

SCXI™-1141/1142/1143

Introduction

This document contains information and step-by-step instructions for calibrating the National Instruments (NI) SCXI-1141/1142/1143 signal conditioning module.

What Is Calibration?

Calibration consists of verifying the measurement accuracy of a device and correcting for any measurement error. *Verification* is measuring the performance of a device and comparing the results to the factory specifications of the device. NI calibrates every SCXI-1141/1142/1143 module at the factory. During the factory calibration process, the calibration constants are stored in the EEPROM of the device. These values are loaded from memory and used as needed by the device.

Why Should You Calibrate?

The accuracy of electronic components drifts with time and temperature, which can affect measurement accuracy as a device ages. Calibration restores the module to its specified accuracy and ensures that it still meets NI standards.

How Often Should You Calibrate?

The measurement accuracy requirements of your application determine how often you should calibrate the SCXI-1141/1142/1143 module. NI recommends that you perform a complete calibration at least once every year. You can shorten this interval to 90 days or six months based on the demands of your application.

Equipment and Other Test Requirements

This section describes the equipment, software, documentation, and test conditions required for calibrating the SCXI-1141/1142/1143 module.

Test Equipment

Calibration requires a high-precision voltage source with at least 50 ppm accuracy, a multiranging 5 1/2 digit digital multimeter (DMM) with 15 ppm accuracy, and a National Instruments E Series DAQ device.

Instruments

NI recommends the following instruments for calibrating an SCXI-1141/1142/1143 module:

- Calibrator—Fluke 5700A
- DMM—NI 4060 or HP 34401A
- National Instruments E Series DAQ device

If these instruments are not available, use the accuracy requirements listed above to select substitute calibration equipment.

Connectors

If you do not have custom connection hardware, you need the following:

- Connector block, such as the NI SCXI-1300
- Shielded 68-pin connector cable
- 50-pin ribbon cable
- 50-pin breakout box
- SCXI-1349 adapter

These components provide easy access to the individual pins on the SCXI-1141/1142/1143 module front and rear connectors.

Software and Documentation

You need the following software and documentation to calibrate SCXI-1141/1142/1143 signal conditioning modules. You can download these from the NI Web site at ni.com:

- The latest version of NI-DAQ
- *NI-DAQ Function Reference Help* file
- *NI-DAQ User Manual for PC Compatibles*
- `SCXIdpCal.zip` if the module is revision F or later



Note Determine the revision of the SCXI-1141/1142/1143 module by checking the part number of the module, which is located on the outside of the module case. For example, part number 182628C-01 is revision C.

Software

The SCXI-1141/1142/1143 module calibration procedure requires the latest version of NI-DAQ on the calibration system. NI-DAQ supports a number of programming languages, including LabVIEW, Measurement Studio, Microsoft Visual C++, Microsoft Visual Basic, and Borland C++. When you install NI-DAQ, you only need to install support for the programming language you use.

If the module is revision F or later, this procedure requires using a calibration software library, which you downloaded or received with this documentation. The library contains a function that is needed to adjust calibration circuitry on the module. If you do not have the software library files, you can download them from ni.com/support/calibrat.

Writing Your Calibration Procedure

The *Calibration* section in this document provides step-by-step instructions for calling the appropriate calibration functions.

The calibration software library consists of these files:

- SCXIdpCal.dll
- SCXIdpCal.h

Documentation

The *NI-DAQ Function Reference Help* file and *NI-DAQ User Manual for PC Compatibles* contain detailed information about using NI-DAQ. The function reference online help file includes detailed information on the driver functions. You can access the online help by clicking **Start» Programs» National Instruments» NI-DAQ» NI-DAQ Help**. The user manual provides instructions for installing and configuring National Instruments DAQ devices. This manual also includes detailed information for creating applications that use NI-DAQ. These are the primary references for writing your calibration utility. For further information on the products you are calibrating, refer to the device user manual.

Test Conditions

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

- Keep connections to the SCXI module short. Long cables and wires act as antennae, picking up extra noise and thermal offsets that can 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 temperature between 18 and 28 °C.
- Keep relative humidity below 80%.
- Allow a warm-up time of at least 15 minutes for the SCXI module and 30 minutes for the E Series DAQ device to ensure the measurement circuitry is at a stable operating temperature.

Calibration

The calibration process consists of the following steps:

1. Setting up the module for testing.
2. Verifying the existing operation of the module to determine whether the module is operating within its specifications.
3. Adjusting the module with respect to a known voltage source.
4. Verifying that the module is operating within its specifications after adjustments.

Setting Up the SCXI-1141/1142/1143 Module

Complete the following steps to set up the module for verification, referring to Figure 1 as needed:

1. Install the SCXI-1141/1142/1143 module in slot 1 of the SCXI chassis.
2. Connect a 68-pin to 68-pin cable between the SCXI module and E Series DAQ device.
3. Configure the hardware with Measurement & Automation Explorer (MAX). If you need more information on configuring the system, refer to the documentation for the E Series DAQ device and SCXI module.

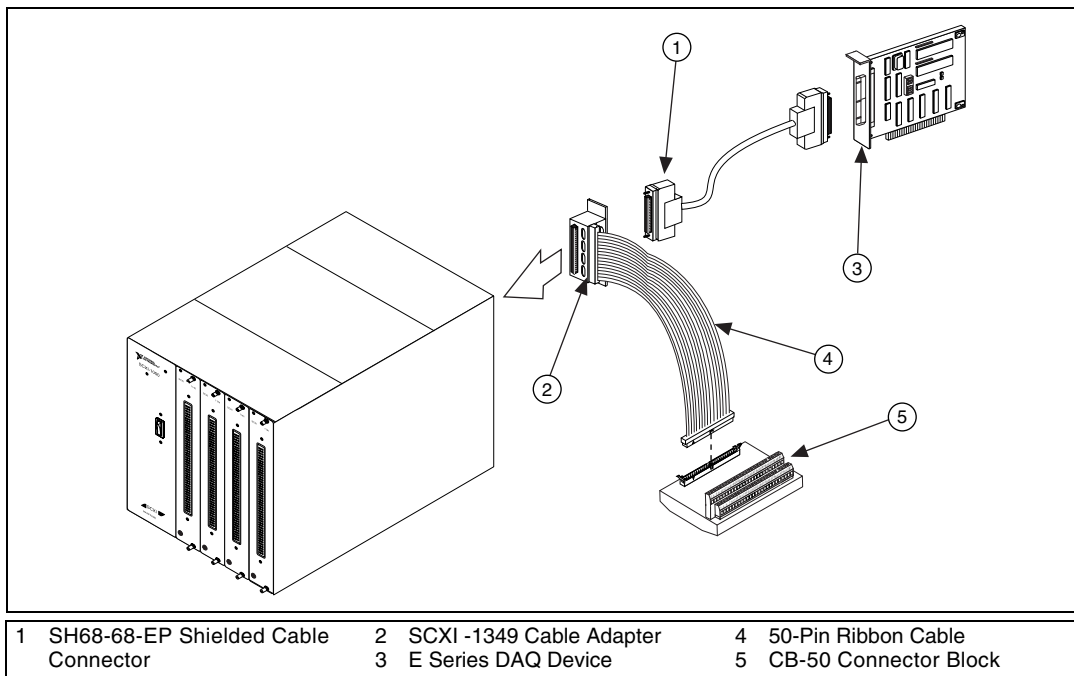


Figure 1. Connecting an SCXI-1141/1142/1143 to an E Series Device and a CB-50 Connector Block

Verifying the Operation of the SCXI-1141/1142/1143 Module

The verification procedure determines how well the SCXI-1141/1142/1143 module is meeting its specifications. You can use this information to select the appropriate calibration interval for your application.

Verifying Analog Input Offsets

Complete the following steps to verify the analog input offsets of the SCXI-1141/1142/1143 module:

1. Read the *Test Conditions* section earlier in this document.
2. Refer to Table 7 for the specifications to test. This table shows all acceptable settings for the module. NI recommends that you verify all ranges and gains. However, you can save time by checking only the ranges that your application uses.
3. Ensure that the E Series DAQ device is connected to the SCXI module.

4. Call `Calibrate_E_Series` to minimize any uncertainty associated with the E Series DAQ device. Set the following parameters:
 - **device**—The device number assigned by MAX
 - **calOp**—`ND_SELF_CALIBRATE`
 - **setOfCalConst**—`ND_USER_EEPROM_AREA`
 - **calRefVolts**—0.0
5. Call `MIO_Config` to enable dithering on the E Series DAQ device measurements. Set the following parameters:
 - **DAQdeviceNumber**—The device number assigned by MAX
 - **dither**—1
 - **useAMUX**—0
6. Call `SCXI_Single_Chan_Setup` to configure the module for single-channel measurements. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **DAQdeviceNumber**—The device number assigned by MAX to the E Series DAQ device
7. Call `SCXI_Set_Gain` to configure the module to the gain value you want to test. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **gain**—The gain value from Table 7 that you want to test
8. Call `SCXI_Configure_Filter` to enable the cutoff filter. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **channel**—0
 - **filterMode**—0
 - **freq**—0 kHz
 - **cutoffDivDown**—0
 - **outClkDivDown**—2

9. Call `SCXI_Calibrate_Setup` to ground the amplifier inputs. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **calibrateOperation**—1 (ground the amplifier)



Note Allow ten seconds for settling.

10. Call `DAQ_Op`. Set the following parameters:
 - **DAQdeviceNumber**—The device number of the DAQ device
 - **channel**—0
 - **gain**—1 for a 16-bit E Series DAQ device or -1 for a 12-bit E Series DAQ device
 - **count**—100
 - **sampleRate**—100
11. Average the results returned from `DAQ_Op`. The averaged result is the offset of the SCXI-1141/1142/1143. Performing the following steps compensate for the offset.
12. Call `SCXI_Cal_Constants` to correct for the offset and store the new calibration constants in the SCXI-1141/1142/1143 module memory. Use the following parameters:
 - **SCXIchassisID**—The device number assigned by MAX to the SCXI chassis
 - **moduleSlot**—1, unless you installed the module in a different slot
 - **channel**—The channel you want to adjust
 - **opCode**—1 (one point)
 - **calibrationArea**—0
 - **rangeCode**—0 (not used for the SCXI-1141/1142/1143)
 - **SCXIgain**— The gain you are testing
 - **DAQboard**—The device number assigned by MAX to the DAQ device
 - **DAQChan**—0
 - **DAQGain**—1 for a 16-bit E Series DAQ device or -1 for a 12-bit E Series DAQ device
 - **Tbgain**—1.0
 - **volt1** and **volt2**—0.0
 - **binary1**—The average offset as measured above

- **binary2**—0.0
 - **calConst1** and **calConst2**—These are return values and can be discarded
13. Call `SCXI_Calibrate_Setup` to connect the input voltage to the amplifier. Set the following parameters:
 - **SCXIChassisID**—The device number assigned by MAX
 - **moduleSlot**—1
 - **calibrateOperation**—0 (Disable calibration setup)
 14. Input the test voltage listed in Table 7 to channel 0 of the SCXI module.
 15. Call `DAQ_Op`. Set the following parameters:
 - **DAQdeviceNumber**—The device number for the DAQ device
 - **channel**—0
 - **gain**—1 for a 16-bit E Series DAQ device or -1 for a 12-bit E Series DAQ device
 - **count**—100
 - **sampleRate**—100
 16. Call `SCXI_Scale` to convert the readings from binary to voltage. Set the following parameters:
 - **SCXIChassisID**—The device number assigned by MAX
 - **moduleSlot**—1
 - **channel**—0
 - **SCXIgain**—The gain you are testing
 - **TBgain**—1
 - **DAQboard**—The device number for the DAQ device
 - **DAQChannel**—0
 - **DAQgain**—1
 - **numPoints**—100
 - **binArray**—The array returned from `DAQ_Op`

The result is a set of scaled voltages read from the SCXI module.
 17. Average the results returned by `SCXI_Scale`. Compare the averaged result to the upper and lower limits listed in Table 7.
 18. Repeat steps 6 through 17 for each remaining test point.
 19. Repeat steps 6 through 18 for each remaining channel, changing the **moduleChan** variable to the channel number you are testing.

You have now finished verifying the operation of the SCXI-1141/1142/1143 module.

Verifying Filter Parameters

Complete the following steps to set up the SCXI-1141/1142/1143 module for this verification process:

1. Read the *Test Conditions* section in this document.
2. Ensure that the E Series DAQ device is connected to the SCXI-1141/1142/1143.
3. Call `SCXI_Configure_Filter` to enable the cutoff filter. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **channel**—0
 - **filterMode**—1
 - **freq**—10 kHz
 - **cutoffDivDown**—0
 - **outClkDivDown**—2
4. Call `SCXI_Set_Gain` to configure the module to a gain of 1. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **gain**—1
5. Connect the calibrator to analog input channel 0. Refer to Table 6 to determine which pins on the 96-pin front connector correspond to the positive and negative inputs of the specified channel. If you are using an SCXI-1304 breakout module connected to the SCXI-1141/1142/1143, connect the calibrator to the CH0+ and CH0– inputs.
6. Connect the DMM to the output of channel 0. Refer to Figure 4 to determine which pins on the 50-pin rear connector correspond to the positive and negative outputs for the specified channel. For example, the positive output for channel 0 is pin 3, which is labeled MCH0+. The negative output for channel 0 is pin 4, which is labeled MCH0–.

Verifying Stopband Attenuation

Verify the stopband attenuation by performing the following steps:

1. Set the calibrator to output a 10 kHz, $1V_{\text{rms}}$ sine wave.
2. With a DMM, ensure that you read a $1V_{\text{rms}}$ signal.

3. Increase the input signal frequency generated by the calibrator until the level read by the DMM is $10 \text{ mV}_{\text{rms}}$.
4. Verify that the frequency is within the limits shown in Table 1.

Table 1. Input Frequency

Module	Lower Limit (kHz)	Upper Limit (kHz)
SCXI-1141	12.5	13.5
SCXI-1142	31.0	33.0
SCXI-1143	17.5	19.0

Verifying Corner Frequency

Verify the corner frequency by performing the following steps:

1. Set the calibrator to output a 10 kHz, 1 V_{rms} sine wave.
2. Verify that the output is within the values shown in Table 2.

Table 2. SCXI-1141/1142/1143 Output

Module	Lower Limit (kHz)	Upper Limit (kHz)
SCXI-1141	0.9829	1.0198
SCXI-1142	0.6839	0.7328
SCXI-1143	0.6918	0.7762

Verifying Passband

Verify the passband by performing the following steps:

1. Set the calibrator output to a 1 V_{rms} sine wave at the frequency specified in Tables 3, 4, or 5.
2. Verify that the output is within the bounds specified by Tables 3, 4, or 5.
3. Repeat steps 1 and 2 until all test points are verified.

Table 3. Passband Test Points for the SCXI-1141

Frequency (kHz)	Lower Limit (V_{rms})	Upper Limit (V_{rms})
3.81	0.9806	1.014
5.94	0.9806	1.014
7.59	0.9806	1.014
8.66	0.9806	1.014

Table 3. Passband Test Points for the SCXI-1141 (Continued)

Frequency (kHz)	Lower Limit (V_{rms})	Upper Limit (V_{rms})
9.39	0.9806	1.014
9.93	0.9806	1.014

Table 4. Passband Test Points for the SCXI-1142

Frequency (kHz)	Lower Limit (V_{rms})	Upper Limit (V_{rms})
2.5	0.9661	0.9886
5.0	0.8913	0.9333

Table 5. Passband Test Point for the SCXI-1143

Frequency (kHz)	Lower Limit (V_{rms})	Per Limit (V_{rms})
5.0	0.9886	0.9999

Adjusting the SCXI-1141/1142/1143 Module

This section contains three adjustment procedures: one for measuring gain error, one for adjusting calibration gain constants, and one for adjusting filter AC gain.

Measuring Gain Errors

Complete the following steps to measure the gain errors in the SCXI-1141/1142/1143 module:

1. Read the *Test Conditions* section earlier in this document.
2. Refer to Table 7 for the specifications to be tested. This table shows all acceptable settings for the module.
3. Ensure that the E Series DAQ device is connected to the SCXI-1141/1142/1143 module.
4. Call `SCXI_Single_Chan_Setup` to configure the module for single-channel measurements. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **DAQdeviceNumber**—The device number assigned by MAX for the E Series DAQ device

5. Call `SCXI_Set_Gain` to configure the module to the gain value you want to adjust. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **gain**—The gain value from Table 7 that you are currently testing
6. Connect the calibrator to the appropriate analog input channel, starting with channel 0. Refer to Table 6 to determine the pins on the 96-pin front connector that correspond to the positive and negative inputs of the specified channel. If you are using an SCXI-1304 breakout module connected to the SCXI-1141/1142/1143 module, connect the calibrator to the CH0+ and CH0– inputs.
7. Connect the DMM to the positive output on pin 3 (MCHO+) and the negative output on pin 4 (MCHO–) on the rear panel connector, illustrated in Figure 4.



Tip For easy access to individual pins, use a CB-50 connector block connected as shown in Figure 1.

8. Set the calibrator voltage to the positive test-point value in Table 7.
9. Read the voltage from the DMM. Record the DMM reading as *output1*, and the calibrator output voltage as *volt1*, for later use.
10. Set the calibrator to the negative test-point value for the same gain. Skip any input limits that are specified as 0.0 V. You need only upper and lower limits for adjustment.
11. Read the voltage from the DMM. Record the DMM reading as *output2*, and the calibrator output voltage as *volt2*. You now have two pairs of data points, (*volt1*, *output1*) and (*volt2*, *output2*), where *volt1* and *volt2* are calibrator readings, and *output1* and *output2* are DMM readings.
12. Convert the DMM voltage readings (*output1* and *output2*) to binary readings (*binary1* and *binary2*) by using one of the following equations:

$$\text{binary reading for 12-bit E Series products (binary)} = \left(\frac{\text{output}}{20} \right) \times 2^{12}$$

$$\text{binary reading for 16-bit E Series products (binary)} = \left(\frac{\text{output}}{20} \right) \times 2^{16}$$



Note In both of the above equations, *output* is either *output1* or *output2*.

For example, using a 12-bit product such as a PCI-MIO-16E-1 and obtaining a DMM reading of -9.90000 V, you get the following results:

$$\text{binary} = (-9.90000/20) \times 2^{12} = -2027.52$$

13. Record *binary1* with *volt1*, and *binary2* with *volt2*, for later use.
14. Repeat steps 5 through 13 for the remaining gain values you want to measure on this channel.
15. Repeat steps 4 through 14 for the remaining channels you want to measure.

You have now finished measuring the gain on the SCXI-1141/1142/1143 module.

Adjusting Calibration Constants

Complete the following steps to adjust the calibration constants on the SCXI-1141/1142/1143 module to compensate for the gain error measured in the *Measuring Gain Errors* section:

1. Reconnect the E Series DAQ device to the SCXI-1141/1142/1143 module.
2. Call `SCXI_Cal_Constants` to create and store the new calibration constants in the SCXI-1141/1142/1143 module memory. Use the following parameters:
 - **SCXIchassisID**—The ID assigned by MAX
 - **moduleSlot**—1, unless you installed the module in a different slot
 - **channel**—The channel you want to adjust
 - **opCode**—2
 - **calibrationArea**—0
 - **rangeCode**—0 (not used for the SCXI-1141/1142/1143)
 - **SCXIgain**—The gain setting you want to adjust
 - **DAQboard**—The device number assigned by MAX
 - **DAQChan**—0
 - **DAQGain**—1 for 16-bit devices, -1 for 12-bit devices
 - **Tbgain**—1.0
 - **volt1** and **volt2**—The first and second voltage readings for the gain values that you are saving on the SCXI-1141/1142/1143
 - **binary1** and **binary2**—The first and second binary readings for the gain values that you are saving on the SCXI-1141/1142/1143
 - **calConst1** and **calConst2**—The return values

3. Repeat step 2, changing **calibrationArea** to 1.
4. Repeat step 2, changing **calibrationArea** to 3.
5. Repeat steps 2 through 4 for the next channel.
6. Repeat steps 2 through 5 for the next gain setting.

You have now finished adjusting the calibration constants on the SCXI-1141/1142/1143 module.

Adjusting Filter AC Gain

The AC gain of the filter is independent of the gain of the amplifier, so you can do this procedure with any amplifier gain. Ideally, you set the amplifier gain (G_s) and the amplitude of the sine wave (V_s) so that $V_s = 3.4 V_{\text{rms}}/G_s$. V_s can be set to a lower amplitude, but not a higher one. To prevent errors due to ripple in the passband, the frequency of the sine wave must be lower than 1/50th of the cutoff frequency. For this procedure, set the filters to a cutoff frequency of 25 kHz and use a sine wave of less than 500 Hz.

SCXI-1141/1142/1143 Modules Before Revision F

Complete the following steps to set up the SCXI-1141/1142/1143 module for adjustment and to adjust the AC gain filter, referring to Figures 2 and 3 as needed:

1. Remove the grounding screw from the module.
2. Remove the cover on the module to access the potentiometers.

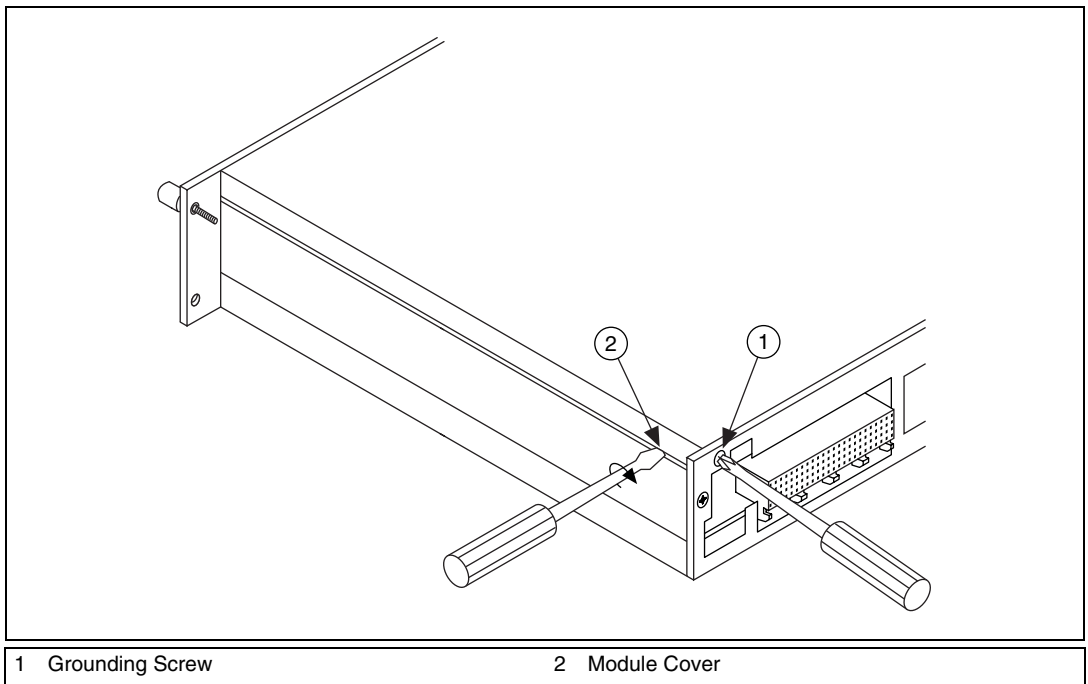


Figure 2. Grounding Screw and Cover Removal

3. Remove the side plate of the SCXI chassis.
4. Install the module into slot 4 of the SCXI chassis.

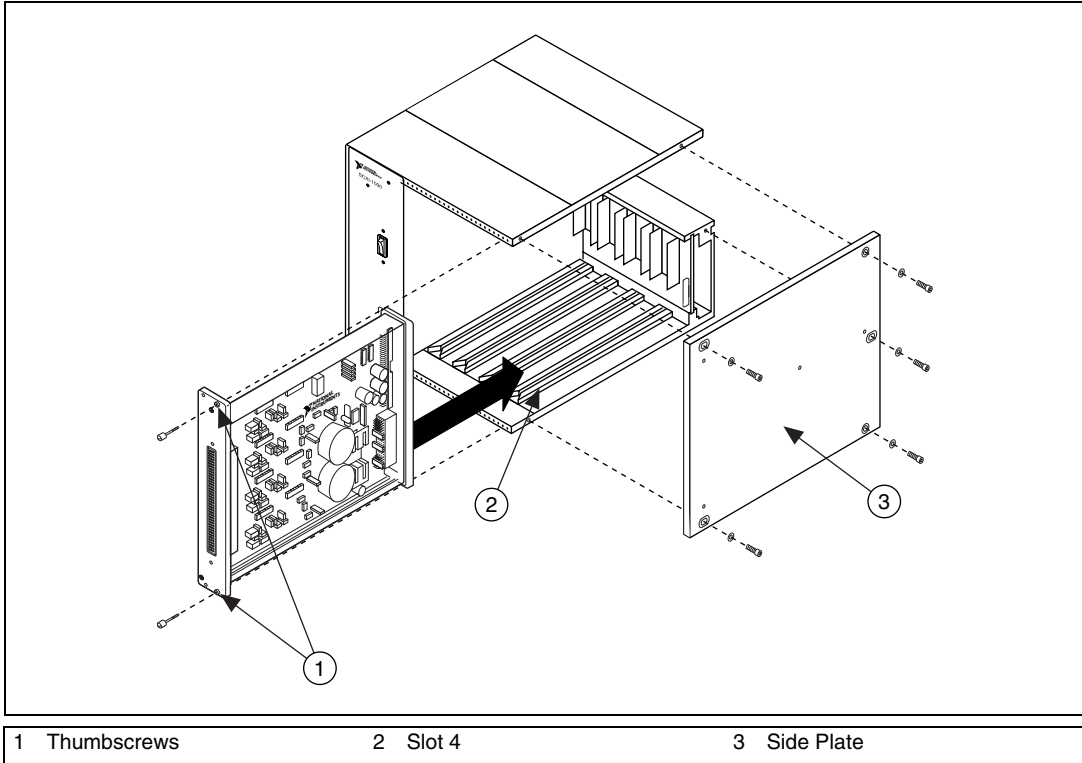


Figure 3. Side Plate Removal and Module Installation

5. Read the *Test Conditions* section earlier in this document.
6. Ensure that the E Series DAQ device is connected to the SCXI-1141/1142/1143 module.
7. Call `SCXI_Set_Gain` to configure the module to a gain value of 1. Set the following parameters:
 - **SCXIchassisID**—The device number assigned by MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **gain**—1

8. Call `SCXI_Configure_Filter` to enable the filter bypass. Set the following parameters:
 - **SCXIchassisID**—The value configured in MAX
 - **moduleSlot**—1
 - **channel**—0
 - **filterMode**—0
 - **freq**—0 kHz
 - **cutoffDivDown**—0
 - **outClkDivDown**—0
9. Connect the calibrator to analog input channel 0. Refer to Figure 1 to determine the pins on the 96-pin front connector that correspond to the positive and negative inputs of the specified channel. If you are using an SCXI-1304 breakout module connected to the SCXI-1141/1142/1143 module, connect the calibrator to the CH0+ and CH0– inputs.
10. Connect the DMM to the output of channel 0. Refer to Figure 2 to determine the pins on the 50-pin rear connector that correspond to the positive and negative outputs for the specified channel. For example, the positive output for channel 0 is pin 3, which is labeled MCH0+. The negative input for channel 0 is pin 4, which is labeled MCH0–.
11. Set the calibrator voltage to 3.4 V_{rms}, 400 Hz.
12. Measure and record the amplitude of the sine wave with the DMM.
13. Call `SCXI_Configure_Filter` to disable the filter bypass. Set the following parameters:
 - **SCXIchassisID**—The value configured in MAX
 - **moduleSlot**—1
 - **channel**—0
 - **filterMode**—1
 - **freq**—25 kHz
 - **cutoffDivDown**—0
 - **outClkDivDown**—2
14. Measure the amplitude of the sine wave at the output and adjust the potentiometer until the amplitude is at the same level as it was with the filter in bypass mode.
15. Repeat steps 8 through 14 for the remaining channels.

You have now finished adjusting the filter AC gain of the SCXI-1141/1142/1143 module.

SCXI-1141/1142/1143 Modules Revision F or Later

Complete the following steps to adjust the AC gain of the filter on an SCXI-1141/1142/1143 module revision F or later:

1. Read the *Test Conditions* section in this document.
2. Ensure that the E Series DAQ device is connected to the SCXI-1141/1142/1143 module.
3. Call `SCXI_Set_Gain` to configure the module to a gain value of 1. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **moduleChan**—0
 - **gain**—1
4. Call `SCXI_Configure_Filter` to enable the filter bypass. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **channel**—0
 - **filterMode**—0
 - **freq**—0 kHz
 - **cutoffDivDown**—0
 - **outClkDivDown**—0
5. Connect the calibrator to analog input channel 0. Refer to Table 6 to determine the pins on the 96-pin front connector that correspond to the positive and negative inputs of the specified channel. If you are using an SCXI-1304 that is connected to the SCXI-1141/1142/1143 module, connect the calibrator to the CH0+ and CH0- inputs.
6. Connect the DMM to the output of channel 0. Refer to Figure 4 to determine the pins on the 50-pin rear connector that correspond to the positive and negative outputs for the specified channel. For example, the positive output for channel 0 is pin 3, which is labeled MCH0+. The negative input for channel 0 is pin 4, which is labeled MCH0-.
7. Set the calibrator voltage to 3.4 V_{rms}, 400 Hz.
8. Measure and record the amplitude of the sine wave with the DMM.

9. Call `SCXI_Configure_Filter` to enable the cutoff filter. Set the following parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **channel**—0
 - **filterMode**—1
 - **freq**—25 kHz
 - **cutoffDivDown**—0
 - **outClkDivDown**—2
10. Call the `SCXI_SetDP` function in `SCXIdpCa1.dll` to set the digital potentiometer to a neutral position, set the following short integer parameters:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **channel**—0
 - **value**—127
11. Measure the amplitude of the sine wave at the output of the module.
12. If the measured value is less than the value measured with the filter bypassed, increase the value to which the digital potentiometer is set. If it is greater, decrease the value. Keep in mind that the extremes to which you can set the digital potentiometer are 0 and 255.
13. Call `SCXI_SetDP` to set the digital potentiometer to the new value:
 - **SCXIchassisID**—The value obtained from MAX
 - **moduleSlot**—1
 - **channel**—0
 - **value**—The new value decided upon in step 12
14. Repeat steps 11 through 13 until the measured amplitude is as close as possible to the level it was with the filter in bypass mode.
15. Repeat steps 4 through 14 for the remaining channels.

You have now finished adjusting the filter AC gain of the SCXI-1141/1142/1143 module.

Verifying Adjusted Values

After you complete the adjustment procedure, it is important that you verify the accuracy of the adjusted values by repeating the procedure in the [Verifying the Operation of the SCXI-1141/1142/1143 Module](#) section. Verifying the adjusted values ensures that the SCXI-1141/1142/1143 module is operating within its specifications after adjustments.



Note If the module fails verification after adjustment, return it to NI for repair or replacement.

Front and Rear Panel Pin Assignments

Table 6 shows the pin assignments for the SCXI-1141/1142/1143 module front panel connector.

Table 6. SCXI-1141/1142/1143 Front Connector Pin Assignments

Pin Number	Column A	Column B	Column C
32	IN0+	NC	IN0–
31	NC	NC	NC
30	IN1+	NC	IN1–
29	NC	NC	NC
28	AGND	NC	AGND
27	NC	NC	NC
26	IN2+	NC	IN2–
25	NC	NC	NC
24	IN3+	NC	IN3–
23	NC	NC	NC
22	AGND	NC	AGND
21	NC	NC	NC
20	IN4+	NC	IN4–
19	NC	NC	NC
18	IN5+	NC	IN5–
17	NC	NC	NC
16	AGND	NC	AGND

Table 6. SCXI-1141/1142/1143 Front Connector Pin Assignments (Continued)

Pin Number	Column A	Column B	Column C
15	NC	NC	NC
14	IN6+	NC	IN6–
13	NC	NC	NC
12	IN7+	NC	IN7–
11	NC	NC	NC
10	NC	NC	NC
9	NC	NC	NC
8	DGND	NC	DGND
7	NC	NC	NC
6	RSVD	NC	DGND
5	NC	NC	NC
4	RSVD	NC	EXTCLK
3	NC	NC	NC
2	DGND	NC	OUTCLK
1	NC	NC	NC
NC — Not Connected			

Figure 4 shows the pin assignments for the SCXI-1141/1142/1143 module rear panel connector.

AOGND	1	2	AOGND
MCH0+	3	4	MCH0-
	5	6	
	7	8	
	9	10	
	11	12	
	13	14	
	15	16	
	17	18	
OUTREF	19	20	
	21	22	
	23	24	DIGGND
SERDATIN	25	26	SERDATOUT
DAQD*/A	27	28	
SLOT0SEL*	29	30	
	31	32	
DIGGND	33	34	
	35	36	SCANCLK
SERCLK	37	38	
	39	40	
	41	42	
RSVD	43	44	
	45	46	RSVD
	47	48	
	49	50	

Figure 4. SCXI-1141 Rear Connector Pin Assignments

Specifications

The following table contains test specifications for the SCXI-1141/1142/1143 signal conditioning module. If the module has been calibrated within the last year, the Test Point value should fall between the Upper Limit and Lower Limit values.

Table 7. SCXI-1141/1142/1143 Specifications

Test Point (V)	Gain	Upper Limit (V)	Lower Limit (V)
4.9	1	4.930235	4.869765
0.0	1	0.000835	-0.000835
-4.9	1	-4.869765	-4.930235
2.45	2	2.465417	2.434583
0.0	2	0.000717	-0.000717
-2.45	2	-2.434583	-2.465417
0.98	5	0.986527	0.973473
0.0	5	0.000647	-0.000647
-0.98	5	-0.973473	-0.986527
0.49	10	0.493564	0.486437
0.0	10	0.000624	-0.000624
-0.49	10	-0.486437	-0.493564
0.245	20	0.246541	0.243459
0.0	20	0.000612	-0.000612
-0.245	20	-0.243459	-0.246541
0.098	50	0.098613	0.097387
0.0	50	0.000605	-0.000605
-0.098	50	-0.097387	-0.098613
0.049	100	0.049309	0.048691
0.0	100	0.000603	-0.000603
-0.049	100	-0.048691	-0.049309