# SCXI Terminal Blocks

## SCXI Terminal Blocks

- Terminal blocks for quick, easy connections
- Strain-relief clamps for reliable wiring
- Connectivity options including BNC and thermocouple plugs
- Shielded front-mount terminal blocks
- Rack-mount and DIN-rail-mount options available
- Terminal block options for specific measurement types
- Onboard temperature sensor for cold-junction compensation
- Isothermal construction for high-accuracy thermocouple measurements
- High-voltage attenuation
- AC/DC coupling
- Bridge offset nulling, shunt calibration
- Current inputs



## Overview

National Instruments SCXI terminal blocks provide a convenient method for connecting and disconnecting signals to your system. The NI SCXI-13xx front-mount terminal blocks provide direct connections to transducers at the screw terminals located within a fully shielded enclosure or at front-mounted BNC connectors. Strain-relief clamps hold the signal wires safely in place. You can also choose either the TC-2095 or BNC-2095 rack-mount terminal blocks for minithermocouple connectors or BNC connectors. These terminal blocks are ideal solutions for large-channel-count temperature or voltage applications.

TBX DIN-rail mount terminal blocks are an alternative to the SCXI-13xx terminal blocks which, attach directly to the front of an SCXI module. The TBX system includes shielded cables that connect the front I/O connector of an SCXI module to a TBX terminal block.

Some terminal blocks are designed for specific input types, such as thermocouples, strain gauges, and high-voltage inputs. See Tables 2, 3, and 4 to determine which SCXI terminal blocks are compatible with your SCXI module.

*Figure 1. Terminal Block Configuration*

| Terminal Block | Compatible SCXI Modules | Cabling | CJC | Special Features |
|---|---|---|---|---|
| | | | | Open TC detection Isothermal construction, selectable ground referencing |
| | | | | Sockets for current input resistors, Isothermal construction, high-voltage 250 VDC |
| | | | | |
| | | | | |
| | | | | |

*The TBX-24F is a general-purpose feedthrough terminal block that you can use with any SCXI module or front mounting terminal blocks.

*Table 1. TBX Terminal Block Selection Guide*

# SCXI Terminal Blocks

## TBX Terminal Block
### Selection Guide

Use the following steps to select the correct combination of TBX terminal blocks and cables for your SCXI system:

**1. Select the required terminal blocks** – For each SCXI module, use Table 1 to select the proper TBX terminal block. If a TBX-13xx terminal block is not available for your SCXI module, select the appropriate number of general-purpose TBX-24F feedthrough terminal blocks.

**2. Select cabling** – For each TBX terminal block, Table 1 lists the cable needed to connect the TBX terminal block to the SCXI module. Shielded cables are available in lengths of 1, 2, and 5 m. If using the TBX-1303, you also have the option to build a custom cable using the SBS-96F backshell kit. For each TBX-1303 for which you will build a custom cable, select two SBS-96F kits. If using the TBX-24F, you will use discrete wires to connect the TBX-24F to an SCXI front-mounting terminal block. Therefore, select the appropriate SCXI front-mounting terminal block for each SCXI module that will use the TBX-24F.

**3. Rack-mount accessory (optional)** – If mounting for 19 in. rack enclosures is needed, use Table 2 to select the appropriate number of TBX-RM1 rack-mount kits.

**4. Calibration** – Calibration of cold-junction sensors and attenuation terminal blocks is available for some devices. For more information, please visit ***ni.com/calibration***

| Module | Terminal Blocks | CJC[1] Sensor | Other Terminal Block Functions |
|---|---|---|---|
| | | | Isothermal, signal ground referencing, and open thermocouple detection |
| | | | – |
| | | | Thermocouple plugs, signal ground referencing, Isothermal |
| | | | – |
| | | | Extends signal input range to 250 $V_{rms}$, switch configurable per channel |
| | | | Isothermal, high-accuracy design for thermocouples |
| | | | Current Input, 249 resistor across each input |
| | | | Extends signal input range to 300 $V_{rms}$, programmable per channel |
| | | | – |
| | | | Extends signal input range to 250 $V_{rms}$, switch configurable per channel |
| | | | Isothermal, high-accuracy design for thermocouples |
| | | | Current Input, 249 resistor across each input |
| | | | – |
| | | | Offset nulling and shunt calibration for strain gauges |
| | | | Extends signal input range to 250 $V_{rms}$, switch configurable per channel |
| | | | Isothermal, high-accuracy design for thermocouples |
| | | | – |
| | | | – |
| | | | – |

[1] [2]Recommended for thermocouples; includes isothermal design and high-precision CJC sensor. [3]Recommended for RTDs when using both SCXI-1102 and SCXI-1581.

*Table 3. SCXI-13xx, TC, and BNC Selection Guide*

| Terminal Block | Width Required (TBX-RM1 Rack-Mount) |
|---|---|
| TBX-1303 | One-half |
| TBX-1325, TBX-1326, TBX-1328, TBX-1329, TBX-24F, CB-50 | One-third |

*Table 2. Rack-Mount Widths of TBX Terminal Blocks*

| Module | Connector and Shell Assembly |
|---|---|
| SCXI-1100, SCXI-1102B/C, SCXI-1140, SCXI-1141, SCXI-1181 | SCXI-1310 |
| SCXI-1120, SCXI-1120D, SCXI-1121, SCXI-1126, and SCXI-1181 | SCXI-1330 |

*Table 4. Custom Cabling Accessories*

# SCXI Terminal Blocks

*Figure 1. SCXI-1303 Terminal Block*

*Figure 2. SCXI-1305 Terminal Block*

*Figure 3. SCXI-1310 Connector and Shell Assembly*

**SCXI-1300** .....777687-00
The SCXI-1300 connects input signals to the SCXI-1100, SCXI-1102/B/C, and SCXI-1104/C modules. The SCXI-1300 is a general-purpose terminal block with an onboard temperature sensor for cold-junction compensation. Also works with SCXI-1181 and SCXI-1181K modules.

**SCXI-1301** .....777687-01
20-screw terminal block for the SCXI-1140, SCXI-1181, and SCXI-1181K modules.

**SCXI-1302** .....777687-02
50-screw terminal block for SCXI-1180 feedthrough panel.

**SCXI-1303 (See Figure 1)** .....777687-03
Terminal block for use with the SCXI-1100 and SCXI-1102/B/C modules. Designed especially for high-accuracy thermocouple measurements, the SCXI-1303 includes isothermal construction that minimizes errors caused by thermal gradients between terminals and the cold-junction sensor. The SCXI-1303 also includes circuitry for open-thermocouple detection as well as automatic ground referencing for floating (nongrounded) thermocouples.

**SCXI-1304** .....777687-04
The SCXI-1304, for the SCXI-114x modules, includes AC coupling circuitry, with switches on each channel. Each channel also includes a switchable connection to ground through a 100 k bias resistor to provide a reference for floating input sources.

**SCXI-1305 (See Figure 2)**.....777687-05
Includes convenient BNC connectors for use with the SCXI-1120/D, SCXI-1121, SCXI-1125, SCXI-1126, and SCXI-114x. Functionally equivalent to the SCXI-1304 terminal block, the SCXI-1305 includes switchable AC coupling circuitry and ground referencing on each channel.

**SCXI-1308** .....777687-08
Current input terminal block for the SCXI-1100 and SCXI-1102/B/C analog input modules. Each input includes a 249 precision resistor so you can read 0 to 20 mA and 4 to 20 mA current inputs.

**SCXI-1310 (See Figure 3)** .....777687-10
Connector and shell assembly used to create custom cabling solutions from the SCXI-1100, SCXI-1102/B/C, SCXI-1104/C, SCXI-114x, and SCXI-1181 to custom terminations. A low-cost alternative to SCXI terminal blocks, it consists of a hardened plastic enclosure and one connector with solder pins for signal connections.

**SCXI-1313** .....777687-13
Extends the input range of the SCXI-1125 to 300 $V_{rms}$ or 300 VDC, on a per-channel basis programmatically through software commands. The SCXI-1313 also includes an onboard temperature sensor for thermocouples cold-junction compensation.

# SCXI Terminal Blocks



**SCXI-1314** .....777687-14
Front-mounting terminal block for the SCXI-1520 module. With factory-installed and socketed 350 quarter-bridge completion resistors for each channel. Eight 120 resistors for use with 120 quarter-bridge strain gauges are included, but not installed. It also includes two factory-installed, socketed 100 k shunt calibration resistors per channel.

**SCXI-1315** .....777687-15
8-channel front-mounting terminal block for the SCXI-1540 LVDT with six terminals for each LVDT channel – CH+, CH-, EX+, EX-, Synch, and GND.

**SCXI-1320 (See Figure 4)** .....777687-20
General-purpose terminal block for connecting signals to the SCXI-1120/D, SCXI-1121, SCXI-1125, and SCXI-1126 modules. It includes an onboard temperature sensor for cold-junction compensation using thermocouples, but the SCXI-1328 is recommended for precision thermocouple measurements.

**SCXI-1321 (See Figure 5)** .....777687-21
Adds nulling and shunt calibration to SCXI-1121 strain guage applications. With a front-panel trimming potentiometer, you can manually null out the offset voltage of bridge transducers. Each channel includes shunt calibration circuits. When activated, a switch connects a 301 k shunt resistor in parallel with the strain gauge. Both the nulling resistor and the shunt resistor are socketed for easy customization.

**SCXI-1322** .....777687-22
Terminal block required to connect signals to the SCXI-1122 module that includes an onboard temperature sensor for cold-junction compensation.

**SCXI-1324** .....777687-24
High-voltage terminal block with 48 screw terminals for the SCXI-1160 relay module.

**SCXI-1325** .....777687-25
26-screw terminal block for the SCXI-1124 module.

**SCXI-1326** .....777687-26
High-voltage terminal block with 48 screw terminals for the SCXI-1162 Series and SCXI-1163 Series modules.

**SCXI-1327 (See Figure 6)** .....777687-27
With the SCXI-1327 you can extend the input range of the SCXI-1120/D and SCXI-1121 to ±250 V, and extend the threshold level of the SCXI-1126 module from 5 V up to 300 V. The extended input voltage range is enabled or disabled on a per-channel basis using switches located within the SCXI-1327. The SCXI-1327 also includes an onboard temperature sensor for cold-junction compensation with thermocouples. Using the SCXI-1327 reduces the input impedence of your SCXI module to 1 M .

**SCXI-1328 (See Figure 7)** .....777687-28
Isothermal terminal block with a high-precision cold-junction sensor for high-accuracy thermocouple applications with the SCXI-1120/D, SCXI-1121, or SCXI-1125.

**SCXI-1330** .....777687-30

*Figure 4. SCXI-1320 Terminal Block*

*Figure 5. SCXI-1321 Terminal Block*

*Figure 6. SCXI-1327 Terminal Block*

*Figure 7. SCXI-1328 Terminal Block*

# SCXI Terminal Blocks

*Figure 8. SCXI-1331Terminal Block*

*Figure 9. SCXI-1332 Terminal Block*



*Figure 10. BNC-2095*

Connector and shell assembly (hardened plastic enclosure and solder pins) used to create custom cabling solutions from the SCXI-1120/D, SCXI-1121, SCXI-1125, SCXI-1126, and SCXI-1181 to custom terminations.

**SCXI-1331 (See Figure 8)** .....777687-31
General-purpose terminal block for the SCXI-1127 multiplexer/matrix module with 64 generic screw terminals and a cold-junction compensation sensor. For SCXI-1127 multiplexer applications or matrix configurations other than a multiple of eight columns by four rows. Includes sockets for matrix expansion cables.

**SCXI-1332 (See Figure 9)** .....777687-32
Multiplexer/matrix terminal block for the SCXI-1127 configures the SCXI-1127 as an eight column by four row switching matrix. You can connect signals to both the columns and rows using screw terminals.

**SCXI-1333** .....777687-33
**SCXI-1334** .....777687-34
**SCXI-1335** .....777687-35
**SCXI-1336** .....777687-36
**SCXI-1337** .....777687-37
**SCXI-1339** .....777687-39
These terminal blocks are designed for use with the SCXI-1129 high-density matrix switching module. Each of these terminal blocks gives the high-density matrix a different configuration. See page 484 for more information on how to choose the appropriate series of terminal blocks for the SCXI-1129.

**SCXI-1338** .....777687-38
Current input terminal block for the SCXI-1120/D, SCXI-1125, and SCXI-1126. Each input includes a 249 precision resistor for reading 0 to 20 mA or 4 to 20 mA current inputs.

**BNC-2095 (See Figure 10)** .....777508-01
The BNC-2095 has 32 labeled BNC connectors, one for each input channel of the SCXI-1100, or SCXI-1104/C. The BNC-2095 also includes circuitry for configurable signal referencing. You can enable or disable both the pull-up and pull-down resistors on a per-channel basis using switches.

**TC-2095** .....777509-01
The TC-2095 has 32 miniature uncompensated thermocouple plugs, one for each input channel of the SCXI-1100 or SCXI-1102/B/C and a thermistor for accurate cold-junction compensation. In addition, the TC-2095 includes circuitry for configurable signal referencing. You can enable or disable both the pull-up and pull-down resistors on a per-channel basis using switches located on the rear of the TC-2095. The TC-2095 is not recommended for use with the SCXI-1104/C. The TC-2095 requires the SH96-96 or R96-96 for connection to a SCXI module.

# SCXI TBX Terminal Blocks



**TBX-1303 (See Figure 11)** .....777207-03
Designed for thermocouples, with cold-junction compensation sensor, isothermal construction with a plastic cover to minimize thermal gradients, open-thermocouple detection circuitry, and automatic ground-referencing circuitry. With the SCXI-1102B/C, the TBX-1303 provides a high-impedance path to ground so that systems work reliably with either floating or ground-referenced thermocouples. For applications with the SCXI-1100, you can configure the channels as ground-referenced or floating in blocks of eight channels. The TBX-1303 also works with the SCXI-1181 breadboard module.

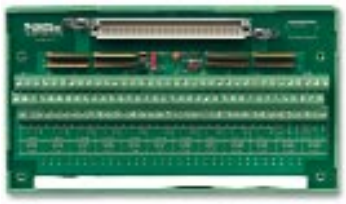

*Figure 11. TBX-1303*

**TBX-96** .....777264-01
Mass termination terminal block that provides a generic solution for the SCXI-1100, SCXI-1102B/C, SCXI-1104/C, and the SCXI-1140 Series.

**TBX-1316 (See Figure 12)** .....777207-16
High-voltage terminal block, for extending the input range of the SCXI-1120/D, SCXI-1125, or SCXI-1126 modules to ±1000 VDC (680 $V_{rms}$) Each input channel includes a 200:1 attenuation circuit, and offers a positive, negative, and ground terminal for up to 12 AWG wire. You can panel mount this enclosure or simply place it on a desktop. The hinged lid makes accessing the signals easier and key locked for safety. The TBX-1316 is rated for Category III installations.

*Figure 12. TBX-1316*

**TBX-1325** .....777207-25
Terminal block with 30 screw terminals for signal connections to the SCXI-1124 module. You cable the TBX-1325 to the SCXI-1124 with the SH48-48-A shielded cable.

*Figure 13. TBX-1326*

**TBX-1326 (See Figure 13)** .....777207-26
High-voltage terminal block with 48 screw terminals for signal connections to the SCXI-1162, SCXI-1162HV, SCXI-1163, and SCXI-1163R modules. You can cable the TBX-1326 to the SCXI module with the SH48-48-B shielded cable. Warning: The TBX-1326 and SH48-48-B limit the maximum working common-mode voltage between banks or between banks and earth ground to 250 $V_{rms}$ maximum.

**TBX-1328 (See Figure 14)** .....777207-28
Terminal block for the SCXI-1120/D, SCXI-1121, SCXI-1125, and SCXI-1126 modules. The TBX-1328 includes a total of 24 screw terminals, including three terminals (CH+, CH-, and chassis ground) for each input channel and sockets for the installation of resistors for 4 to 20 mA inputs. When used with thermocouples, the TBX-1328 maximizes measurement accuracy with an isothermal construction and a plastic cover that minimizes thermal gradients across the terminal block and the resulting errors.

*Figure 14. TBX-1328*

**TBX-1329 (See Figure 15)** .....777207-29
Provides selectable AC coupling for the SCXI-1120/D, SCXI-1121, SCXI-1125, and SCXI-1126 modules.

**TBX-24F** .....777276-01
The TBX-24F is a general-purpose screw terminal block with feedthrough connections for 24 signal lines. You connect the TBX-24F to the SCXI module with discrete wires connected to a standard SCXI terminal block.

*Figure 15. TBX-1329*

# SCXI-13xx, TBX, and BNC/TC Terminal Block Specifications

## Specifications

Typical for 25 ˚C unless otherwise noted.

### SCXI-13xx

Cold-Junction Sensor

Accuracy and repeatability[1]

| | Accuracy | | |
|---|---|---|---|
| Te | | | |
| | | | |
| SCXI-1303[2] | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Sensor output for SCXI-1300,
- SCXI-1320, SCXI-1321 ..... ±10 mV/˚C
- SCXI-1303/1322/1327/1328 ..... 1.91 V (at 0 ˚C) to 0.58 V (at 55 ˚C) (thermistor)

Maximum field wire gauge for SCXI-1300/
- 1302/1303/1314/1322/1324 ..... 26-16 AWG
- 1301/1304/1313/1315/1320/1321/ 1325/1327/1328/1331/1332 ..... 26-14 AWG

AC coupling (SCXI-1304 and SCXI-1305) ..... The AC coupling circuitry on each channel has a corner frequency of 0.16 Hz, rejection capacity of ±50 VDC, and input impedance of 2 M differential, 1 M common mode.
- Corner frequency ..... 0.16 Hz 1-pole RC
- DC rejection capacity ..... ±50 VDC
- Current input SCXI-1308/1338 ..... 0 to 20 mA

### BNC-2095, TC-2095

Input connectors
- BNC-2095 ..... 32 BNC connectors
- TC-2095 ..... 32 thermocouple plugs, uncompensated

Output (to SCXI module) ..... 96-pin DIN

Cold-junction sensor (TC-2095)
- Output ..... 1.91 V (0 ˚C) to 0.58 V (55 ˚C)
- Accuracy (15 to 35 ˚C)[3] ..... 0.5 ˚C for SCXI-1102/B/C; 0.65 ˚C for SCXI-1100
- Repeatability (15 to 35 ˚C)[3] ..... 0.35 ˚C for SCXI 1102/B/C; 0.5 ˚C for SCXI-1100

Signal referencing
- CH+ input ..... 10 M to +5 V, user switchable
- CH- input ..... 10 M or +10 to ground, user switchable 1-pole RC

#### Physical

Dimensions ..... 49.3 by 4.3 by 18.8 cm (19.0 by 1.7 by 7.4 in.)

### TBX Series

Typical for 25˚ C unless otherwise noted.

Maximum working voltage (signal + common mode)
- TBX-1316 ..... 1000 VDC, 680 $V_{rms}$
- TBX-1325 ..... 250 $V_{rms}$
- TBX-1326/1328/1329/24F ..... 300 $V_{rms}$

Signal referencing on TBX-1303
- CH+ input ..... 10 M to +5 V (socketed)
- CH- input ..... 10 M or 10 to ground (user configurable, socketed)

Input inpedance for TBX-1316
- Differential ..... 40 M
- Single-Ended ..... 20 M

Absolute accuracy for TBX-1316
- Gain error ..... 1%
- Temperature drift ..... 20 ppm/˚C

AC Coupling (TBX-1329 only)
- Corner frequency ..... 0.072 Hz 1-pole RC
- DC rejection capacity ..... 250 VDC

Wire resistance of cables ..... 0.21 /m per conductor

### Cold-Junction Sensor (TBX-1303 and TBX-1328)

Accuracy and repeatability[4]

| | Accuracy | | |
|---|---|---|---|
| Terminal Block | 15 to 35 ˚C | 0 to 15 ˚C and 35 to 55 ˚C | Repeatability |
| | | | |
| | | | |

Sensor output ..... 1.91 V (at 0 ˚C) to 0.58 V (at 55 ˚C) (thermistor)

## General

### Physical

Compatible DIN rails[5] ..... DIN EN 50 022, DIN EN 50 035

Screw terminal size
- TBX-1316 ..... 26-12 AWG
- Others ..... 26-14 AWG

### Dimensions

- TBX-1303[6] ..... 19.7 by 11.2 by 7.62 cm (7.8 by 4.4 by 3.0 in.)
- TBX-1316 ..... 30 by 20 by 8.1 cm (11.8 by 7.9 by 3.2 in.)
- TBX-1325/1326/1328/1329[6] ..... 12.7 by 11.2 by 7.62 cm (5.0 by 4.4 by 3.0 in.)
- TBX-24F ..... 12.4 by 4.3 by 5.1 cm (4.9 by 1.7 by 2.0 in.)
- TBX-96 ..... 19.8 by 12.6 by 6.3 cm (7.8 by 4.9 by 2.5 in.)

### Certification and Compliance

- SCXI-1320/1321/1326/1327/1328/1338 ..... 300 V, Cat II working voltage
- SCXI-1322/1324/1325 ..... 250 V, Cat II working voltage
- TBX-1316 ..... 1000 V, Cat III working voltage
- TBX-1328/1329 ..... 300 V, Cat II working voltage
- TBX-1325/1326 ..... 250 V, Cat II working voltage

### European Compliance

- EMC ..... EN 61326 Group I Class A, 10 m, Table 1 Immunity
- Safety ..... EN 61010-1

### North American Compliance

- EMC ..... FCC Part 15 Class A using CISPR
- Safety (SCXI-1320/1321/1326/1327/1328/ 1338/SCXI-1322/1324/1325) ..... UL Listed to UL 3111-1 CAN/CSA C22.2 No. 1010.1
- Safety (TBX-1325/1326/1328/1329) ..... UL Listed to UL 3111-1 CAN/CSA C22.2 No. 1010.1

### Australia and New Zealand Compliance

- EMC (except TBX-1316) ..... AS/NZS 2064.1/2 (CISPR-11)

[1] Accuracy and repeatability include combined effects of sensor, circuitry, and thermal gradients between the sensor and any screw terminal. Thermal gradients for nonisothermal terminal blocks (SCXI-1300, SCXI-1320, SCXI-1321, SCXI-1322, and SCXI-1327) are assumed to be 0.4 ˚C.

[2] With SCXI-1102 module. With SCXI-1100 module, add error of 0.15 ˚C

[3] Accuracy and repeatability include combined effects of sensor, circuitry, and thermal gradients between the sensor and thermocouple connection.

[4] Accuracy and repeatability include combined effects of sensor, circuitry, and thermal gradients between the sensor and any screw terminal.

[5] TBX-1316 is not DIN-rail mountable

[6] Height dimension (7.62 cm) includes DIN-rail mounting and plastic cover.

**For a definition of specific terms, please visit *ni.com/glossary***