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

This document contains information about calibrating National Instruments E, S, M, and B 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/M/B Series devices should be calibrated at a regular interval as defined by the measurement accuracy requirements of your application. National Instruments recommends that you routinely perform a complete calibration at least once every year (once every two years for some M Series devices). You can shorten this interval based on the accuracy demands of your application or requirements of your processes.

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Conventions

The following conventions appear in this manual:

»

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



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

bold	Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names and hardware labels.
italic	Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	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.
`monospace italic`	Italic text in this font denotes text that is a placeholder for a word or value that you must supply.
Platform	Text in this font denotes a specific platform and indicates that the text following it applies only to that platform.

Software

Calibration requires one of the following:

- 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™, C/C++, C#, and Visual Basic .NET.
- Calibration Executive—The National Instruments Calibration Executive integrated environment is used for verifying and adjusting NI measurement devices. No programming is required. Calibration Executive users should refer to the *Calibration Executive Help* at `ni.com/manuals` instead of this document.

Documentation

If you use Calibration Executive, refer to the *Calibration Executive Help* 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 Getting Started Guide* for NI-DAQ 8.0 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.
- *E/M/S Series Calibration Hardware Adapter Installation Guide* provides information on installing and operating the E/M/S Series calibration hardware adapter.

For more information about the devices you are calibrating, refer to your device user documentation.

Password

The default password for password-protected operations is `NI`.

Test Equipment

National Instruments recommends that you use the following instruments for calibrating an E/S/M/B 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, 10 ppm for 16-bit boards, and 10 ppm for 18-bit boards.
- DMM—NI 4070. If that instrument is unavailable, use a multiranging 6 1/2-digit DMM with an accuracy of 40 ppm. The
- 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.
- Shielded DAQ cable—NI recommends using shielded cables, as described in Table 1.

Table 1. Recommended Cables

Device	Cable
E/S/B Series devices with a 68-pin SCSI II connector	SH68-68-EP
E/S/M Series devices with 68-pin VHDCI connectors	SHC68-68-EP, SHC68-68-EPM, SHC68-68-S
E Series devices with a 100-pin connector	SH1006868. Connect the 68-pin cable labeled MIO-16 to the accessory. The 68-pin cable labeled Extended I/O remains unconnected.
M/B Series devices with a 37-pin D-SUB connector	SH37F-37M-1

- One of the following DAQ accessories:
  - E/M/S Series calibration hardware adapter—The E/M/S Series calibration hardware adapter connects your calibration equipment to your 68-pin E/S/M Series device. If you programmatically control this fixture, you will not need to disconnect and reconnect cables at each step of the procedure.

Note For M Series devices with two connectors, you will need to disconnect the calibration equipment from Connector 0 and reconnect to Connector 1 midway through the verification 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.
  - CB-37F-LP—The CB-37F-LP is a low-cost termination accessory with 37 screw terminals for easy connection of field I/O signals to 37-pin 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 PCI/PCI Express/PXI devices and 30 minutes for DAQCard/DAQPad devices to ensure that the measurement circuitry is at a stable operating temperature.

Calibration Process

This section provides instructions for verifying and adjusting your device.

Note If you use Calibration Executive, refer to the *Calibration Executive Help* 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/M/B 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/M/B 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. Although NI recommends that you verify all ranges, you may wish to save time by checking only the ranges used in your application.

Initial Setup

The device must be configured in Measurement & Automation Explorer (MAX) to communicate with NI-DAQmx.

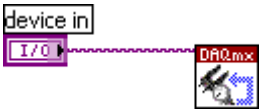
The following procedure describes how to configure a device in MAX.

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.

Self-Calibration

Self-calibration should be performed after the device has warmed up for the recommended time period. Call self-calibration before doing the first verification. This function measures the onboard reference voltage of the device and adjusts the self-calibration constants to account for any errors caused by short-term fluctuations in the environment. When you self-calibrate a device, no external signal connections are necessary.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxSelfCal` with the following parameters: **Device_Name[]**: `dev1`	

E/S/M/B 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 *Device Test Limits* section to determine if your device needs to be adjusted.

Analog Input Verification

Since E/S/M/B Series devices have many different ranges, you must check measurements for each available range. Because there is only one ADC on E, M, and B Series devices, you only need to perform verification on one 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.

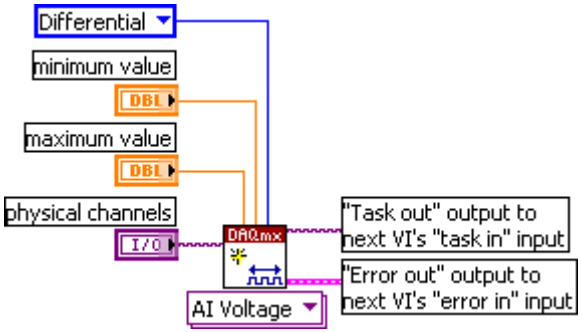
Table 2. Calibrator Connections

Device	Connections*
E/M/B Series	• Connect the positive output of the calibrator to AI 0 (pin 68). • Connect the negative output of the calibrator to AI 8 (pin 34). • If your calibrator has a guard connection, connect that terminal to AI GND. • If your calibrator does not have a guard connection and has a floating output, connect the negative output to AI GND. If the calibrator output is not floating, do not make any other connections. For more information, refer to the user documentation for the device you are using. • If you are using the E/M/S Series calibration hardware adapter, connect the device as described in the *E/M/S Series Calibration Hardware Adapter Installation Guide*.
S Series	• Connect the positive output of the calibrator to AI 0 + (pin 68). • 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 does not have a guard connection and has a floating output, connect the negative output to AI GND. If the calibrator output is not floating, do not make any other connections. For more information, refer to the user documentation for the device you are using. • If you are using the E/M/S Series calibration hardware adapter, connect the device as described in the *E/M/S Series Calibration Hardware Adapter Installation Guide*.
* Pin numbers are given for 68-pin connectors only. If you are using a BNC, 32-pin, 37-pin, or 100-pin connector, refer to your device user documentation for signal connection locations.	

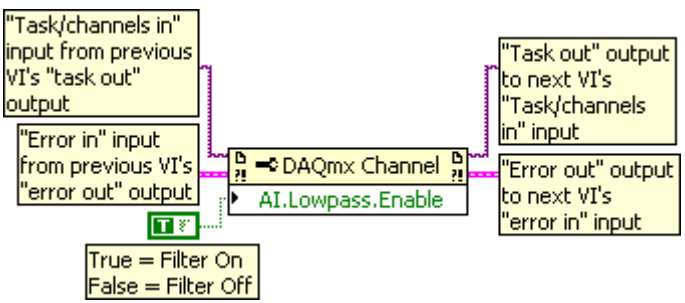
2. Choose the table from the *Device Test Limits* section that corresponds to the device you are verifying. This table shows all acceptable settings for the device type. NI recommends that you verify all ranges, although you may want to save time by checking only the ranges used in your application.
3. Set the calibrator voltage to the test value indicated in the device table.
4. Create a task using `DAQmxCreateTask`.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCreateTask` with the following parameters: **taskName**: *`AIVerificationTask`* **taskHandle**: `&taskHandle`	LabVIEW does not require this step.

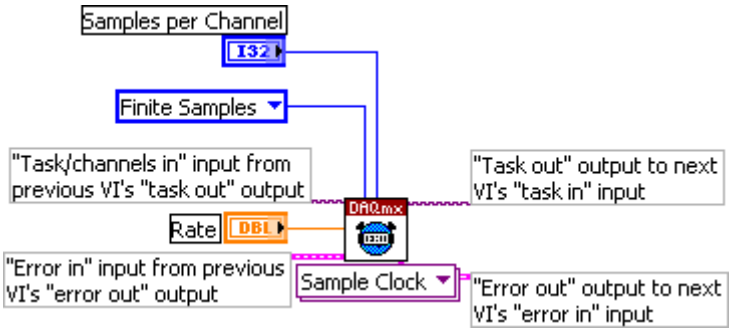
5. Add a channel to the task using `DAQmxCreateAIVoltageChan` (**DAQmx Create Virtual Channel VI**) and configure the channel. Use the tables in the *Device Test Limits* section to determine the minimum and maximum values for your device.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCreateAIVoltageChan` with the following parameters: **taskHandle**: `taskHandle` **physicalChannel**: `dev1/ai0` **nameToAssignToChannel**: *`myVoltageChannel`* **terminalConfig**: `DAQmx_Val_Cfg_Default` **minVal**: *`-10.0`* **maxVal**: *`10.0`* **units**: `DAQmx_Val_Volts` **customScaleName**: `NULL`	

6. **(NI 628*x* Devices Only)** Configure the lowpass filter.

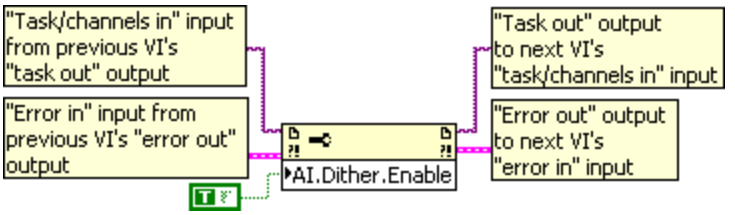
NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxSetChanAttribute` with the following parameters: **taskHandle**: `taskHandle` **Channel**: `""` **Attribute**: `DAQmx_AI_Lowpass_Enable` **Value**: `0` (filter off) or `1` (filter on)	

7. Configure timing for the voltage acquisition using `DAQmxCfgSampClkTiming` (**DAQmx Timing VI**).

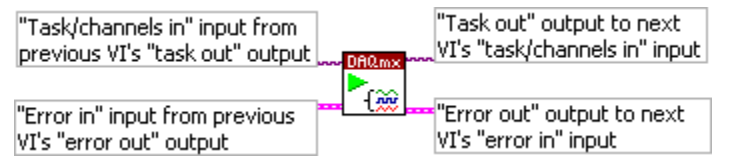
NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCfgSampClkTiming` with the following parameters: **taskHandle**: `taskHandle` **source**: `NULL` **rate**: `100000.0` **activeEdge**: `DAQmx_Val_Rising` **sampleMode**: `DAQmx_Val_FiniteSamps` **sampsPerChan**: `10000`	

Note (**PCI-MIO-16XE-50 (NI 6011E) and NI 6115/6120 Devices)** Use the following alternative parameters:
rate: `20000.0`
sampsPerChan: `20000`

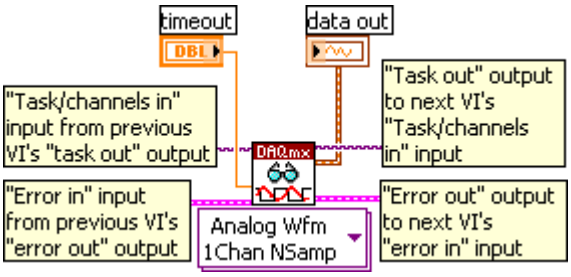
8. **(12-Bit E Series Devices)** Configure dither to be on. It is accessed through a property node.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxSetAIDitherEnable` with the following parameters: **taskHandle**: `taskHandle` **channel []**: *`MyVoltageChannel`* **bool32**: `TRUE`	

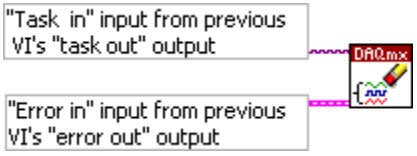
9. Start the acquisition using `DAQmxStartTask` (**DAQmx Start Task VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxStartTask` with the following parameter: **taskHandle**: `taskHandle`	

10. Acquire 10,000 points of voltage data using `DAQmxReadAnalogF64` (**DAQmx Read VI**). If you are calibrating NI 6115/6120 or PCI-MIO-16XE-50 (NI 6011E) devices, acquire 20,000 points of voltage data.

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

11. Average the voltage values that you acquired. Compare the resulting average to the upper and lower limits listed in the table. If the result is between these values, the device passes the test.
12. Clear the acquisition using `DAQmxClearTask` (**DAQmx Clear Task VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxClearTask` with the following parameter: **taskHandle**: `taskHandle`	

13. For E/M/B Series devices, repeat steps 4 through 12 until all values have been verified. For S Series devices, repeat steps 4 through 12 for all channels and all values.
14. 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/M/B Series devices have two analog outputs, AO 0 and AO 1. Some M Series devices have four analog outputs. This test checks all 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	Connector 0, AO 0 (pin 22)	Connector 0, AO GND (pin 55)
AO 1	Connector 0, AO 1 (pin 21)	Connector 0, AO GND (pin 55)
AO 2	Connector 1, AO 2 (pin 22)	Connector 1, AO GND (pin 55)
AO 3	Connector 1, AO 3 (pin 21)	Connector 1, AO GND (pin 55)

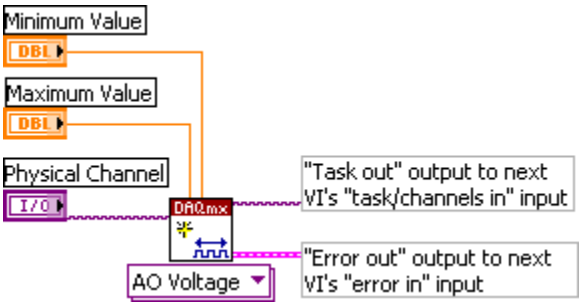
* Pin numbers are given for 68-pin connectors only. If you are using a BNC, 32-pin, 37-pin, or 100-pin connector, refer to your device user documentation for signal connection locations.

   For M Series devices with four analog outputs, AO 0 and AO 1 are on Connector 0 and AO 2 and AO 3 are on Connector 1.

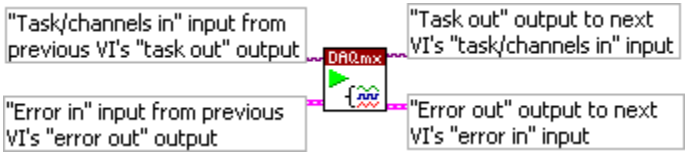
2. Choose the table from the *Device Test Limits* section that corresponds to the device you are verifying. This table shows all acceptable settings for the device. NI recommends that you verify all ranges, although you may want to save time by checking only the ranges used in your application.
3. Create a task using `DAQmxCreateTask`.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCreateTask` with the following parameters: **taskName**: *`MyAOVoltageTask`* **taskHandle**: `&taskHandle`	LabVIEW does not require this step.

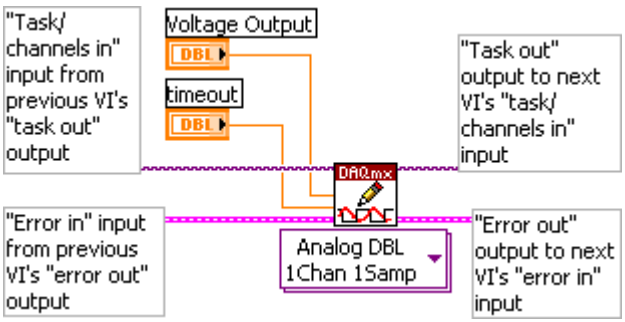
4. Add an AO voltage task using `DAQmxCreateAOVoltageChan` (**DAQmx Create Virtual Channel VI**) and configure the channel, AO 0. Use the tables in the *Device Test Limits* section to determine the minimum and maximum values for your device.

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 generation using `DAQmxStartTask` (**DAQmx Start Task VI**).

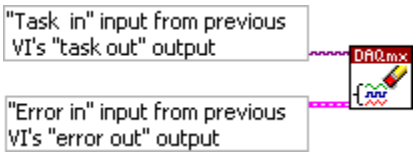
NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxStartTask` with the following parameters: **taskHandle**: `taskHandle`	

6. Write a voltage to the AO channel using `DAQmxWriteAnalogF64` (**DAQmx Write VI**).

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

7. 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 device passes the test.

8. Clear the acquisition using `DAQmxClearTask` (**DAQmx Clear Task VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxClearTask` with the following parameter: **taskHandle**: `taskHandle`	

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

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

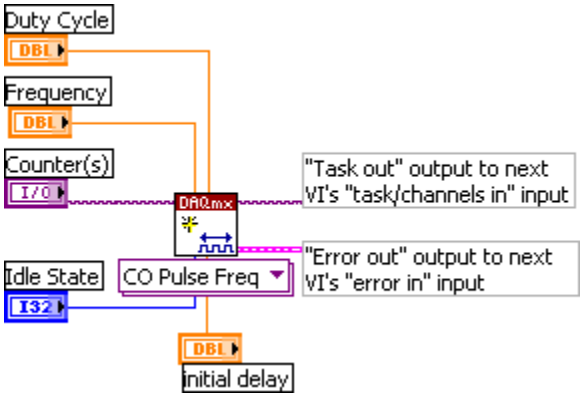
Counter Verification

This procedure verifies the performance of the counter. E/S/M/B 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.

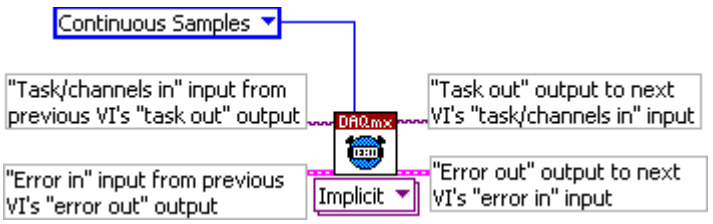
1. Connect your counter positive input to CTR 0 OUT (pin 2) and your counter negative input to D GND (pin 35).
2. Create a task using `DAQmxCreateTask`.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCreateTask` with the following parameters: **taskName**: *`MyCounterOutputTask`* **taskHandle**: `&taskHandle`	LabVIEW does not require this step.

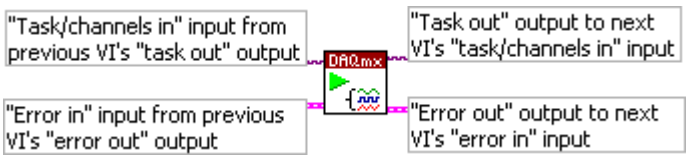
3. Add a counter output channel to the task using `DAQmxCreateCOPulseChanFreq` (**DAQmx Create Virtual Channel VI**) and configure the channel.

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

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

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCfgImplicitTiming` with the following parameters: **taskHandle**: `taskHandle` **sampleMode**: `DAQmx_Val_ContSamps` **sampsPerChan**: `10000`	

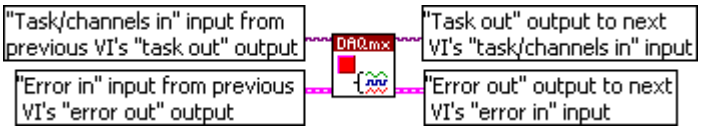
5. Start the generation of a square wave using `DAQmxStartTask` (**DAQmx Start Task VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxStartTask` with the following parameter: **taskHandle**: `taskHandle`	

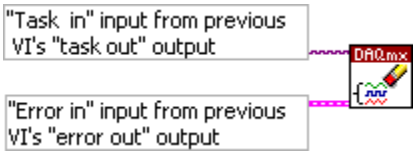
The device begins to generate a 5 MHz square wave when the `DAQmxStartTask` function completes execution.

6. Compare the value read by your counter to the test limits shown on the device table. If the value falls between these limits, the device passes the test.

7. Stop the generation using `DAQmxStopTask` (**DAQmx Stop Task VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxStopTask` with the following parameter: **taskHandle**: `taskHandle`	

8. Clear the generation using `DAQmxClearTask` (**DAQmx Clear Task VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxClearTask` with the following parameter: **taskHandle**: `taskHandle`	

9. Disconnect the counter from your device.

You have verified the counter on your device.

E/S/M/B Series Adjustment Procedure

Use the E/S/M/B 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.

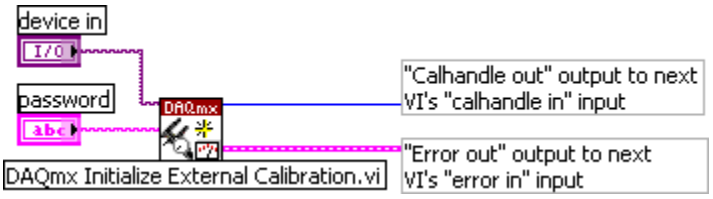
1. The calibrator connections depend on the resolution of the device you are calibrating. Refer to Table 4 to determine connections between the device and the calibrator.

Table 4. Calibrator Connections

Device	Connections*
12-bit E Series	• Connect the positive output of the calibrator to AI 8 (pin 34). • Connect the negative output of the calibrator to AI SENSE (pin 62). • 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 you are using the E/M/S Series calibration hardware adapter, connect the device as described in the *E/M/S Series Calibration Hardware Adapter Installation Guide*.
16-bit E Series 16-bit M Series 18-bit M Series	• Connect the positive output of the calibrator to AI 0 (pin 68). • Connect the negative output of the calibrator to 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 8 (pin 34). • If you are using the E/M/S Series calibration hardware adapter, connect the device as described in the *E/M/S Series Calibration Hardware Adapter Installation Guide*.
S Series	• Connect the positive output of the calibrator to AI 0 + (pin 68). • Connect the negative output of the calibrator to AI 0 – (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). • If you are using the E/M/S Series calibration hardware adapter, connect the device as described in the *E/M/S Series Calibration Hardware Adapter Installation Guide*.
* Pin numbers are given for 68-pin connectors only. If you are using a BNC, 32-pin, 37-pin, or 100-pin connector, refer to your device user documentation for signal connection locations.	

2. Set your calibrator to output a voltage of 3.75 V for the NI 6010, 5.0 V for the NI 6120, 4.5 V for the NI 6143, and 7.50 V for all other devices.

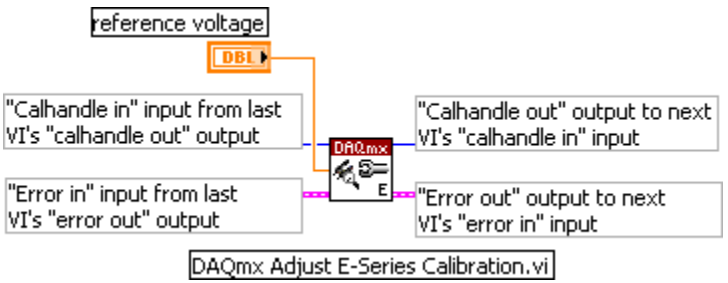
3. Open a calibration session on your device using `DAQmxInitExtCal` (**DAQmx Initialize External Calibration VI**). The default password is `NI`.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxInitExtCal` with the following parameters: **deviceName**: `dev1` **password**: `NI` **calHandle**: `&calHandle`	

4. Perform an external calibration adjustment using `DAQmx`*`X`*`SeriesCalAdjust` (**DAQmx Adjust *X*-Series Calibration VI**), where *X* is the letter of the device series.

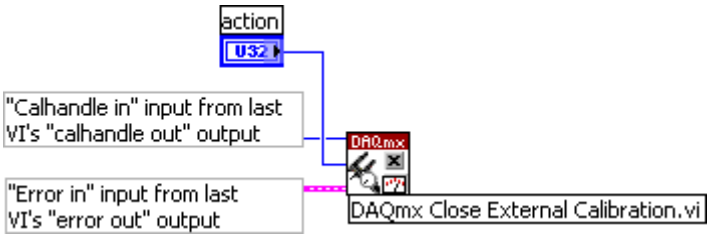
Note **(NI 6010 Devices)** Use `DAQmxMSeriesCalAdjust` (**DAQmx Adjust M-Series Calibration VI**).

Note **(NI 6013/6014/6015/6016 Devices)** Use `DAQmxESeriesCalAdjust` (**DAQmx Adjust E-Series Calibration VI**).

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmx`*`X`*`SeriesCalAdjust` with the following parameters: **calHandle**: `calHandle` **referenceVoltage**: `7.5`	

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

Note If the device fails the calibration procedure, no constants will be written to the EEPROM.

NI-DAQ Function Call	LabVIEW Block Diagram
Call `DAQmxCloseExtCal` with the following parameters: **calHandle**: `calHandle` **action**: `DAQmx_Val_Action_Commit`	

6. 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/M/B Series Verification Procedure* section.

Device Test Limits

The tables in this section list the specifications for E/S/M/B 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 limits 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.

Note NI 6122, NI 6123, NI 625*x*, and NI 628*x* devices have 2-year and 24-hour calibration intervals.

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. *Value* refers to the voltage value to be verified and is in volts. *Pos FS* stands for positive full-scale and *Neg FS* stands for negative full-scale.

24-Hour Limits

The *24-Hour Limits* 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.



Note Some devices only have 1-year specifications.

1-Year Limits

The *1-Year Limits* 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.

E Series Device Test Limits

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 Limits		1-Year Limits	
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

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

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
0	5	0	0.01	0.009862	0.010138	0.009862	0.010138
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 Limits		1-Year Limits	
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 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 8. NI 6023E/6024E/6025E Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.800	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	–9.800	–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 9. NI 6023E/6024E/6025E Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.800000	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	–9.800000	–9.807665	–9.792335	–9.808076	–9.791924

Table 10. 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 11. NI DAQCard-6024E Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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

Table 11. NI DAQCard-6024E Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–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 12. NI DAQCard-6024E Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 13. NI DAQCard-6024E Counter Values

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

NI 6030E/6031E/6032E/6033E 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 14. NI 6030E/6031E/6032E/6033E Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 14. NI 6030E/6031E/6032E/6033E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 14. NI 6030E/6031E/6032E/6033E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 15. NI 6030E/6031E/6032E/6033E Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 16. NI 6030E/6031E/6032E/6033E Family Counter Values

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

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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 17. NI 6034E/6035E/6036E Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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	0.0495	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	–0.0495	–0.049559	–0.049441	–0.049561	–0.049439

Table 18. NI 6035E Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 19. NI 6036E Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 20. 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 21. NI DAQCard-6036E Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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	0.0495	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	–0.0495	–0.049564	–0.049436	–0.049566	–0.049434

Table 22. NI DAQCard-6036E Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 23. 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 PCI-MIO-16E-4 and NI PXI-6040E.

Table 24. NI 6040E Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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
–0.25	0.25	Pos FS	0.249500	0.24911	0.24989	0.24910	0.24990

Table 24. NI 6040E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–0.25	0.25	0	0.000000	–0.00023	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
0	0.5	0	0.001000	0.00077	0.00123	0.00077	0.00123

Table 24. NI 6040E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
0	0.2	Pos FS	0.199600	0.199361	0.199839	0.199352	0.199848
0	0.2	0	0.000400	0.000295	0.000505	0.000295	0.000505
0	0.1	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 25. NI 6040E Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 26. 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 PCI-6052E and NI PXI-6052E.

Table 27. NI 6052E Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 27. NI 6052E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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	0.009280	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 27. NI 6052E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	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	0.1	Pos FS	0.098	0.097944	0.098056	0.097942	0.098058
0	0.1	0	0.0098	0.009784	0.009816	0.009784	0.009816

Table 28. NI 6052E Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.8000000	9.798771	9.801229	9.798604	9.801396
–10	10	0	0.0000000	–0.000798	0.000798	–0.000798	0.000798
–10	10	Neg FS	–9.8000000	–9.801229	–9.798771	–9.801396	–9.798604
0	10	Pos FS	9.8000000	9.799000	9.801000	9.798833	9.801167
0	10	0	0.0098000	0.009231	0.010369	0.009230	0.010370

Table 29. 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 30. NI DAQCard-6062E Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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	4.900000	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	–4.900000	–4.9074	–4.8926	–4.9076	–4.8924
–2.5	2.5	Pos FS	2.450000	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	–2.450000	–2.45497	–2.44503	–2.45508	–2.44492
–1	1	Pos FS	0.980000	0.977997	0.982003	0.977956	0.982044
–1	1	0	0.000000	–0.001099	0.001099	–0.001099	0.001099
–1	1	Neg FS	–0.980000	–0.982003	–0.977997	–0.982044	–0.977956
–0.5	0.5	Pos FS	0.490000	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	–0.490000	–0.49051	–0.48949	–0.49053	–0.48947
–0.25	0.25	Pos FS	0.245000	0.2445	0.2455	0.2445	0.2455

Table 30. NI DAQCard-6062E Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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	–0.245000	–0.2455	–0.2445	–0.2455	–0.2445
–0.1	0.1	Pos FS	0.098000	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	–0.098000	–0.09822	–0.09778	–0.09823	–0.09777
–0.05	0.05	Pos FS	0.049000	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	–0.049000	–0.049123	–0.048877	–0.049125	–0.048875
0	10	Pos FS	9.800000	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	4.900000	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	0.980000	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	0.490000	0.48925	0.49075	0.48923	0.49077
0	0.5	0	0.001000	0.000704	0.001296	0.000704	0.001296

Table 30. NI DAQCard-6062E Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 31. NI DAQCard-6062E Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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	–0.008370	0.008370	–0.008370	0.008370
–10	10	Neg FS	–9.8000000	–9.810105	–9.789895	–9.810516	–9.789484

Table 32. 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, and NI PXI-6071E.

Table 33. NI 6070E Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 33. NI 6070E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 33. NI 6070E Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 34. NI 6070E Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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 35. NI 6070E Family Counter Values

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

S Series Device Test Limits

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

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

Table 36. NI PCI-6110/6111 Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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

Table 36. NI PCI-6110/6111 Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–1	1	Pos FS	0.9900000	0.98865	0.99135	0.98863	0.99137
–1	1	0	0.0000000	–0.00079	0.00079	–0.00079	0.00079
–1	1	Neg FS	–0.9900000	–0.99135	–0.98865	–0.99137	–0.98863
–0.5	0.5	Pos FS	0.4950000	0.494256	0.495744	0.494248	0.495752
–0.5	0.5	0	0.0000000	–0.000461	0.000461	–0.000461	0.000461
–0.5	0.5	Neg FS	–0.4950000	–0.495744	–0.494256	–0.495752	–0.494248
–0.2	0.2	Pos FS	0.1980000	0.197648	0.198352	0.197645	0.198355
–0.2	0.2	0	0.0000000	–0.000239	0.000239	–0.000239	0.000239
–0.2	0.2	Neg FS	–0.1980000	–0.198352	–0.197648	–0.198355	–0.197645

Table 37. NI PCI-6110/6111 Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.9900000	9.982299	9.997701	9.981879	9.998121
–10	10	0	0.0000000	–0.005933	0.005933	–0.005933	0.005933
–10	10	Neg FS	–9.9900000	–9.997701	–9.982299	–9.998121	–9.981879

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Table 38. NI PCI-6110/6111 Family Counter Values

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

NI 6115 Family—12-Bit Resolution

The following tables include values for the NI PCI-6115 and NI PXI-6115.

Table 39. NI 6115 Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–42	42	Pos FS	41.16	40.9752	41.3448	40.9743	41.3457
–42	42	0	0	–0.033	0.033	–0.033	0.033
–42	42	Neg FS	–41.16	–41.3448	–40.9752	–41.3457	–40.9743
–20	20	Pos FS	19.6	19.5294	19.6706	19.529	19.671
–20	20	0	0	–0.013	0.013	–0.013	0.013
–20	20	Neg FS	–19.6	–19.6706	–19.5294	–19.671	–19.529
–10	10	Pos FS	9.8	9.7907	9.8093	9.7905	9.8095
–10	10	0	0	–0.0067	0.0067	–0.0067	0.0067
–10	10	Neg FS	–9.8	–9.8093	–9.7907	–9.8095	–9.7905
–5	5	Pos FS	4.9	4.8958	4.9042	4.8957	4.9043
–5	5	0	0	–0.0034	0.0034	–0.0034	0.0034
–5	5	Neg FS	–4.9	–4.9042	–4.8958	–4.9043	–4.8957

Table 39. NI 6115 Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	**Maximum**	**Location**	**Value (V)**	**Lower Limit (V)**	**Upper Limit (V)**	**Lower Limit (V)**	**Upper Limit (V)**
–2	2	Pos FS	1.96	1.958	1.962	1.9579	1.9621
–2	2	0	0	–0.0013	0.0013	–0.0013	0.0013
–2	2	Neg FS	–1.96	–1.962	–1.958	–1.9621	–1.9579
–1	1	Pos FS	0.98	0.97889	0.98111	0.97888	0.98112
–1	1	0	0	–0.00068	0.00068	–0.00068	0.00068
–1	1	Neg FS	–0.98	–0.98111	–0.97889	–0.98112	–0.97888
–0.5	0.5	Pos FS	0.49	0.48936	0.49064	0.48935	0.49065
–0.5	0.5	0	0	–0.00035	0.00035	–0.00035	0.00035
–0.5	0.5	Neg FS	–0.49	–0.49064	–0.48936	–0.49065	–0.48935
–0.2	0.2	Pos FS	0.196	0.19565	0.19635	0.19564	0.19636
–0.2	0.2	0	0	–0.00015	0.00015	–0.00015	0.00015
–0.2	0.2	Neg FS	–0.196	–0.19635	–0.19565	–0.19636	–0.19564

Table 40. NI 6115 Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.8	9.7868	9.8132	9.7866	9.8134
–10	10	0	0	–0.0089	0.0089	–0.0089	0.0089
–10	10	Neg FS	–9.8	–9.8132	–9.7868	–9.8134	–9.7866

Table 41. NI 6115 Family Counter Values

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

NI 6120 Family—16-Bit Resolution

The following tables include values for the NI PCI-6120 and NI PXI-6120.

Table 42. NI 6120 Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–42	42	Pos FS	41.16	41.087252	41.232748	41.086552	41.233448
–42	42	0	0	–0.008086	0.008086	–0.008086	0.008086
–42	42	Neg FS	–41.16	–41.232748	–41.087252	–41.233448	–41.086552
–20	20	Pos FS	19.6	19.569232	19.630768	19.568899	19.631101
–20	20	0	0	–0.003563	0.003563	–0.003563	0.003563
–20	20	Neg FS	–19.6	–19.630768	–19.569232	–19.631101	–19.568899
–10	10	Pos FS	9.8	9.795013	9.804987	9.794846	9.805154
–10	10	0	0	–0.001783	0.001783	–0.001783	0.001783
–10	10	Neg FS	–9.8	–9.804987	–9.795013	–9.805154	–9.794846
–5	5	Pos FS	4.9	4.897360	4.902640	4.897276	4.902724
–5	5	0	0	–0.000906	0.000906	–0.000906	0.000906
–5	5	Neg FS	–4.9	–4.902640	–4.897360	–4.902724	–4.897276
–2	2	Pos FS	1.96	1.958832	1.961168	1.958801	1.961199
–2	2	0	0	–0.000397	0.000397	–0.000397	0.000397
–2	2	Neg FS	–1.96	–1.961168	–1.958832	–1.961199	–1.958801
–1	1	Pos FS	0.98	0.978951	0.981049	0.978934	0.981066

Table 42. NI 6120 Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–1	1	0	0	–0.000294	0.000294	–0.000294	0.000294
–1	1	Neg FS	–0.98	–0.981049	–0.978951	–0.981066	–0.978934
–0.5	0.5	Pos FS	0.49	0.489316	0.490684	0.489307	0.490693
–0.5	0.5	0	0	–0.000194	0.000194	–0.000194	0.000194
–0.5	0.5	Neg FS	–0.49	–0.490684	–0.489316	–0.490693	–0.489307
–0.2	0.2	Pos FS	0.196	0.195661	0.196339	0.195658	0.196342
–0.2	0.2	0	0	–0.000098	0.000098	–0.000098	0.000098
–0.2	0.2	Neg FS	–0.196	–0.196339	–0.195661	–0.196342	–0.195658

Table 43. NI 6120 Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.8	9.793128	9.806872	9.792961	9.807039
–10	10	0	0	–0.001864	0.001864	–0.001864	0.001864
–10	10	Neg FS	–9.8	–9.806872	–9.793128	–9.807039	–9.792961

Table 44. NI 6120 Family Counter Values

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

NI 6122/6123 Family—16-Bit Resolution

The following tables include values for the NI PCI-6122, NI PXI-6122, NI PCI-6123, and NI PXI-6123 (analog input only).

Table 45. NI 6122/6123 Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.950000	9.945926	9.954074	9.945647	9.954353
–10	10	0	0.000000	–0.002880	0.002880	–0.002880	0.002880
–10	10	Neg FS	–9.950000	–9.954074	–9.945926	–9.954353	–9.945647
–5	5	Pos FS	4.950000	4.947896	4.952104	4.947757	4.952243
–5	5	0	0.000000	–0.001510	0.001510	–0.001510	0.001510
–5	5	Neg FS	–4.950000	–4.952104	–4.947896	–4.952243	–4.947757
–2.5	2.5	Pos FS	2.450000	2.448836	2.451164	2.448768	2.451232
–2.5	2.5	0	0.000000	–0.000858	0.000858	–0.000858	0.000858
–2.5	2.5	Neg FS	–2.450000	–2.451164	–2.448836	–2.451232	–2.448768
–1.25	1.25	Pos FS	1.200000	1.199386	1.200614	1.199353	1.200647

Table 45. NI 6122/6123 Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–1.25	1.25	0	0.000000	–0.000464	0.000464	–0.000464	0.000464
–1.25	1.25	Neg FS	–1.200000	–1.200614	–1.199386	–1.200647	–1.199353

Table 46. NI 6122/6123 Family Counter Values

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

NI 6132/6133 Family—14-Bit Resolution

The following tables include values for the NI PCI-6132, NI PXI-6132, NI PCI-6133, and NI PXI-6133 (analog input only).

Table 47. NI 6132/6133 Family Analog Input Values

Range (V)		Test Point		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.8	9.7958	9.8042
–10	10	0	0	–0.0024	0.0024
–10	10	Neg FS	–9.8	–9.8042	–9.7958
–5	5	Pos FS	4.9	4.8978	4.9022
–5	5	0	0	–0.0012	0.0012

Table 47. NI 6132/6133 Family Analog Input Values (Continued)

Range (V)		Test Point		1-Year Limits	
Minimum	**Maximum**	**Location**	**Value (V)**	**Lower Limit (V)**	**Upper Limit (V)**
–5	5	Neg FS	–4.9	–4.9022	–4.8978
–2.5	2.5	Pos FS	2.45	2.44875	2.45125
–2.5	2.5	0	0	–0.00067	0.00067
–2.5	2.5	Neg FS	–2.45	–2.45125	–2.44875
–1.25	1.25	Pos FS	1.225	1.22432	1.22568
–1.25	1.25	0	0	–0.00036	0.00036
–1.25	1.25	Neg FS	–1.225	–1.22568	–1.22432

Table 48. NI 6132/6133 Family Counter Values

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

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NI 6143 Family—16-Bit Resolution

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

Table 49. NI 6143 Family Analog Input Values

Range (V)		Test Point		1-Year Limits	
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 50. NI 6143 Family Counter Values

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

M Series Device Test Limits

NI 6220/6221/6224/6225/6229 Family—16-Bit Resolution

The following tables include values for the NI PCI-6220, NI PXI-6220, NI PCI-6221 (37-pin), NI PCI-6221 (68-pin), NI PXI-6221 (68-pin), NI PCI-6224, NI PXI-6224, NI PCI-6225, NI PXI-6225, NI PCI-6229, and NI PXI-6229.

Table 51. NI 6220/6221/6224/6225/6229 Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.977921	9.982079	9.977472	9.982528
–10	10	0	0.000000	–0.001530	0.001530	–0.001530	0.001530
–10	10	Neg FS	–9.980000	–9.982079	–9.977921	–9.982528	–9.977472
–5	5	Pos FS	4.990000	4.988896	4.991104	4.988671	4.991329
–5	5	0	0.000000	–0.000780	0.000780	–0.000780	0.000780
–5	5	Neg FS	–4.990000	–4.991104	–4.988896	–4.991329	–4.988671
–1	1	Pos FS	0.998000	0.997745	0.998255	0.997700	0.998300
–1	1	0	0.000000	–0.000180	0.000180	–0.000180	0.000180
–1	1	Neg FS	–0.998000	–0.998255	–0.997745	–0.998300	–0.997700
–0.2	0.2	Pos FS	0.199600	0.199511	0.199689	0.199502	0.199698
–0.2	0.2	0	0.000000	–0.000066	0.000066	–0.000066	0.000066
–0.2	0.2	Neg FS	–0.199600	–0.199689	–0.199511	–0.199698	–0.199502

Table 52. NI 6220/6221/6224/6225/6229 Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.977571	9.982429	9.977122	9.982878
–10	10	0	0.000000	–0.001880	0.001880	–0.001880	0.001880
–10	10	Neg FS	–9.980000	–9.982429	–9.977571	–9.982878	–9.977122

Table 53. NI 6220/6221/6224/6225/6229 Family Counter Values

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

NI 6250/6251/6254/6259 Family—16-Bit Resolution

The following tables include values for the NI PCI-6250, NI PXI-6250, NI PCI-6251, NI PCIe-6251, NI PXI-6251, NI PCI-6254, NI PXI-6254, NI PCI-6259, NI PCIe-6259, and NI PXI-6259.

Table 54. NI 6250/6251/6254/6259 Family Analog Input Values

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.978541	9.981459	9.978261	9.981739
–10	10	0	0.000000	–0.001010	0.001010	–0.001010	0.001010
–10	10	Neg FS	–9.980000	–9.981459	–9.978541	–9.981739	–9.978261
–5	5	Pos FS	4.990000	4.989221	4.990779	4.989081	4.990919
–5	5	0	0.000000	–0.000505	0.000505	–0.000505	0.000505
–5	5	Neg FS	–4.990000	–4.990779	–4.989221	–4.990919	–4.989081
–2	2	Pos FS	1.996000	1.995682	1.996318	1.995626	1.996374
–2	2	0	0.000000	–0.000208	0.000208	–0.000208	0.000208
–2	2	Neg FS	–1.996000	–1.996318	–1.995682	–1.996374	–1.995626
–1	1	Pos FS	0.998000	0.997828	0.998172	0.997800	0.998200
–1	1	0	0.000000	–0.000107	0.000107	–0.000107	0.000107
–1	1	Neg FS	–0.998000	–0.998172	–0.997828	–0.998200	–0.997800
–0.5	0.5	Pos FS	0.499000	0.498896	0.499104	0.498882	0.499118
–0.5	0.5	0	0.000000	–0.000067	0.000067	–0.000067	0.000067
–0.5	0.5	Neg FS	–0.499000	–0.499104	–0.498896	–0.499118	–0.498882

Table 54. NI 6250/6251/6254/6259 Family Analog Input Values (Continued)

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–0.2	0.2	Pos FS	0.199600	0.199538	0.199662	0.199532	0.199668
–0.2	0.2	0	0.000000	–0.000039	0.000039	–0.000039	0.000039
–0.2	0.2	Neg FS	–0.199600	–0.199662	–0.199538	–0.199668	–0.199532
–0.1	0.1	Pos FS	0.099800	0.099757	0.099843	0.099754	0.099846
–0.1	0.1	0	0.000000	–0.000030	0.000030	–0.000030	0.000030
–0.1	0.1	Neg FS	–0.099800	–0.099843	–0.099757	–0.099846	–0.099754

Table 55. NI 6250/6251/6254/6259 Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.978151	9.981849	9.977872	9.982128
–10	10	0	0.000000	–0.001210	0.001210	–0.001210	0.001210
–10	10	Neg FS	–9.980000	–9.981849	–9.978151	–9.982128	–9.977872
–5	5	Pos FS	4.990000	4.989071	4.990929	4.988931	4.991069
–5	5	0	0.000000	–0.000605	0.000605	–0.000605	0.000605
–5	5	Neg FS	–4.990000	–4.990929	–4.989071	–4.991069	–4.988931

Table 56. NI 6250/6251/6254/6259 Family Counter Values

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

NI 6280/6281/6284/6289 Family—18-Bit Resolution

The following tables include values for the NI PCI-6280, NI PXI-6280, NI PCI-6281, NI PXI-6281, NI PCI-6284, NI PXI-6284, NI PCI-6289, and NI PXI-6289.

Table 57. NI 6280/6281/6284/6289 Family Analog Input Values (Filter On)

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.979421	9.980579	9.979141	9.980859
–10	10	0	0.000000	–0.000290	0.000290	–0.000290	0.000290
–10	10	Neg FS	–9.980000	–9.980579	–9.979421	–9.980859	–9.979141
–5	5	Pos FS	4.990000	4.989685	4.990315	4.989546	4.990454
–5	5	0	0.000000	–0.000145	0.000145	–0.000145	0.000145
–5	5	Neg FS	–4.990000	–4.990315	–4.989685	–4.990454	–4.989546
–2	2	Pos FS	1.996000	1.995870	1.996130	1.995814	1.996186
–2	2	0	0.000000	–0.000062	0.000062	–0.000062	0.000062
–2	2	Neg FS	–1.996000	–1.996130	–1.995870	–1.996186	–1.995814
–1	1	Pos FS	0.998000	0.997916	0.998084	0.997888	0.998112
–1	1	0	0.000000	–0.000040	0.000040	–0.000040	0.000040

Table 57. NI 6280/6281/6284/6289 Family Analog Input Values (Filter On) (Continued)

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–1	1	Neg FS	–0.998000	–0.998084	–0.997916	–0.998112	–0.997888
–0.5	0.5	Pos FS	0.499000	0.498948	0.499052	0.498934	0.499066
–0.5	0.5	0	0.000000	–0.000030	0.000030	–0.000030	0.000030
–0.5	0.5	Neg FS	–0.499000	–0.499052	–0.498948	–0.499066	–0.498934
–0.2	0.2	Pos FS	0.199600	0.199569	0.199631	0.199564	0.199636
–0.2	0.2	0	0.000000	–0.000018	0.000018	–0.000018	0.000018
–0.2	0.2	Neg FS	–0.199600	–0.199631	–0.199569	–0.199636	–0.199564
–0.1	0.1	Pos FS	0.099800	0.099776	0.099824	0.099773	0.099827
–0.1	0.1	0	0.000000	–0.000013	0.000013	–0.000013	0.000013
–0.1	0.1	Neg FS	–0.099800	–0.099824	–0.099776	–0.099827	–0.099773

Table 58. NI 6280/6281/6284/6289 Family Analog Input Values (Filter Off)

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.979351	9.980649	9.979071	9.980929
–10	10	0	0.000000	–0.000310	0.000310	–0.000310	0.000310
–10	10	Neg FS	–9.980000	–9.980649	–9.979351	–9.980929	–9.979071
–5	5	Pos FS	4.990000	4.989650	4.990350	4.989511	4.990489

Table 58. NI 6280/6281/6284/6289 Family Analog Input Values (Filter Off) (Continued)

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–5	5	0	0.000000	–0.000155	0.000155	–0.000155	0.000155
–5	5	Neg FS	–4.990000	–4.990350	–4.989650	–4.990489	–4.989511
–2	2	Pos FS	1.996000	1.995856	1.996144	1.995800	1.996200
–2	2	0	0.000000	–0.000066	0.000066	–0.000066	0.000066
–2	2	Neg FS	–1.996000	–1.996144	–1.995856	–1.996200	–1.995800
–1	1	Pos FS	0.998000	0.997909	0.998091	0.997881	0.998119
–1	1	0	0.000000	–0.000042	0.000042	–0.000042	0.000042
–1	1	Neg FS	–0.998000	–0.998091	–0.997909	–0.998119	–0.997881
–0.5	0.5	Pos FS	0.499000	0.498945	0.499055	0.498931	0.499069
–0.5	0.5	0	0.000000	–0.000031	0.000031	–0.000031	0.000031
–0.5	0.5	Neg FS	–0.499000	–0.499055	–0.498945	–0.499069	–0.498931
–0.2	0.2	Pos FS	0.199600	0.199568	0.199632	0.199562	0.199638
–0.2	0.2	0	0.000000	–0.000018	0.000018	–0.000018	0.000018
–0.2	0.2	Neg FS	–0.199600	–0.199632	–0.199568	–0.199638	–0.199562
–0.1	0.1	Pos FS	0.099800	0.099776	0.099824	0.099773	0.099827
–0.1	0.1	0	0.000000	–0.000013	0.000013	–0.000013	0.000013
–0.1	0.1	Neg FS	–0.099800	–0.099824	–0.099776	–0.099827	–0.099773

Table 59. NI 6280/6281/6284/6289 Family Analog Output Values

Range (V)		Test Point		24-Hour Limits		2-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.980000	9.978691	9.981309	9.978411	9.981589
–10	10	0	0.000000	–0.000890	0.000890	–0.000890	0.000890
–10	10	Neg FS	–9.980000	–9.981309	–9.978691	–9.981589	–9.978411
–5	5	Pos FS	4.990000	4.989295	4.990705	4.989156	4.990844
–5	5	0	0.000000	–0.000470	0.000470	–0.000470	0.000470
–5	5	Neg FS	–4.990000	–4.990705	–4.989295	–4.990844	–4.989156
–2	2	Pos FS	1.996000	1.995642	1.996358	1.995586	1.996414
–2	2	0	0.000000	–0.000234	0.000234	–0.000234	0.000234
–2	2	Neg FS	–1.996000	–1.996358	–1.995642	–1.996414	–1.995586
–1	1	Pos FS	0.998000	0.997764	0.998236	0.997736	0.998264
–1	1	0	0.000000	–0.000154	0.000154	–0.000154	0.000154
–1	1	Neg FS	–0.998000	–0.998236	–0.997764	–0.998264	–0.997736

Table 60. NI 6280/6281/6284/6289 Family Counter Values

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

B Series Device Test Limits

NI 6010—16-Bit Resolution

The following tables include values for the NI PCI-6010.

Table 61. NI 6010 Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–5	5	Pos FS	4.990000	4.986712	4.993288	4.986213	4.993787
–5	5	0.000000	0.000000	–0.002290	0.002290	–0.002290	0.002290
–5	5	Neg FS	–4.990000	–4.993288	–4.986712	–4.993787	–4.986213
–1	1	Pos FS	0.998000	0.997248	0.998752	0.997148	0.998852
–1	1	0.000000	0.000000	–0.000499	0.000499	–0.000499	0.000499
–1	1	Neg FS	–0.998000	–0.998752	–0.997248	–0.998852	–0.997148
–0.200	0.200	Pos FS	0.199600	0.199392	0.199808	0.199372	0.199828
–0.200	0.200	0.000000	0.000000	–0.000151	0.000151	–0.000151	0.000151
–0.200	0.200	Neg FS	–0.199600	–0.199808	–0.199392	–0.199828	–0.199372

Table 62. NI 6010 Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–5	5	Pos FS	4.990000	4.986294	4.993706	4.985795	4.994205
–5	5	0.000000	0.000000	–0.001690	0.001690	–0.001690	0.001690
–5	5	Neg FS	–4.990000	–4.993706	–4.986294	–4.994205	–4.985795

Table 63. NI 6010 Counter Values

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

NI 6013/6014 and NI 6015/6016 Families—16-Bit Resolution

The following tables include values for the NI PCI-6013 (analog input only), the NI PCI-6014, the NI DAQPad-6015, and the NI DAQPad-6016.

Table 64. NI 6013/6014 and NI 6015/6016 Families Analog Input Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
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

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Table 65. NI 6014 and NI 6015/6016 Analog Output Values

Range (V)		Test Point		24-Hour Limits		1-Year Limits	
Minimum	Maximum	Location	Value (V)	Lower Limit (V)	Upper Limit (V)	Lower Limit (V)	Upper Limit (V)
–10	10	Pos FS	9.8000000	9.795069	9.804931	9.794236	9.805764
–10	10	0	0.0000000	–0.002461	0.002461	–0.002461	0.002461
–10	10	Neg FS	–9.8000000	–9.804931	–9.795069	–9.805764	–9.794236

Table 66. NI 6013/6014 and NI 6015/6016 Families Counter Values

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

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