CALIBRATION PROCEDURE

SCXI™-1322 Terminal Block

This document contains information and step-by-step instructions for verifying the temperature sensor performance of the National Instruments SCXI-1322 terminal block.

What Is Calibration?

For SCXI-1322 terminal blocks, calibration is simply determining the measurement accuracy of the components on the SCXI-1322. Because these components are not user-adjustable, calibration consists of a verification procedure only.

Why Calibrate?

Electronic components drift with time, which can affect measurement accuracy as the device ages. Calibration ensures that your SCXI-1322 terminal block is still meeting NI standards. If the results of the procedure indicate that your terminal block is out of specification, return it to NI for repair.

How Often Should You Calibrate?

The measurement accuracy requirements of your application determine the calibration interval of your SCXI-1322 terminal block. NI recommends you perform a complete calibration at least once every year. You can shorten this interval to six months or 90 days, based on the demands of your application.

NATIONAL INSTRUMENTS™

Equipment and Other Test Requirements

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

Test Equipment

Verification requires a high-precision voltage source with at least 50 ppm accuracy, and a multiranging 5 1/2 digit digital multimeter (DMM) with 15 ppm accuracy.

NI recommends you use the following instruments for verification of an SCXI-1322:

- Calibrator—Fluke 5700A
- DMM—NI 4070 or HP 34401A

If these instruments are not available, use the accuracy requirements previously listed to select a substitute calibration standard.

Software and Documentation

No software is required to verify the operation of the SCXI-1322. All required documentation is found in this calibration procedure. However, if you would like more information on the product, refer to the *SCXI-1322 High-Voltage Terminal Block Installation Guide*.

Test Conditions

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

- Keep connections to the SCXI-1322 short. Long cables and wires act as antennae, picking up extra noise 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.
- Keep relative humidity below 80%.
- Maintain temperature between 15 °C and 35 °C.
- Allow a warm-up time of at least 15 minutes to ensure that the circuitry is at a stable operating temperature.

Verification Procedure

1. Connect a +5 VDC power source to the terminal block.
   a. Hold the SCXI-1322 vertically and view it from the rear. The terminals on the 96-pin DIN connector are illustrated in Figure 1.

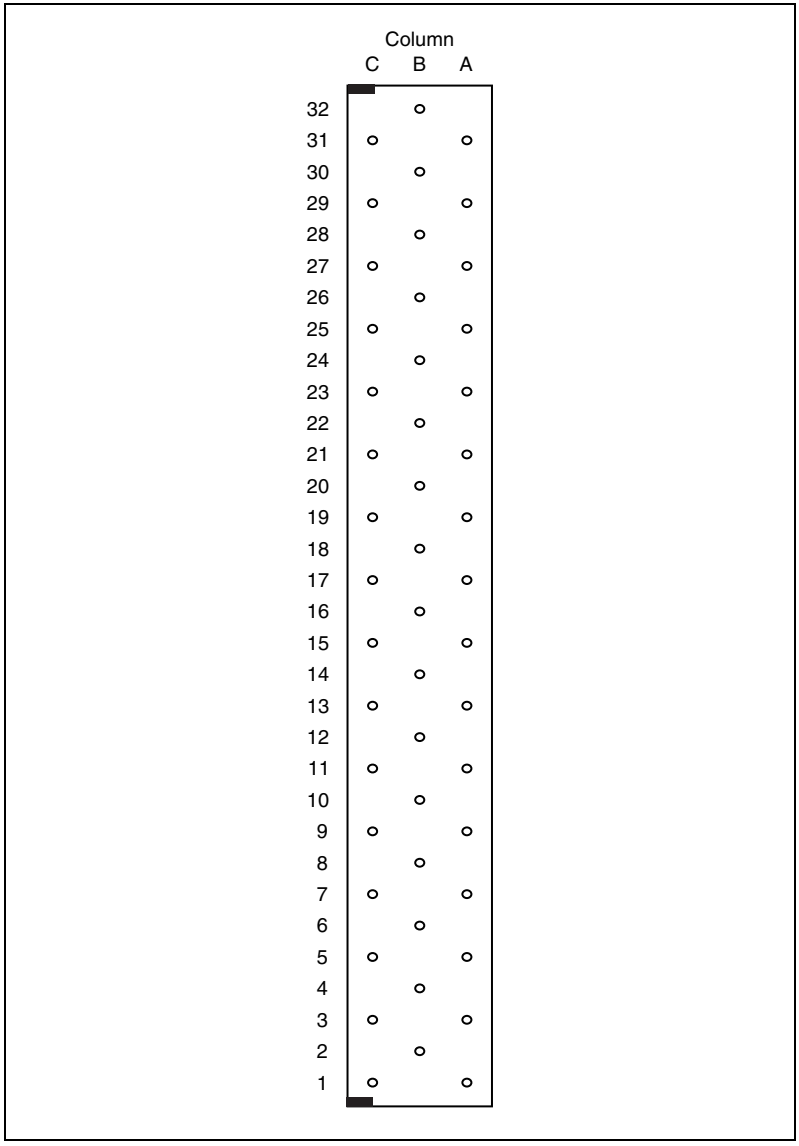

Figure 1. SCXI-1322 96-Pin DIN Connector

This conforms to the labeling of the pins on the front connector of a matching SCXI terminal block. It does not necessarily correspond to labeling of the pins on the rear of the terminal block connector itself, which you can only view by opening the terminal block enclosure.

b. Strip 12.7 mm (0.5 in.) of insulation from one end of a 22 AWG solid wire. Insert the stripped end of the wire into terminal A7 on the 96-pin female DIN connector on the rear of the terminal block. Attach the other end of this wire to the positive terminal of the +5 VDC power supply.

c. Strip 12.7 mm (0.5 in.) of insulation from one end of a 22 AWG solid wire. Insert the stripped end of the wire into terminal A1 on the 96-pin female DIN connector on the rear of the terminal block. Attach the other end of this wire to the negative terminal of the +5 VDC power supply.

2. Connect a calibrated DMM to the temperature sensor output of the terminal block.

   a. Strip 12.7 mm (0.5 in.) of insulation from one end of a 22 AWG solid wire. Insert the stripped end of the wire into terminal A3 on the 96-pin female DIN connector on the rear of the terminal block. Attach the other end of this wire to the positive input terminal of the calibrated DMM.

   b. Connect the negative input terminal of the calibrated DMM to the negative terminal of the +5 VDC power supply.

3. Place the terminal block in a temperature-controlled environment where the temperature is between 15 °C and 35 °C.

4. When the terminal block temperature has equilibrated with its surroundings, measure the temperature sensor output V_{meas} using a calibrated DMM.

5. Measure the actual temperature T_{act} in the temperature-controlled environment using a calibrated temperature-measurement instrument.

6. Convert V_{meas} (in volts) to measured temperature T_{meas} (in °C) by performing the following calculation.

   a. Calculate.

$$x = \frac{2.5 - V_{meas}}{5000}$$

   b. Calculate.

$$y = \ln\left(\frac{V_{meas}}{x}\right)$$

   c. Calculate.

$$T_{meas} = \left[\frac{1}{a + y(b + cy^2)}\right] - 273.15$$

   where

$$a = 1.295361 \times 10^{-3}$$

$$b = 2.343159 \times 10^{-4}$$

$$c = 1.018703 \times 10^{-7}$$

7. Compare T_{act} to T_{meas}.

   - If $(T_{meas} - 0.65\ °C) \le T_{act} \le (T_{meas} + 0.65\ °C)$, you have verified that the operation of the terminal block temperature sensor is within its specifications.
   - If $T_{act} < (T_{meas} - 0.65\ °C)$, the temperature sensor is nonfunctional. Return the terminal block to NI for repair or replacement.
   - If $T_{act} > (T_{meas} + 0.65\ °C)$, the temperature sensor is nonfunctional. Return the terminal block to NI for repair or replacement.

You have completed the calibration verification procedure for the SCXI-1322.

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