibration. The device temperature will be greater than the ambient temperature. Refer to the [Verification and Adjustment Procedure](#) section for more information about verification and adjustment temperatures and temperature drift.
- Keep relative humidity below 80%.
- Allow at least 15 minutes warm-up time to ensure that the measurement circuitry is 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.

Verification and Adjustment Procedure

The verification and adjustment process has six steps.

1. *Initial Setup*—Configure your device in NI-DAQmx.
2. *Self-Calibration*—Adjust the self-calibration constants of the device.
3. *Checking Device Temperature Changes*—Determine that the current device temperature will not cause you to incorrectly verify and adjust your device.
4. *Verification Procedure*—Verify the existing operation of the device. This step allows you to confirm that the device was operating within its specified range prior to adjustment.
5. *Adjustment Procedure*—Perform an external calibration that adjusts the device calibration constants with respect to a known voltage source.
6. *Reverification*—Perform another verification to ensure that the device is operating within its specifications after adjustment.

These steps are described in detail in the following sections. Although NI recommends that you verify all ranges, you can save time by checking only the ranges used in your application.

Initial Setup

The device must be configured in Measurement & Automation Explorer (MAX) to communicate with NI-DAQmx. Complete the following steps to configure a device in MAX.

1. Install the NI-DAQmx driver software.



Caution Always have the PXI Express chassis turned off when inserting a module.

2. Insert the module into an available slot in the PXI Express chassis.
3. Launch MAX.
4. Select **My System»Devices and Interfaces»Chassis 1**.
5. Right-click **NI PXIe-4300** and select **Self-Test** to ensure that the module is working properly.



Note When a device is configured with MAX, it is assigned a device identifier. Each function call uses this identifier to determine which DAQ device to verify or, verify and adjust.

Self-Calibration

Perform self-calibration after the device has warmed up for the recommended time period of 15 minutes. Call self-calibration before doing the first verification. This function measures the onboard reference voltage of the device and adjusts the self-calibration constants to account for any errors caused by short-term fluctuations in the environment.

You can initiate self-calibration using MAX, by completing the following steps.

1. Launch MAX.
2. Select **My System»Devices and Interfaces»Chassis 1»NI PXIe-4300**.
3. Initiate self-calibration using one of the following methods:
 - Click **Self-Calibrate** in the upper right corner of MAX.
 - Right-click **NI PXIe-4300** and select **Self-Calibrate** from the drop-down menu.



Note NI recommends self-calibrating using MAX, although you can also self-calibrate programmatically.

Checking Device Temperature Changes

Device temperature changes (greater than ± 10 °C since the previous external calibration or greater than ± 1 °C since the previous self-calibration) can cause you to incorrectly verify and adjust your device. After self-calibrating your device as described in the [Self-Calibration](#) section, complete the following steps to compare the current device temperature to the temperatures measured during the last self-calibration and external calibration in MAX.



Note The maximum temperature change for most DAQ devices is ± 10 °C. To find the valid temperature drifts for your NI PXIe-4300 module, refer to the *AI Absolute Accuracy Table* in the *NI PXIe-4300 Specifications*.

1. Launch MAX.
2. Select **My System»Devices and Interfaces»Chassis 1»NI PXIe-4300**.
3. Click the **Calibration** tab.

If the device temperature is outside the maximum range, choose one of the following options:

- Recalculate the test limits to include the additional error due to temperature drift. Refer to the *NI PXIe-4300 Specifications* for more information.
- Change the system so that the temperature will be closer to the temperature recorded during the last external calibration.

Verification Procedure

This section provides instructions for verifying the NI PXIe-4300 specifications.

Throughout the verification process, use Table 3 to determine if your device needs to be adjusted.



Note Limits in the Table 3 are based upon the February 2010 edition of the *NI PXIe-4300 Specifications*. Refer to the most recent *NI PXIe-4300 Specifications* online at ni.com/manuals. If a more recent edition of the specifications is available, recalculate the limits based upon the latest specifications.

Since NI PXIe-4300 modules have many different ranges, you must check measurements for each available range. You must perform verification on all ranges of all analog input channels of NI PXIe-4300 modules in differential mode.



Note The test limits used in this document assume a maximum temperature drift of ± 10 °C from the last external calibration, and a maximum temperature drift of ± 1 °C from the last self-calibration. Refer to the *Checking Device Temperature Changes* section for more information and instructions on reading your device temperature and comparing it against the device temperature during the last external calibration.



Complete the following steps to verify the analog input:

Note The TB-4300B cannot be used for verification or adjustment of the NI PXIe-4300.

1. Connect the output of the calibrator to the TB-4300 as shown in Figure 1.
2. Connect the TB-4300 to the NI PXIe-4300.
3. If your calibrator has a guard connection, leave it disconnected.
4. If your calibrator output is truly floating, you must connect the negative output to a quiet earth ground as well as COM to give the entire system a ground reference.

For more information, refer to the *NI PXIe-4300 User Manual*.

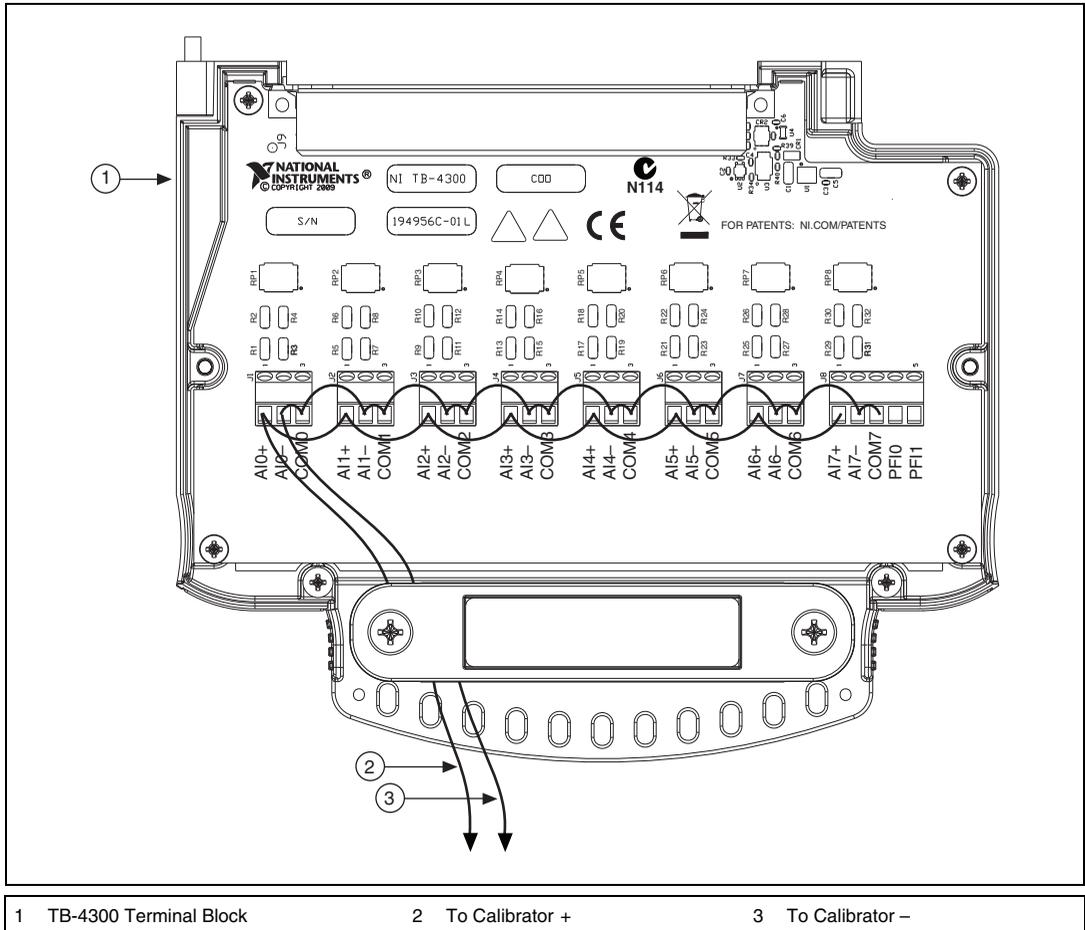


Figure 1. TB-4300 to Calibrator Wiring Diagram

Table 3 shows all acceptable values for the NI PXIe-4300. NI recommends that you verify all ranges, although you may want to save time by checking only the ranges used in your application.

5. Set the calibrator voltage to the test value indicated in Table 3.



Note Refer to Table 2 when completing the following steps.

6. Create and configure a DAQmx channel using the settings in Table 2.
7. Start the acquisition.
8. Average the voltage values that you acquired.
9. Compare the resulting average to the upper and lower limits listed in Table 3. If the result is between these values, the device passes the test.
10. Clear the acquisition.
11. For each value in Table 3, repeat steps 5 through 10 for all channels.
12. Disconnect the calibrator from the device.
13. To update the calibration date on the device, initialize and immediately close (specify the commit action) a DAQmx external calibration session.

Table 2. Verification Values

Configuration	Value
Physical Channels	Use channel names specific to your application.
Sample Mode	Finite number of samples.
Sample Clock Rate	100000
Samples per Channel	10000
Measurement Type	Voltage
Units	V
Terminal Configuration	Differential
Sample Timing Type	Sample Clock

You have finished verifying the analog input specification on your device.

Table 3. NI PXIe-4300 Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
-10	10	Pos FS	9.980000	9.978420	9.981580	9.977541	9.982459
-10	10	Neg FS	-9.980000	-9.981580	-9.978420	-9.982459	-9.977541
-5	5	Neg FS	-4.990000	-4.990985	-4.989015	-4.991424	-4.988576
-5	5	Pos FS	4.990000	4.989015	4.990985	4.988576	4.991424
-2	2	Pos FS	1.996000	1.995391	1.996609	1.995216	1.996784
-2	2	Neg FS	-1.996000	-1.996609	-1.995391	-1.996784	-1.995216
-1	1	Neg FS	-0.998000	-0.998488	-0.997512	-0.998575	-0.997425
-1	1	Pos FS	0.998000	0.997512	0.998488	0.997425	0.998575
-10	10	0.000000	0.000000	-0.001196	0.001196	-0.001196	0.001196
-5	5	0.000000	0.000000	-0.000773	0.000773	-0.000773	0.000773
-2	2	0.000000	0.000000	-0.000512	0.000512	-0.000512	0.000512
-1	1	0.000000	0.000000	-0.000426	0.000426	-0.000426	0.000426

Adjustment Procedure

Following the adjustment procedure automatically updates the calibration date and temperature, and adjusts the analog input calibration constants and stores them in the EEPROM of the NI PXIe-4300.

Complete the following steps to perform device adjustment using a calibrator:

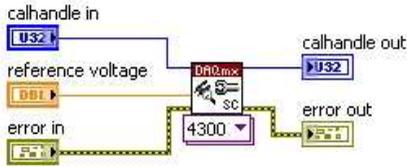
1. Connect the output of the calibrator to the TB-4300 as shown in Figure 1.
2. If your calibrator has a guard connection, leave it disconnected.
3. If your calibrator output is truly floating, you must connect the negative output to a quiet earth ground as well as COM to give the entire system a ground reference.
4. Set your calibrator to output a voltage of 7.5 V.
5. Open an external calibration session on your device using the DAQmx Initialize External Calibration VI. The default password is NI.



Note Throughout the procedure, refer to the NI-DAQmx function call parameters for the LabVIEW input values.

LabVIEW Block Diagram	NI-DAQmx Function Call
	<p>Call DAQmxInitExtCal with the following parameters:</p> <p>deviceName: Dev1 password: NI calHandle: &calHandle</p>

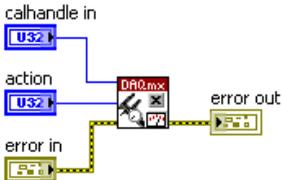
- Perform an external calibration adjustment by selecting the DAQmx Adjust 4300 Calibration VI, from the DAQmx Adjust SC Express Calibration polymorphic VI.

LabVIEW Block Diagram	NI-DAQmx Function Call
	<p>Call DAQmxAdjust4300Cal with the following parameters:</p> <p>calHandle: calHandle referenceVoltage: 7.5</p>

- Save the adjustment constants to the EEPROM, using the DAQmx Close External Calibration VI. This VI also saves the date, time, and temperature of the adjustment to the onboard memory.



Note If an error occurs during adjustment, no constants will be written to the EEPROM.

LabVIEW Block Diagram	NI-DAQmx Function Call
	<p>Call DAQmxCloseExtCal with the following parameters:</p> <p>calHandle: calHandle action: DAQmx_Val_Action_Commit</p>

- Place the calibrator in Standby.
- Disconnect the calibrator from the device.

The device is now adjusted with respect to your external source.

After adjusting the device, you must reverify the analog input operation. To do this, repeat the [Verification Procedure](#) section using the [24-Hour Limits](#) in Table 3.

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.

CVI, LabVIEW, National Instruments, NI, ni.com, the National Instruments corporate logo, and the Eagle logo are trademarks of National Instruments Corporation. Refer to the *Trademark Information* at ni.com/trademarks for other National Instruments trademarks. The mark LabWindows is used under a license from Microsoft Corporation. Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patent Notice* at ni.com/patents. Refer to the *Export Compliance Information* at ni.com/legal/export-compliance for the National Instruments global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data.