SCXI™-1331 HIGH-VOLTAGE GENERAL-PURPOSE TERMINAL BLOCK

This guide describes how to use and install the SCXI-1331 terminal block with your SCXI-1127/1128 module.

Introduction

The SCXI-1331 terminal block consists of a shielded board with 84 screw terminals for easy connection to the SCXI-1127 or the SCXI-1128 input connector. The SCXI-1331 allows you to connect 1-, 2-, and 4-wire signals to the SCXI-1127/1128. It also has terminals for connecting external trigger signals to the SCXI-1127/1128. Detailed explanations of the various input and triggering terminals of the SCXI-1331 are in the *SCXI-1127/1128 User Manual*.

Conventions Used in This Guide

The following conventions are used in this guide:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
	This icon denotes a note, which alerts you to important information.
	This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

italic	Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts.

What You Need to Get Started

To set up and use your SCXI-1331 terminal block, you need the following items:

❑ SCXI-1331 terminal block

❑ This installation guide

❑ SCXI chassis

❑ SCXI-1127 or SCXI-1128 module

❑ *SCXI-1127/1128 User Manual*

❑ Number 1 and 2 Phillips-head screwdrivers

❑ 1/8 in. flathead screwdriver

❑ Long-nose pliers

❑ Wire cutter

❑ Wire insulation stripper

Safety Information

The following cautions contain important safety information concerning hazardous voltages.

⚠ **Cautions**   You *must* insulate all of your signal connections appropriately to the *highest* available voltage with which the terminal block may come in contact. Any voltage connected to the terminal block may appear on any other pin of this terminal block.

Equipment described in this document must be used in an Installation Category II[1] environment per IEC 60664. This category requires local level mains-connected installation.

Do *not* operate the module in an explosive atmosphere or where there may be flammable gases or fumes.

Shock Hazard—This unit should only be opened by qualified personnel aware of the dangers involved. Disconnect all power before removing the cover. Always install the grounding screw. If signal wires are connected to the module or terminal block, dangerous voltages may exist even when the equipment is turned off. Before you remove any installed terminal block or module, disconnect the AC power line or any high-voltage sources, (≥ 30 V_{rms} and 42.4 V_{peak}, or 60 VDC), that may be connected to any terminal block or module.

Do not operate damaged equipment. The safety-protection features built into this module can be impaired if the module becomes damaged in any way. If it is damaged, turn the module off and do *not* use it until service-trained personnel can check its safety. If necessary, return the module to National Instruments for service and repair to ensure that its safety is not compromised.

The terminal block must be used in a UL-listed SCXI chassis with a UL-listed SCXI module.

Use only 26–14 AWG wire with a voltage rating of 300 V and 60 °C for all signals that may come in contact with 250 V.

Do not substitute parts or modify equipment. Because of the danger of introducing additional hazards, do *not* install unauthorized parts or modify the terminal block. Return the module to National Instruments for service and repair to ensure that its safety features are not compromised.

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[1] Category II refers to local-level power distribution such as that provided by a standard wall outlet.

When using the terminal block with high common-mode voltages, you *must* insulate your signal wires appropriately. National Instruments is *not* liable for any damages or injuries resulting from inadequate signal wire insulation.

Connections, including power signals to ground and vice versa, that exceed any of the maximum signal ratings on the SCXI-1331 can damage any or all of the modules connected to the SCXI chassis, the host computer, and the SCXI-1331. National Instruments is *not* liable for any damages or injuries resulting from incorrect signal connections.

If high voltages ($\geq$ 30 V_{rms} and 42.4 V_{peak}, or 60 VDC) are present, you must connect safety earth ground to the strain-relief tab of the terminal block. This action maintains compliance with UL 3111-1 and IEC-61010, and protects against electric shock when the terminal block is not connected to the chassis. To connect the safety earth ground to the strain-relief tab, run an earth ground wire in the cable from the signal source to the terminal block. National Instruments is *not* liable for any damages or injuries resulting from inadequate safety earth ground connections.

Do *not* loosen or re-orient the safety ground solder lug hardware when connecting the safety ground wire; to do so reduces the safety isolation between the high voltage and safety ground.

Clean the terminal block by brushing off light dust with a soft, nonmetallic brush. Remove other contaminants with deionized water and a stiff nonmetallic brush. The unit must be completely dry and free from contaminants before returning to service.

Connecting Signals to the Terminal Block

📝 **Note** Refer to the *Safety Information* section before removing equipment covers or connecting or disconnecting any signal wires.

To connect the signal to the terminal block, refer to Figure 1 while performing the following steps:
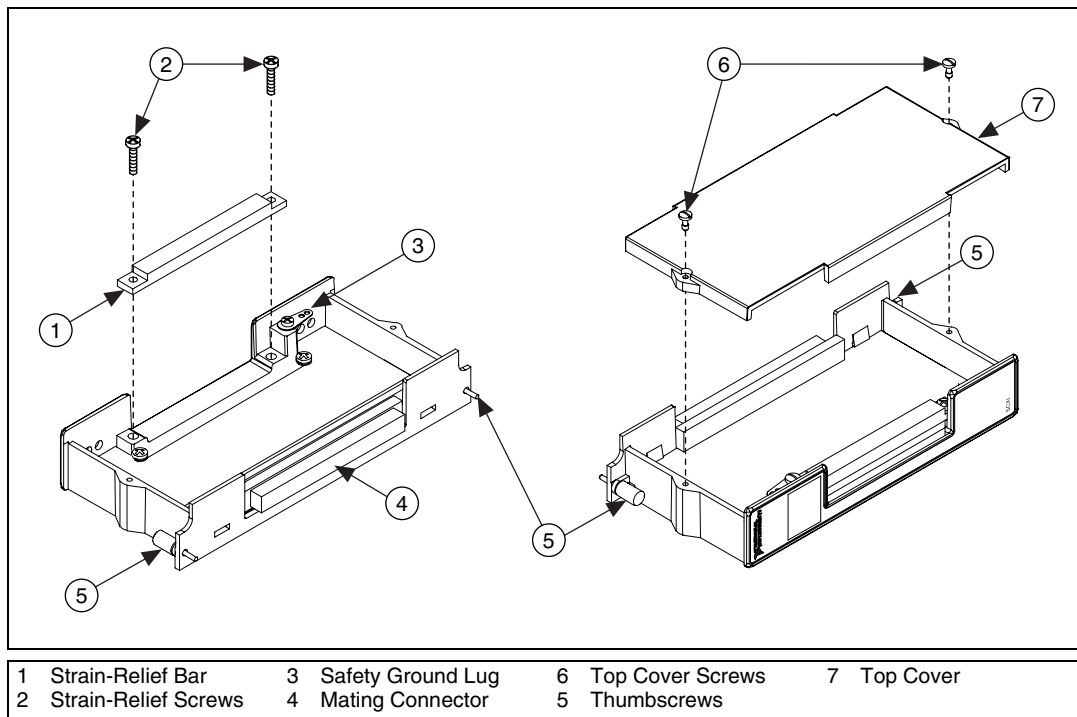

1	Strain-Relief Bar	3	Safety Ground Lug	6	Top Cover Screws	7	Top Cover
2	Strain-Relief Screws	4	Mating Connector	5	Thumbscrews		

Figure 1. SCXI-1331 Parts Locator Diagram

1. Unscrew the top cover screws and remove the top cover.

2. Loosen the strain-relief screws and remove the strain-relief bar.

3. Run the signal wires through the strain-relief opening. You can add insulation or padding if necessary.

4. Prepare your signal wire by stripping the insulation no more than 7 mm.

5. Connect the wires to the screw terminals by inserting the stripped end of the wire fully into the terminal. No bare wire should extend past the screw terminal. Exposed wire increases the risk of short circuits and equipment failure.

When connecting your signals to the SCXI-1331, follow the labeling on the SCXI-1331 for the appropriate module, as indicated in Figure 2.
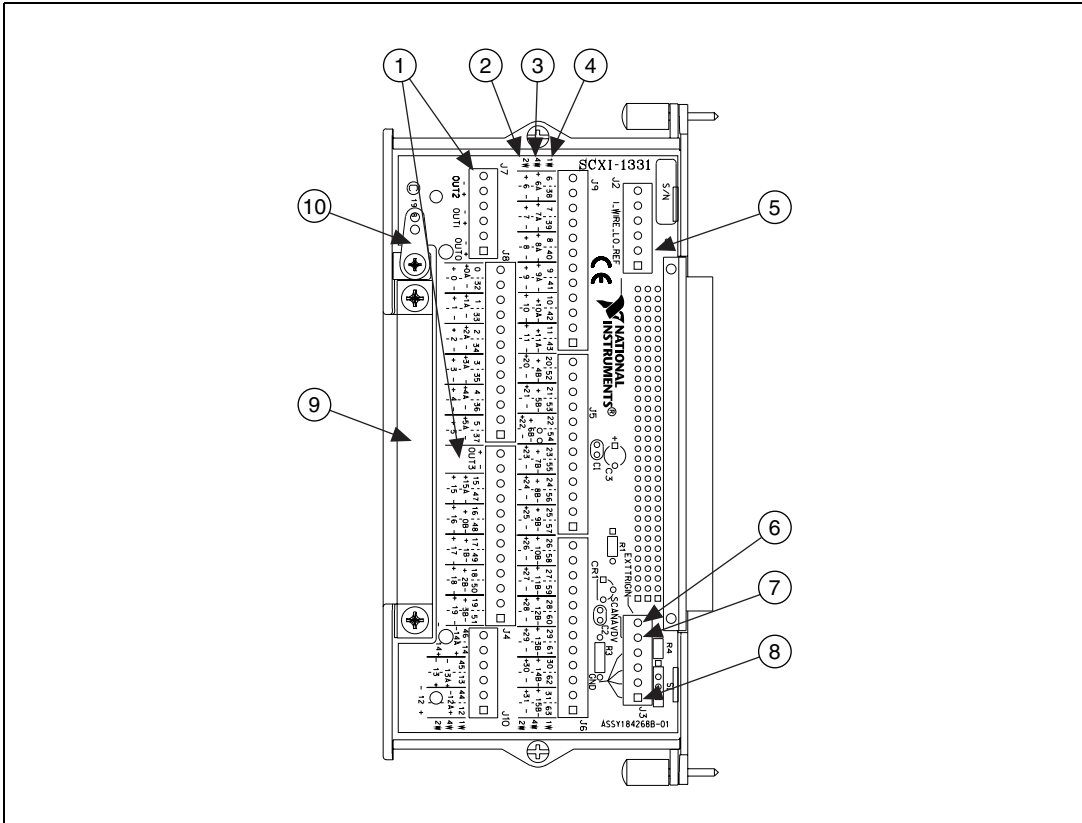
1	Multiplexer Outputs	6	External Trigger Input (EXTTRIGIN)
2	2-Wire Mode Channel Numbering	7	Scanner Advanced Output (SCANADV)
3	4-Wire Mode Channel Numbering	8	Ground Reference for Trigger Signals
4	1-Wire Mode Channel Numbering	9	Cable Strain Relief
5	1-Wire Low Reference (1_WIRE_LO_REF)	10	Safety Ground Lug

Figure 2. SCXI-1331 Signal Connections

6. Tighten the screws to a torque of 5–7 in.-lb.

7. Connect safety earth ground to the safety ground lug. Refer to the *Safety Information* section for connection information.

8. Reinstall the strain-relief bar and tighten the strain-relief screws.

9. Reinstall the top cover and tighten the top cover screws.

Installing the Terminal Block

To connect the terminal block to the SCXI module front connector, perform the following steps:

1. Connect the module front connector to its mating connector on the terminal block.

2. Tighten the top and bottom thumbscrews on the back of the terminal block to hold it securely in place.

📝 **Note** For accurate cold-junction compensation, place the SCXI chassis away from an extreme temperature differential.

Temperature Sensor Output and Accuracy

The SCXI-1331 temperature sensor outputs 0.2 to 0.024 V from 0 to 50 °C and has an accuracy of ±0.5 °C over the 15 to 35 °C range and ±0.9 °C over the 0 to 15 °C and 35 to 50 °C ranges.[1]

National Instruments software can convert a thermistor voltage to the thermistor temperature for the circuit diagram shown in Figure 3.
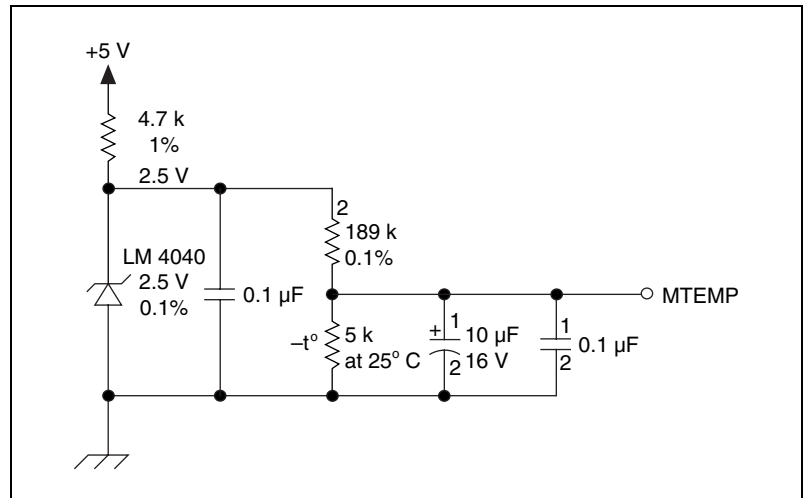

Figure 3. Temperature Sensor Circuit Diagram

In LabVIEW, you can use the Convert Thermistor Reading VI in the **Data Acquisition»Signal Conditioning** palette. If you are using

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[1] Includes the combined effects of the temperature sensor accuracy and the temperature difference between the temperature sensor and any screw terminal. The temperature sensor accuracy includes tolerances in all component values, the effects caused by temperature and loading, and self-heating.

LabWindows/CVI or NI-DAQ, use the `Thermistor_Convert` function. This VI takes the output voltage of the temperature sensor, the reference voltage (2.5 V), and the precision resistance (189 kΩ) and returns the thermistor temperature.

Alternatively, you can use the following formulas:

$$T(°C) = T_K - 273.15$$

where T_K is the temperature in Kelvin,

$$T_K = \frac{1}{[a + b(\ln R_T) + c(\ln R_T)^3]}$$

where $a = 1.295361 \times 10^{-3}$,
$b = 2.343159 \times 10^{-4}$,
$c = 1.018703 \times 10^{-7}$, and
R_T = resistance of the thermistor in ohms,

$$R_T = 189,000\left(\frac{V_{TEMPOUT}}{2.5 - V_{TEMPOUT}}\right)$$

where $V_{TEMPOUT}$ is the output voltage of the temperature sensor,

$$T(°F) = \frac{[T(°C)]9}{5} + 32$$

where $T(°F)$ and $T(°C)$ are the temperature readings in degrees Fahrenheit and degrees Celsius, respectively.

Specifications

All specifications are typical at 25 °C unless otherwise specified.

Cold-Junction Sensor

Accuracy[1]...0.5 °C from 15 to 35 °C
0.9 °C from 0 to 15 °C and
35 to 50 °C

Output ....0.2 to 0.024 V from 0 to 50 °C

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[1] The temperature sensor accuracy includes tolerances in all component values, effects caused by temperature, loading, self-heating, and temperature gradients.

Maximum Voltage

Terminal to earth .... 250 V_{rms} or VDC

Terminal to terminal .... 250 V_{rms} or VDC

Environment

Operating temperature .... 0 to 50 °C

Storage temperature .... −20 to 70 °C

Relative humidity .... 10 to 90%

Safety

Designed in accordance with IEC61010-1, UL 3111-1, and
CAN/CSA C22.2 No. 1010.1 for electrical measuring and test equipment

For use at altitudes up to 2000 m

Indoor use only

Installation Category II

Pollution Degree 2

Electromagnetic Compatibility

EMC/EMI .... CE, C-Tick and FCC Part 15
(Class A) Compliant

Electrical emissions .... EN 55011 Class A at 10 m;
FCC Part 15A above 1 GHz

Electrical immunity .... Evaluated to EN 61326:1998,
Table 1

Note This device should only be operated with shielded cabling for full EMC and EMI
compliance. See the Declaration of Conformity for this product for any additional
regulatory compliance information.

Technical Support Resources

NI Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of ni.com

Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of ni.com. Branch office Web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 03 9879 5166, Austria 0662 45 79 90 0, Belgium 02 757 00 20, Brazil 011 284 5011, Canada (Calgary) 403 274 9391, Canada (Ottawa) 613 233 5949, Canada (Québec) 514 694 8521, China (Shanghai) 021 6555 7838, China (ShenZhen) 0755 3904939, Denmark 45 76 26 00, Finland 09 725 725 11, France 01 48 14 24 24, Germany 089 741 31 30, Greece 30 1 42 96 427, Hong Kong 2645 3186, India 91805275406, Israel 03 6120092, Italy 02 413091, Japan 03 5472 2970, Korea 02 596 7456, Mexico 5 280 7625, Netherlands 0348 433466, New Zealand 09 914 0488, Norway 32 27 73 00, Poland 0 22 528 94 06, Portugal 351 1 726 9011, Singapore 2265886, Spain 91 640 0085, Sweden 08 587 895 00, Switzerland 056 200 51 51, Taiwan 02 2528 7227, United Kingdom 01635 523545