

Calibrating the SCXI™ -1520 with Calibration Executive

This document contains step-by-step instructions for using Calibration Executive to load and run a calibration procedure for SCXI-1520 modules with an SCXI-1314 terminal block.



Note If you do not have a terminal block, you can connect to the pins on the front panel using a 96-pin Euro-style connector. This document does not include instructions for using the 96-pin Euro-style connector.

Equipment and Other Test Requirements

This section describes the equipment, documentation, and test conditions needed for calibration.

Test Equipment

Calibration requires a high-precision voltage standard with an accuracy of at least 50 ppm, a multiranging 6 1/2 digit digital multimeter (DMM) with an accuracy of 15 ppm, and a 16-bit E Series National Instruments data acquisition (DAQ) device.

The calibration procedure runs in automated mode if you use IVI-supported DMMs and calibrators. NI recommends you use the following instruments:

- Calibrator—Fluke 5700A
- DMM—Agilent 34401A
- 16-bit E Series DAQ device



Note The 16-bit E Series DAQ device must be within the one year calibration interval and must connect directly to the SCXI module you want to calibrate.

If you do not have these instruments, use the accuracy requirements previously listed to select a substitute calibration standard.

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Connectors

Although you can perform the calibration procedure without any special connectors, connecting and disconnecting the calibration hardware is easier with the correct equipment. If you do not have custom connection hardware, you need the following types of connectors:

- Terminal block, such as the SCXI-1314
- SCXI-1349 shielded cable adapter, which includes an SH68-68-EP shielded cable and a cable adapter

Documentation

Refer to the following documents, as needed, to calibrate the SCXI-1520:

- This guide, *Calibrating the SCXI-1520 with Calibration Executive*
- *Calibration Executive Software User Manual*
- *SCXI Quick Start Guide*
- *Getting Started with SCXI*
- *SCXI-1520 User Manual*
- *SCXI-1314 Universal Strain Terminal Block Installation Guide*
- *SCXI-1349 Shielded Cable Adapter Installation Guide*

You can download these documents from ni.com/manuals.

Software Installation

To install Calibration Executive, complete the following steps:

1. Insert the Calibration Executive installation CD into the CD drive.
2. If the CD does not run automatically, select **Run** from the **Start** menu on the desktop task bar.
3. In the command line box, enter `x:setup.exe` (where *x* is the letter of the CD drive you are using), then click **OK**.
4. Follow the instructions that appear in the dialog boxes.

For more information, refer to the *Calibration Executive Software User Manual*.

The setup program installs Calibration Executive and the associated files listed in Table 1.

Table 1. Calibration Executive Directories and Supporting Files

Directory Name	Contents
Calibration Executive\Procedures\SCXI 1520\Limits	Calibration limits database
Calibration Executive\Procedures\SCXI 1520	Calibration procedures
Calibration Executive\Procedures\SCXI 1520\Support Files	Required support files

Test Conditions

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

- Keep the connections to the terminal block as short as possible. Long cables and wires act as antennae, which conduct noise that can affect measurements.
- Use shielded copper wire for all cable connections to the terminal block. Use twisted-pair wire to reduce noise.
- Maintain a temperature between 18 and 28 °C.
- Keep the relative humidity below 80%.
- Allow a warm-up time of at least 30 minutes for the SCXI-1520 module and the E Series DAQ device to ensure that the measurement circuitry is at a stable operating temperature.

Setting Up and Running Calibration

This section explains how to set up and run the Calibration Executive procedure. In automated mode, the calibration procedure should take approximately one and a half hours. In manual mode, the calibration procedure can take as long as three hours.

Setting Up the SCXI-1520 Module for Calibration

To set up the module for calibration, refer to Figure 1 as you complete the following steps:

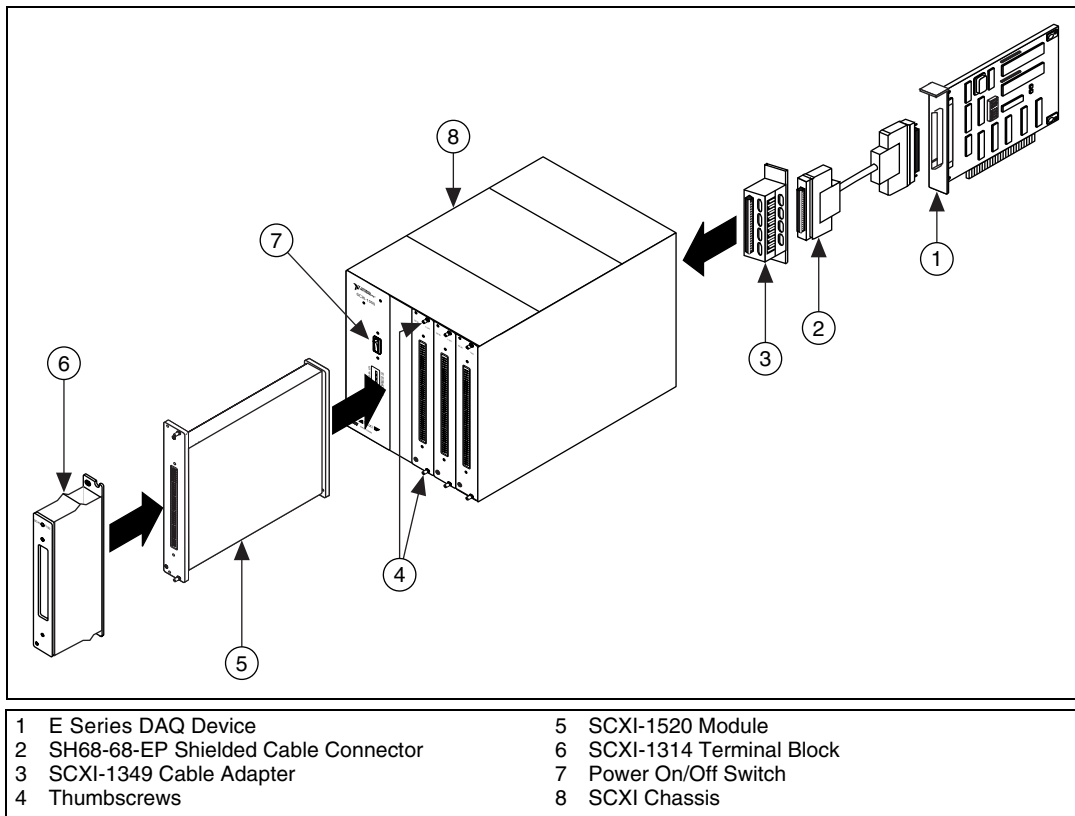


Figure 1. Connecting an SCXI Module to an E Series DAQ Device

1. Install the SCXI-1520 module in the SCXI chassis and tighten the thumbscrews.
2. Install the E Series DAQ device into the host computer.
3. Connect the SH68-68-EP shielded cable between the SCXI-1520 and the E Series DAQ device installed in the host computer using the SCXI-1349 cable adapter.
4. Configure the hardware with Measurement & Automation Explorer (MAX).
 - a. Click the **Measurement & Automation** icon on your desktop to open MAX.
 - b. Expand **Devices and Interfaces**.
 - c. Right-click **Traditional NI-DAQ Devices**.

- d. Select **Add SCXI Chassis**. Click **Next**.
- e. In the dialog boxes, which follow in MAX, configure your settings. For more information on how to configure your settings, refer to **Help»Help Topics»Traditional NI-DAQ** in MAX.
- f. Click **Finish**.



Note If you need additional configuration information, you can refer to the *DAQ Quick Start Guide*, the *SCXI Quick Start Guide*, and the *Getting Started with SCXI*.

Connecting the Calibrator and SCXI-1314 Terminal Block

Figure 2 illustrates the connections to the calibrator from the SCXI-1314.

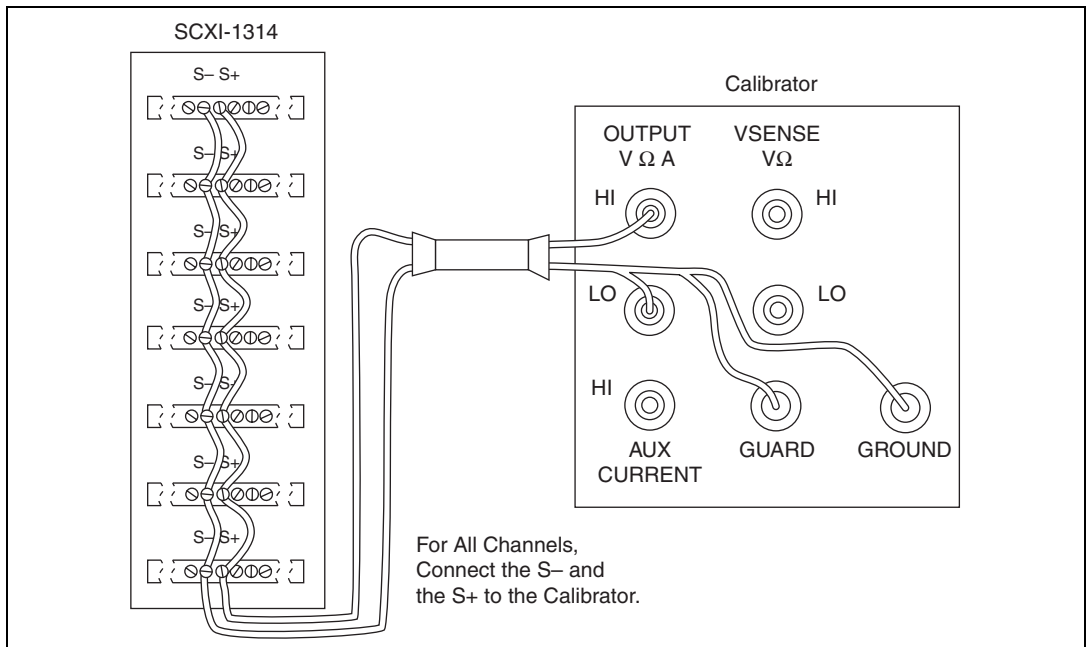


Figure 2. SCXI-1314 Connections to the Calibrator

Complete the following steps to connect the calibrator to the SCXI-1520 module using an SCXI-1314 terminal block:

1. Connect all negative inputs (S-) of each channel together on the SCXI-1314 terminal block. Connect all positive inputs (S+) of each channel together on the SCXI-1314 terminal block. If you are not using an SCXI-1314 terminal block, refer to Table 2 for the pin assignments.

Table 2. SCXI-1520 Front Signal Pin Assignments

Front Connector Diagram				Pin Number	Column A	Column B	Column C
				32	SCB0	S0-	S0+
				31	SCB0	RS0-	RS0+
				30	SCB1	P0-	P0+
				29	SCB1	SCA0	SCA0
				28	RSVD	S1-	S1+
				27	RSVD	RS1-	RS1+
				26	RSVD	P1-	P1+
				25	RSVD	SCA1	SCA1
				24	SCB2	S2-	S2+
				23	SCB2	RS2-	RS2+
				22	SCB3	P2-	P2+
				21	SCB3	SCA2	SCA2
				20	RSVD	S3-	S3+
				19	RSVD	RS3-	RS3+
				18	RSVD	P3-	P3+
				17	RSVD	SCA3	SCA3
				16	SCB4	S4-	S4+
				15	SCB4	RS4-	RS4+
				14	SCB5	P4-	P4+
				13	SCB5	SCA4	SCA4
				12	RSVD	S5-	S5+
				11	RSVD	RS5-	RS5+
				10	RSVD	P5-	P5+
				9	RSVD	SCA5	SCA5
				8	SCB6	S6-	S6+
				7	SCB6	RS6-	RS6+
				6	SCB7	P6-	P6+
				5	SCB7	SCA6	SCA6
				4	RSVD	S7-	S7+
				3	RSVD	RS7-	RS7+
				2	RSVD	P7-	P7+
				1	RSVD	SCA7	SCA7

	Column		
	A	B	C
32	○	○	○
31	○	○	○
30	○	○	○
29	○	○	○
28	○	○	○
27	○	○	○
26	○	○	○
25	○	○	○
24	○	○	○
23	○	○	○
22	○	○	○
21	○	○	○
20	○	○	○
19	○	○	○
18	○	○	○
17	○	○	○
16	○	○	○
15	○	○	○
14	○	○	○
13	○	○	○
12	○	○	○
11	○	○	○
10	○	○	○
9	○	○	○
8	○	○	○
7	○	○	○
6	○	○	○
5	○	○	○
4	○	○	○
3	○	○	○
2	○	○	○
1	○	○	○

2. Connect the calibrator positive output to S+ of the SCXI-1314 terminal block.
3. Connect the calibrator negative output to S- of the SCXI-1314 terminal block.
4. Connect the calibrator guard and ground cables together, then connect these to S- on the SCXI-1314 terminal block.
5. Connect the SCXI-1314 terminal block to the front of the SCXI-1520 module.

Connecting the DMM to the SCXI-1314

Complete the following steps to connect the DMM to the SCXI-1314 terminal block:

1. Connect the DMM positive input lead to each channel (terminal P+) of the SCXI-1314 terminal block, as prompted by Calibration Executive and shown in Figure 3.

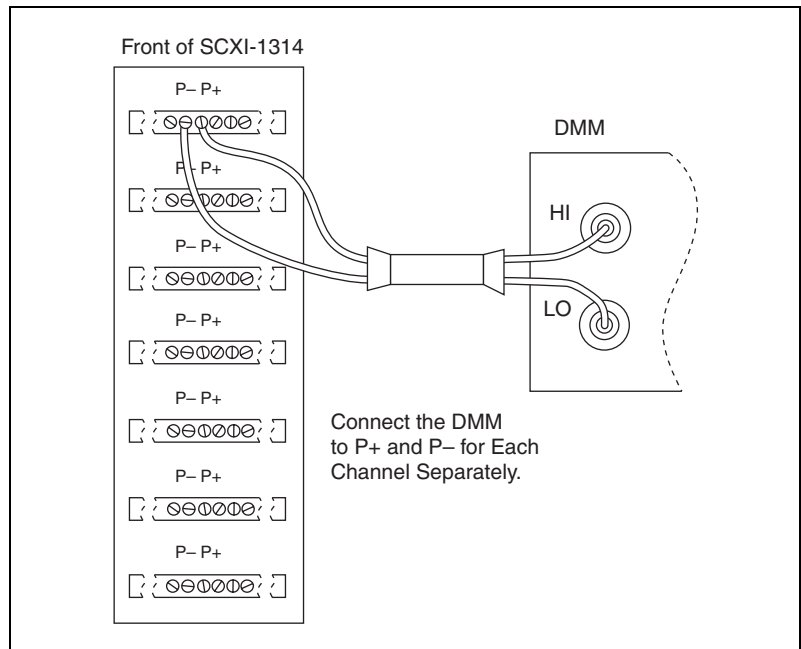


Figure 3. SCXI-1314 DMM Connections

2. Connect the DMM negative lead to (P-) of the given channel.

Running the Calibration Executive Procedure

To run the Calibration Executive verification procedure, complete the following steps:

1. Open Calibration Executive and follow the instructions in the Calibration Configuration Wizard to load the SCXI-1520 module calibration procedure. If you need more information on configuring and loading a calibration procedure, refer to the *Calibration Executive Software User Manual*.
2. When the procedure is loaded, click **Run Procedure**.
3. Enter the following information about the installed hardware, as prompted by Calibration Executive:
 - **SCXI Chassis ID**—the ID number assigned by MAX to the SCXI chassis
 - **SCXI Module Slot**—the SCXI slot where the SCXI-1520 module is installed
 - **MIO Resolution**—the resolution of the E Series DAQ device; refer to the user manual for the resolution of the device
 - **Channels to Verify and Adjust**—verify and adjust the SCXI-1520 module channels as needed; refer to the *Calibration Executive Software User Manual* to learn how to perform verification only



Note You *cannot* adjust the excitation voltages. If the excitation voltages fail verification, return the module to NI for repair. For more information about contacting NI for repair, refer to the *Signal Conditioning Technical Support Information* document.

4. Follow any instructions you receive from Calibration Executive.

After the procedure finishes, complete the following steps to view the calibration report:

1. Select **View»Reports**.
2. Select **View** to launch your browser and view the report.

For more information about how to configure reports, refer to the *Calibration Executive Software User Manual*.

You have finished calibrating the SCXI-1520 module with Calibration Executive.

Troubleshooting Guidelines

This section describes problems you might encounter when calibrating the SCXI-1520 module and explains how to correct the problems.

If the SCXI-1520 module is not recognized in MAX, make sure that you followed the configuration guidelines. Additional configuration information is available at ni.com/support/daq. If MAX fails to recognize the SCXI-1520 module after you reconfigure and refresh (<F5>), refer to the *Signal Conditioning Technical Support* document to contact NI technical support for repair or replacement.

If the SCXI-1520 module fails after calibration, try the following:

1. Check the connections and run the Calibration Executive procedure again.
2. If the calibration still fails, try inputting or outputting the failed test points in MAX using test panels for the E Series DAQ device. For example, if the analog input (AI) failed at 0.98 V, input that value from the calibrator.
 - a. Click the E Series DAQ device in MAX.
 - b. Click **Test Panels**.
 - c. Click the **Analog Input** tab.
 - d. Set the **High Limit** to 1.00 V and set the **Low Limit** to -1.00 V for bipolar readings.
 - e. Enter $SC_x ! MD_y ! z$ in the channel string field, where x is the chassis ID as configured in MAX, y is the slot in the SCXI chassis where the SCXI-1520 module is installed, and z is the channel you are testing on the SCXI-1520 module.
 - f. Enable the **Average Reading** indicator.

If the Average Reading still fails, contact NI for repair or replacement. If the Average Reading passes, you can change the calibration report to indicate the passing value.



Note If you have Microsoft Access 2000 or later, you also can modify the database containing the test results. By default, this database is located in `\Calibration Executive\Databases\Calibration Reports.mdb`.

NI-DAQ Errors and Other Errors

The following section describes some of the error codes that can occur when calibrating the SCXI-1520 module.

Error Code—15

When received at the beginning of the calibration procedure, **Error Code—15** indicates that the computer may be configured to use commas as decimal places.

To change this configuration on the computer, complete the following steps:

1. Select **Start»Settings»Control Panel**.
2. Click **Regional Options**.
3. Click the **Numbers** tab and change:
 - a. The Decimal Symbol from a comma (,) to a period (.
 - b. The Digit Grouping Symbol from a period (.) to a comma (,).



Note If you change the Regional Settings or Regional Options on the computer, remember to change them back to the default after running the Calibration Executive procedure.

Error Code—10005

Indicates that the E Series DAQ device number you selected is not configured or recognized in MAX. Configure the device in MAX and restart Calibration Executive.

Error Code—10842

When received during the internal calibration step, **Error Code—10842** indicates that the E Series DAQ device hardware is not responding correctly and needs repair. When you contact NI for repair, explicitly indicate that the E Series DAQ device internal calibration function returns **Error Code—10842** during calibration.



Note **Error Code—10842** involves the E Series DAQ device hardware only, not the SCXI-1520 module.

You can find more information on other error codes in the *Traditional NI-DAQ Function Reference Help*. To find this file, select **Start»Programs»National Instruments»NI-DAQ**.

Specifications

For specification information on the SCXI-1520, refer to one of the following documents:

- *SCXI-1520 Calibration Procedure*, which is available at ni.com/support/calibrat/mancal.
- *SCXI-1520 User Manual*, which is available at ni.com/manuals.