CALIBRATING THE SCXI™-1102 WITH CALIBRATION EXECUTIVE

Thank you for purchasing the SCXI-1102 calibration module for Calibration Executive. This document offers an overview of calibration, tells you the equipment and environmental conditions needed for calibration, and offers device-specific instructions for loading and running a calibration procedure.

Calibration Overview

This section defines calibration, describes why it is necessary, and explains how often you should perform it.

What Is Calibration?

Calibration is a procedure of reading offset and gain errors from a device and correcting for these errors during measurement. National Instruments calibrates every SCXI-1102 module at the factory. During the factory-calibration procedure, the calibration constants are stored in the nonvolatile memory of the module—the EEPROM. From memory, these values are loaded and used as needed.

Why Calibrate?

Offset and gain errors may drift with time and temperature. As a result, the factory-set calibration constants may become invalid, requiring calibration to achieve the specified accuracy of the device.

How Often Should You Calibrate?

The measurement accuracy requirements of your application determine how often you should calibrate your SCXI-1102 module. National Instruments recommends that you perform a complete calibration at least once every year. You can shorten this interval to 90 days or 6 months if desired.

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Equipment and Other Test Requirements

This section describes the equipment and environmental conditions needed for calibration.

Test Equipment

To calibrate an SCXI-1102, you need a voltage standard, a digital multimeter (DMM), and an E Series device. The calibration procedure runs in automated mode if you use NI-IVI-supported DMMs and calibrators. National Instruments recommends you use the following standards:

- Calibrator—Fluke 5700A
- DMM—HP34401A
- 12- or 16-bit National Instruments E Series data acquisition device

Note For an explanation of automated versus manual calibration, refer to the *Automated Versus Manual Calibration* section in Chapter 2, *Calibration Executive System Overview,* of your *Calibration Executive Software User Manual.*

If you do not have these instruments, use the following accuracy requirements to select a substitute calibration standard:

- A high-precision voltage source that is more accurate than the analog circuitry on the SCXI-1102 (at least 50 ppm accurate)
- A multiranging 5 1/2 digit DMM with an accuracy of 15 ppm

Connectors

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

- Connector block such as the National Instruments SCXI-1300
- Shielded 68-pin connector cable
- SCXI adapter board
- 50-pin terminal block such as the CB-50
- 50-pin ribbon cable

Connection and Environmental Considerations

You need to be aware of several connection and environmental concerns during calibration:

- Keep connections to the SCXI module 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. It is often advisable to use twisted-pair wire to eliminate noise and thermal offsets.
- Maintain a temperature of 18–28 °C.
- Keep relative humidity below 80%.
- Allow a warm-up time of at least 30 minutes for the SCXI module and E Series device to ensure that the measurement circuitry is at a stable operating temperature.

Calibration Temperature Considerations

Temperature change affects an instrument's measurement characteristics. To take these changes into account, the tested specifications include the effects of temperature drift. For the SCXI-1102, valid temperature drift is ±5 °C.

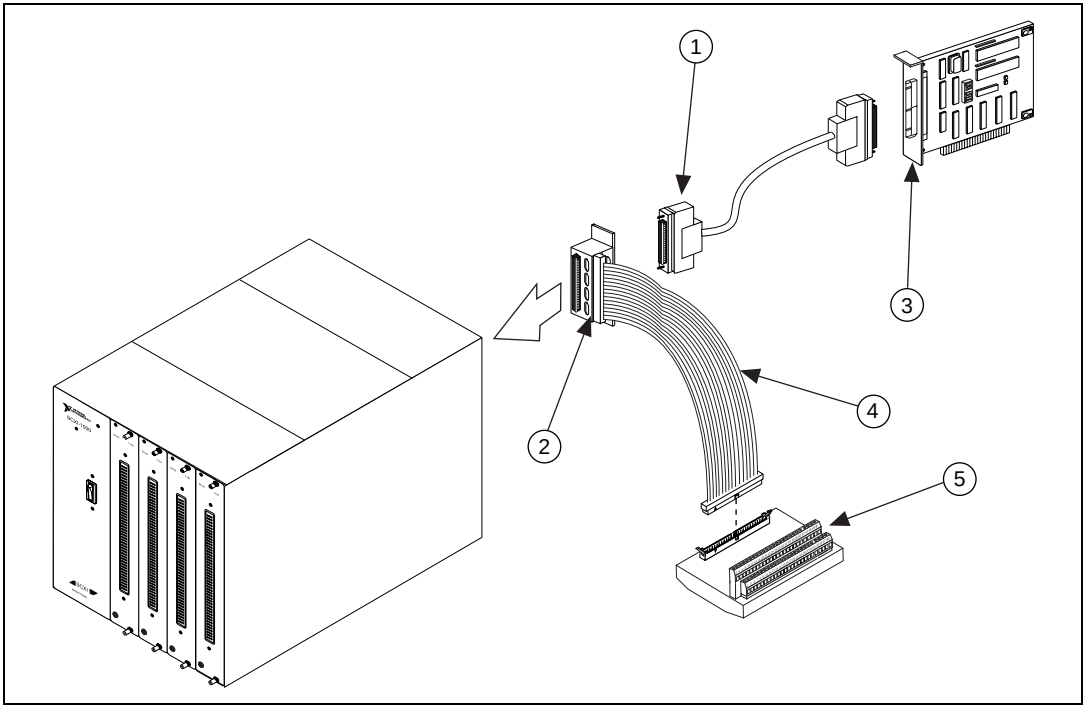
Running the SCXI-1102 Calibration Procedure

This section will help you set up and run the calibration procedure. In automated mode, the calibration procedure should take approximately 1 hour. In manual mode, the calibration procedure can take as long as 2 hours.

Setting Up Your Device

To make sure your module is ready for calibration, refer to Figure 1 as you perform the following steps:

1. Install the SCXI-1102 in slot 1 of the SCXI chassis.
2. Install the E Series device in your host computer.
3. Connect a 68-to-68-pin cable between the SCXI module and the E Series data acquisition device installed in your host computer via the SCXI adapter board.
4. Connect the terminal block to the 50-pin breakout on the adapter board.
5. Configure the hardware with Measurement & Automation Explorer.



1	68-to-68 Pin Connector	3	E Series Device	5	Terminal Block
2	SCXI Adapter Board	4	50-Pin Ribbon Cable		

Figure 1. Connecting an SCXI Module to an E Series Device and Terminal Block

Note Refer to the *SCXI Quick Start Guide* and *DAQ Quick Start Guide* that you received with this procedure for additional configuration information.

Connecting Your Calibrator, DMM, and SCXI Module

The calibration procedure will step you through the connections between your calibrator, DMM, and the SCXI module. However, the first connections are the following:

1. Connect all negative inputs of each SCXI-1102 channel together.
2. Connect all positive inputs of each channel together.
3. Connect your calibrator to CH0+ of the SCXI-1102.
4. Connect your DMM HI voltage input to pin 3 of the 50-pin terminal block.
5. Connect your DMM LO voltage input to pin 4 of the 50-pin terminal block.

Loading Calibration Procedures

Start Calibration Executive, and follow the steps listed in the Calibration Configuration Wizard to load the SCXI-1102 calibration procedure. Refer to Chapter 1, *Introduction to Calibration Executive*, in the *Calibration Executive Software User Manual* for more information on configuring and loading a calibration procedure.

To calibrate your module, the calibration procedure prompts you to enter the following information about the installed hardware:

- *MIO Device Number*—The device number assigned by Measurement & Automation Explorer for your E Series device
- *MIO Channel*—The analog input channel that your E Series device uses to communicate with your SCXI module. This value can typically be left at 0.
- *SCXI Chassis ID*—The ID number that Measurement & Automation Explorer assigns for your SCXI chassis
- *SCXI Module Slot*—The SCXI slot where the SCXI-1102 has been installed
- *MIO Resolution*—The resolution of your E Series data acquisition device; the device user manual tells you the resolution of your device
- *SCXI Module*—A list of all 1102 modules supported by the calibration procedure. Select the module type that you are going to calibrate.

When the procedure is loaded, click **Run Procedure** to start the procedure. For more information on running a calibration procedure, refer to Chapter 2, *Calibration Executive System Overview*, in your *Calibration Executive Software User Manual*.

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