ROC800-Series Thermocouple Module

The Thermocouple (T/C) Input module provides the ROC800-Series Remote Operations Controller with Series 2 architecture (ROC800) with the ability to monitor various thermocouple sensors.

The T/C module provides four individually isolated differential inputs for measuring B, C, E, J, K, N, R, S, or T type thermocouples. The cold junction compensation circuit is located behind the terminal block.

Each channel contains signal conditioning circuitry, a 24-bit Analog to Digital Converter (ADC), and digital isolator circuitry.

Each channel provides electrical isolation of 85 volts dc (channel to channel/system bus) and surge protection.

A temperature sensor IC measures the PCB board temperature at the terminal block.

The extensive use of current-limiting short-circuit protection and surge protection techniques eliminates the need for fuses on the Input/Output (I/O) modules. This reduces maintenance for remote locations. The I/O modules are self-resetting after a fault clears.

The terminal blocks can accommodate wire sizes 16 to 24 American Wire Gauge (AWG).

The modules each have their own integrated short-circuit protected isolated power supply. This power supply allows the field circuitry to be completely isolated from the backplane and the Central Processor Unit (CPU).

Each module provides isolation from other modules and the backplane, including power and signal isolation.

Compatibility and Installation

Thermocouple modules can be installed in any module slot on a Series 2 ROC800. Installation and replacement of these modules is easily accomplished by removing the two captive screws accessible from the front of the unit.
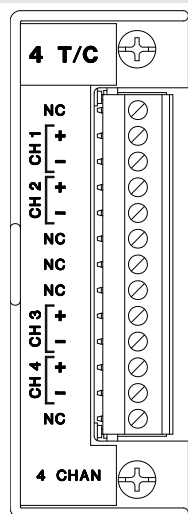
T/C modules are both hot-swappable (they can be removed and another module of the same kind installed when the unit is powered) and hot-pluggable (they can be installed directly into unused module slots when the unit is powered).
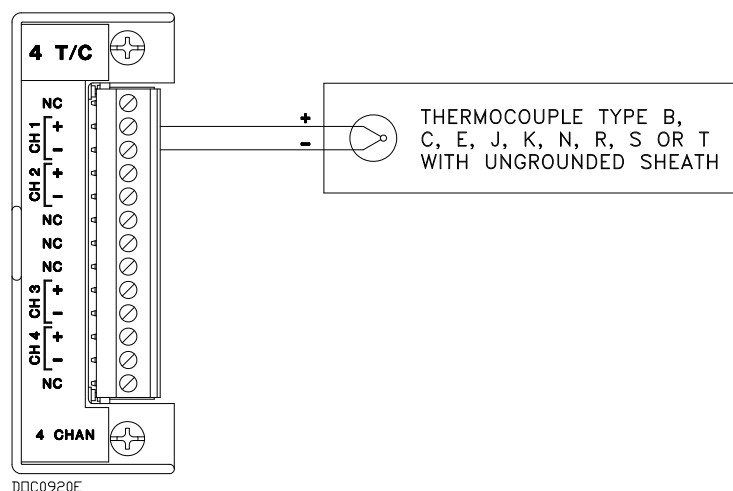
Thermocouple Wiring

EMERSON.
Process Management

ROC800-Series Thermocouple Module

Field Wiring Terminals

Terminal	Definition
1	Not Used
2	Positive Analog Input 1
3	Negative Analog Input 1
4	Positive Analog Input 2
5	Negative Analog Input 2
6	Not Used
7	Not Used
8	Not Used
9	Positive Analog Input 3
10	Negative Analog Input 3
11	Positive Analog Input 4
12	Negative Analog Input 4
13	Not Used

Input

Quantity	4 channels
Type	Differential
Input Configuration	Thermocouple type B, C, E, J, K, N, R, S, or T
Voltage Input Impedance	10 MΩ
Input Current	75 μA max
Input Common Mode Range	85 Vdc between channels
Electrical Isolation	85 Vdc channel to channel and channels to system bus
Surge Suppression	30 V transorb between signal and ground Meets IEEE 472-1978 specifications
Common Mode Rejection	120 dB
Normal Mode Rejection	65 dB
Conversion Time	66 milliseconds
Input Accuracy	Input accuracy consists of Absolute Accuracy + Cold Junction Compensation Effect. Absolute Accuracy and Cold Junction Compensation Effect values are given in the following tables:

Absolute Accuracy	Input Type	Process Temperature	25˚C	−40°C to 75°C
	B - Thermocouple	100°C to 200°C	±8°C	±16°C
		201°C to 390°C	±4°C	±8°C
		391°C to 840°C	±2°C	±4°C
		841°C to 1800°C	±1°C	±2°C
	C - Thermocouple	0°C to 2315°C	±0.75°C	±1.5°C
	E - Thermocouple	−270°C to −260°C	±3°C	±6°C
		−259°C to −225°C	±1°C	±2°C
		−224°C to −201°C	±0.75°C	±1.5°C
		−200°C to 1000°C	±0.5°C	±1°C
	J - Thermocouple	−210°C to 190°C	±0.75°C	±1.5°C
		191°C to 1200°C	±0.5°C	±1°C
	K - Thermocouple	−270°C to −261°C	±5°C	±10°C
		−260°C to −246°C	±2°C	±4°C
		−245°C to −180°C	±1°C	±2°C
		−179°C to −145°C	±0.75°C	±1.5°C
		−144°C to 1372°C	±0.5°C	±1°C
	N - Thermocouple	−270°C to −260°C	±8°C	±16°C
		−259°C to −250°C	±4°C	±8°C
		−249°C to −230°C	±2°C	±4°C
		−229°C to −150°C	±1°C	±2°C
		−149°C to 1300°C	±0.5°C	±1°C
	R - Thermocouple	−50°C to 50°C	±2°C	±4°C
		51°C to 1720°C	±1°C	±2°C
	S - Thermocouple	−50°C to 50°C	±2°C	±4°C
		51°C to 1760°C	±1°C	±2°C
	T - Thermocouple	−270°C to −261°C	±4°C	±8°C
		−260°C to −251°C	±2°C	±4°C
		−250°C to −181°C	±1°C	±2°C
		−180°C to −136°C	±0.75°C	±1.5°C
		−135°C to 400°C	±0.5°C	±1°C

Note: Absolute accuracy includes: linearity, hysteresis, repeatability, stability, gain, and offset error.

	Input Type	Process Temperature	25˚C
Cold Junction Compensation Effect	B – Thermocouple	100°C to 1820°C	±0.5°C
	C - Thermocouple	0°C to 2315°C	±0.54°C
	E - Thermocouple	−270°C to −260°C	±15.3°C
		−259°C to −245°C	±4.4°C
		−244°C to −200°C	±1.7°C
		−199°C to −87°C	±1.2°C
		−86°C to 25°C	±0.6°C
		24°C to 1000°C	±0.5°C
	J - Thermocouple	−210°C to −111°C	±1.4°C
		−110°C to 25°C	±0.6°C
		26°C to 1200°C	±0.5°C
	K - Thermocouple	−270°C to −261°C	±20.5°C
		−260°C to −247°C	±6.9°C
		−246°C to −221°C	±4.1°C
		−220°C to −160°C	±1.2°C
		−159°C to 25°C	±0.8°C
		26°C to 1372°C	±0.5°C
	N - Thermocouple	−270°C to −261°C	±27°C
		−260°C to −250°C	±6.8°C
		−249°C to −231°C	±4.5°C
		−230°C to −189°C	±2.7°C
		−188°C to −71°C	±0.84°C
		−71°C to 25°C	±0.6°C
		26°C to 1300°C	±0.5°C
	R - Thermocouple	−50°C to 50°C	±1.0°C
		51°C to 1720°C	±0.43°C
	S - Thermocouple	−50°C to 50°C	±0.8°C
		51°C to 1760°C	±0.5°C
	T - Thermocouple	−270°C to −261°C	±10.3°C
		−260°C to −243°C	±5.1°C
		−242°C to −196°C	±3.4°C
		−195°C to −61°C	±1.2°C
		−60°C to 25°C	±0.6°C
		26°C to 400°C	±0.5°C

Note: The cold junction compensation does not include any variation between the measured PC board temperature and the actual terminal block junction temperature.

Power		
Consumption	Main power supply loading at the battery terminals (at 12.0 Vdc)	54 mA typical

Physical	
Dimensions	26 mm W by 75 mm H by 133 mm D (1.03 in. W by 2.96 in. H by 5.24 in. D)
Weight	108 g (3.8 oz)
Terminations	13-pin removable terminal blocks
Wiring	Size 16 to 24 AWG at the removable terminal blocks

Environmental
Same as the ROC800-Series in which it is installed

Approvals
Same as the ROC800-Series in which it is installed

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