

CALIBRATING THE NI 4350/4351 WITH CALIBRATION EXECUTIVE

Thank you for purchasing the NI 4350/4351 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 NI 4350/4351 device at the factory. During the factory-calibration procedure, the calibration constants are stored in the nonvolatile memory of the device—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 NI 4350/4351 device. 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.

Equipment and Other Test Requirements

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

Test Equipment

To calibrate an NI 4350/4351, you need a calibrator and a digital multimeter (DMM). The calibration procedure runs in automated mode if you use NI-IVI-supported calibrators and DMMs. National Instruments recommends you use the following standards:

- Calibrator—Fluke 5700A
- DMM—HP 3458A



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 this instrument, use the following accuracy requirements to select a substitute calibration standard:

- A calibrator that is more accurate than the A/D converter (ADC) on the device—at least 10 ppm (0.001%) 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 can be easier with the correct equipment. The automated calibration procedure for NI 4350/4351 devices is designed to only work with the following equipment:

- 68-to-68-pin shielded cable
- NI 4350/4351 calibration fixture

Connection and Environmental Considerations

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

- 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. 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 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 NI 4350/4351, valid temperature drift is ± 10 °C.

Running the NI 4350/4351 Calibration Procedure

This section will help you set up and run your the calibration procedure. In automated mode, the calibration procedure should take approximately 45 minutes. In manual mode, the calibration procedure can take as long as 1.5 hours.

Setting Up Your Device

Make sure your device is ready for calibration by following these steps:

1. Install the NI 4350/4351 device in your host computer.
2. Connect the device to the NI 4350/4351 calibration fixture with a SH68-68 shielded cable.
3. Configure the hardware with Measurement & Automation Explorer.



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

The calibration procedure will step you through any remaining connections.

Loading Calibration Procedures

Start Calibration Executive, and follow the steps listed in the Calibration Configuration Wizard to load the NI 4350/4351 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 device, the Calibration Configuration Wizard requires you to enter the following device number assigned by Measurement & Automation Explorer when you configure your hardware.

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*.

