

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**

NI-9207

CALIBRATION PROCEDURE

NI 9207

16-channel, ± 2 - mA/ ± 10 V, 24-bit Analog Input Module

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

This document contains the verification and adjustment procedures for the National Instruments 9207. For more information about calibration solutions, visit ni.com/calibration.

Contents

Software	1
Documentation	2
Test Equipment	2
Test Conditions	3
Initial Setup	3
Verification	3
Voltage Accuracy Verification	4
Current Accuracy Verification	5
Adjustments	7
Voltage Accuracy Adjustment	7
Current Accuracy Adjustment	8
EEPROM Update	8
Reverification	9
Accuracy Under Calibration Conditions	9
Worldwide Support and Services	10

Software

Calibrating the NI 9207 requires the installation of NI-DAQmx 9.1 or later on the calibration system. You can download NI-DAQmx from ni.com/downloads. NI-DAQmx supports LabVIEW, LabWindows™/CVI™, C/C++, C#, and Visual Basic .NET. When you install NI-DAQmx you only need to install support for the application software that you intend to use.

Documentation

Consult the following documents for information about the NI 9207, NI-DAQmx, and your application software. All documents are available on ni.com and help files install with the software.



NI cDAQ-9174/9178 USB Chassis Quick Start

NI-DAQmx installation and hardware setup



NI 9207 Operating Instructions and Specifications

NI 9207 specific information, specifications, and calibration interval



NI DAQmx Help

Information about creating applications that use the NI-DAQmx driver



LabVIEW Help

LabVIEW programming concepts and reference information about NI-DAQmx VIs and functions



NI-DAQmx C Reference Help

Reference information for NI-DAQmx C functions and NI-DAQmx C properties



NI-DAQmx .NET Help Support for Visual Studio

Reference information for NI-DAQmx .NET methods and NI-DAQmx .NET properties, key concepts, and a C enum to .NET enum mapping table

Test Equipment

Table 1 lists the equipment recommended for the performance verification and adjustment procedures. If the recommended equipment is not available, select a substitute using the requirements listed in Table 1.

Table 1. Recommended Equipment

Equipment	Recommended Model	Minimum Requirements
Source	Fluke 5700A	Use a source with an accuracy ≤ 100 ppm.
cDAQ Chassis	NI cDAQ-9178	—
Connection Accessory	NI 9923	—

Test Conditions

The following setup and environmental conditions are required to ensure the NI 9207 meets published specifications.

- Keep connections to the device as short as possible. Long cables and wires act as antennas, picking up extra noise that can affect measurements.
- Verify that all connections to the device are secure.
- Use shielded copper wire for all cable connections to the device. Use twisted-pairs wire to eliminate noise and thermal offsets.
- Maintain an ambient temperature of 23 ± 5 °C. The device temperature will be greater than the ambient temperature.
- Keep relative humidity below 80%.
- Allow a warm-up time of at least 10 minutes to ensure that the NI 9207 measurement circuitry is at a stable operating temperature.

Initial Setup

Complete the following steps to set up the NI 9207.

1. Install NI-DAQmx.
2. Make sure the NI cDAQ-9178 power source is not connected.
3. Install the module in slot 8 of the NI cDAQ-9178 chassis. Leave slots 1 through 7 of the NI cDAQ-9178 chassis empty.
4. Connect the NI cDAQ-9178 chassis to your host computer.
5. Connect the power source to the NI cDAQ-9178 chassis.
6. Launch Measurement & Automation Explorer (MAX).
7. Right-click the device name and select **Self-Test** to ensure that the module is working properly.

Verification

The following performance verification procedures describe the sequence of operation and test points required to verify the NI 9207 and assumes that adequate traceable uncertainties are available for the calibration references.

Voltage Accuracy Verification

Complete the following procedure to determine the As-Found status of the NI 9207.

1. Set the calibrator to Standby mode (STBY).
2. Connect the NI 9207 to the calibrator as shown in Figure 1.

Figure 1. Voltage Accuracy Connections



- 1 Connections when using a calibrator with a guard connection.
- 2 Connections when using a calibrator with no guard connection.



Note If the calibrator outputs are truly floating, connect the negative output to a quiet earth ground as well as COM to give the entire system a ground reference.

3. Set the calibrator voltage to a Test Point value indicated in Table 4.
4. Set the calibrator to Operate mode (OPR).
5. Acquire and average samples.
 - a. Create and configure an AI voltage task on the NI 9207 according to Table 2.

Table 2. NI 9207 Configuration for Voltage Accuracy Verification

Input Range		Scaled Units	Terminal Configuration
Min	Max		
-10	10	Volts	Differential

- b. Configure the AI voltage task according to Table 3. Set the ADC timing mode to high-resolution.

Table 3. NI 9207 Voltage Timing Configuration

ADC Timing Mode	Sample Mode	Samples to Read
High-Resolution	N Samples	5
High-Speed	N Samples	75

- c. Start the task.
 - d. Average the readings.
 - e. Clear the task.

- Compare the average to the limits in Table 4.

Table 4. NI 9207 Verification Test Limits for Voltage Accuracy

Range (V)		Test Point		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)
-10.00000	10.00000	Pos FS	10.00000	9.98792	10.01208
-10.00000	10.00000	Mid	0.00000	-0.00208	0.00208
-10.00000	10.00000	Neg FS	-10.00000	-10.01208	-9.98792

- Repeat step 5 and 6 with the ADC timing mode on the NI 9207 set to high-speed.
- Set the calibrator to Standby mode (STBY).
- Repeat steps 3 through 8 for each test point listed in Table 4.
- Disconnect the calibrator from the device.
- Repeat steps 1 through 10 for each voltage channel on the NI 9207.

Current Accuracy Verification

Complete the following procedure to determine the As-Found status of the NI 9207.

- Set the calibrator to Standby mode (STBY).
- Connect the NI 9207 to the calibrator as shown in Figure 2.

Figure 2. Current Accuracy Connections



Note If the calibrator outputs are truly floating, connect the negative output to a quiet earth ground as well as COM to give the entire system a ground reference.

- Set the calibrator current to a Test Point value indicated in Table 7.
- Set the calibrator to Operate mode (OPR).

5. Acquire and average samples.
 - a. Create and configure an AI voltage task on the NI 9207 according to Table 5.

Table 5. NI 9207 Configuration for Current Accuracy Verification

Input Range		Scaled Units	Terminal Configuration
Min	Max		
-0.02	0.02	Amps	RSE

- b. Configure the AI current task according to Table 6. Set the ADC timing mode to high-resolution.

Table 6. Current Timing Configuration

ADC Timing Mode	Sample Mode	Samples to Read
High-Resolution	N Samples	5
High-Speed	N Samples	75

- c. Start the task.
 - d. Average the readings.
 - e. Clear the task.
6. Compare the average to the limits in Table 7.
7. Repeat steps 5 and 6 with the ADC timing mode on the NI 9207 set to high-speed.
8. Set the calibrator to Standby mode (STBY).
9. Repeat steps 3 through 8 for each test point in Table 7.
10. Disconnect the calibrator from the device.
11. Repeat steps 1 through 10 for each current channel on the NI 9207.

Table 7. NI 9207 Test Limits for Current Accuracy Verification

Range (A)		Test Point		1-Year Limits	
Minimum	Maximum	Location	Value (A)	Lower Limit (A)	Upper Limit (A)
-0.020000	0.020000	Pos FS	0.021000	0.020970	0.021030
-0.020000	0.020000	Mid	0.000000	-0.000002	0.000002
-0.020000	0.020000	Neg FS	-0.021000	-0.021030	-0.020970

Reverification

Repeat the *Verification* section to determine the As-Left status of the device.



Note If any test fails Reverification after performing an adjustment, verify that you have met the *Test Conditions* before returning your device to NI. Refer to *Worldwide Support and Services* for assistance in returning the device to NI.

Accuracy Under Calibration Conditions

The values in the following table are based on calibrated scaling coefficients, which are stored in the onboard EEPROM.

The following accuracy table is valid for calibration under the following conditions:

- Ambient temperature $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$
- NI 9207 installed in slot 8 of an NI cDAQ-9178 chassis
- Slots 1 through 7 of the NI cDAQ-9178 chassis are empty



Note The test limits listed in Tables 4 and 7 are derived using the values in Table 10.

Table 10. NI 9207 Accuracy Under Calibration Conditions

Input Channels	Percentage of Reading	Percentage of Range*
Voltage	0.100%	0.020%
Current	0.150%	0.012%

* Range equals 10.4 V for voltage and 22 mA for current.



Note For operational specifications, refer to the most recent *NI 9207 Operating Instructions and Specifications* online at ni.com/manuals.

Worldwide Support and Services

The National Instruments website 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.

Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit ni.com/register to register your National Instruments product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Refer to the *NI Trademarks and Logo Guidelines* at ni.com/trademarks for more information on National Instruments trademarks. 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 Patents Notice* at ni.com/patents. You can find information about end-user license agreements (EULAs) and third-party legal notices in the readme file for your NI product. 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. NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. U.S. Government Customers: The data contained in this manual was developed at private expense and is subject to the applicable limited rights and restricted data rights as set forth in FAR 52.227-14, DFAR 252.227-7014, and DFAR 252.227-7015.