

# CALIBRATION PROCEDURE

# NI WSN-3202

This document contains information for calibrating the National Instruments WSN-3202. For more information on calibration, visit [ni.com/calibration](http://ni.com/calibration).

## Contents

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Conventions .....	2
Software Requirements .....	2
Documentation Requirements .....	3
Calibration Interval .....	3
Test Equipment .....	4
Test Conditions .....	4
Calibration Procedures .....	5
Initial Setup .....	5
Verification .....	5
Where to Go for Support .....	8

# Conventions

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The following conventions are used in this document:

» The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.



This icon denotes a note, which alerts you to important information.

**bold** Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

*italic* Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.

monospace Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

## Software Requirements

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Calibrating the NI WSN-3202 requires installing LabVIEW 8.6.1 or later and NI-WSN on the calibration system. The NI-WSN instrument driver is available at [ni.com/downloads](http://ni.com/downloads).

NI recommends installing NI-WSN before connecting the hardware.

# Documentation Requirements

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For information about NI-WSN and the NI WSN-3202, you can consult the following documents:

- *NI Wireless Sensor Network Devices Getting Started Guide*—provides instructions for installing and configuring NI Wireless Sensor Network (WSN) devices and software. Available online at [ni.com/manuals](http://ni.com/manuals).
- *NI WSN-3202 User Guide and Specifications*—includes detailed information about NI WSN-3202 and provides the published specification values for the NI WSN-3202. Refer to the most recent *NI WSN-3202 User Guide and Specifications* online at [ni.com/manuals](http://ni.com/manuals) for specifications.
- *LabVIEW Help*—includes information about creating applications that use NI-WSN. The LabVIEW Help is available by selecting **Help» Search the LabVIEW Help** in LabVIEW.
- *MAX Help for WSN Devices*—includes information about configuring your device in MAX. Available in MAX from **Start»All Programs» National Instruments»NI-WSN»Configuring WSN in MAX**.

## Calibration Interval

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National Instruments recommends a calibration interval of one year for the NI WSN-3202. Adjust the recommended calibration interval based on the measurement accuracy demands of your application.

# Test Equipment

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National Instruments recommends that you use the equipment in Table 1 for calibrating the NI WSN-3202.

**Table 1.** Recommended Equipment

Equipment	Recommended Model	Parameter Measured	Minimum Requirements
Calibrator	Fluke 5500A	Voltage	If this instrument is unavailable, use a high-precision voltage source with an accuracy of at least 50 ppm and an output impedance of $\leq 50 \Omega$
WSN Ethernet gateway and power supply	NI WSN-9791 with 9–30 V power supply or NI 9792 with 9–35 V power supply	Voltage	—
Screw terminal wiring	—	Voltage	14 to 24 AWG wire

## Test Conditions

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Follow these guidelines to optimize the equipment and the environment during calibration:

- Keep connections to the device as short as possible. Long cables and wires act as antennae, picking up extra noise that can affect measurements. To further reduce settling and noise, use shielded twisted-pair PTFE-insulated cables.
- Verify that all connections to the device are secure.
- The NI WSN-3202 must be powered by either an external 9–30 V power supply or four AA (1.5 V) batteries (alkaline only).
- Maintain an ambient temperature of  $23 \pm 5 \text{ }^\circ\text{C}$ .
- Keep relative humidity between 10% and 90%.
- Allow a warm up time of at least 10 minutes to ensure that the measurement circuitry is at a stable operating temperature.

# Calibration Procedures

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The calibration process includes the following steps:

1. *Initial Setup*—Install the device and configure it in Measurement & Automation Explorer (MAX).
2. *Verification*—Verify the existing operation of the device. This step confirms whether the device is operating within the published specifications prior to adjustment.
3. *Adjustment*—If the device does not fall within the desired specifications, return the device to NI for a factory calibration to adjust the calibration constants. Refer to [ni.com/calibration](http://ni.com/calibration) for information about returning a device to NI for a factory calibration.
4. *Reverification*—Repeat the verification procedure to ensure that the device is operating within the published specifications after adjustment.

The first two procedures are described in more detail in the following sections.

## Initial Setup

Refer to the *NI Wireless Sensor Network Devices Getting Started Guide* for information about how to install the software and hardware and how to configure the device in MAX.

## Verification

This section provides instructions for verifying the NI WSN-3202 specifications.

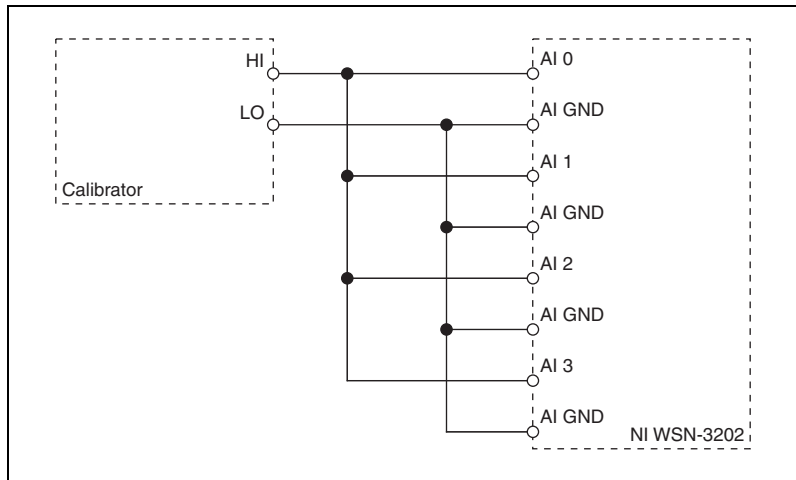
### Verifying Voltage

Complete the following steps to verify voltage.



**Note** The NI WSN-3202 has a single set of calibration coefficients for all analog input channels. You need to check only one AI channel to assure that all channels are inside the limits listed in Table 2.

1. Connect the calibrator to the NI WSN-3202 as shown in Figure 1.



**Figure 1.** NI WSN-3202 Calibration Connections

2. Set the sample interval rate on the NI WSN-3202 to one second.
3. Set the range on the NI WSN-3202 to the range that you are testing.
4. Set the calibrator voltage to a Test Point value indicated in Table 2.
5. Create a VI in LabVIEW to acquire a voltage reading from the AI 0 variable on the NI WSN-3202.
6. Compare the NI WSN-3202 reading with the 1-Year Limits in Table 2.
7. Repeat steps 2 through 6 for all test points in Table 2. NI recommends that you verify the values for all the iterations listed in Table 2, but you can save time by verifying only the values used in your application.



**Note** Limits in the following table are based upon the November 2009 edition of the *NI WSN-3202 User Guide and Specifications*. Refer to the most recent NI WSN-3202 specifications online at [ni.com/manuals](http://ni.com/manuals). If a more recent edition of the specifications is available, recalculate the limits based upon the latest specifications.

**Table 2.** NI WSN-3202 Test Limits

Iteration	Range (V)	Test Point (V)	1-Year Limits (V)	
			Lower Limit	Upper Limit
1	-0.5 to 0.5	-0.45	-0.450499	-0.449501
2		-0.2	-0.200396	-0.199604
3		0	-0.000314	0.000314
4		0.2	0.199604	0.200396
5		0.45	0.449501	0.450499
6	-2 to 2	-1.8	-1.802227	-1.797773
7		-0.8	-0.801805	-0.798195
8		0	-0.001467	0.001467
9		0.8	0.798195	0.801805
10		1.8	1.797773	1.802227
11	-5 to 5	-4.5	-4.504305	-4.495695
12		-2	-2.003450	-1.996550
13		0	-0.002766	0.002766
14		2	1.996550	2.003450
15		4.5	4.495695	4.504305
16	-10 to 10	-9	-9.007079	-8.992921
17		-4	-4.005794	-3.994206
18		0	-0.004766	0.004766
19		4	3.994206	4.005794
20		9	8.992921	9.007079

# Where to Go for Support

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The National Instruments Web site is your complete resource for technical support. At [ni.com/support](http://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](http://ni.com/support) and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0,  
Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,  
Canada 800 433 3488, China 86 21 5050 9800,  
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,  
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,  
Germany 49 89 7413130, India 91 80 41190000, Israel 972 3 6393737,  
Italy 39 02 41309277, Japan 0120-527196, Korea 82 02 3451 3400,  
Lebanon 961 (0) 1 33 28 28, Malaysia 1800 887710,  
Mexico 01 800 010 0793, Netherlands 31 (0) 348 433 466,  
New Zealand 0800 553 322, Norway 47 (0) 66 90 76 60,  
Poland 48 22 328 90 10, Portugal 351 210 311 210,  
Russia 7 495 783 6851, Singapore 1800 226 5886,  
Slovenia 386 3 425 42 00, South Africa 27 0 11 805 8197,  
Spain 34 91 640 0085, Sweden 46 (0) 8 587 895 00,  
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