# CB-27T AND TBX-68T ISOTHERMAL TERMINAL BLOCKS

This installation guide describes how to install and connect signals to the CB-27T and TBX-68T isothermal terminal blocks for use with the DAQMeter 4350, which include the PC-4350 for the ISA bus and the DAQCard-4350 for the PCMCIA slot.

## Introduction

The CB-27T isothermal terminal block is a shielded board with screw terminals that connects to the DAQCard-4350 input/output (I/O) connector.

The TBX-68T isothermal terminal block is a DIN-rail mountable terminal block that consists of a shielded board with screw terminals that connects to the PC-4350 I/O connector.

The terminals blocks can easily accommodate thermocouples, resistance temperature detectors (RTDs), thermistors, and voltage signals. The terminal blocks feature isothermal construction to minimize the temperature gradients across the screw terminals and a high-accuracy thermistor cold-junction temperature sensor for measuring with thermocouples. Enclosures keep out air currents to maintain an isothermal environment for the screw terminals and the cold-junction sensor. The TBX-68T mounts on most European standard DIN EN mounting rails.

The terminal blocks provide connections to all digital I/O lines on the DAQMeter 4350. The terminal blocks also provide connections to all but two analog input channels (CH)—CH0 is dedicated for the cold-junction sensor and CH1 is dedicated for auto-zeroing circuitry. Refer to the *DAQMeter 4350 User Manual* for further details on these two channels.

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# What You Need to Get Started

You need the following to set up and use your terminal block:

- ❑ One of the following DAQMeter 4350 devices:
  - DAQCard-4350
  - PC-4350
- ❑ *DAQMeter 4350 User Manual*
- ❑ *CB-27T and TBX-68T Isothermal Terminal Blocks Installation Guide*
- ❑ One of the following isothermal terminal blocks:
  - ♦ DAQCard-4350
    - CB-27T isothermal terminal block
  - ♦ PC-4350
    - TBX-68T isothermal terminal block
- ❑ One of the following cable assemblies:
  - ♦ DAQCard-4350
    - PSH32-30F shielded cable
  - ♦ PC-4350
    - SH6868 shielded cable (recommended)
    - R6868 ribbon cable
- ❑ Tie wraps (for CB-27T installation only)
- ❑ $^1/_8$ in. flathead screwdriver
- ❑ No. 1 Phillips-head screwdriver
- ❑ Wire cutters
- ❑ Wire insulation strippers

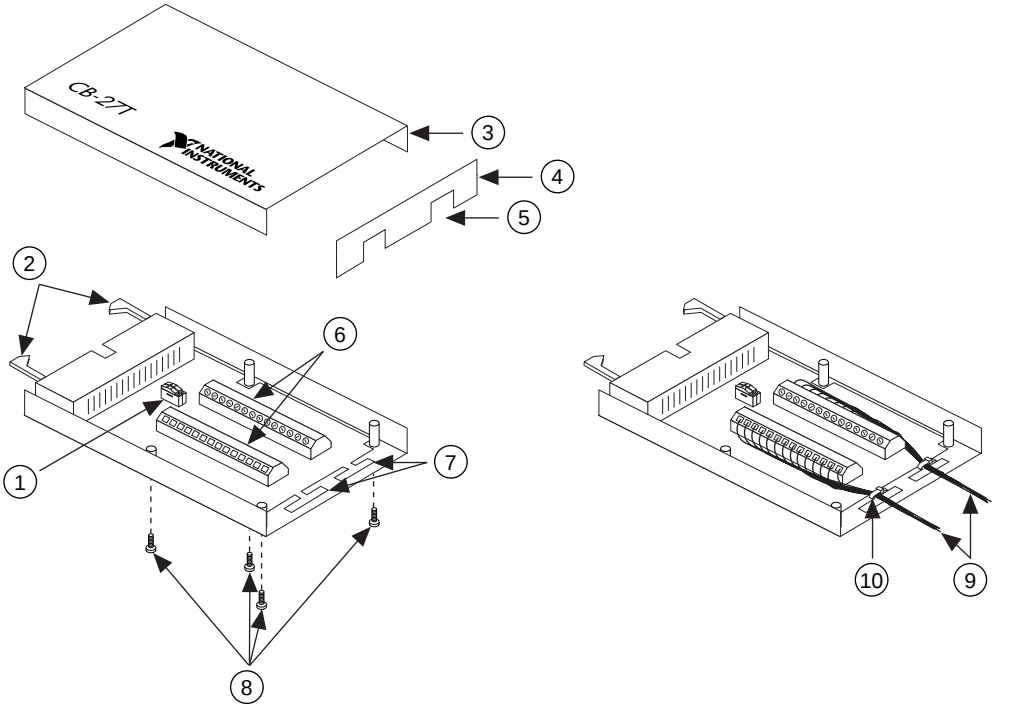
# Signal Connection

See your *DAQMeter 4350 User Manual* for examples of how to connect your signals. Refer to Figures 1 and 2 as you perform the following steps to connect your signals to your terminal block:

1. Remove the terminal block cover by unscrewing the four cover screws in the cover corners using the Phillips-head screwdriver. Remove the front panel of the CB-27T.
2. Use wire cutters and wire insulation strippers to strip the wire ends as necessary to connect them to screw terminals.
3. Loosen the screws in the screw terminals with a $^1/_8$ in. flathead screwdriver.
4. Insert the stripped wires into the screw terminals. Tighten the screws with the $^1/_8$ in. flathead screwdriver.
5. Allow your signal wires to exit through the terminal block cover opening. On the CB-27T, you can use tie-wraps to tie the wires to the strain-relief tabs.

☞ **Note:** ***The TBX-68T terminal block does not provide strain relief for signal wires. Add strain relief and insulation for your signal wires, if necessary.***

6. Replace the front panel of the CB-27T.
7. Replace the terminal block cover and tighten the cover screws.

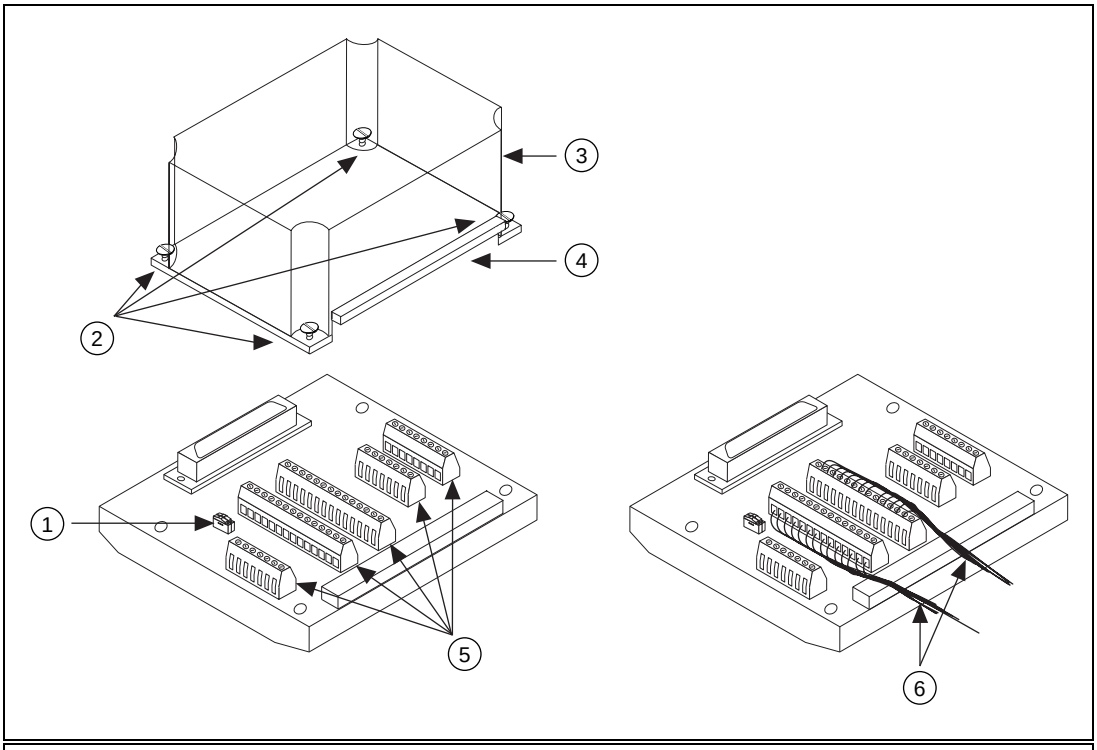



a. Components

b. Using the Strain-Relief Tabs

| | | | | | |
|---|---|---|---|---|---|
| 1 | S1, S2 Switches | 5 | Cover Opening | 8 | Cover Screws |
| 2 | Ejector Ears | 6 | Screw Terminals | 9 | Signal Wires |
| 3 | Cover | 7 | Strain-Relief Tabs | 10 | Tie Wrap |
| 4 | Front Panel | | | | |

**Figure 1.** CB-27T Parts Locator Diagram




| | | | | | |
|---|---|---|---|---|---|
| 1 | S1, S2 Switches | 3 | Cover | 5 | Screw Terminals |
| 2 | Cover Screws | 4 | Cover Opening | 6 | Signal Wires |

**Figure 2.** TBX-68T Parts Locator Diagram

# Installing Your Terminal Block

☞ **Note:** ***To minimize the temperature gradient inside the terminal block and thus maintain its isothermal nature for accurate cold-junction compensation, place the terminal block away from extreme temperature differentials.***

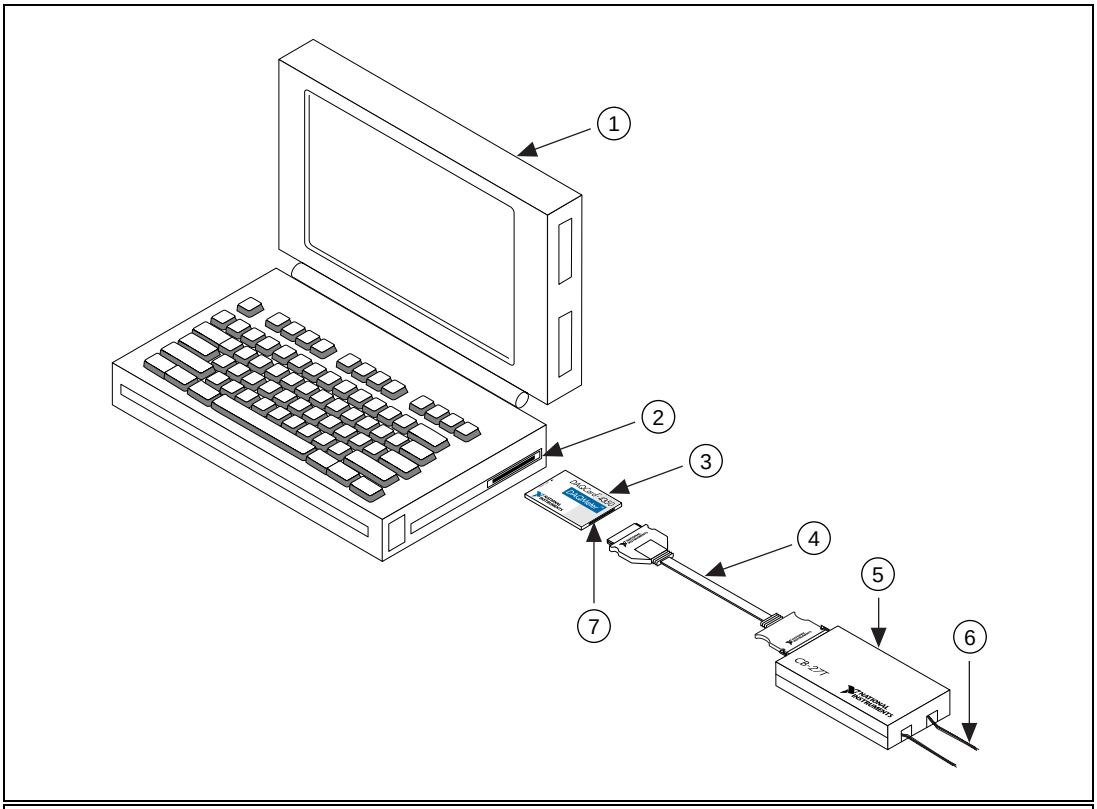
Refer to Figures 3 and 4 as you perform the following steps to connect the terminal block to the DAQMeter 4350 connector:

1. Attach the connector on one end of the cable to the DAQMeter 4350 connector. The two connectors should snap together in place.

2. Attach the connector on the other end of the cable to the terminal block connector.
   - On the CB-27T, the ejector ears should lock the cable connector in place.
   - On the TBX-68T, if you use the SH6868 cable, the two connectors should snap together. The R6868 ribbon cable has no latches and should simply join together without a snap.
3. To disconnect the cable from the CB-27T, press outward on the ejector ears; the cable should pop out. To disconnect the cable from the TBX-68T, push the two ejector ears on the backshell of the cable and gently pull on the backshell. Do *not* pull the cable.

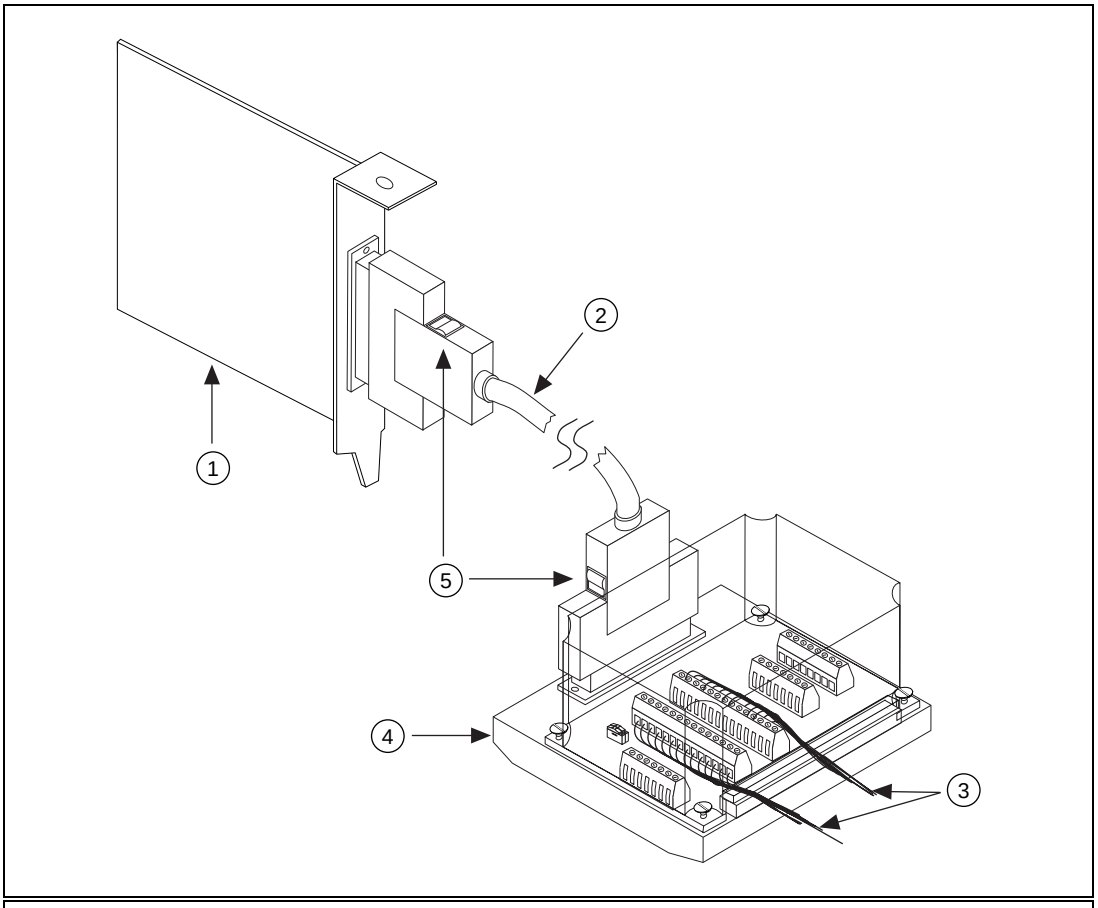


**Caution:** ***The connectors of both the DAQMeter 4350 and the cable are polarized. You can attach them in only one way. Do not force the cable when inserting it into or removing it from the DAQMeter 4350 connector.***




| | | | | | |
|---|---|---|---|---|---|
| 1 | Portable Computer | 4 | PSH32-30F Shielded Cable | 7 | DAQCard 4350 I/O Connector |
| 2 | PCMCIA Slot | 5 | CB-27T | | |
| 3 | DAQCard-4350 | 6 | Signal Wires | | |

**Figure 3.** Connecting the CB-27T Cable Assembly




| | | | |
|---|---|---|---|
| 1 | PC-4350 | 3 | Signal Wires |
| 2 | SH6868 Shielded Cable (shown) or R6868 Ribbon Cable | 4 | TBX-68T |
| | | 5 | Ejector Ears |

**Figure 4.** Connecting the TBX-68T Cable Assembly

# Rack-Mounting the TBX-68T

When you have completed signal connections and terminal block installation, you can mount the TBX-68T assembly into your rack. If you are using the National Instruments TBX Rack-Mount Assembly, refer to the *TBX Rack-Mount Installation Guide* for instructions.

If you are not using this rack-mount assembly, perform the following steps to mount the TBX assembly directly onto your DIN rail:

- Snap the TBX-68T bottom onto the DIN rail with a firm push.
- To remove the TBX-68T from the DIN rail, place a flathead screwdriver into the slot above the terminal block base and pry it away from the rail.

☞ **Note:** ***You cannot mount the CB-27T onto a rack.***

# Using the Current Source

You can use the current source on the DAQMeter 4350 to provide excitation for RTDs, thermistors, and other resistors. Follow the instructions in the *DAQMeter 4350 User Manual* to connect your signals.

The screw terminals on the terminal block labeled IEX+ and IEX– provide external access to this current source. IEX+ is the current output and IEX– is the current return. To enable external access of the current source, push both slide switches S1 and S2, shown in Figures 1 and 2, to the On position.

☞ **Note:** ***To measure the cold-junction temperature sensor while you are not using the current source externally through IEX+ and IEX–, push the slide switches*** S1 ***and*** S2 ***to the*** Off ***position.***

# Cold-Junction Temperature Sensor

The CB-27T and the TBX-68T cold-junction temperature sensor consists of a precision thermistor excited by the 25 µA current source on the DAQMeter 4350. At 25° C, the resistance of the thermistor is 5,000 Ω. The thermistor resistance varies from 16,305 Ω to 1,492 Ω over a 0° to 55° C temperature range. The corresponding sensor output voltage varies from 408 to 37 mV over this temperature range.

To select and read the temperature sensor, refer to your data acquisition software documentation for programming information.

Alternatively, you can use the following formulas to convert the cold-junction sensor voltage to cold-junction temperature:

$$T(^\circ C) = T_K - 273.15$$

where $T_K$ is the temperature in kelvin.

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

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

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

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

$R_T$ = resistance of the thermistor in ohms

$$T(^\circ F) = \frac{T(^\circ C) \cdot 9}{5} + 32$$

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

# Specifications

| | |
|---|---|
| Cold-junction temperature sensor accuracy[1] | 0.06° C from 15 to 35° C<br>0.2° C from 0° to 15° C and 35° to 55° C |
| Isothermal accuracy | 0.1° C |
| Compatible DIN rails | DIN EN 50 022<br>DIN EN 50 035 |
| Terminal block dimensions | |
| CB-27T | 11.7 x 7.0 x 2.3 cm<br>(4.6 x 2.75 x 0.9 in.) |
| TBX-68T | 12.7 x 11.2 x 7.62 cm<br>(5.0 x 4.4 x 3.0 in.) |
| Max working voltage[2] (signal + common mode) | Each input should remain within ±42 V of ground |

[1] Includes only the thermistor accuracy. The combined effects of the temperature sensor accuracy, as well as the current source tolerances due to tolerances in all component values in the DAQMeter 4350, the effects caused by temperature and loading, and self-heating and current leakage are discussed in the *DAQMeter 4350 User Manual*.

[2] Refer to the DAQMeter 4350 maximum working voltage specification; use the lower number of the two.



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