


E/S Series Calibration Procedure for NI-DAQ™ mx

Contents

| | |
|---|----|
| Introduction | 2 |
| Software | 3 |
| Documentation | 3 |
| Test Equipment | 4 |
| Test Considerations | 5 |
| Calibration Process | 6 |
| Calibration Process Overview | 6 |
| Initial Setup | 6 |
| E/S Series Verification Procedure | 7 |
| Analog Input Verification | 7 |
| Analog Output Verification | 10 |
| Counter Verification | 13 |
| E/S Series Adjustment Procedure | 15 |
| E/S Series Device Test Limits | 17 |
| Using the Tables | 18 |
| Range | 18 |
| Test Point | 18 |
| 24-Hour Ranges | 18 |
| 1-Year Ranges | 18 |
| Counters | 18 |
| NI 6011E—16-Bit Resolution | 19 |
| NI 6013/6014 Family—16-Bit Resolution | 21 |
| NI 6020E Family—12-Bit Resolution | 23 |
| NI 6023E/6024E/6025E Family—12-Bit Resolution | 26 |
| NI DAQCard-6024E—12-Bit Resolution | 28 |
| NI 6030E Family—16-Bit Resolution | 30 |
| NI 6034E/6035E/6036E Family—16-Bit Resolution | 33 |
| NI DAQCard-6036E—16-Bit Resolution | 35 |
| NI 6040E Family—12-Bit Resolution | 37 |
| NI 6052E Family—16-Bit Resolution | 40 |
| NI DAQCard-6062E—12-Bit Resolution | 43 |
| NI 6070E Family—12-Bit Resolution | 46 |

Conventions

| | |
|---|--|
| | The following conventions appear in this manual: |
|  | 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 and hardware labels. |
| <i>italic</i> | Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply. |
| monospace | Monospace text 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. |
| <i>monospace italic</i> | Italic text in this font denotes text that is a placeholder for a word or value that you must supply. |

Introduction

This document contains information about calibrating National Instruments E and S Series data acquisition (DAQ) devices.

This document does not discuss programming techniques or compiler configuration. The National Instruments DAQmx driver contains online help files that have compiler-specific instructions and detailed function explanations. You can add these help files when you install NI-DAQmx on the calibration computer.

E/S Series devices should be calibrated at a regular interval as defined by the measurement accuracy requirements of your application. National Instruments recommends that you perform a complete calibration at least once every year. You can shorten this interval to 90 days or six months.

Software

Calibration requires one of the following:

- Calibration Executive—The National Instruments Calibration Executive integrated environment is used for verifying and adjusting NI measurement devices. No programming is required.
- The latest NI-DAQmx driver—NI-DAQmx includes high-level function calls to simplify the task of writing software to calibrate devices. The driver supports many programming languages, including LabVIEW, LabWindows™/CVI™, Microsoft Visual C++, Microsoft Visual Basic, and Borland C++.

Documentation

If you use Calibration Executive, refer to *Calibrating E/S Series Devices with Calibration Executive* at ni.com/manuals instead of this document.

If you are using the NI-DAQmx driver, the following documents are your primary references for writing your calibration utility:

- The *NI-DAQmx C Reference Help* includes information about the functions in the driver.
- The *DAQ Quick Start Guide* for NI-DAQ 7.2 or later provides instructions for installing and configuring NI-DAQ devices.
- The *NI-DAQmx Help* includes information about creating applications that use the NI-DAQmx driver.

For more information about the devices you are calibrating, refer to the *E Series Help* or the *S Series Help*.

Test Equipment

Figure 1 shows the test equipment you need to calibrate your device. The specific connections are described in the *Calibration Process* section.

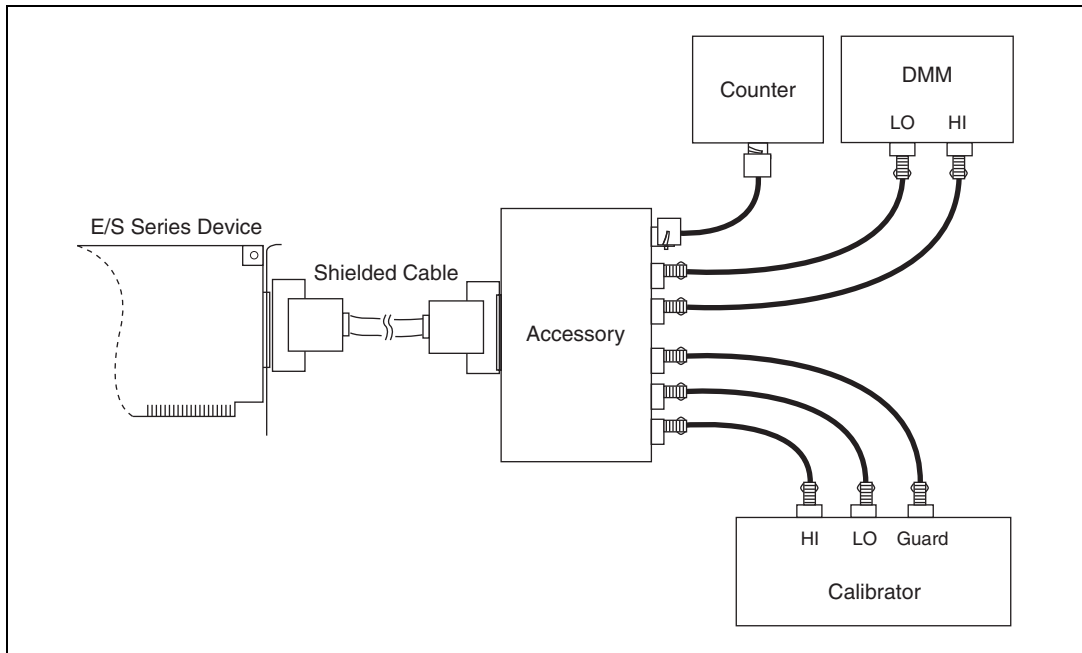


Figure 1. Calibration Connections

When performing calibration, National Instruments recommends that you use the following instruments for calibrating an E/S Series device:

- Calibrator—Fluke 5700A. If that instrument is unavailable, use a high-precision voltage source that is at least 50 ppm accurate for 12-bit boards and 10 ppm for 16-bit boards
- DMM—NI 4070. If that instrument is unavailable, use a multiranging 5 1/2-digit DMM with an accuracy of 40 ppm.
- Counter—Hewlett-Packard 53131A. If that instrument is unavailable, use a counter accurate to 0.01%.
- Low thermal copper EMF plug-in cables—Fluke 5440A-7002. Do not use standard banana cables.
- DAQ cable—NI recommends using shielded cables, as described in Table 1.

Table 1. Recommended Cables

| Device | Cable |
|---|---|
| E/S Series devices with a 68-pin SCSI II connector | SH68-68-EP |
| E/S Series devices with a 68-pin VHDCI connector (for example, DAQCard-6036E) | SHC68-68-EP |
| E/S Series devices with a 100-pin connector (for example, PCI/PXI-6025E, PCI/PXI-6031E, PCI/PXI-6033E, PCI/PXI-6071E) | SH1006868. Connect the 68-pin cable labeled MIO-16 to the accessory. The 68-pin cable labeled Extended I/O remains unconnected. |

- One of the following DAQ accessories:
 - E Series calibration fixture—The E Series calibration fixture connects your calibration equipment to your E/S Series device. If you programmatically control this fixture, you will not need to disconnect and reconnect cables at each step of the procedure.
 - SCB-68—The SCB-68 is a shielded I/O connector block with 68 screw terminals for easy signal connection to 68- or 100-pin DAQ devices.
 - CB-68LP/CB-68LPR/TBX-68—The CB-68LP, CB-68LPR, and TBX-68 are low-cost termination accessories with 68 screw terminals for easy connection of field I/O signals to 68-pin DAQ devices.
 - BNC-2110—The BNC-2110 is a desktop and DIN rail-mountable BNC adapter you can connect to DAQ devices.

Test Considerations

Connection and environmental considerations:

- Keep connections to the device as short as possible. Long cables and wires can act as antennae, which could pick up extra noise that would affect measurements.
- Use shielded copper wire for all cable connections to the device. Use twisted-pair wire to eliminate noise and thermal offsets.
- Maintain the ambient temperature between 18–28 °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 for PXI/PCI/AT bus devices and 30 minutes for PCMCIA cards to ensure that the measurement circuitry is at a stable operating temperature.

Calibration Process

This section provides instructions for verifying and calibrating your device.



Note If you use Calibration Executive, refer to *Calibrating E/S Series Devices with Calibration Executive* at ni.com/manuals instead of this document.

Calibration Process Overview

The calibration process has four steps:

1. Initial Setup—Configure your device in NI-DAQmx.
2. E/S Series Verification Procedure—Verify the existing operation of the device. This step allows you to confirm that the device was operating within its specified range prior to calibration.
3. E/S Series Adjustment Procedure—Perform an external calibration that adjusts the device calibration constants with respect to a known voltage source.
4. Perform another verification to ensure that the device is operating within its specifications after adjustment.

These steps are described in detail in the following sections. As a complete verification of all of the device's ranges can take some time, you may wish to verify only the ranges of interest to you.

Initial Setup

NI-DAQmx automatically detects all E/S Series devices. However, for the driver to communicate with the device, it must be configured in NI-DAQmx.

The following procedure describes how to configure a device in NI-DAQmx:

1. Install the NI-DAQmx driver software.
2. Power off the computer that will hold the device, and install the device in an available slot.
3. Power on the computer and launch Measurement & Automation Explorer (MAX).
4. Configure the device identifier and select **Self-Test** to ensure that the device is working properly.



Note When a device is configured with MAX, it is assigned a device identifier. Each function call uses this identifier to determine which DAQ device to calibrate.

E/S Series Verification Procedure

Verification determines how well the DAQ device is meeting its specifications. By performing this procedure, you can see how your device has operated over time. You can use this information to help determine the appropriate calibration interval for your application.

The verification procedure is divided into the major functions of the device. Throughout the verification process, use the tables in the *E/S Series Device Test Limits* section to determine if your device needs to be adjusted.

Analog Input Verification

Since E/S Series devices have many different ranges, you must check measurements for each available range. Because there is only one ADC on E Series devices, you only need to perform verification on a single analog input channel. For S Series devices, you must perform verification on all analog input channels.

Use the following procedure to check the performance of the analog input:

1. Refer to Table 2 to determine connections between the device and the calibrator.

Table 2. Calibrator Connections

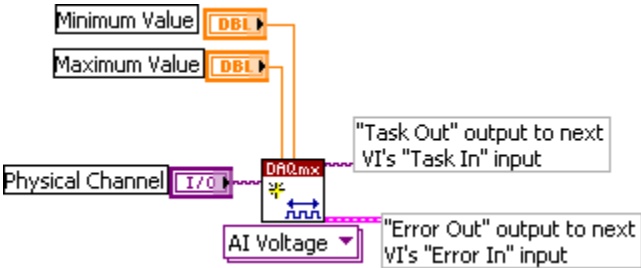
| E Series Devices | S Series Devices |
|--|--|
| Connect the positive output of the calibrator to AI 0 (pin 68). | Connect the positive output of the calibrator to AI 0 + (pin 68). |
| Connect the negative output of the calibrator to AI 8 (pin 34). | Connect the negative output of the calibrator to AI 0 – (pin 34). |
| If your calibrator has a guard connection, connect that terminal to AI GND. | If your calibrator has a guard connection, connect that terminal to AI GND. |
| If your calibrator does not have a guard connection, connect the negative output to AI GND, but ensure that it is not connected to earth ground. | If your calibrator does not have a guard connection, connect the negative output to AI GND, but ensure that it is not connected to earth ground. |

2. Choose the table from the *E/S Series Device Test Limits* section of this document that corresponds to the device you are verifying. This sheet shows all acceptable settings for the device type. Although NI recommends that you verify all ranges, you may wish to save time by checking only the ranges used in your application.

3. Set the calibrator voltage to the test value indicated on the device table.
4. Create a task using DAQmxCreateTask.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-------------------------------------|
| Call DAQmxCreateTask with the following parameters: taskName: <i>AIVerificationTask</i> taskHandle: &taskHandle | LabVIEW does not require this step. |

5. Add a channel to the task using DAQmxCreateAIVoltageChan (DAQmx Create Virtual Channel VI) and configure the channel. Use the tables in the *E/S Series Device Test Limits* section to determine the minimum and maximum values for your device.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|---|
| Call DAQmxCreateAIVoltageChan with the following parameters: taskHandle: taskHandle physicalChannel: dev1/ai0 nameToAssignToChannel: <i>myVoltageChannel</i> terminalConfig: <i>DAQmx_Val_Cfg_Default</i> minVal: -10.0 maxVal: 10.0 units: DAQmx_Val_Volts customScaleName: NULL |  <p>The diagram shows the DAQmx Create Virtual Channel VI block. The 'Physical Channel' input is set to 'I/O'. The 'Minimum Value' and 'Maximum Value' inputs are connected to DBI (Double Buffered Input) controls. The 'Units' input is set to 'AI Voltage'. The 'Task Out' output is connected to the 'Task In' input of the next VI, and the 'Error Out' output is connected to the 'Error In' input of the next VI.</p> |

- Configure timing for the voltage acquisition using DAQmxCfgSampClkTiming (DAQmx Timing VI).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-----------------------|
| <p>Call DAQmxCfgSampClkTiming with the following parameters:</p> <p>taskHandle: taskHandle source: NULL rate: 100000.0 activeEdge: DAQmx_Val_Rising sampleMode: DAQmx_Val_FiniteSamps sampsPerChan: 10000</p> | |

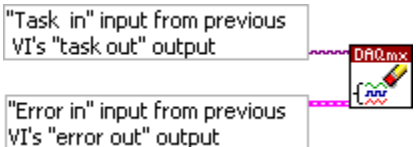
- Start the acquisition using DAQmxStartTask (DAQmx Start Task VI).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|-----------------------|
| <p>Call DAQmxStartTask with the following parameter:</p> <p>taskHandle: taskHandle</p> | |

- Acquire 10,000 points of voltage data using DAQmxReadAnalogF64 (DAQmx Read VI).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-----------------------|
| <p>Call DAQmxReadAnalogF64 with the following parameters:</p> <p>taskHandle: taskHandle numSampsPerChan: -1 timeout: 10.0 fillMode: DAQmx_Val_GroupByChannel readArray: data arraySizeInSamples: 10000 sampsPerChanRead: &read reserved: NULL</p> | |

9. Average the 10,000 voltage values. Compare the resulting average to the upper and lower limits listed in the table. If the result is between these values, the test is considered to have passed.
10. Clear the acquisition using `DAQmxClearTask` (**DAQmx Clear Task VI**).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|--|
| Call <code>DAQmxClearTask</code> with the following parameter: taskHandle: <code>taskHandle</code> |  |

11. For E Series devices, repeat steps 4 through 10 until all values have been verified. For S Series devices, repeat these steps for all channels and for all values.
12. Disconnect the calibrator from the device.

You have finished verifying the analog input levels on your device.

Analog Output Verification

This procedure checks the performance of the analog output. Skip this step if the device you are calibrating does not have analog output circuitry.

Check measurements using the following procedure:

1. Most E/S Series devices have two analog outputs, AO 0 and AO 1. This test checks both analog output channels. Connect your DMM to AO 0 as shown in Table 3.

Table 3. Connections to Analog Outputs

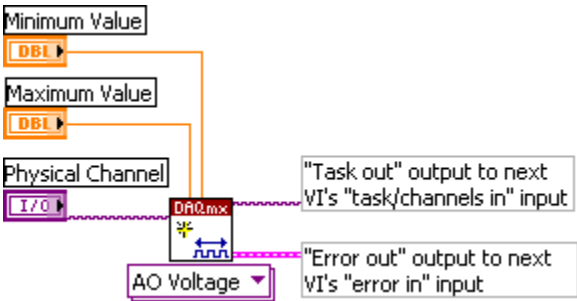
| Analog Output | DMM Positive Input | DMM Negative Input |
|---------------|--------------------|--------------------|
| AO 0 | AO 0 (pin 22) | AO GND (pin 55) |
| AO 1 | AO 1 (pin 21) | AO GND (pin 55) |

2. Choose the table from the *E/S Series Device Test Limits* section of this document that corresponds to the device you are verifying. This table shows all acceptable settings for the device. Although NI recommends that you verify all ranges, you may wish to save time by checking only the ranges used in your application.

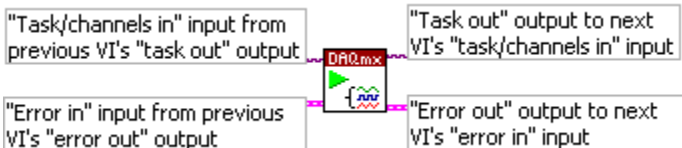
3. Create a task using DAQmxCreateTask.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-------------------------------------|
| Call DAQmxCreateTask with the following parameters: taskName: <i>MyAOVoltageTask</i> taskHandle: &taskHandle | LabVIEW does not require this step. |

4. Add an AO voltage task using DAQmxCreateAOVoltageChan (DAQmx Create Virtual Channel VI) and configure the channel, AO 0. Use the tables in the *E/S Series Device Test Limits* section to determine the minimum and maximum values for your device.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|--|
| Call DAQmxCreateAOVoltageChan with the following parameters: taskHandle: taskHandle physicalChannel: dev1/ao0 nameToAssignToChannel: AOVoltageChannel minVal: -10.0 maxVal: 10.0 units: DAQmx_Val_Volts customScaleName: NULL |  |

5. Start the acquisition using DAQmxStartTask (DAQmx Start Task VI).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|--|
| Call DAQmxStartTask with the following parameters: taskHandle: taskHandle |  |

- Write a voltage to the AO channel using DAQmxWriteAnalogF64 (DAQmx Write VI).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-----------------------|
| <p>Call DAQmxWriteAnalogF64 with the following parameters:</p> <p>taskHandle: taskHandle numSampsPerChan: 1 autoStart: 1 timeout: 10.0 dataLayout: DAQmx_Val_GroupByChannel writeArray: &data sampsPerChanWritten: &samplesWritten reserved: NULL</p> | |

- Compare the resulting value shown by the DMM to the upper and lower limits in the table. If the value is between these limits, the test is considered to have passed.
- Clear the acquisition using DAQmxClearTask (DAQmx Clear Task VI).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|-----------------------|
| <p>Call DAQmxClearTask with the following parameter:</p> <p>taskHandle: taskHandle</p> | |

- Repeat steps 4 through 8 until all values have been tested.
- Disconnect the DMM from AO 0, and reconnect it to AO 1, making the connections as shown in Table 3.
- Repeat steps 4 through 10 for AO 1.
- Disconnect your DMM from the device.

You have finished verifying the analog output levels on your device.

Counter Verification

This procedure verifies the performance of the counter. The E/S Series devices have only one timebase to verify, so only counter 0 needs to be checked. It is not possible to adjust this timebase, so only verification can be performed. Perform checks using the following procedure:

1. Connect your counter positive input to CTR 0 OUT (pin 2) and your counter negative input to D GND (pin 35).
2. Create a task using DAQmxCreateTask.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|--|
| <p>Call DAQmxCreateTask with the following parameters:</p> <p>taskName: <i>MyCounterOutputTask</i></p> <p>taskHandle: &taskHandle</p> | <p>LabVIEW does not require this step.</p> |

3. Add a counter output channel to the task using DAQmxCreateCOPulseChanFreq (**DAQmx Create Virtual Channel VI**) and configure the channel.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-----------------------|
| <p>Call DAQmxCreateCOPulseChanFreq with the following parameters:</p> <p>taskHandle: taskHandle</p> <p>counter: dev1/ctr0</p> <p>nameToAssignToChannel: CounterOutputChannel</p> <p>units: DAQmx_Val_Hz</p> <p>idleState: DAQmx_Val_Low</p> <p>initialDelay: 0.0</p> <p>freq: 5000000.0</p> <p>dutyCycle: .5</p> | |

- Configure the counter for continuous square wave generation using `DAQmxCfgImplicitTiming` (**DAQmx Timing VI**).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-----------------------|
| Call <code>DAQmxCfgImplicitTiming</code> with the following parameters: taskHandle: taskHandle sampleMode: <code>DAQmx_Val_ContSamps</code> sampsPerChan: 10000 | |

- Start the generation of a square wave using `DAQmxStartTask` (**DAQmx Start Task VI**).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|-----------------------|
| Call <code>DAQmxStartTask</code> with the following parameter: taskHandle: taskHandle | |

- The device will begin to generate a 5 MHz square wave when the `DAQmxStartTask` function completes execution. Compare the value read by your counter to the test limits shown on the device table. If the value falls between these limits, the test is considered to have passed.
- Clear the generation using `DAQmxClearTask` (**DAQmx Clear Task VI**).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|-----------------------|
| Call <code>DAQmxClearTask</code> with the following parameter: taskHandle: taskHandle | |

- Disconnect the counter from your device.

You have verified the counter on your device.

E/S Series Adjustment Procedure

Use the E/S Series adjustment procedure to adjust the analog input and output calibration constants. At the end of each calibration procedure, these new constants are stored in the external calibration area of the EEPROM. These values are password-protected, which prevents the accidental access or modification of any calibration constants adjusted by the metrology laboratory. The default password is NI.

Perform adjustment of the device with a calibrator using the following procedure:

1. The calibrator connections depend on the resolution of the device you are calibrating. Refer to Table 4 to determine connections between the device and the calibrator.

Table 4. Calibrator Connections

| 12-Bit E Series Devices | 16-Bit E Series Devices | S Series Devices |
|--|---|---|
| Connect the positive output of the calibrator to AI 8 (pin 34). | Connect the positive output of the calibrator to AI 0 (pin 68). | Connect the positive output of the calibrator to AI 0 + (pin 68). |
| Connect the negative output of the calibrator to AI SENSE (pin 62). | Connect the negative output of the calibrator to AI 8 (pin 34). | Connect the negative output of the calibrator to AI 0 – (pin 34). |
| Connect AO 0 (pin 22) line to AI 0 (pin 68). | — | — |
| If your calibrator and computer are floating with respect to each other, connect the negative output of the calibrator to AI SENSE (pin 62) and AI GND (pin 29). | If your calibrator and computer are floating with respect to each other, connect the negative output of the calibrator to the AI GND line (pin 32) and AI 8 (pin 34). | If your calibrator and computer are floating with respect to each other, connect the negative output of the calibrator to the AI GND line (pin 32) and AI 0 – (pin 34). |

2. Set your calibrator to output a voltage of 4.5 V for the NI 6143, and 7.50 V for all other devices.

- Open a calibration session on your device using `DAQmxInitExtCal` (**DAQmx Initialize External Calibration VI**). The default password is NI.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|---|-----------------------|
| <p>Call <code>DAQmxInitExtCal</code> with the following parameters:</p> <p>deviceName: dev1 password: NI calHandle: &calHandle</p> | |

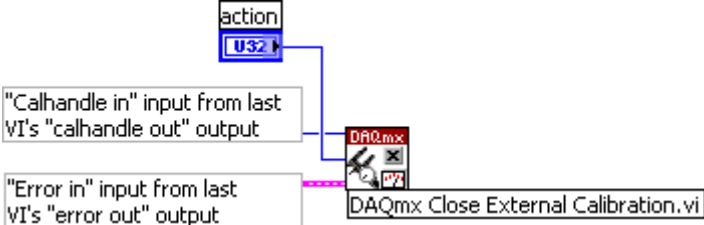
- Perform an external calibration adjustment using `DAQmxESeriesCalAdjust` (**DAQmx Adjust E-Series Calibration VI**).

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|-----------------------|
| <p>Call <code>DAQmxESeriesCalAdjust</code> with the following parameters:</p> <p>calHandle: calHandle referenceVoltage: 7.5</p> | |



Note If you are using an S Series device, use `DAQmxSSeriesCalAdjust` (**DAQmx Adjust S-Series Calibration VI**).

- Save the adjustment to the EEPROM, or onboard memory, using DAQmxCloseExtCal (**DAQmx Close External Calibration**). This function also saves the date, time, and temperature of the adjustment to the onboard memory.

| NI-DAQ Function Call | LabVIEW Block Diagram |
|--|---|
| <p>Call DAQmxCloseExtCal with the following parameters:</p> <p>calHandle: calHandle action: DAQmx_Val_Action_Commit</p> |  <p>The diagram shows a LabVIEW block diagram for the DAQmx Close External Calibration function. It features an 'action' block with 'US2' selected, connected to the 'action' input of the 'DAQmx Close External Calibration.vi' block. The 'calHandle in' input of the VI is connected to the 'calhandle out' output of the previous VI, and the 'Error in' input is connected to the 'error out' output of the previous VI.</p> |

- Disconnect the calibrator from the device.

The device is now calibrated with respect to your external source.

After calibrating the device, you may want to verify the analog input and output operation. To do this, repeat the [E/S Series Verification Procedure](#) section.

E/S Series Device Test Limits

The tables in this section list the specifications for the E/S Series devices. The specifications are divided into analog input, analog output, and counter/timer tables of values.

The tables display the specifications for both 1-year and 24-hour calibration intervals. The 1-year ranges display the specifications that the devices should meet if it has been one year between calibrations. When a device has been calibrated with an external source, the values shown in the 24-hour tables are the valid specifications.

Using the Tables

The following definitions describe how to use the information from the tables in this section.

Range

Range refers to the maximum allowable voltage range of an input or output signal.

Test Point

The *Test Point* is the voltage value that is input or output for verification purposes. This value is broken down into two columns: *Location* and *Value*. *Location* refers to where the test value fits within the test range. *Pos FS* stands for positive full-scale and *Neg FS* stands for negative full-scale. *Value* refers to the voltage value to be verified and is in volts.

24-Hour Ranges

The *24-Hour Ranges* column contains the *Upper Limits* and *Lower Limits* for the test point value. That is, when the device is within its 24-hour calibration interval, the test point value should fall between the upper and lower limit values. Upper and lower limits are expressed in volts.

1-Year Ranges

The *1-Year Ranges* column contains the *Upper Limits* and *Lower Limits* for the test point value. That is, when the device is within its 1-year calibration interval, the test point value should fall between the upper and lower limit values. Upper and lower limits are expressed in volts.

Counters

It is not possible to adjust the resolution of the counter/timers. Therefore, these values do not have a 1-year or 24-hour calibration period. However, the test point and upper and lower limits are provided for verification purposes.

NI 6011E—16-Bit Resolution

The following tables include values for the NI 6011E (NI PCI-MIO-16XE-50).

Table 5. NI 6011E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.98 | 9.978978 | 9.981022 | 9.978559 | 9.981441 |
| -10 | 10 | 0 | 0 | -0.000443 | 0.000443 | -0.000443 | 0.000443 |
| -10 | 10 | Neg FS | -9.98 | -9.981022 | -9.978978 | -9.981441 | -9.978559 |
| -5 | 5 | Pos FS | 4.99 | 4.988739 | 4.991261 | 4.988529 | 4.991471 |
| -5 | 5 | 0 | 0 | -0.000224 | 0.000224 | -0.000224 | 0.000224 |
| -5 | 5 | Neg FS | -4.99 | -4.991261 | -4.988739 | -4.991471 | -4.988529 |
| -1 | 1 | Pos FS | 0.998 | 0.997745 | 0.998255 | 0.997703 | 0.998297 |
| -1 | 1 | 0 | 0 | -0.000048 | 0.000048 | -0.000048 | 0.000048 |
| -1 | 1 | Neg FS | -0.998 | -0.998255 | -0.997745 | -0.998297 | -0.997703 |
| -0.1 | 0.1 | Pos FS | 0.0998 | 0.099751 | 0.099849 | 0.099746 | 0.099854 |
| -0.1 | 0.1 | 0 | 0 | -0.000009 | 0.000009 | -0.000009 | -0.000009 |
| -0.1 | 0.1 | Neg FS | -0.0998 | -0.099849 | -0.099751 | -0.099854 | -0.099746 |
| 0 | 10 | Pos FS | 9.98 | 9.979154 | 9.980846 | 9.978735 | 9.981266 |
| 0 | 10 | 0 | 0.02 | 0.019731 | 0.020269 | 0.019731 | 0.020270 |
| 0 | 5 | Pos FS | 4.99 | 4.988826 | 4.991174 | 4.988617 | 4.991383 |
| 0 | 5 | 0 | 0.01 | 0.009862 | 0.010138 | 0.009862 | 0.010138 |

Table 5. NI 6011E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 1 | Pos FS | 0.998 | 0.997762 | 0.998238 | 0.997720 | 0.998280 |
| 0 | 1 | 0 | 0.002 | 0.001969 | 0.002031 | 0.001969 | 0.002031 |
| 0 | 0.1 | Pos FS | 0.0998 | 0.099752 | 0.099848 | 0.099748 | 0.099852 |
| 0 | 0.1 | 0 | 0.0002 | 0.000193 | 0.000207 | 0.000193 | 0.000207 |

Table 6. NI 6011E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9800000 | 9.973195 | 9.986805 | 9.972796 | 9.987204 |
| -10 | 10 | 0 | 0.0000000 | -0.005408 | 0.005408 | -0.005408 | 0.005408 |
| -10 | 10 | Neg FS | -9.9800000 | -9.986805 | -9.973195 | -9.987204 | -9.972796 |
| 0 | 10 | Pos FS | 9.9800000 | 9.975637 | 9.984363 | 9.975238 | 9.984762 |
| 0 | 10 | 0 | 0.0200000 | 0.017031 | 0.022969 | 0.017030 | 0.022970 |

Table 7. NI 6011E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6013/6014 Family—16-Bit Resolution

The following tables include values for the NI PCI-6013 (analog input only) and the NI PCI-6014.

Table 8. NI 6013/6014 Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.800 | 9.7916 | 9.8084 | 9.7912 | 9.8088 |
| -10 | 10 | 0 | 0.000 | -0.0020 | 0.0020 | -0.0020 | 0.0020 |
| -10 | 10 | Neg FS | -9.800 | -9.8084 | -9.7916 | -9.8088 | -9.7912 |
| -5 | 5 | Pos FS | 4.900 | 4.8982 | 4.9018 | 4.8980 | 4.9020 |
| -5 | 5 | 0 | 0.000 | -0.0010 | 0.0010 | -0.0010 | 0.0010 |
| -5 | 5 | Neg FS | -4.900 | -4.9018 | -4.8982 | -4.9020 | -4.8980 |
| -0.5 | 0.5 | Pos FS | 0.490 | 0.48956 | 0.49044 | 0.48954 | 0.49046 |
| -0.5 | 0.5 | 0 | 0.000 | -0.00012 | 0.00012 | -0.00012 | 0.00012 |
| -0.5 | 0.5 | Neg FS | -0.490 | -0.49044 | -0.48956 | -0.49046 | -0.48954 |
| -0.05 | 0.05 | Pos FS | 0.049 | 0.048933 | 0.049067 | 0.048931 | 0.049069 |
| -0.05 | 0.05 | 0 | 0.000 | -0.000034 | 0.000034 | -0.000034 | 0.000034 |
| -0.05 | 0.05 | Neg FS | -0.049 | -0.049067 | -0.048933 | -0.049069 | -0.048931 |

Table 9. NI 6014 Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.8000000 | 9.796923 | 9.803077 | 9.796511 | 9.803489 |
| -10 | 10 | 0 | 0.0000000 | -0.001568 | 0.001568 | -0.001568 | 0.001568 |
| -10 | 10 | Neg FS | -9.8000000 | -9.803077 | -9.796923 | -9.803489 | -9.796511 |

Table 10. NI 6013/6014 Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6020E Family—12-Bit Resolution

The following tables include values for the NI DAQPad-6020E.

Table 11. NI 6020E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.98 | 9.965588 | 9.994412 | 9.965189 | 9.994811 |
| -10 | 10 | 0 | 0 | -0.007226 | 0.007226 | -0.007226 | 0.007226 |
| -10 | 10 | Neg FS | -9.98 | -9.994412 | -9.965588 | -9.994811 | -9.965189 |
| -5 | 5 | Pos FS | 4.99 | 4.985431 | 4.994569 | 4.985331 | 4.994669 |
| -5 | 5 | 0 | 0 | -0.003621 | 0.003621 | -0.003621 | 0.003621 |
| -5 | 5 | Neg FS | -4.99 | -4.994569 | -4.985431 | -4.994669 | -4.985331 |
| -2.5 | 2.5 | Pos FS | 2.495 | 2.491385 | 2.498615 | 2.491285 | 2.498715 |
| -2.5 | 2.5 | 0 | 0 | -0.001819 | 0.001819 | -0.001819 | 0.001819 |
| -2.5 | 2.5 | Neg FS | -2.495 | -2.498615 | -2.491385 | -2.498715 | -2.491285 |
| -1 | 1 | Pos FS | 0.998 | 0.996543 | 0.999457 | 0.996504 | 0.999496 |
| -1 | 1 | 0 | 0 | -0.000738 | 0.000738 | -0.000738 | 0.000738 |
| -1 | 1 | Neg FS | -0.998 | -0.999457 | -0.996543 | -0.999496 | -0.996504 |
| -0.5 | 0.5 | Pos FS | 0.499 | 0.498264 | 0.499736 | 0.498244 | 0.499756 |
| -0.5 | 0.5 | 0 | 0 | -0.000377 | 0.000377 | -0.000377 | 0.000377 |
| -0.5 | 0.5 | Neg FS | -0.499 | -0.499736 | -0.498264 | -0.499756 | -0.498244 |
| -0.25 | 0.25 | Pos FS | 0.2495 | 0.249123 | 0.249877 | 0.249113 | 0.249887 |

Table 11. NI 6020E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -0.25 | 0.25 | 0 | 0 | -0.000197 | 0.000197 | -0.000197 | 0.000197 |
| -0.25 | 0.25 | Neg FS | -0.2495 | -0.249877 | -0.249123 | -0.249887 | -0.249113 |
| -0.1 | 0.1 | Pos FS | 0.0998 | 0.099639 | 0.099961 | 0.099635 | 0.099965 |
| -0.1 | 0.1 | 0 | 0 | -0.000089 | 0.000089 | -0.000089 | 0.000089 |
| -0.1 | 0.1 | Neg FS | -0.0998 | -0.099961 | -0.099639 | -0.099965 | -0.099635 |
| -0.05 | 0.05 | Pos FS | 0.0499 | 0.049811 | 0.049989 | 0.049809 | 0.049991 |
| -0.05 | 0.05 | 0 | 0 | -0.000053 | 0.000053 | -0.000053 | 0.000053 |
| -0.05 | 0.05 | Neg FS | -0.0499 | -0.049989 | -0.049811 | -0.049991 | -0.049809 |
| 0 | 10 | Pos FS | 9.98 | 9.974483 | 9.985517 | 9.974283 | 9.985717 |
| 0 | 10 | 0 | 0.02 | 0.016375 | 0.023625 | 0.016375 | 0.023625 |
| 0 | 5 | Pos FS | 4.99 | 4.984588 | 4.995412 | 4.984389 | 4.995611 |
| 0 | 5 | 0 | 0.01 | 0.008174 | 0.011826 | 0.008173 | 0.011827 |
| 0 | 2 | Pos FS | 1.996 | 1.993825 | 1.998175 | 1.993745 | 1.998255 |
| 0 | 2 | 0 | 0.004 | 0.003259 | 0.004741 | 0.003259 | 0.004741 |
| 0 | 1 | Pos FS | 0.998 | 0.996904 | 0.999096 | 0.996865 | 0.999135 |
| 0 | 1 | 0 | 0.002 | 0.001622 | 0.002378 | 0.001621 | 0.002379 |
| 0 | 0.5 | Pos FS | 0.499 | 0.498444 | 0.499556 | 0.498424 | 0.499576 |
| 0 | 0.5 | 0 | 0.001 | 0.000802 | 0.001198 | 0.000802 | 0.001198 |

Table 11. NI 6020E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 0.2 | Pos FS | 0.1996 | 0.199367 | 0.199833 | 0.199359 | 0.199841 |
| 0 | 0.2 | 0 | 0.0004 | 0.000311 | 0.000489 | 0.000311 | 0.000489 |
| 0 | 0.1 | Pos FS | 0.0998 | 0.099675 | 0.099925 | 0.099671 | 0.099929 |
| 0 | 0.1 | 0 | 0.0002 | 0.000147 | 0.000253 | 0.000147 | 0.000253 |

Table 12. NI 6020E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9800000 | 9.972274 | 9.987726 | 9.974314 | 9.985686 |
| -10 | 10 | 0 | 0 | -0.005930 | 0.005930 | -0.003490 | 0.003490 |
| -10 | 10 | Neg FS | -9.9800000 | -9.987726 | -9.972274 | -9.985686 | -9.974314 |
| 0 | 10 | Pos FS | 9.9800000 | 9.972274 | 9.987726 | 9.974314 | 9.985686 |
| 0 | 10 | 0 | 0.0200000 | 0.014066 | 0.025934 | 0.016506 | 0.023494 |

Table 13. NI 6020E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6023E/6024E/6025E Family—12-Bit Resolution

The following tables include values for the NI PCI-6023E (analog input only), NI PCI-6024E, NI PCI-6025E, and NI PXI-6025E.

Table 14. NI 6023E/6024E/6025E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9800 | 9.7841 | 9.8159 | 9.7837 | 9.8163 |
| -10 | 10 | 0 | 0.000 | -0.0074 | 0.0074 | -0.0074 | 0.0074 |
| -10 | 10 | Neg FS | -9.9800 | -9.8159 | -9.7841 | -9.8163 | -9.7837 |
| -5 | 5 | Pos FS | 4.900 | 4.8950 | 4.9050 | 4.8948 | 4.9052 |
| -5 | 5 | 0 | 0.000 | -0.0037 | 0.0037 | -0.0037 | 0.0037 |
| -5 | 5 | Neg FS | -4.900 | -4.9050 | -4.8950 | -4.9052 | -4.8948 |
| -0.5 | 0.5 | Pos FS | 0.490 | 0.48918 | 0.49082 | 0.48916 | 0.49084 |
| -0.5 | 0.5 | 0 | 0.000 | -0.00039 | 0.00039 | -0.00039 | 0.00039 |
| -0.5 | 0.5 | Neg FS | -0.490 | -0.49082 | -0.48918 | -0.49084 | -0.48916 |
| -0.05 | 0.05 | Pos FS | 0.049 | 0.048897 | 0.049103 | 0.048895 | 0.049105 |
| -0.05 | 0.05 | 0 | 0.000 | -0.000060 | 0.000060 | -0.000060 | 0.000060 |
| -0.05 | 0.05 | Neg FS | -0.049 | -0.049103 | -0.048897 | -0.049105 | -0.048895 |

Table 15. NI 6023E/6024E/6025E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9800000 | 9.792335 | 9.807665 | 9.791924 | 9.808076 |
| -10 | 10 | 0 | 0.0000000 | -0.005930 | 0.005930 | -0.005930 | 0.005930 |
| -10 | 10 | Neg FS | -9.9800000 | -9.807665 | -9.792335 | -9.808076 | -9.791924 |

Table 16. NI 6023E/6024E/6025E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI DAQCard-6024E—12-Bit Resolution

The following tables include values for the NI DAQCard-6024E.

Table 17. NI DAQCard-6024E Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.800 | 9.7816 | 9.8184 | 9.7812 | 9.8188 |
| -10 | 10 | 0 | 0.000 | -0.0099 | 0.0099 | -0.0099 | 0.0099 |
| -10 | 10 | Neg FS | -9.800 | -9.8184 | -9.7816 | -9.8188 | -9.7812 |
| -5 | 5 | Pos FS | 4.900 | 4.8937 | 4.9063 | 4.8935 | 4.9065 |
| -5 | 5 | 0 | 0.000 | -0.0049 | 0.0049 | -0.0049 | 0.0049 |
| -5 | 5 | Neg FS | -4.900 | -4.9063 | -4.8937 | -4.9065 | -4.8935 |
| -0.5 | 0.5 | Pos FS | 0.490 | 0.48906 | 0.49094 | 0.48904 | 0.49096 |
| -0.5 | 0.5 | 0 | 0.000 | -0.00051 | 0.00051 | -0.00051 | 0.00051 |
| -0.5 | 0.5 | Neg FS | -0.490 | -0.49094 | -0.48906 | -0.49096 | -0.48904 |
| -0.05 | 0.05 | Pos FS | 0.049 | 0.048884 | 0.049116 | 0.048882 | 0.049118 |
| -0.05 | 0.05 | 0 | 0.000 | -0.000073 | 0.000073 | -0.000073 | 0.000073 |
| -0.05 | 0.05 | Neg FS | -0.049 | -0.049116 | -0.048884 | -0.049118 | -0.048882 |

Table 18. NI DAQCard-6024E Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.8000000 | 9.789895 | 9.810105 | 9.789484 | 9.810516 |
| -10 | 10 | 0 | 0.0000000 | -0.008370 | 0.008370 | -0.008370 | 0.008370 |
| -10 | 10 | Neg FS | -9.8000000 | -9.810105 | -9.789895 | -9.810516 | -9.789484 |

Table 19. NI DAQCard-6024E Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6030E Family—16-Bit Resolution

The following tables include values for the NI PCI 6030E (PCI-MIO-16XE-10), NI PXI-6030E, NI PXI-6031E, NI PCI-6031E, NI PCI-6032E, and NI PCI-6033E.

Table 20. NI 6030E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.98 | 9.979027 | 9.980973 | 9.978857 | 9.981143 |
| -10 | 10 | 0 | 0 | -0.000534 | 0.000534 | -0.000534 | 0.000534 |
| -10 | 10 | Neg FS | -9.98 | -9.980973 | -9.979027 | -9.981143 | -9.978857 |
| -5 | 5 | Pos FS | 4.99 | 4.988012 | 4.991988 | 4.987928 | 4.992072 |
| -5 | 5 | 0 | 0 | -0.000271 | -0.000271 | -0.000271 | 0.000271 |
| -5 | 5 | Neg FS | -4.99 | -4.991988 | -4.988012 | -4.992072 | -4.987928 |
| -2 | 2 | Pos FS | 1.996 | 1.995200 | 1.996800 | 1.995166 | 1.996834 |
| -2 | 2 | 0 | 0 | -0.000113 | 0.000113 | -0.000113 | 0.000113 |
| -2 | 2 | Neg FS | -1.996 | -1.996800 | -1.995200 | -1.996834 | -1.995166 |
| -1 | 1 | Pos FS | 0.998 | 0.997596 | 0.998404 | 0.997579 | 0.998421 |
| -1 | 1 | 0 | 0 | -0.000061 | 0.000061 | -0.000061 | 0.000061 |
| -1 | 1 | Neg FS | -0.998 | -0.998404 | -0.997596 | -0.998421 | -0.997579 |
| -0.5 | 0.5 | Pos FS | 0.499 | 0.498794 | 0.499206 | 0.498785 | 0.499215 |
| -0.5 | 0.5 | 0 | 0 | -0.000035 | 0.000035 | -0.000035 | 0.000035 |
| -0.5 | 0.5 | Neg FS | -0.499 | -0.499206 | -0.498794 | -0.499215 | -0.498785 |

Table 20. NI 6030E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -0.2 | 0.2 | Pos FS | 0.1996 | 0.199502 | 0.199698 | 0.199499 | 0.199701 |
| -0.2 | 0.2 | 0 | 0 | -0.000019 | 0.000019 | -0.000019 | 0.000019 |
| -0.2 | 0.2 | Neg FS | -0.1996 | -0.199698 | -0.199502 | -0.199701 | -0.199499 |
| -0.1 | 0.1 | Pos FS | 0.0998 | 0.099741 | 0.099859 | 0.099739 | 0.099861 |
| -0.1 | 0.1 | 0 | 0 | -0.000015 | 0.000015 | -0.000015 | 0.000015 |
| -0.1 | 0.1 | Neg FS | -0.0998 | -0.099859 | -0.099741 | -0.099861 | -0.099739 |
| 0 | 10 | Pos FS | 9.98 | 9.979198 | 9.980802 | 9.979028 | 9.980972 |
| 0 | 10 | 0 | 0.02 | 0.019636 | 0.020364 | 0.019636 | 0.020364 |
| 0 | 5 | Pos FS | 4.99 | 4.988098 | 4.991902 | 4.988013 | 4.991987 |
| 0 | 5 | 0 | 0.01 | 0.009811 | 0.010189 | 0.009811 | 0.010189 |
| 0 | 2 | Pos FS | 1.996 | 1.995234 | 1.996766 | 1.995200 | 1.996800 |
| 0 | 2 | 0 | 0.004 | 0.003920 | 0.004080 | 0.003920 | 0.004080 |
| 0 | 1 | Pos FS | 0.998 | 0.997613 | 0.998387 | 0.997596 | 0.998404 |
| 0 | 1 | 0 | 0.002 | 0.001956 | 0.002044 | 0.001956 | 0.002044 |
| 0 | 0.5 | Pos FS | 0.499 | 0.498802 | 0.499198 | 0.498793 | 0.499207 |
| 0 | 0.5 | 0 | 0.001 | 0.000973 | 0.001027 | 0.000973 | 0.001027 |
| 0 | 0.2 | Pos FS | 0.1996 | 0.199505 | 0.199695 | 0.199502 | 0.199698 |
| 0 | 0.2 | 0 | 0.0004 | 0.000384 | 0.000416 | 0.000384 | 0.000416 |

Table 20. NI 6030E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 0.1 | Pos FS | 0.0998 | 0.099743 | 0.099857 | 0.099741 | 0.099859 |
| 0 | 0.1 | 0 | 0.0002 | 0.000187 | 0.000213 | 0.000187 | 0.000213 |

Table 21. NI 6030E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9800000 | 9.978738 | 9.981262 | 9.978568 | 9.981432 |
| -10 | 10 | 0 | 0.0000000 | -0.000813 | 0.000813 | -0.000813 | 0.000813 |
| -10 | 10 | Neg FS | -9.9800000 | -9.981262 | -9.978738 | -9.981432 | -9.978568 |
| 0 | 10 | Pos FS | 9.9800000 | 9.978967 | 9.981033 | 9.978797 | 9.981203 |
| 0 | 10 | 0 | 0.0200000 | 0.019415 | 0.020585 | 0.019415 | 0.020585 |

Table 22. NI 6030E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6034E/6035E/6036E Family—16-Bit Resolution

The following tables include values for the NI PCI-6034E (analog input only), NI PCI-6035E, and NI PCI-6036E.

Table 23. NI 6034E/6035E/6036E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.900 | 9.8929 | 9.9071 | 9.8925 | 9.9075 |
| -10 | 10 | 0 | 0.000 | -0.0017 | 0.0017 | -0.0017 | 0.0017 |
| -10 | 10 | Neg FS | -9.900 | -9.9071 | -9.8929 | -9.9075 | -9.8925 |
| -5 | 5 | Pos FS | 4.950 | 4.9484 | 4.9516 | 4.9482 | 4.9518 |
| -5 | 5 | 0 | 0.000 | -0.0009 | 0.0009 | -0.0009 | 0.0009 |
| -5 | 5 | Neg FS | -4.950 | -4.9516 | -4.9484 | -4.9518 | -4.9482 |
| -0.5 | 0.5 | Pos FS | 0.495 | 0.49462 | 0.49538 | 0.49460 | 0.49540 |
| -0.5 | 0.5 | 0 | 0.000 | -0.00011 | 0.00011 | -0.00011 | 0.00011 |
| -0.5 | 0.5 | Neg FS | -0.495 | -0.49538 | -0.49462 | -0.49540 | -0.49460 |
| -0.05 | 0.05 | Pos FS | 0.050 | 0.049441 | 0.049559 | 0.049439 | 0.049561 |
| -0.05 | 0.05 | 0 | 0.000 | -0.000032 | 0.000032 | -0.000032 | 0.000032 |
| -0.05 | 0.05 | Neg FS | -0.050 | -0.049559 | -0.049441 | -0.049561 | -0.049439 |

Table 24. NI 6035E Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9000000 | 9.892315 | 9.907685 | 9.891899 | 9.908101 |
| -10 | 10 | 0 | 0.0000000 | -0.005933 | 0.005933 | -0.005933 | 0.005933 |
| -10 | 10 | Neg FS | -9.9000000 | -9.907685 | -9.892315 | -9.908101 | -9.891899 |

Table 25. NI 6036E Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9000000 | 9.898009 | 9.901991 | 9.897603 | 9.902397 |
| -10 | 10 | 0 | 0.0000000 | -0.001100 | 0.001100 | -0.001100 | 0.001100 |
| -10 | 10 | Neg FS | -9.9000000 | -9.901991 | -9.898009 | -9.902397 | -9.897603 |

Table 26. NI 6034E/6035E/6036E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI DAQCard-6036E—16-Bit Resolution

The following tables include values for the NI DAQCard-6036E.

Table 27. NI DAQCard-6036E Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.900 | 9.8918 | 9.9082 | 9.8914 | 9.9086 |
| -10 | 10 | 0 | 0.000 | -0.0027 | 0.0027 | -0.0027 | 0.0027 |
| -10 | 10 | Neg FS | -9.900 | -9.9082 | -9.8918 | -9.9086 | -9.8914 |
| -5 | 5 | Pos FS | 4.950 | 4.9479 | 4.9521 | 4.9477 | 4.9523 |
| -5 | 5 | 0 | 0.000 | -0.0014 | 0.0014 | -0.0014 | 0.0014 |
| -5 | 5 | Neg FS | -4.950 | -4.9521 | -4.9479 | -4.9523 | -4.9477 |
| -0.5 | 0.5 | Pos FS | 0.495 | 0.49457 | 0.49543 | 0.49455 | 0.49545 |
| -0.5 | 0.5 | 0 | 0.000 | -0.00016 | 0.00016 | -0.00016 | 0.00016 |
| -0.5 | 0.5 | Neg FS | -0.495 | -0.49543 | -0.49457 | -0.49545 | -0.49455 |
| -0.05 | 0.05 | Pos FS | 0.050 | 0.049436 | 0.049564 | 0.049434 | 0.049566 |
| -0.05 | 0.05 | 0 | 0.000 | -0.000037 | 0.000037 | -0.000037 | 0.000037 |
| -0.05 | 0.05 | Neg FS | -0.050 | -0.049564 | -0.049436 | -0.049566 | -0.049434 |

Table 28. NI DAQCard-6036E Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.9000000 | 9.897879 | 9.902121 | 9.897463 | 9.902537 |
| -10 | 10 | 0 | 0.0000000 | -0.001220 | 0.001220 | -0.001220 | 0.001220 |
| -10 | 10 | Neg FS | -9.9000000 | -9.902121 | -9.897879 | -9.902537 | -9.897463 |

Table 29. NI DAQCard-6036E Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6040E Family—12-Bit Resolution

The following tables include values for the NI DAQCard-AI-16E-4 (analog input only), NI PCI-MIO-16E-4, and NI PXI-6040E.

Table 30. NI 6040E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.980000 | 9.96507 | 9.99493 | 9.96465 | 9.99535 |
| -10 | 10 | 0 | 0.000000 | -0.00823 | 0.00823 | -0.00823 | 0.00823 |
| -10 | 10 | Neg FS | -9.980000 | -9.99493 | -9.96507 | -9.99535 | -9.96465 |
| -5 | 5 | Pos FS | 4.99 | 4.98452 | 4.99548 | 4.98431 | 4.99569 |
| -5 | 5 | 0 | 0.000000 | -0.00412 | 0.00412 | -0.00412 | 0.00412 |
| -5 | 5 | Neg FS | -4.99 | -4.99548 | -4.98452 | -4.99569 | -4.98431 |
| -2.5 | 2.5 | Pos FS | 2.495000 | 2.49125 | 2.49875 | 2.49115 | 2.49885 |
| -2.5 | 2.5 | 0 | 0.000000 | -0.00207 | 0.00207 | -0.00207 | 0.00207 |
| -2.5 | 2.5 | Neg FS | -2.495000 | -2.49875 | -2.49125 | -2.49885 | -2.49115 |
| -1 | 1 | Pos FS | 0.998000 | 0.99649 | 0.99951 | 0.99645 | 0.99955 |
| -1 | 1 | 0 | 0.000000 | -0.00084 | 0.00084 | -0.00084 | 0.00084 |
| -1 | 1 | Neg FS | -0.998000 | -0.99951 | -0.99649 | -0.99955 | -0.99645 |
| -0.5 | 0.5 | Pos FS | 0.499000 | 0.49823 | 0.49977 | 0.49821 | 0.49979 |
| -0.5 | 0.5 | 0 | 0.000000 | -0.00043 | 0.00043 | -0.00043 | 0.00043 |
| -0.5 | 0.5 | Neg FS | -0.499000 | -0.49977 | -0.49823 | -0.49979 | -0.49821 |

Table 30. NI 6040E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -0.25 | 0.25 | Pos FS | 0.249500 | 0.24911 | 0.24989 | 0.24910 | 0.24990 |
| -0.25 | 0.25 | 0 | 0.000000 | -0.00023 | 0.00023 | -0.00023 | 0.00023 |
| -0.25 | 0.25 | Neg FS | -0.249500 | -0.24989 | -0.24911 | -0.24990 | -0.24910 |
| -0.1 | 0.1 | Pos FS | 0.099800 | 0.09963 | 0.09997 | 0.09962 | 0.09998 |
| -0.1 | 0.1 | 0 | 0.000000 | -0.00011 | 0.00011 | -0.00011 | 0.00011 |
| -0.1 | 0.1 | Neg FS | -0.099800 | -0.09997 | -0.09963 | -0.09998 | -0.09962 |
| -0.05 | 0.05 | Pos FS | 0.049900 | 0.04980 | 0.05000 | 0.04980 | 0.05000 |
| -0.05 | 0.05 | 0 | 0.000000 | -0.00006 | 0.00006 | -0.00006 | 0.00006 |
| -0.05 | 0.05 | Neg FS | -0.049900 | -0.05000 | -0.04980 | -0.05000 | -0.04980 |
| 0 | 10 | Pos FS | 9.980000 | 9.97316 | 9.98684 | 9.97274 | 9.98726 |
| 0 | 10 | 0 | 0.020000 | 0.01587 | 0.02413 | 0.01587 | 0.02413 |
| 0 | 5 | Pos FS | 4.990000 | 4.98458 | 4.99542 | 4.98437 | 4.99563 |
| 0 | 5 | 0 | 0.010000 | 0.00792 | 0.01208 | 0.00792 | 0.01208 |
| 0 | 2 | Pos FS | 1.996000 | 1.99382 | 1.99818 | 1.99373 | 1.99827 |
| 0 | 2 | 0 | 0.004000 | 0.00316 | 0.00484 | 0.00316 | 0.00484 |
| 0 | 1 | Pos FS | 0.998000 | 0.99690 | 0.99910 | 0.99686 | 0.99914 |
| 0 | 1 | 0 | 0.002000 | 0.00157 | 0.00243 | 0.00157 | 0.00243 |
| 0 | 0.5 | Pos FS | 0.499000 | 0.49844 | 0.49956 | 0.49842 | 0.49958 |

Table 30. NI 6040E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 0.5 | 0 | 0.001000 | 0.00077 | 0.00123 | 0.00077 | 0.00123 |
| 0 | 0.2 | Pos FS | 0.199600 | 0.199361 | 0.199839 | 0.199352 | 0.199848 |
| 0 | 0.2 | 0 | 0.000400 | 0.000295 | 0.000505 | 0.000295 | 0.000505 |
| 0 | 0.01 | Pos FS | 0.099800 | 0.099669 | 0.099931 | 0.099665 | 0.099935 |
| 0 | 0.01 | 0 | 0.000200 | 0.000136 | 0.000264 | 0.000136 | 0.000264 |

Table 31. NI 6040E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.98 | 9.972304 | 9.987696 | 9.971884 | 9.988116 |
| -10 | 10 | 0 | 0 | -0.005930 | 0.005930 | -0.005930 | 0.005930 |
| -10 | 10 | Neg FS | -9.98 | -9.987696 | -9.972304 | -9.988116 | -9.971884 |
| 0 | 10 | Pos FS | 9.98 | 9.974744 | 9.985256 | 9.974324 | 9.985676 |
| 0 | 10 | 0 | 0.02 | 0.016506 | 0.023494 | 0.016506 | 0.023494 |

Table 32. NI 6040E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6052E Family—16-Bit Resolution

The following tables include values for the NI 6052E.

Table 33. NI 6052E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.800 | 9.7955 | 9.8045 | 9.7953 | 9.8047 |
| -10 | 10 | 0 | 0.00 | -0.0010 | 0.0010 | -0.0010 | 0.0010 |
| -10 | 10 | Neg FS | -9.800 | -9.8045 | -9.7955 | -9.8047 | -9.7953 |
| -5 | 5 | Pos FS | 4.900 | 4.8992 | 4.9008 | 4.8991 | 4.9009 |
| -5 | 5 | 0 | 0.000 | -0.0005 | 0.0005 | -0.0005 | 0.0005 |
| -5 | 5 | Neg FS | -4.900 | -4.9008 | -4.8992 | -4.9009 | -4.8991 |
| -2.5 | 2.5 | Pos FS | 2.450 | 2.44887 | 2.45113 | 2.44883 | 2.45117 |
| -2.5 | 2.5 | 0 | 0.000 | -0.00026 | 0.00026 | -0.00026 | 0.00026 |
| -2.5 | 2.5 | Neg FS | -2.450 | -2.45113 | -2.44887 | -2.45117 | -2.44883 |
| -1 | 1 | Pos FS | 0.980 | 0.9795 | -0.9805 | 0.9795 | 0.9805 |
| -1 | 1 | 0 | 0.000 | -0.0001 | 0.0001 | -0.0001 | 0.0001 |
| -1 | 1 | Neg FS | -0.980 | -0.9805 | -0.9795 | -0.9805 | -0.9795 |
| -0.5 | 0.5 | Pos FS | 0.490 | 0.48977 | 0.49023 | 0.48976 | 0.49024 |
| -0.5 | 0.5 | 0 | 0.000 | -0.00006 | 0.00006 | -0.00006 | 0.00006 |
| -0.5 | 0.5 | Neg FS | -0.490 | -0.49023 | -0.48977 | -0.49024 | -0.48976 |
| -0.25 | 0.25 | Pos FS | 0.245 | 0.2449 | 0.2451 | 0.2449 | 0.2451 |

Table 33. NI 6052E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -0.25 | 0.25 | 0 | 0.000 | -0.0000316 | 0.0000316 | -0.0000316 | 0.0000316 |
| -0.25 | 0.25 | Neg FS | -0.245 | -0.2451 | -0.2449 | -0.2451 | -0.2449 |
| -0.1 | 0.1 | Pos FS | 0.098 | 0.09794 | 0.09806 | 0.09794 | 0.09806 |
| -0.1 | 0.1 | 0 | 0.000 | -0.0000165 | 0.0000165 | -0.0000165 | 0.0000165 |
| -0.1 | 0.1 | Neg FS | -0.098 | -0.09806 | -0.09794 | -0.09806 | -0.09794 |
| -0.05 | 0.05 | Pos FS | 0.049 | 0.048966 | 0.049034 | 0.048965 | 0.049035 |
| -0.05 | 0.05 | 0 | 0.000 | -0.000012 | 0.000012 | -0.000012 | 0.000012 |
| -0.05 | 0.05 | Neg FS | -0.049 | -0.049034 | -0.048966 | -0.049035 | -0.048965 |
| 0 | 10 | Pos FS | 9.8 | 9.798951 | 9.801049 | 9.798785 | 9.801215 |
| 0 | 10 | 0 | 0.0098 | 0.09280 | 0.010320 | 0.009280 | 0.010320 |
| 0 | 5 | Pos FS | 4.9 | 4.898003 | 4.901997 | 4.897919 | 4.902081 |
| 0 | 5 | 0 | 0.0098 | 0.009534 | 0.010066 | 0.009534 | 0.010066 |
| 0 | 2 | Pos FS | 1.96 | 1.959198 | 1.960802 | 1.959165 | 1.960835 |
| 0 | 2 | 0 | 0.0098 | 0.009689 | 0.009911 | 0.009688 | 0.009912 |
| 0 | 1 | Pos FS | 0.98 | 0.979547 | 0.980453 | 0.979530 | 0.980470 |
| 0 | 1 | 0 | 0.0098 | 0.009739 | 0.009861 | 0.009739 | 0.009861 |
| 0 | 0.5 | Pos FS | 0.49 | 0.489746 | 0.490254 | 0.489738 | 0.490262 |
| 0 | 0.5 | 0 | 0.0098 | 0.009764 | 0.009836 | 0.009764 | 0.009836 |

Table 33. NI 6052E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| | | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 0.2 | Pos FS | 0.196 | 0.195895 | 0.196105 | 0.195891 | 0.196109 |
| 0 | 0.2 | 0 | 0.0098 | 0.009779 | 0.009821 | 0.009779 | 0.009821 |
| 0 | 0.01 | Pos FS | 0.098 | 0.097944 | 0.098056 | 0.097942 | 0.098058 |
| 0 | 0.01 | 0 | 0.0098 | 0.009784 | 0.009816 | 0.009784 | 0.009816 |

Table 34. NI 6052E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|----|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| | | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.800000 | 9.798771 | 9.801229 | 9.798604 | 9.801396 |
| -10 | 10 | 0 | 0.000000 | -0.000798 | 0.000798 | -0.000798 | 0.000798 |
| -10 | 10 | Neg FS | -9.800000 | -9.801229 | -9.798771 | -9.801396 | -9.798604 |
| 0 | 10 | Pos FS | 9.800000 | 9.799000 | 9.801000 | 9.798833 | 9.801167 |
| 0 | 10 | 0 | 0.0098000 | 0.009231 | 0.010369 | 0.009230 | 0.010370 |

Table 35. NI 6052E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI DAQCard-6062E—12-Bit Resolution

The following tables include values for the NI DAQCard-6062E.

Table 36. NI DAQCard-6062E Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.80000 | 9.7802 | 9.8198 | 9.7797 | 9.8203 |
| -10 | 10 | 0 | 0.000000 | -0.0108 | 0.0108 | -0.0108 | 0.0108 |
| -10 | 10 | Neg FS | -9.80000 | -9.8198 | -9.7802 | -9.8203 | -9.7797 |
| -5 | 5 | Pos FS | 4.990000 | 4.9826 | 4.9074 | 4.8924 | 4.9076 |
| -5 | 5 | 0 | 0.000000 | -0.0054 | 0.0054 | -0.0054 | 0.0054 |
| -5 | 5 | Neg FS | -4.990000 | -4.9074 | -4.8926 | -4.9076 | -4.8924 |
| -2.5 | 2.5 | Pos FS | 2.495000 | 2.44503 | 2.45497 | 2.44492 | 2.45508 |
| -2.5 | 2.5 | 0 | 0.000000 | -0.00271 | 0.00271 | -0.00271 | 0.00271 |
| -2.5 | 2.5 | Neg FS | -2.495000 | -2.45497 | -2.44503 | -2.45508 | -2.44492 |
| -1 | 1 | Pos FS | 0.998000 | 0.97997 | 0.982003 | 0.977956 | 0.982044 |
| -1 | 1 | 0 | 0.000000 | -0.001099 | 0.001099 | -0.001099 | 0.001099 |
| -1 | 1 | Neg FS | -0.998000 | -0.982003 | -0.977997 | -0.982044 | -0.977956 |
| -0.5 | 0.5 | Pos FS | 0.499000 | 0.4890 | 0.4910 | 0.4890 | 0.4910 |
| -0.5 | 0.5 | 0 | 0.000000 | -0.0006 | 0.0006 | -0.0006 | 0.0006 |
| -0.5 | 0.5 | Neg FS | -0.499000 | -0.49051 | -0.48949 | -0.49053 | -0.48947 |
| -0.25 | 0.25 | Pos FS | 0.249500 | 0.2445 | 0.2455 | 0.2445 | 0.2455 |

Table 36. NI DAQCard-6062E Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -0.25 | 0.25 | 0 | 0.000000 | -0.0003 | 0.0003 | -0.0003 | 0.0003 |
| -0.25 | 0.25 | Neg FS | -0.249500 | -0.2455 | -0.2445 | -0.2455 | -0.2445 |
| -0.1 | 0.1 | Pos FS | 0.099800 | 0.09778 | 0.09822 | 0.09777 | 0.09823 |
| -0.1 | 0.1 | 0 | 0.000000 | -0.00013 | 0.00013 | -0.00013 | 0.00013 |
| -0.1 | 0.1 | Neg FS | -0.099800 | -0.09822 | -0.09778 | -0.09823 | -0.09777 |
| -0.05 | 0.05 | Pos FS | 0.049900 | 0.048877 | 0.049123 | 0.048875 | 0.049125 |
| -0.05 | 0.05 | 0 | 0.000000 | -0.000078 | 0.000078 | -0.000078 | 0.000078 |
| -0.05 | 0.05 | Neg FS | -0.049900 | -0.049123 | -0.048877 | -0.049125 | -0.048875 |
| 0 | 10 | Pos FS | 9.980000 | 9.7907 | 9.8093 | 9.7903 | 9.8097 |
| 0 | 10 | 0 | 0.020000 | 0.0146 | 0.0254 | 0.0146 | 0.0254 |
| 0 | 5 | Pos FS | 4.990000 | 4.8928 | 4.9072 | 4.8926 | 4.9074 |
| 0 | 5 | 0 | 0.010000 | 0.0073 | 0.0127 | 0.0073 | 0.0127 |
| 0 | 2 | Pos FS | 1.996000 | 1.9571 | 1.9629 | 1.9570 | 1.9630 |
| 0 | 2 | 0 | 0.004000 | 0.0029 | 0.0051 | 0.0029 | 0.0051 |
| 0 | 1 | Pos FS | 0.998000 | 0.97854 | 0.98146 | 0.97850 | 0.98150 |
| 0 | 1 | 0 | 0.002000 | 0.00144 | 0.00256 | 0.00144 | 0.00256 |
| 0 | 0.5 | Pos FS | 0.499000 | 0.48925 | 0.49075 | 0.48923 | 0.49077 |
| 0 | 0.5 | 0 | 0.001000 | 0.000704 | 0.001296 | 0.000704 | 0.001296 |

Table 36. NI DAQCard-6062E Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 0.2 | Pos FS | 0.199600 | 0.195688 | 0.196312 | 0.195680 | 0.196320 |
| 0 | 0.2 | 0 | 0.000400 | 0.000269 | 0.000531 | 0.000269 | 0.000531 |
| 0 | 0.01 | Pos FS | 0.099800 | 0.0978 | 0.0982 | 0.0978 | 0.0982 |
| 0 | 0.01 | 0 | 0.000200 | 0.0001 | 0.0003 | 0.0001 | 0.0003 |

Table 37. NI DAQCard-6062E Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.8000000 | 9.789895 | 9.810105 | 9.789484 | 9.810516 |
| -10 | 10 | 0 | 0.0000000 | -0.008370 | 0.008370 | -0.008370 | 0.008370 |
| -10 | 10 | Neg FS | -9.8000000 | -9.810105 | -9.789895 | -9.810516 | -9.789484 |

Table 38. NI DAQCard-6062E Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI 6070E Family—12-Bit Resolution

The following tables include values for the NI PCI-MIO-16E-1, NI PCI-6070E, NI PXI-6070E, NI PXI-6070E, NI PXI-6071E, AT-MIO-16E-1, and NI DAQPad-6070E (for IEEE 1394).

Table 39. NI 6070E Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.980000 | 9.96607 | 9.99393 | 9.96565 | 9.99435 |
| -10 | 10 | 0 | 0.00000 | -0.00723 | 0.00723 | -0.00723 | 0.00723 |
| -10 | 10 | Neg FS | -9.980000 | -9.99393 | -9.96607 | -9.99435 | -9.96565 |
| -5 | 5 | Pos FS | 4.990000 | 4.98502 | 4.99498 | 4.98481 | 4.99519 |
| -5 | 5 | 0 | 0.00000 | -0.00362 | 0.00362 | -0.00362 | 0.00362 |
| -5 | 5 | Neg FS | -4.990000 | -4.99498 | -4.98502 | -4.99519 | -4.98481 |
| -2.5 | 2.5 | Pos FS | 2.495000 | 2.49150 | 2.49850 | 2.49140 | 2.49860 |
| -2.5 | 2.5 | 0 | 0.00000 | -0.00182 | 0.00182 | -0.00182 | 0.00182 |
| -2.5 | 2.5 | Neg FS | -2.495000 | -2.49850 | -2.49150 | -2.49860 | -2.49140 |
| -1 | 1 | Pos FS | 0.998000 | 0.99659 | 0.99941 | 0.99655 | 0.99945 |
| -1 | 1 | 0 | 0.00000 | -0.00074 | 0.00074 | -0.00074 | 0.00074 |
| -1 | 1 | Neg FS | -0.998000 | -0.99941 | -0.99659 | -0.99945 | -0.99655 |
| -0.5 | 0.5 | Pos FS | 0.499000 | 0.49829 | 0.49971 | 0.49827 | 0.49973 |
| -0.5 | 0.5 | 0 | 0.00000 | -0.00038 | 0.00038 | -0.00038 | 0.00038 |
| -0.5 | 0.5 | Neg FS | -0.499000 | -0.49971 | -0.49829 | -0.49973 | -0.49827 |

Table 39. NI 6070E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -0.25 | 0.25 | Pos FS | 0.249500 | 0.24913 | 0.24987 | 0.24912 | 0.24988 |
| -0.25 | 0.25 | 0 | 0.00000 | -0.00020 | 0.00020 | -0.00020 | 0.00020 |
| -0.25 | 0.25 | Neg FS | -0.249500 | -0.24987 | -0.24913 | -0.24988 | -0.24912 |
| -0.1 | 0.1 | Pos FS | 0.099800 | 0.09964 | 0.09996 | 0.09964 | 0.09996 |
| -0.1 | 0.1 | 0 | 0.00000 | -0.00009 | 0.00009 | -0.00009 | 0.00009 |
| -0.1 | 0.1 | Neg FS | -0.099800 | -0.09996 | -0.09964 | -0.09996 | -0.09964 |
| -0.05 | 0.05 | Pos FS | 0.049900 | 0.04981 | 0.04999 | 0.04981 | 0.04999 |
| -0.05 | 0.05 | 0 | 0.00000 | -0.00006 | 0.00006 | -0.00006 | 0.00006 |
| -0.05 | 0.05 | Neg FS | -0.049900 | -0.04999 | -0.04981 | -0.04999 | -0.04981 |
| 0 | 10 | Pos FS | 9.980000 | 9.97366 | 9.98634 | 9.97324 | 9.98676 |
| 0 | 10 | 0 | 0.020000 | 0.01637 | 0.02363 | 0.01637 | 0.02363 |
| 0 | 5 | Pos FS | 4.990000 | 4.98483 | 4.99517 | 4.98462 | 4.99538 |
| 0 | 5 | 0 | 0.010000 | 0.00817 | 0.01183 | 0.00817 | 0.01183 |
| 0 | 2 | Pos FS | 1.996000 | 1.99392 | 1.99808 | 1.99384 | 1.99816 |
| 0 | 2 | 0 | 0.004000 | 0.00326 | 0.00474 | 0.00326 | 0.00474 |
| 0 | 1 | Pos FS | 0.998000 | 0.99695 | 0.99905 | 0.99691 | 0.99909 |
| 0 | 1 | 0 | 0.002000 | 0.00162 | 0.00238 | 0.00162 | 0.00238 |
| 0 | 0.5 | Pos FS | 0.499000 | 0.49846 | 0.49954 | 0.49844 | 0.49956 |

Table 39. NI 6070E Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| 0 | 0.5 | 0 | 0.001000 | 0.00080 | 0.00120 | 0.00080 | 0.00120 |
| 0 | 0.2 | Pos FS | 0.199600 | 0.199374 | 0.199826 | 0.199365 | 0.199835 |
| 0 | 0.2 | 0 | 0.000400 | 0.000308 | 0.000492 | 0.000308 | 0.000492 |
| 0 | 0.1 | Pos FS | 0.099800 | 0.099677 | 0.099923 | 0.099673 | 0.099927 |
| 0 | 0.1 | 0 | 0.000200 | 0.000144 | 0.000256 | 0.000144 | 0.000256 |

Table 40. NI 6070E Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.98 | 9.972304 | 9.987696 | 9.971884 | 9.988116 |
| -10 | 10 | 0 | 0 | -0.005930 | 0.005930 | -0.005930 | 0.005930 |
| -10 | 10 | Neg FS | -9.98 | -9.987696 | -9.972304 | -9.988116 | -9.971884 |
| 0 | 10 | Pos FS | 9.98 | 9.974744 | 9.985256 | 9.974324 | 9.985676 |
| 0 | 10 | 0 | 0.02 | 0.016506 | 0.023494 | 0.016506 | 0.023494 |

Table 41. NI 6070E Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|-----------------|-------------------|-------------------|
| 5 | 4.9995 | 5.0005 |

NI PCI-6110/6111 Family—12-Bit Resolution

The following tables include values for the NI PCI-6110 and NI PCI-6111.

Table 42. NI PCI-6110/6111 Family Analog Input Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-------------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -42 | 42 | Pos FS | 41.5800000 | 41.3301 | 41.8299 | 41.3294 | 41.8306 |
| -42 | 42 | 0 | 0.0000000 | -0.0391 | 0.0391 | -0.0391 | 0.0391 |
| -42 | 42 | Neg FS | -41.5800000 | -41.8299 | -41.3301 | -41.8306 | -41.3294 |
| -20 | 20 | Pos FS | 19.8000000 | 19.6780 | 19.9220 | 19.6776 | 19.9224 |
| -20 | 20 | 0 | 0.0000000 | -0.0216 | 0.0216 | -0.0216 | 0.0216 |
| -20 | 20 | Neg FS | -19.8000000 | -19.9220 | -19.6780 | -19.9224 | -19.6776 |
| -10 | 10 | Pos FS | 9.9000000 | 9.8828 | 9.9172 | 9.8826 | 9.9174 |
| -10 | 10 | 0 | 0.0000000 | -0.0066 | 0.0066 | -0.0066 | 0.0066 |
| -10 | 10 | Neg FS | -9.9000000 | -9.9172 | -9.8828 | -9.9174 | -9.8826 |
| -5 | 5 | Pos FS | 4.9500000 | 4.94376 | 4.95624 | 4.94368 | 4.95632 |
| -5 | 5 | 0 | 0.0000000 | -0.00341 | 0.00341 | -0.00341 | 0.00341 |
| -5 | 5 | Neg FS | -4.9500000 | -4.95624 | -4.94376 | -4.95632 | -4.94368 |
| -2 | 2 | Pos FS | 1.9500000 | 1.94744 | -1.95256 | 1.94741 | 1.95259 |
| -2 | 2 | 0 | 0.0000000 | -0.00145 | 0.00145 | -0.00145 | 0.00145 |
| -2 | 2 | Neg FS | -1.9500000 | -1.95256 | -1.94744 | -1.95259 | -1.94741 |
| -1 | 1 | Pos FS | 0.9900000 | 0.98865 | 0.99135 | 0.98863 | 0.99137 |

Table 42. NI PCI-6110/6111 Family Analog Input Values (Continued)

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -1 | 1 | 0 | 0.000000 | -0.00079 | 0.00079 | -0.00079 | 0.00079 |
| -1 | 1 | Neg FS | -0.990000 | -0.99135 | -0.98865 | -0.99137 | -0.98863 |
| -0.5 | 0.5 | Pos FS | 0.495000 | 0.494256 | 0.495744 | 0.494248 | 0.495752 |
| -0.5 | 0.5 | 0 | 0.000000 | -0.000461 | 0.000461 | -0.000461 | 0.000461 |
| -0.5 | 0.5 | Neg FS | -0.495000 | -0.495744 | -0.494256 | -0.495752 | -0.494248 |
| -0.2 | 0.2 | Pos FS | 0.198000 | 0.197648 | 0.198352 | 0.197645 | 0.198355 |
| -0.2 | 0.2 | 0 | 0.000000 | -0.000239 | 0.000239 | -0.000239 | 0.000239 |
| -0.2 | 0.2 | Neg FS | -0.198000 | -0.198352 | -0.197648 | -0.198355 | -0.197645 |

Table 43. NI PCI-6110/6111 Family Analog Output Values

| Range (V) | | Test Point | | 24-Hour Ranges | | 1-Year Ranges | |
|-----------|---------|------------|-----------|-----------------|-----------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) | Lower Limit (V) | Upper Limit (V) |
| -10 | 10 | Pos FS | 9.990000 | 9.982299 | 9.997701 | 9.981879 | 9.998121 |
| -10 | 10 | 0 | 0.000000 | -0.005933 | 0.005933 | -0.005933 | 0.005933 |
| -10 | 10 | Neg FS | -9.990000 | -9.997701 | -9.982299 | -9.981879 | -9.981879 |

Table 44. NI PCI-6110/6111 Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|--------------------|----------------------|----------------------|
| 5 | 4.9995 | 5.0005 |

NI 6143 Family—16-Bit Resolution

The following tables include values for the NI PCI-6143 and NI PXI-6143 (analog input only).

Table 45. NI 6143 Family Analog Input Values

| Range (V) | | Test Point | | 1-Year Ranges | |
|-----------|---------|------------|------------|-----------------|-----------------|
| Minimum | Maximum | Location | Value (V) | Lower Limit (V) | Upper Limit (V) |
| -5 | 5 | Pos FS | 4.9500000 | 4.946455 | 4.953545 |
| -5 | 5 | 0 | 0.0000000 | -0.000708 | 0.000708 |
| -5 | 5 | Neg FS | -4.9500000 | -4.953545 | -4.946455 |

Table 46. NI 6143 Family Counter Values

| Set Point (MHz) | Lower Limit (MHz) | Upper Limit (MHz) |
|--------------------|----------------------|----------------------|
| 5 | 4.9995 | 5.0005 |

