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NI-9265

CALIBRATION PROCEDURE
NI 9265

4-Channel, 0–20 mA, 16-Bit Analog Current Output Module

This document contains the verification and adjustment procedures for the National Instruments 9265. For more information on calibration solutions, visit `ni.com/calibration`.

Contents

Software

Calibrating the NI 9265 requires the installation of NI-DAQmx 9.6 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.

NATIONAL INSTRUMENTS™

Documentation

Consult the following documents for information about the NI 9265, 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 9265 Operating Instructions and Specifications

NI 9265 specific information, specifications, and calibration interval

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

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

National Instruments recommends that you use the equipment in Table 1 for calibrating the NI 9265. If the recommended equipment is not available, select a substitute using the requirements listed in Table 1.

Table 1. Recommended Equipment

Equipment	Recommended Model	Requirements
DMM	NI 4070 DMM	Use a multiranging 6 1/2 digit DMM with a DC current measurement accuracy of 400 ppm.
Chassis	NI cDAQ-9178	—
Bench-Top Power Supply	—	9 VDC to 36 VDC output voltage.

Test Conditions

The following setup and environmental conditions are required to ensure the NI 9265 meets published specifications.

- Keep connections to the NI 9265 as short as possible. Long cables and wires act as antennae, picking up extra noise that can affect measurements.
- Verify that all connections to the NI 9265 are secure.
- Use shielded copper wire for all cable connections to the NI 9265. Use twisted-pair wire to eliminate noise and thermal offsets.
- Maintain an ambient temperature of 23 °C ±5 °C. The NI 9265 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 9265 measurement circuitry is at a stable operating temperature.

Initial Setup

Complete the following steps to set up the NI 9265.

1. Install NI-DAQmx.
2. Make sure that the NI cDAQ-9178 power source is not connected.
3. Insert the module into 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 device is working properly.
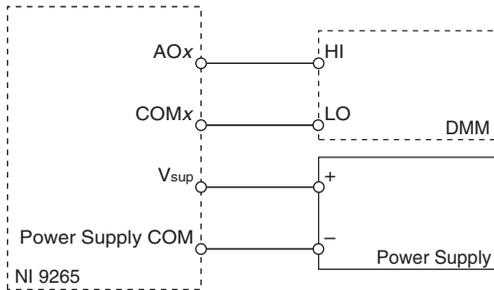
Verification

The following performance verification procedure describes the sequence of operation and provides test points required to verify the NI 9265. The verification procedure assumes that adequate traceable uncertainties are available for the calibration references.

Accuracy Verification

Complete the following steps to determine the As-Found status of the NI 9265.

1. Set the DMM to Standby mode (STBY).
2. Connect the NI 9265 to the bench-top power supply and the DMM as shown in Figure 1.

Figure 1. NI 9265 Current Accuracy Connections

3. Set the DMM to read DC current in the 20 mA range.
4. Acquire a sample.
   a. Create and configure an AO current task on the NI 9265 according to Table 2.

Table 2. NI 9265 Configuration for Current Accuracy Verification

Range (A)		Scaled Units	Custom Scale
Minimum	**Maximum**		
0	0.02	Amps	None

   b. Start the task.
   c. Generate a current output according to Table 3.

Table 3. NI 9265 Output Configuration

Samples Per Channel	Timeout
1	10.0

   d. Wait the appropriate amount of time for the DMM measurement to settle.
   e. Read the NI 9265 output current measurement from the DMM.
   f. Clear the task.

5. Compare the DMM measurement to the test limits in Table 4.
6. Repeat steps 3 through 5 for each test point in Table 4.
7. Disconnect the DMM and bench-top power supply from the NI 9265.
8. Repeat steps 1 through 7 for each channel on the NI 9265.

Table 4. NI 9265 Test Limits for Current Accuracy Verification

| Output Range (mA) | | Test Point | | 1-Year Limits | |
Min	Max	Location	Value (mA)	Lower Limit (mA)	Upper Limit (mA)
0	20	Minimum	1	0.973868	1.026132
0	20	Maximum	19	18.955868	19.044132

Adjustment

The following adjustment procedure describes the sequence of operation required to adjust the NI 9265.

Accuracy Adjustment

Complete the following procedure to adjust the accuracy of the NI 9265.

1. Adjust the NI 9265.
   a. Initialize a calibration session on the NI 9265. The default password is NI.
   b. Input the external temperature in degrees Celsius.
   c. Call the NI 9265 get C Series adjustment points function to obtain an array of recommended calibration currents for the NI 9265.
   d. Connect the DMM and the bench-top power supply to the NI 9265 as shown in Figure 1.
   e. Set the DMM to read DC current in the 20 mA range.
   f. Call and configure the NI 9265 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 9265 output current measurement from the DMM.
   i. Call and configure the NI 9265 adjustment function according to Table 5.

Table 5. Adjustment Configuration

Physical Channel	Reference Value
cDAQMod8/ao*x*	The NI 9265 output curent measured from the DMM.

   j. Repeat steps f to i for each calibration current in the array.
   k. Close the calibration session.
   l. Disconnect the DMM from the NI 9265.
2. Repeat step 1 for each channel on the NI 9265.

EEPROM Update

When an adjustment procedure is completed, the NI 9265 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 *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 9265 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 Table 4 are derived using the values in Table 6.

Table 6. NI 9265 Accuracy Under Calibration Conditions

Percentage of Reading (Gain Error)	Percentage of Range[*] (Offset Error)
0.100%	0.122%
[*] Range equals 20.6 mA.	

> **Note** For operational specifications, refer to the most recent *NI 9265 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.

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