CALIBRATION PROCEDURE

NI PXIe-4464

4-Channel, 204.8 kS/s DSA Input

This document contains the verification and adjustment procedures for the National Instruments PXIe-4464. The NI PXIe-4464 is available in two input connector variants: BNC and mXLR. The calibration procedure is common between them; only the connecting cabling is different. In this document, the BNC and mXLR variants are referred to inclusively as the NI PXIe-4464. For more information about calibration solutions, visit ni.com/calibration.

Contents

Software

Calibrating the NI PXIe-4464 requires the installation of NI-DAQmx on the calibration system. NI-DAQmx 14.1 added driver support for the NI PXIe-4464. For the list of devices supported by a specific release, refer to the *NI-DAQmx Readme*, available on the version-specific download page or installation media.

You can download NI-DAQmx from ni.com/downloads. NI-DAQmx supports LabVIEW, LabWindows™/CVI™, C/C++, C#, and Visual Basic .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 PXIe-4464, NI-DAQmx, and your application software. All documents are available on `ni.com` and help files install with the software.

NI PXIe-4464 Getting Started Guide

NI-DAQmx driver software installation and hardware setup

NI PXIe-4464 Specifications

NI PXIe-4464 specifications and calibration interval

NI-DAQmx Readme

Operating system and application software support in NI-DAQmx

NI-DAQmx Help

Information about creating applications that use the NI-DAQmx driver

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

Table 1 lists the equipment recommended for the performance verification and adjustment procedures. The test instrumentation requirements are the same for each input connector variant. If the recommended equipment is not available, select a substitute using the minimum requirements listed in the table.

Table 1. Recommended Equipment

Equipment	Recommended Model(s)	Where Used	Minimum Requirements
Calibrator	Fluke 5700A	AI Gain	Frequency Range: 40 Hz to 92.2 kHz Voltage Range: up to 6.3 V_{rms} ACV Accuracy: 40 Hz: 0.017% 1 kHz: 0.016% 20 kHz: 0.017% 45 kHz: 0.087% 92.2 kHz: 0.29%
Function Generator	Keysight (Agilent) 33250A series	Timebase Frequency	Frequency Range: up to 90 kHz Frequency Accuracy: 2 ppm Voltage Range: up to 9 V_{pk}
Digital Multimeter	NI PXI-4070	IEPE Current	Current Accuracy: 0.9%
BNC Shorting Cap (quantity 4)	Pomona Electronics 5085 or Pomona Electronics 3840-50	AI Offset	Resistance: ≤50 Ω
BNC F-F-F T-Connector (quantity 3)	Pomona Electronics 3284	AI Gain	Characteristic Impedance: 50 Ω
BNC (F) to Banana Adapter (quantity 1)	Pomona Electronics 1269	AI Gain	—
BNC (M) Cable (BNC variant: quantity 7 mXLR variant: quantity 3)	Pomona Electronics 5697	AI Gain	Characteristic Impedance: 50 Ω
mXLR (F) to BNC (M) Cable[*] (quantity 4)	NI 156789-XX or NI 140150-XX 0R460.46 m 0R910.91 m 2R42.4 m	All	—
BNC F-F Adapter[*] (quantity 4)	Pomona Electronics 3283	AI Offset	—
[*] Required only for the mXLR variant.			

Connecting the NI PXIe-4464

The NI PXIe-4464 provides connections for four channels. Figure 1 shows the front panel connections of the NI PXIe-4464 with BNC connectors and the NI PXIe-4464 with mXLR connectors.

Figure 1. NI PXIe-4464 BNC and mXLR Connector Front Panel
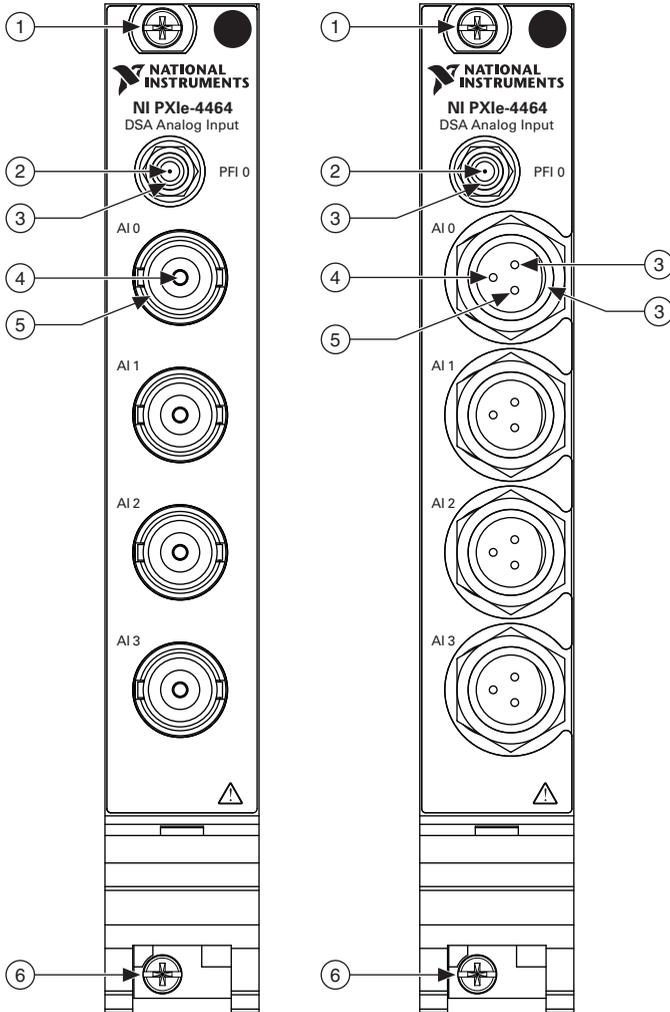
1	Top Module Mounting Screw	4	AI+
2	PFI	5	AI-
3	Chassis Ground	6	Bottom Module Mounting Screw

Test Conditions

The following setup and environmental conditions are required to ensure the NI PXIe-4464 meets published specifications.

- Keep connections to the NI PXIe-4464 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 device are secure.
- Maintain an ambient temperature of 23 °C ±5 °C. The device temperature will be greater than the ambient temperature.
- Keep relative humidity below 80%.
- Allow a warm-up time of at least 15 minutes to ensure that the NI PXIe-4464 measurement circuitry is at a stable operating temperature.
- Allow adequate warm-up time for all of the instruments and equipment according to the manufacturer instructions.

Initial Setup

Refer to the *DAQ Getting Started Guide* and the *NI PXIe-4464 Getting Started Guide* for information about how to install the software and hardware and how to configure the device in Measurement & Automation Explorer (MAX).

Note When a device is configured in MAX, it is assigned a device name. Each function call uses this device name to determine which device to calibrate. This document uses *Dev_name* to refer to the device name. In the following procedures, use the device name as it appears in MAX.

Self-Calibration

The NI PXIe-4464 includes precise internal circuits and references used during self-calibration to adjust for any errors caused by short-term fluctuations in the environment.

Note Conduct a self-calibration before completing the first verification (that is, verification that does not immediately follow adjustment).

Complete the following steps to self-calibrate the device.

Note No signal connections are needed for self-calibration.

1. Wait 15 minutes for the device to warm up.
2. Launch MAX.
3. Select **My System»Devices and Interfaces»*your device***.
4. Initiate self-calibration using one of the following methods:
   - Click **Self-Calibrate** in the upper right corner of the window.
   - Right-click the device name under **Devices and Interfaces**, and select **Self-Calibrate** from the drop-down menu.

Verification

The following performance verification procedures describe the sequence of operation and provide test points required to verify the NI PXIe-4464. The verification procedures assume that adequate traceable uncertainties are available for the calibration references.

Note Conduct a self-calibration before completing the first verification (that is, verification that does not immediately follow adjustment). Refer to the *Self-Calibration* section for instructions on performing a self-calibration.

Note Test limits in Tables 2 through 15 are based upon the July 2014 edition of the *NI PXIe-4464 Specifications*. Refer to the most recent *NI PXIe-4464 Specifications* at ni.com/manuals.

Analog Input Performance Verification

This section verifies the analog input (AI) performance of the NI PXIe-4464. Some, but not all, performance characteristics are affected by adjustment and are subject to reverification after adjustment. Characteristics affected by adjustment have As Left test limits in addition to As Found test limits. Characteristics unaffected by adjustment solely have test limits with no additional qualification.

AI Offset Accuracy Verification

Complete the following steps to verify the AI offset accuracy:

1. Using the equipment described in Table 1, connect a BNC shorting cap to each device input channel.
2. Create and configure an AI voltage task on the device as shown in Table 2.

Table 2. AI Offset Verification Configuration

Configuration	Value
Physical channels	*Dev_name*/ai0:3
Gain*	-20 (dB)
Coupling	DC
Terminal configuration	Pseudodifferential
Excitation (IEPE)	0 (A)
Acquisition mode	Finite number of samples
Rate	204800.0
Samples per channel	102400
* As you configure the AI voltage task, refer to Table 3 for the maximum and minimum voltages to specify when creating the task to ensure the specified gain range is used on the module. The module automatically selects the gain range based on the maximum and minimum voltages you supply when you create the task.	

Table 3. Gain Range and Corresponding Max and Min Voltages

Desired Gain Range (dB)	Max Voltage (V)	Min Voltage (V)
-20	42.4	-42.4
-10	31.6	-31.6
0	10.0	-10.0
10	3.16	-3.16
20	1.00	-1.00
30	0.316	-0.316

3. Start the task.
4. Acquire readings with the NI PXIe-4464.
5. On a per channel basis, average all of the acquired samples.
6. Stop and clear the task.
7. Compare the averaged values to the appropriate limits in Table 4. The average is the offset at the -20 dB gain setting.

Table 4. AI Offset Accuracy Limits

Device Gain (dB)	As Found Test Limit		As Left Test Limit	
	Min (mV)	Max (mV)	Min (mV)	Max (mV)
-20	-9.0	9.0	-2.2	2.2
-10	-3.0	3.0	-0.75	0.75
0	-0.9	0.9	-0.25	0.25
10	-0.3	0.3	-0.1	0.1
20	-0.15	0.15	-0.05	0.05
30	-0.1	0.1	-0.05	0.05

8. Repeat steps 2 through 7 for each gain setting of the device. When performing step 2, set the **gain**[1] parameter to -10, 0, 10, 20, and 30 as required.

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[1] Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.

AI Gain Accuracy Verification

Complete the following steps to verify the AI gain accuracy:

1. Using the equipment described in Table 1, connect the output of the calibrator to the analog input channel 0 of the device.

2. Configure the calibrator to generate an output with the amplitude and frequency listed in the -20 dB gain row of Table 5.

Table 5. AI Gain Accuracy Limits

Device Gain (dB)	Calibrator Output		As Found Test Limit		As Left Test Limit	
	Amplitude (V_{rms})	Frequency (Hz)	Min (V_{rms})	Max (V_{rms})	Min (V_{rms})	Max (V_{rms})
-20	6.3	1000	6.27828	6.32180	6.29606	6.30394
-10	6.3	1000	6.27828	6.32180	6.29606	6.30394
0	6.3	1000	6.27828	6.32180	6.29606	6.30394
10	2.0	1000	1.99310	2.00692	1.99875	2.00125
20	0.63	1000	0.62783	0.63218	0.62961	0.63039
30	0.2	1000	0.19931	0.20069	0.19988	0.20013

3. Create and configure an AI voltage task on the device as shown in Table 6.

Table 6. AI Gain Verification Configuration

Configuration	Value
Physical channel	*Dev_name*/ai0
Gain*	-20 (dB)
Coupling	AC
Terminal configuration	Pseudodifferential
Excitation (IEPE)	0 (A)
Acquisition mode	Finite number of samples
Rate	204800.0
Samples per channel	102400
* Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.	

4. If the coupling changes from DC to AC (for example, on the first gain verification point tested), commit the configuration using the DAQmx Control Task VI and wait 5 seconds for the input to settle. Subsequent gain verification points, which do not change the coupling, do not require a delay.

5. Start the task.

6. Acquire readings with the NI PXIe-4464.

7. Calculate the RMS amplitude of the acquired fundamental harmonic. Compare this amplitude to the appropriate voltage limits in Table 5. The calculated amplitude is used to verify the gain accuracy of analog input channel 0 at the -20 dB gain setting.

   As an example, you can use the Extract Single Tone Information VI to help calculate RMS. Note that the output of this VI is peak amplitude, and you must divide the result by $\sqrt{2}$ to convert to RMS.

8. Stop and clear the task.

9. Repeat steps 2 through 8 for each gain setting of the device. When performing step 2, configure the calibrator output to the amplitude and frequency indicated for the gain range to be verified. When performing step 3, set the **gain**[1] parameter to -10, 0, 10, 20, and 30 as required.

10. Repeat steps 1 through 9 for all input channels of the device. In step 1, connect the output of the calibrator to the channel being verified. In step 3, replace ai0 in the **physical channel** parameter with the channel being verified.

AI Gain Flatness Verification

Note This performance characteristic is not affected by adjustment. Consequently, reverification after adjustment is not necessary.

Note DC-coupled gain flatness is inherently better than AC-coupled gain flatness, specifically at low frequencies. Consequently, the verification of AC-coupled gain flatness covers both configurations.

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[1] Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.

Complete the following steps to verify the AI gain flatness:

1. Using the equipment described in Table 1, connect the output of the calibrator to the analog input channel 0 of the device.

2. Configure the calibrator to generate an output with the amplitude and frequency listed in the -20 dB gain row of Table 7.

Table 7. AI Gain Flatness Inputs

	Calibrator Output	
Device Gain (dB)	Amplitude (V_{rms})	Frequency (Hz)
-20	6.3	1000
-10	6.3	1000
0	6.3	1000
10	2.0	1000
20	0.63	1000
30	0.2	1000

3. Create and configure an AI voltage task on the device as shown in Table 8.

Table 8. AI Gain Flatness Verification Configuration

Configuration	Value
Physical channel	*Dev_name*/ai0
Gain[*]	-20 (dB)
Coupling	AC
Terminal configuration	Pseudodifferential
Excitation (IEPE)	0 (A)
Acquisition mode	Finite number of samples
Rate	204800.0
Samples per channel	102400

[*] Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.

4. Start the task.

5. Acquire readings with the NI PXIe-4464.

6. Calculate the RMS amplitude of the acquired fundamental harmonic. The measured amplitude represents V_{1kHz} referenced in Table 9.

   As an example, you can use the Extract Single Tone Information VI to help calculate RMS. Note that the output of this VI is peak amplitude, and you must divide the result by $\sqrt{2}$ to convert to RMS.

7. Stop and clear the task.

8. Repeat steps 2 through 7 for each row in Table 9. When performing step 2, instead of 1 kHz, configure the calibrator output to the frequency listed in Table 9. The calibrator output amplitude remains constant. Compare this amplitude to the appropriate limits in Table 9.

📝 **Note** The value of V_{1kHz} is the measured amplitude of the 1 kHz tone, not the nominal amplitude listed in Table 7.

9. Repeat steps 2 through 8 for each gain setting of the device. When performing step 2, configure the calibrator output to the amplitude and frequency indicated for the gain range to be verified. When performing step 3, set the **gain**[1] parameter to -10, 0, 10, 20, and 30 as required.

10. Repeat steps 1 through 9 for all input channels of the device. In step 1, connect the output of the calibrator to the channel being verified. In step 3, replace ai0 in the **physical channel** parameter with the channel being verified.

Table 9. AI Flatness Limits

Calibrator Output Frequency (Hz)	Test Limit (-10 dB, -20 dB ranges)		Test Limit (0 dB, 10 dB, 20 dB, 30 dB ranges)	
	Min	**Max**	**Min**	**Max**
40	$0.97724 * V_{1kHz}$	$1.02329 * V_{1kHz}$	$0.99931 * V_{1kHz}$	$1.00069 * V_{1kHz}$
20000	$0.97724 * V_{1kHz}$	$1.02329 * V_{1kHz}$	$0.99931 * V_{1kHz}$	$1.00069 * V_{1kHz}$
45000	$0.93325 * V_{1kHz}$	$1.07152 * V_{1kHz}$	$0.99655 * V_{1kHz}$	$1.00346 * V_{1kHz}$
92200	$0.89125 * V_{1kHz}$	$1.12202 * V_{1kHz}$	$0.98855 * V_{1kHz}$	$1.01158 * V_{1kHz}$

[1] Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.

AI Noise Verification

📝 **Note** This performance characteristic is not affected by adjustment. Consequently, reverification after adjustment is not necessary.

Complete the following steps to verify the AI noise:

1. Using the equipment described in Table 1, connect a BNC shorting cap to each device input channel.
2. Create and configure an AI voltage task on the device as shown in Table 10.

Table 10. AI Noise Verification Configuration

Configuration	Value
Physical channels	*Dev_name*/ai0:3
Gain*	-20 (dB)
Coupling	DC
Terminal configuration	Pseudodifferential
Excitation (IEPE)	0 (A)
Acquisition mode	Finite number of samples
Rate	204800.0
Samples per channel	102400

*Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.

3. Start the task.
4. Acquire readings with the NI PXIe-4464.
5. On a per channel basis, compute the standard deviation of the acquired samples.
6. Stop and clear the task.
7. Compare the computed values to the appropriate limits in Table 11. The standard deviation is the input noise at the -20 dB gain setting at the 204.8 kS/s sample rate.

Table 11. AI Noise Limits

Device Gain (dB)	f_s = 51.2 kS/s Max (μV_{rms})	f_s = 204.8 kS/s Max (μV_{rms})
-20	197	445
-10	117	243
0	14.0	32.9

Table 11. AI Noise Limits (Continued)

Device Gain (dB)	f_s = 51.2 kS/s Max (μV_{rms})	f_s = 204.8 kS/s Max (μV_{rms})
10	4.7	10.8
20	2.0	4.3
30	1.4	2.8

8. Repeat steps 2 through 7 for the 51.2 kS/s sample rate. When performing step 2, set the **rate** parameter to 51200 and the **samples per channel** parameter to 25600.

9. Repeat steps 2 through 8 for each gain setting of the device. When performing step 2, set the **gain**[1] parameter to -10, 0, 10, 20, and 30 as required.

IEPE Current Verification

📝 **Note** This performance characteristic is not affected by adjustment. Consequently, reverification after adjustment is not necessary.

Complete the following steps to verify the IEPE current:

1. Set the digital multimeter to the AMPS function and a range suitable to measure currents between 4 mA and 20 mA.

2. Using the equipment described in Table 1, connect the AMPS input of the digital multimeter to the analog input channel 0 of the device.

3. Create and configure an AI voltage task on the device as shown in Table 12.

Table 12. IEPE Current Verification Configuration

Configuration	Value
Physical channel	*Dev_name*/ai0
Gain*	-20 (dB)
Coupling	AC
Terminal configuration	Pseudodifferential
Excitation (IEPE)	0.004 (A)
Acquisition mode	Finite number of samples
Rate	204800.0
Samples per channel	10240
* Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module	

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[1] Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.

4. Start the task.

5. Acquire readings with the NI PXIe-4464. The readings are not used; the task is simply run to set the device configuration.

6. Measure the output current on the digital multimeter.

7. Stop and clear the task.

8. Compare this value to the appropriate limit in Table 13.

Table 13. IEPE Current Limits

	Test Limit	
IEPE Current Setting (mA)	**Min (mA)**	**Max (mA)**
4	4.0	4.3
10	9.6	10.4
20	19.3	20.7

9. Repeat steps 3 through 8 for each IEPE current setting of the device. When performing step 3, set the **excitation** parameter to 0.010 and 0.020 as required.

10. After the last IEPE current verification step, turn off the current by performing steps 3 through 7 with the **excitation** parameter in step 3 set to 0.

11. Repeat steps 2 through 10 for all input channels of the device. In step 2, connect the AMPS input of the digital multimeter to the channel being verified. In step 3, replace ai0 in the **physical channel** parameter with the channel being verified.

Timebase Frequency Accuracy Verification

Note All analog inputs on a single device use the same timebase circuitry. Therefore, the measurements made on one channel are valid for all channels.

Complete the following steps to verify the timebase frequency accuracy:

1. Using the equipment described in Table 1, connect the output of the function generator to the analog input channel 0 of the device. Connect a BNC shorting cap to the other device input channels.

2. Configure the function generator to output a sine wave of 6.3 V_{rms} (8.9 V_{pk}) signal, no offset, at a frequency of 10.000 kHz.

3. Create and configure an AI voltage task on the device as shown in Table 14.

Table 14. Timebase Frequency Verification Configuration

Configuration	Value
Physical channel	*Dev_name*/ai0
Gain[*]	0 (dB)
Coupling	AC
Terminal configuration	Pseudodifferential
Excitation (IEPE)	0 (A)
Acquisition mode	Finite number of samples
Rate	40000.0
Samples per channel	2560000
[*] Refer to Table 3 for the maximum and minimum voltages to specify to ensure the specified gain range is used on the module.	

4. Start the task.
5. Acquire readings with the NI PXIe-4464.
6. Measure the frequency of the acquired signal around 10 kHz. Compare the measured frequency to the limits in Table 15.

Table 15. Timebase Frequency Accuracy Limits

Function Generator Output		As Found Test Limit		As Left Test Limit	
Amplitude (V_{rms})	Frequency (kHz)	Min (kHz)	Max (kHz)	Min (kHz)	Max (kHz)
6.3	10.000	9.99973	10.00027	9.99992	10.00008

7. Stop and clear the task.

Adjustment

If the NI PXIe-4464 successfully passed each of the verification procedures within the As Left test limits *without adjustment*, then an adjustment is recommended, but not required, to warrant the published specifications for the next calibration interval. If the device was not within the As Left test limits, you can perform the adjustment procedure to improve the device accuracy and reset the calibration interval.

In order to update the calibration date without performing adjustment, see the instructions in the *Updating the Calibration Date without Performing Adjustment* section.

The external calibration interval is listed in the *NI PXIe-4464 Specifications*. An adjustment is required at least once within this interval. Performing the adjustment procedure automatically updates the calibration constants, date, and temperature in the device EEPROM.

The following performance adjustment procedures describe the sequence of operation required to adjust the NI PXIe-4464.

Initialization

1. Call `DAQmxInitExtCal` (DAQmx Initialize External Calibration VI) to initialize the calibration, using the following parameters:

    deviceName: *Dev_name*

    password: `NI`

    calHandle: `&myCalHandle`

Offset Adjustment

2. Using the equipment described in Table 1, connect a BNC shorting cap to each device input channel.

3. Call `DAQmxAdjustDSAAICalWithGainAndCoupling` (DAQmx Adjust DSA AI Calibration with Gain and Coupling VI from the DAQmx Adjust DSA AI Calibration Polymorphic VI), using the following parameters:

    calHandle: `myCalHandle`

    coupling: `DAQmx_Val_DC`

    gain: `0`

    referenceVoltage: `0.0`

> **Note** Set the **gain** parameter to the value of the device gain setting being calibrated, where 0, for example, represents 0 dB.

4. Repeat step 3 for each of the remaining gain ranges, sequentially substituting the **gain** parameter with 10, 20, 30, -10, and -20.

> **Note** All ranges must be adjusted for offset for the calibration to be valid.

Gain Adjustment

5. Using the equipment described in Table 1, connect the output of the calibrator to all of the device input channels in parallel.

6. Configure the calibrator to output a 6.3 V_{rms} signal at 1 kHz.

7. Call `DAQmxAdjustDSAAICalWithGainAndCoupling` (DAQmx Adjust DSA AI Calibration With Gain and Coupling VI from the DAQmx Adjust DSA AI Calibration Polymorphic VI), using the following parameters:

   calHandle: `myCalHandle`

   coupling: `DAQmx_Val_AC`

   gain: `-20`

   referenceVoltage: `6.3`

   📝 **Note** Set the **gain** parameter to the value of the device gain setting being calibrated, where -20, for example, represents -20 dB.

8. Repeat step 7 for the -10 dB and 0 dB gain ranges, sequentially substituting the **gain** parameter with -10 and 0.

9. Configure the calibrator to output a 2.0 V_{rms} signal at 1 kHz.

10. Repeat step 7 for the 10 dB gain range, substituting the **gain** parameter with 10 and the **referenceVoltage** parameter with 2.0.

11. Configure the calibrator to output a 630 mV_{rms} signal at 1 kHz.

12. Repeat step 7 for the 20 dB gain range, substituting the **gain** parameter with 20 and the **referenceVoltage** parameter with 0.63.

13. Configure the calibrator to output a 200 mV_{rms} signal at 1 kHz.

14. Repeat step 7 for the 30 dB gain range, substituting the **gain** parameter with 30 and the **referenceVoltage** parameter with 0.2.

   📝 **Note** All ranges must be adjusted for gain for the calibration to be valid.

Timebase Adjustment

15. Using the equipment described in Table 1, connect the output of the function generator to the analog input channel 0 of the device. Connect a BNC shorting cap to the other device input channels.

16. Configure the function generator to output a sine wave of 6.3 V_{rms} (8.9 V_{pk}) signal, no offset, at a frequency of 90.000 kHz.

17. Call `DAQmxAdjustDSATimebaseCal` (DAQmx Adjust DSA Timebase Calibration VI) with the following parameters to perform the timebase adjustment:

   calHandle: `myCalHandle`

   referenceFrequency: `90000.0`

Committal

18. Call `DAQmxCloseExtCal` (DAQmx Close External Calibration VI) with the following parameters to finish the calibration adjustment:

    calHandle: `myCalHandle`

    action: `DAQmx_Val_Action_Commit` or `DAQmx_Val_Action_Cancel`

    Use the action `cancel` if there has been any error during the calibration or if you do not want to save the new calibration constants in the device EEPROM.

    Use the action `commit` if you want to save the new calibration constants in the device onboard storage.

The device is now calibrated with respect to the external sources.

Reverification

After completing the adjustment procedure, repeat the *Verification* section to determine the As Left status of the device. Some, but not all, performance characteristics are affected by adjustment and would be subject to reverification after adjustment. Characteristics affected by adjustment have As Left test limits in addition to As Found test limits. Characteristics unaffected by adjustment solely have test limits with no additional qualification.

> **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 *Where to Go for Support* for assistance in returning the device to NI.

Updating the Calibration Date without Performing Adjustment

You can update the calibration date without performing the adjustment procedure. This might be appropriate if the NI PXIe-4464 successfully passed each of the verification procedures within the As Left test limits *without adjustment*. Complete the following steps to update the calibration date:

1. Open a calibration session using the DAQmx Initialize External Calibration VI with the following parameters:
   - **deviceName**: *Dev_name*
   - **password**: `NI`
   - **calHandle**: `&myCalHandle`

2. Close the session with the DAQmx Close External Calibration VI with the following parameters:
   - **calHandle**: `myCalHandle`
   - **action**: `DAQmx_Val_Action_Commit`

Specifications

Refer to the *NI PXIe-4464 Specifications* for calibration intervals and detailed specification information.

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.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone 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, support phone numbers, email addresses, and current events.