CALIBRATION PROCEDURE

NI 9262

1 MS/s/ch Simultaneous, ±10 V, 6-Channel C Series Voltage Output Module

This document contains the verification and adjustment procedures for the NI 9262. For more information on calibration solutions, visit `ni.com/calibration`.

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Software

Calibrating the NI 9262 requires the installation of NI-DAQmx 19.5 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 need to install support for only the application software you intend to use.

Documentation

Consult the following documents for information about the NI 9262, 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 9262 Operating Instructions and Specifications

NI 9262 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

NI recommends that you use the equipment in Table 1 for calibrating the NI 9262. 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 4081	10 V Range: ≤8.7 ppm gain error
Chassis	NI cDAQ-9178	—
Connection Accessory	NI 9923	—

Test Conditions

The following setup and environmental conditions are required to ensure the NI 9262 meets published specifications.

- Keep connections to the NI 9262 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 9262 are secure.
- Use shielded copper wire for all cable connections to the NI 9262. Use twisted-pair wire to eliminate noise and thermal offsets.
- Maintain an ambient temperature of 23 ± 5 °C. The NI 9262 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 9262 measurement circuitry is at a stable operating temperature.

Initial Setup

Complete the following steps to set up the NI 9262.

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

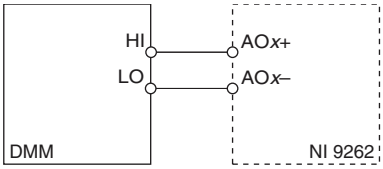
The following performance verification procedure describes the sequence of operation and provides test points required to verify the NI 9262. The verification procedure assumes that adequate traceable uncertainties are available for the calibration references.

Accuracy Verification

Complete the following procedure to determine the NI 9262 As-Found status.

1. Set the DMM to Standby mode (STBY).
2. Connect the DMM to the NI 9262 as shown in Figure 1.

Figure 1. Accuracy Verification Connections



3. Set the DMM to read DC voltage in the minimum range required to cover the NI 9262 output range of ±10 V.
4. Acquire a sample
   a. Create and configure an AO voltage channel according to Table 2.

Table 2. NI 9262 AO Voltage Channel Configuration

Input Range		Scaled Units	Terminal Configuration
Min	Max		
-10	10	Volts	Single Ended

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

Table 3. NI 9262 Output Configuration

Samples Per Channel	Timeout	Data
1	10.0	A Test Point value from Table 4

   d. Wait the appropriate time for the DMM measurement to settle.
   e. Read the NI 9262 output voltage 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 from the NI 9262**.**
8. Repeat steps 1 through 7 for each channel on the NI 9262.

Table 4. NI 9262 Test Limits

Range (V)	Test Point		2-Year Limits		As-Left Limits	
	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
+/-10	Max	9.500	9.47241	9.52759	9.49864	9.50136
+/-10	Mid	0.000	-0.00859	0.00859	-0.000537	0.000537
+/-10	Min	-9.500	-9.52759	-9.47241	-9.50136	-9.49864

Note Test limits in Table 4 are derived using the values in Table 6.

Adjustment

The following performance adjustment procedure describes the sequence of operation required to adjust the NI 9262.

Accuracy Adjustment

Complete the following procedure to adjust the NI 9262 accuracy performance.

1. Connect the DMM to the NI 9262 as shown in Figure 1.
2. Adjust the NI 9262.
   a. Initialize a calibration session on the NI 9262. The default password is `NI`.
   b. Input the external temperature in degrees Celsius.
   c. Call the NI 9262 get C Series adjustment points function to obtain an array of recommended calibration voltages for the NI 9262.
   d. Set the DMM to read DC voltage in the minimum range required to cover the NI 9262 output range of ±10 V.
   e. Call and configure the NI 9262 setup calibration function with the DAC value obtained from the array of recommended calibration voltages.
   f. Wait the appropriate amount of time for the DMM measurement to settle.
   g. Read the NI 9262 output voltage measurement from the DMM.
   h. Call and configure the NI 9262 adjustment function according to Table 5.

Table 5. Adjustment Configuration

Physical Channel	Reference Value
cDAQMod8/ao*x*	The NI 9262 output voltage measured from the DMM.

i. Repeat steps e to h for each calibration voltage in the array.

j. Close the calibration session.

3. Disconnect the DMM from the NI 9262.
4. Repeat step 1 for each channel on the NI 9262.

EEPROM Update

When an adjustment procedure is completed, the NI 9262 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 *NI 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 9262 installed in slot 8 of an NI cDAQ-9178 chassis
- Slots 1 through 7 of the NI cDAQ-9178 chassis are empty

Table 6. NI 9262 Accuracy

	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
As Found	0.2%	0.08
As Left	0.0087%	0.005%
* Range equals 10.742 V		

NI Services

Visit ni.com/support to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit ni.com/services to learn about NI service offerings such as calibration options, repair, and replacement.

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

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