CALIBRATION PROCEDURE

NI 9266

8-Channel C Series Current Output Module

This document contains the verification and adjustment procedures for the NI 9266. For more information on calibration solutions, visit *ni.com/calibration*.

Software

Calibrating the NI 9266 requires the installation of NI-DAQmx 18.1 or later on the calibration system.

You can download NI-DAQmx from *ni.com/downloads*. NI-DAQmx supports LabVIEW, LabWindows™/CVI™, ANSI C, and .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 9266, 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 9266 Getting Started Guide

NI 9266 connection information

NI 9266 Datasheet

NI 9266 circuitry and specifications

NI-DAQmx Readme

Operating system and application software support in NI-DAQmx

LabVIEW Help

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

![National Instruments logo]

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

NI recommends that you use equipment in the following table for calibrating the NI 9266. If
the recommended equipment is not available, select a substitute from the requirements
column.

Equipment	Recommended Model	Requirements
DMM	NI 4070 DMM	Use a multi-ranging 6 1/2 digit DMM with a DC current measurement accuracy of 400 ppm.
Chassis	cDAQ-9178	—
Bench-Top Power Supply	—	9 V DC to 30 V DC output voltage with an output rated for at least 5 W.

Test Conditions

The following setup and environmental conditions are required to ensure the NI 9266 meets
calibration specifications.

- Keep connections to the NI 9266 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 NI 9266 are secure.
- Use shielded copper wire for all cable connections to the NI 9266. Use twisted-pairs wire
  to eliminate noise and thermal offsets.
- Maintain an ambient temperature of 23 °C ± 5 °C. The NI 9266 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 9266 measurement
  circuitry is at a stable operating temperature.

Initial Setup

Complete the following steps to set up the NI 9266.

1. Install NI-DAQmx.
2. Make sure that the cDAQ-9178 power source is not connected to the chassis.
3. Insert the module in slot 8 of the cDAQ-9178 chassis. Leave slots 1 through 7 of the cDAQ-9178 chassis empty.
4. Connect the cDAQ-9178 chassis to your host computer.
5. Connect the power source to the 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 procedure describes the sequence of operation and provides test points required to verify the NI 9266. The verification procedure assumes that adequate traceable uncertainties are available for the calibration references.

Accuracy Verification

Complete the following procedure to determine the As-Found status of the NI 9266.

1. Set the DMM to Standby mode (STBY) and disable the output of the bench-top power supply.
2. Connect the NI 9266 to the bench-top power supply and the DMM as shown in the following figure.

Figure 1. Current Accuracy Connections
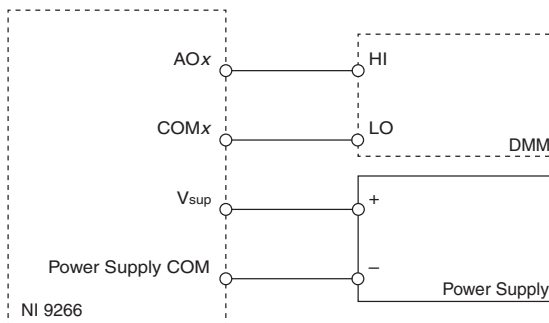
3. Enable the output of the bench-top power supply.

4. Set the DMM to read DC current in the 20 mA range and select the following settings.
   – ≥1 PLC
   – Auto Zero
   – ADC calibration enabled
5. Acquire a sample.
   a. Create and configure an AO task according to the following table.

Table 1. NI 9266 Configuration for Current Accuracy Verification

Range		Scaled Units	Custom Scale
Minimum	Maximum		
0	0.02	Amps	None

   b. Start the task.
   c. Generate a current output test point by writing a single sample according to the following table.

Table 2. NI 9266 Test Limits and Output Data Configuration for Current Accuracy Verification

Test Point Value (mA)	1-Year Limits		Samples Per Channel	Timeout
	Lower Limit (mA)	Upper Limit (mA)		
1	0.97027	1.02973	1	10.0
19	18.95101	19.04899		

The test limits in this table are derived from the values listed in *Accuracy under Calibration Conditions*.

   d. Wait the appropriate amount of time for the DMM measurement to settle.
   e. Read the NI 9266 output current measurement from the DMM.
   f. Clear the task.
6. Compare the DMM measurement to the test limits in the table above.
7. Repeat step 5 for each test point in the table above.
8. Disconnect the DMM and bench-top power supply from the NI 9266.
9. Repeat steps 1 through 7 for each channel on the NI 9266.

Adjustment

The following performance adjustment procedure describes the sequence of operation required to adjust the NI 9266.

Accuracy Adjustment

Complete the following procedure to adjust the accuracy of the NI 9266.
1. Adjust the NI 9266.
   a) Initialize a calibration session on the NI 9266. The default password is NI.

b) Input the external temperature in degrees Celsius.

c) Call the NI 9266 get C Series adjustment points function to obtain an array of recommended calibration currents for the NI 9266.

d) Connect the DMM and the bench-top power supply to the NI 9266 as shown in the *Current Accuracy Connections* figure.

e) Set the DMM to read DC current in the 20 mA range.

f) Call and configure the NI 9266 setup calibration function with the DAC value obtained from the array of recommended calibration currents.

g) Wait the appropriate amount of time for the DMM measurement to settle.

h) Read the NI 9266 output current measurement from the DMM.

i) Call and configure the NI 9266 adjustment function according to the following table.

Physical Channel	Reference Value
cDAQMod8/ao$x$	The NI 9266 output current measured from the DMM.

j) Repeat steps f through i for each calibration current in the array.

k) Close the calibration session.

l) Disconnect the DMM from the NI 9266.

2. Repeat step 1 for each channel on the NI 9266.

EEPROM Update

When an adjustment procedure is completed, the NI 9266 internal calibration memory (EEPROM) is immediately updated.

If you do not want to perform an adjustment, you can update the calibration date and onboard calibration temperature without making any adjustments by initializing an external calibration, setting the C Series calibration temperature, and closing the external calibration.

Reverification

Repeat the *Accuracy 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 °C ± 5 °C
- NI 9266 installed in slot 8 of a cDAQ-9178 chassis
- Slots 1 through 7 of the cDAQ-9178 chassis are empty

Table 3. NI 9266 Accuracy under Calibration Conditions

Device	Percent of Reading (Gain Error)	Percentage of Range (Offset Error)[1]
NI 9266	0.107%	0.138%

Note For operational specifications, refer to the most recent *NI 9266 Datasheet* online at *ni.com/manuals*.

Worldwide Support and Services

The NI 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 information about the services NI offers.

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

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For support in the United States, create your service request at *ni.com/support* or dial 1 866 ASK MYNI (275 6964). For 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.

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[1] Range equals 20.77.