TC-2190 ADAPTER WITH THERMOCOUPLE MINICONNECTORS

This installation guide describes how to install and connect thermocouples and digital I/O signals to the TC-2190 adapter with thermocouple miniconnectors to use with your DAQMeter PC-4350.

Introduction

The TC-2190 adapter consists of a shielded box with 14 miniconnectors that you can use to connect your thermocouples to the PC-4350. This adapter has two 68-pin connectors—one on the front and one in the rear. You can use either of the two connectors to connect the TC-2190 to the PC-4350 using an SH6868 shielded cable (recommended) or an R6868 ribbon cable. You can also access the eight digital input/output (I/O) lines and digital ground of the PC-4350 using the spring terminal blocks.

This adapter is designed specifically for ease of use with thermocouples. It features isothermal construction to minimize the temperature gradients across the thermocouple junctions and a high-accuracy thermistor cold-junction temperature sensor.

The TC-2190 connects to all the digital I/O lines on the PC-4350 and all but two analog input channels (CH)—CH0 is dedicated to the cold-junction sensor and CH1 is dedicated to auto-zeroing circuitry. Refer to the *DAQMeter 4350 User Manual* for further details on the cold-junction sensor and auto-zeroing circuitry.

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What You Need to Get Started

You need the following to set up and use your TC-2190:

- ❑ TC-2190 adapter with thermocouple miniconnectors
- ❑ *TC-2190 Adapter with Thermocouple Miniconnectors Installation Guide*
- ❑ DAQMeter PC-4350 and documentation
- ❑ One of the following cable assemblies:
  - SH6868 shielded cable (recommended)
  - R6868 ribbon cable
- ❑ $^1/_8$ in. flathead screwdriver
- ❑ No. 1 Phillips-head screwdriver
- ❑ Wire cutters
- ❑ Wire insulation strippers
- ❑ Four adhesive rubber feet

Configuring the Shield Ground Jumpers

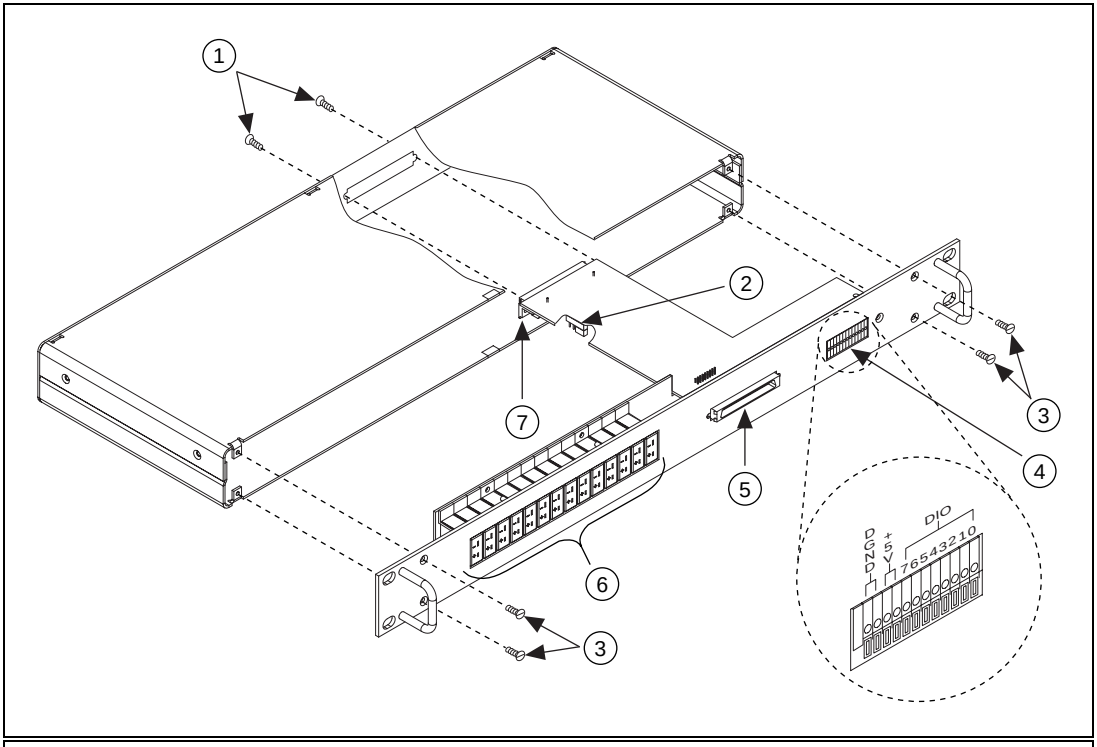
Jumper W1, located inside the TC-2190 on the bottom of the board, connects the shield of the 68-pin connectors and the TC-2190 metal case to DAQMeter 4350 ground through a 100 Ω resistor (default setting) or directly to DAQMeter 4350 ground, or keeps the metal case and DAQMeter 4350 ground separate.

☞ **Note:** ***Use the default setting for jumper W1 unless you notice degraded noise performance.***

Refer to Figure 1 as you perform the following steps to access jumper W1:

1. Using the No. 1 Phillips-head screwdriver, remove the four countersunk front panel screws.

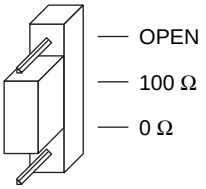
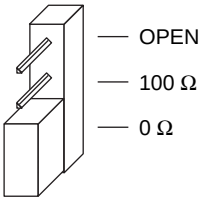
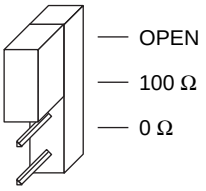
2. Remove the two rear panel screws that hold the rear 68-pin connector.
3. Hold the front panel and slide the assembly out of the metal case.
4. Set jumper W1 as needed. Table 1 shows the configuration options.
5. Reassemble the TC-2190 in reverse order. Do not overtighten the screws.



1	Rear Panel Screws	4	Spring Terminal Blocks	6	Thermocouple Miniconnectors
2	Jumper W1	5	Front 68-Pin Connector	7	Rear 68-Pin Connector
3	Countersunk Front Panel Screws				

Figure 1. TC-2190 Parts Locator Diagram

Table 1. TC-2190 Jumper Configuration Options

Jumper W1 Configuration	Description	When to Use a Setting
	100 Ω (factory default)—This setting connects the TC-2190 metal chassis to DAQMeter 4350 ground through a 100 Ω resistor, while keeping any potential ground loop current very small.	Use this setting when you are using the SH6868 cable, and: • You have not rack-mounted the TC-2190, or • You have mounted the TC-2190 on a rack, but are unsure whether the rack and the TC-2190 are grounded.
	0 Ω—This setting connects the TC-2190 metal chassis to DAQMeter 4350 ground.	Use this setting when you are using the R6868 cable and: • You have not rack-mounted the TC-2190, or • You have mounted the TC-2190 on a rack and are sure that the rack and the TC-2190 are *not* grounded.
	Open—This setting disconnects the TC-2190 metal chassis from DAQMeter 4350 ground.	Use this setting when you are using either the SH6868 cable or the R6868 cable, you have mounted the TC-2190 on a rack, and you are sure that the rack and the TC-2190 are grounded.

Signal Connections

Refer to your *DAQMeter 4350 User Manual* for examples on how to connect to your signals.

Connecting Thermocouples

Insert your thermocouple miniconnector to the mating miniconnector on the TC-2190. Note that each miniconnector consists of two spades of different widths, which polarize the miniconnector.

Do not force the miniconnector; if you encounter difficulty while inserting the miniconnector, check whether the polarity is correct.

Connecting Digital I/O Signals

Refer to Figure 1 as you perform the following steps to connect your digital signals to the TC-2190:

1. Use wire cutters and wire insulation strippers to strip the wire ends as necessary to connect them to terminal blocks. You can use up to 20 AWG wire for connecting signals.
2. Push the spring below the DIO terminal block with a $^1/_8$ in. flathead screwdriver. This will open the terminal block clasp. Keep the spring pressed through step 3.
3. Insert the stripped wires into the terminal blocks. Release the spring. The wire now should be firmly connected.

Connecting the TC-2190 to Your PC-4350

Before installing your TC-2190, make sure you have set jumper W1 correctly for your application.

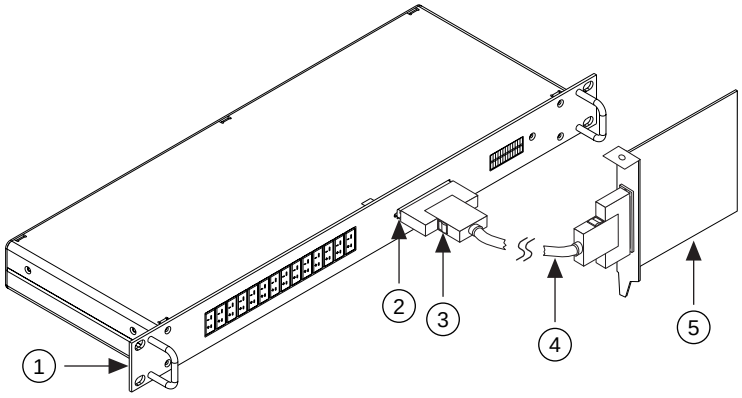
You can mount the TC-2190 into a 19 in. rack or place it on a work bench near the PC-4350. If you do not rack-mount the TC-2190, attach the four adhesive rubber feet included in this kit to the TC-2190 to keep it stationary.

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

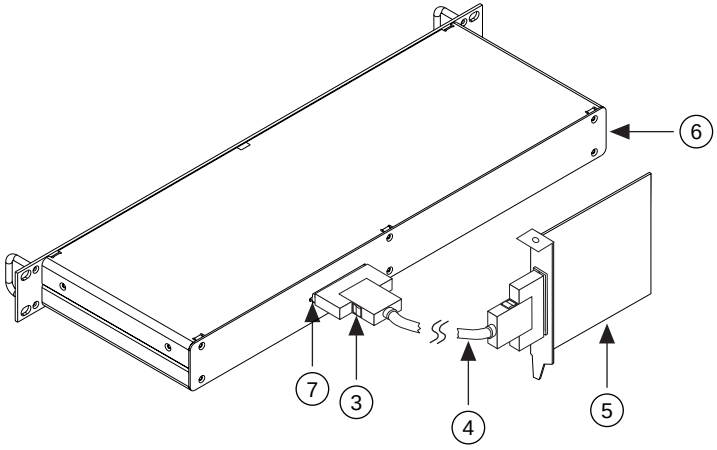
Refer to Figure 2 as you perform the following steps to connect the TC-2190 to the PC-4350:

1. Connect one end of the SH6868 or R6868 cable to the TC-2190 connector on either the front or the back, as desired.
2. Attach the connector on the other end of the SH6868 or R6868 cable to the PC-4350 I/O connector. On the TC-2190, the two connectors should snap together.
3. To disconnect the cable from the TC-2190, push the two ears on the cable backshell and gently pull on the backshell. Do *not* pull the cable.

⚠ **Caution:** ***The connectors of both the TC-2190 and the PC-4350 are polarized. Do not force the cable. If you encounter difficulty, check whether the polarity is correct.***



Front View



Back View

1	Front Panel	4	SH6868 Shielded Cable	6	Rear Panel
2	Front 68-Pin Connector	5	PC-4350	7	Rear 68-Pin Connector
3	Ejector Ears				

Figure 2. Connecting the TC-2190 to the PC-4350

Cold-Junction Temperature Sensor

The TC-2190 cold-junction temperature sensor consists of a precision thermistor excited by the 25 μA current source on the PC-4350. At 25° C, the thermistor resistance is 5,000 Ω. The thermistor resistance varies from 16,305 to 1,492 Ω over the 0° to 55° C temperature range. The corresponding sensor output voltage varies from 408 to 37 mV over this temperature range.

To select and measure 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 = 1.295361×10^{-3}

b = 2.343159×10^{-4}

c = 1.018703×10^{-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 sensor accuracy[1]	0.06° C from 15° to 35° C 0.2° C from 0 ° to 15° C and 35° to 55° C
Dimensions	48.3 by 4.4 by 18.8 cm (19.0 by 1.75 by 7.4 in.)
Maximum 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 PC-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 PC-4350 maximum working voltage specification; use the lower number of the two.

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