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NI-9795

CALIBRATION PROCEDURE

NI WSN-3226

NI Wireless Sensor Network 4-Channel, 20-Bit Voltage/RTD Node

This document contains the verification procedures for the National Instruments WSN-3226. For more information about calibration solutions, visit ni.com/calibration.

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Software

Calibrating the NI WSN-3226 requires the installation of LabVIEW 2010 or later and NI-WSN 1.2 or later on the calibration system. You can download NI-WSN from ni.com/downloads.

Documentation

Consult the following documents for information about the NI WSN-3226, NI-WSN, and LabVIEW. All documents are available on ni.com and help files install with the software.



NI Wireless Sensor Network Devices Getting Started Guide

NI-WSN installation and hardware setup



NI WSN-3226 User Guide and Specifications

NI WSN-3226 specific information, specifications, and calibration interval



Test Equipment

Table 1 lists the equipment recommended for the performance verification 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	Where Used	Requirements
Calibrator	Fluke 5520A	Voltage	Use a high-precision voltage source with an accuracy of at least 50 ppm and an output impedance of $\leq 1 \Omega$
		Resistance	Use a high-precision resistance calibrator with an accuracy of at least 90 ppm
WSN Ethernet gateway and power supply	NI WSN-9791 with 9 V to 30 V power supply	All	—
	NI 9792 with 9 V to 35 V power supply		
	NI 9795 with CompactRIO system		
Screw terminal wiring	—	All	14 to 24 AWG wire

Test Conditions

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

- For the *Resistance Accuracy Verification* procedure, keep connections to the NI WSN-3226 under 5 inches and within 1/8 inch in length of each other.
- Verify that all connections to the device are secure.
- The NI WSN-3226 must be powered by either an external 9 V to 30 V power supply or four AA (1.5 V) batteries (alkaline only).

- Maintain an ambient temperature of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.
- Keep relative humidity between 10% and 90%.
- Allow a warm-up time for all the instruments and equipment, according to the manufacturers' instructions.

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 Measurement & Automation Explorer (MAX).

Verification

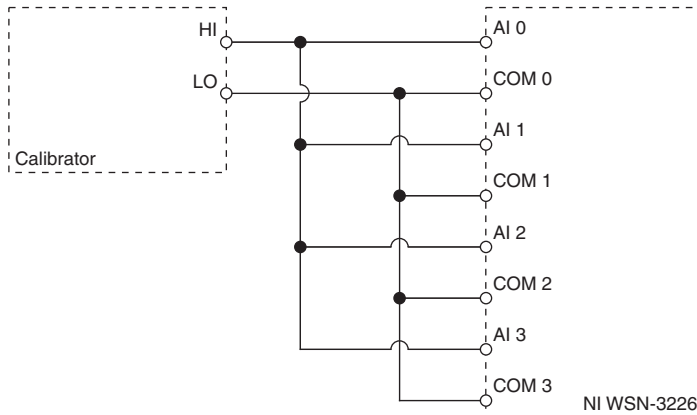
The following performance verification procedures describe the sequence of operation and test points required to verify the NI WSN-3226 and assume that adequate traceable uncertainties are available for the calibration references.

Voltage Accuracy Verification

Complete the following procedure to determine the As-Found status of the NI WSN-3226.

1. Connect the calibrator to the NI WSN-3226 as shown in Figure 1.

Figure 1. NI WSN-3226 Voltage Connections



2. Configure a project for the WSN system in LabVIEW.
3. Right-click the NI WSN-3226 in the Project Explorer and select **Properties** to launch the Properties dialog box.

- Configure the NI WSN-3226 according to Table 2.

Table 2. NI WSN-3226 Voltage Configuration

Channel Attribute*	Channel Value*	Sample Interval	Powerline Filtering	Filtering Strength
Measurement Type	Voltage	1	50/60 Hz	High Rejection
* Set the channel attribute and value for each analog input channel.				

- Click **OK**.
- Right-click the NI WSN-3226 in the Project Explorer and select **Deploy**.
- Set the calibrator to a Test Point value indicated in Table 3.
- Create a VI in LabVIEW to acquire a voltage reading from the AI 0 variable on the NI WSN-3226.
- Acquire and average 25 voltage readings with the NI WSN-3226.
- Compare the average of the NI WSN-3226 readings with the 3-Year Limits in Table 3.
- Repeat steps 7 through 10 for all test points in Table 3.

Table 3. NI WSN-3226 Voltage Test Limits

Range (V)		Test Point	3-Year Limits	
Positive Full Scale	Negative Full Scale	Value (V)	Lower Limit (V)	Upper Limit (V)
10.000	-10.000	9.95000	9.94332	9.95668
		0.00000	-0.0027	0.0027
		-9.95000	-9.95668	-9.94332



Note The limits in Table 3 are derived using the values in Table 6.

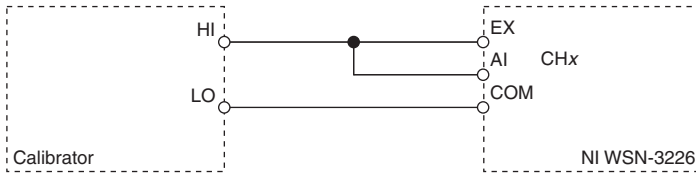
If the Voltage Accuracy verification procedure determines that the NI WSN-3226 is outside of the limits, refer to [Where to Go for Support](#) for assistance in returning the device to NI.

Resistance Accuracy Verification

Complete the following procedure to determine the As-Found status of the NI WSN-3226.

1. Connect the calibrator to the NI WSN-3226 as shown in Figure 2.

Figure 2. NI WSN-3226 Resistance Connections



2. Configure a project for the WSN system in LabVIEW.
3. Right-click the NI WSN-3226 in the Project Explorer and select **Properties** to launch the Properties dialog box.
4. Configure the NI WSN-3226 according to Table 4.

Table 4. NI WSN-3226 Resistance Configuration

Channel Attribute	Channel Value	Sample Interval	Powerline Filtering	Filtering Strength	RTD/Resistance Range
Measurement Type	Resistance	1	50/60 Hz	High Rejection	400 Ω/Pt100
					4 kΩ/Pt1000
					100 kΩ

5. Click **OK**.
6. Right-click the NI WSN-3226 in the Project Explorer and select **Deploy**.
7. Set the calibrator to a Test Point value indicated in Table 5 that corresponds to the appropriate RTD/resistance range.
8. Turn any connection compensation settings on the calibrator off.



Tip On the Fluke 5520A, press the COMP softkey to turn compensation off.

9. Create a VI in LabVIEW to acquire a voltage reading from the AI 0 variable on the NI WSN-3226.
10. Acquire and average 25 voltage readings with the NI WSN-3226.
11. Compare the average of the NI WSN-3226 readings with the 3-Year Limits in Table 5.
12. Repeat steps 7 through 11 for all test points and all RTD/resistance ranges in Table 5.
13. Disconnect the calibrator from the NI WSN-3226.

14. Repeat steps 1 through 13 for each channel on the NI WSN-3226.

Table 5. NI WSN-3226 Resistance Test Limits

RTD/Resistance Range Setting	Test Point (Ω)	3-Year Ranges	
		Lower Limit (Ω)	Upper Limit (Ω)
400 Ω /Pt100	100	99.893	100.107
	390	389.777	390.223
4 k Ω /Pt1000	1000	999.26	1000.74
	4020	4018.35	4021.65
100 k Ω	4020	4011.39	4028.21
	100000	99963	100037



Note The limits in Table 5 are derived using the values in Table 7.

If the Resistance Accuracy verification procedure determines that the NI WSN-3226 is outside of the limits, refer to [Where to Go for Support](#) for assistance in returning the device to NI.

Re-Verification

Repeat the [Verification](#) section to determine the As-Left status of the device.

Accuracy Under Calibration Conditions

The values in the following tables 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 of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$
- Relative humidity between 10% and 90%

Table 6. NI WSN-3226 Voltage Accuracy

Range	Gain (% of Reading)	Offset (mV)
10 V	0.04	2.70



Note The limits in Table 3 are derived using the values in Table 6.

Table 7. NI WSN-3226 Resistance Accuracy

RTD/Resistance Range	Gain (% of Reading)	Offset (Ω)
400 Ω /Pt100	0.04	0.067
4 k Ω /Pt1000	0.03	0.440
100 k Ω	0.04	7.000



Note The limits in Table 5 are derived using the values in Table 7.



Note For operational specifications, refer to the most recent *NI WSN-3226 User Guide and Specifications* online at ni.com/manuals.

Where to Go for Support

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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