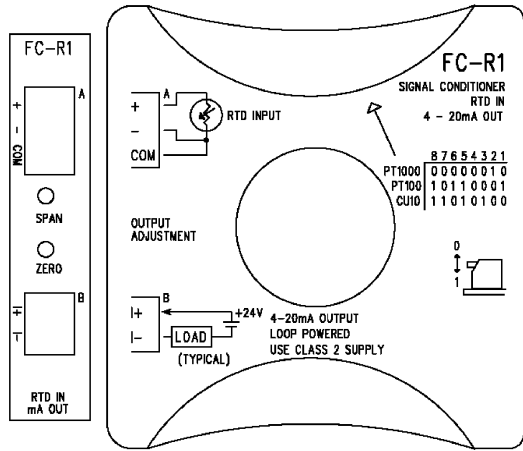


RTD Input, Loop Powered Signal Conditioner



Description

The FC-R1 is a DIN rail mount, Resistive Temperature Detector, signal conditioner. FC-R1 is non-isolated, 3-wire RTD which converts to linearized 4 - 20 mA current loop.

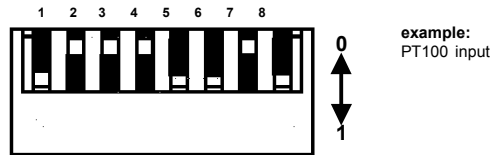
The FC-R1 has user selectable, CU10 (10 Ohm copper), PT100 (100 Ohm platinum), PT1000 (1000 Ohm platinum) RTD input, but also has OFFSET (zero) and SPAN (full scale) adjustments of the output signal. The OFFSET (zero) has an adjustment range of 0 to 25% of full scale output, the SPAN (full scale) has an adjustment of 80% to 102%

Application

The FC-R1 field configurable input signal conditioner is useful for interfacing RTD sensors to our PLC analog current input modules. Use shielded RTD's whenever possible to minimize noise on the input signal. Ground the shield wire at one end only. The suggested 3-lead configuration shown provides one lead to (+) terminal, one lead to the (-) terminal and one lead to the (COM) terminal. Compensation circuitry nulls out the lead length for accurate temperature measurements. Some sensors have 4-leads, when making connections, do not connect the second lead to the (+) terminal, leave that lead unconnected.

Input Selection

The signal conditioner can be configured for either CU10, PT100, PT1000 Input and Output signal type of 4 - 20mA.



Input Ranges	Switch Position							
	1	2	3	4	5	6	7	8
CU10	0	0	1	0	1	0	1	1
PT100	1	0	0	0	1	1	0	1
PT1000	0	1	0	0	0	0	0	0

Specifications	
Input Ranges	Ranges
	CU10 -200°C to 260°C -328°F to 500°F
	PT100 -200°C to 850°C -328°F to 1562°F
	PT1000 -200°C to 595°C -328°F to 1103°F
RTD Excitation Current	CU10, PT100 500µA ±50µA PT1000 80µA ±20µA
Common Mode Range	0 -3.5VDC
Maximum Inaccuracy (includes offset, span, linearity)	0.35% FSO CU10 0.2% FSO @ 25°C PT100 & PT1000 0.26% FSO PT100 & PT1000
Maximum Loop Supply	30VDC
Load Impedance	0Ω minimum
Maximum Load / Power Supply	203Ω / 12V, 745Ω / 24V
Linearity Error	0.35% FSO CU10 0.2% FSO maximum PT100 & PT1000
Output Slew Rate	1% @ 20mS
Filter Characteristics	105dB@DC, 60dB@10Hz, 40dB@60Hz
Stability	0.05% FSO maximum

Note: All data 0 - 60C except where specified.

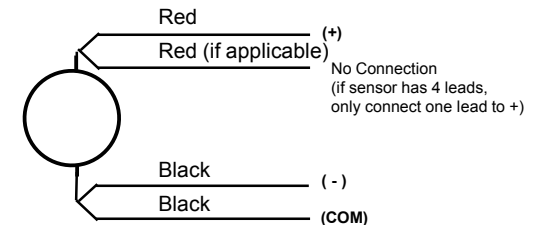
The default setting from the factory is PT100. This selects the DIN (Deutsche Institute for Normung) requirements for accuracy of the RTD element. The temperature vs. resistance curve, RTD's are calibrated to DIN 43760, BS1995, or IEC751 specifications which is 0.00385 Ω / Ω / °C (100°C = 138.50Ω).

The PT1000 utilizes the same type curve except it is (100°C = 1385Ω).

The CU10 utilizes temperature coefficient of 0.0042 Ω / Ω / °C (100°C = 12.89683Ω)

Precision excitation currents are used to generate voltage drop across the RTD element. To maintain accuracy it is important that all 3 RTD wires are the same length.

It is suggested if your application does not need modified OFFSET or SPAN - DO NOT ADJUST potentiometers since this loses the factory calibration.



Operating Temperature	0 to 60°C (32 to 140°F)
Storage Temperature	-20 to 70°C (-4 to 158°F)
Relative Humidity	5 to 90% (non-condensing)
Environmental air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304

Calculations -

$$\text{Max}_{\text{temp}} - \text{Min}_{\text{temp}} = \text{Total}_{\text{temp}} / \text{Counts} = \text{resolution}$$

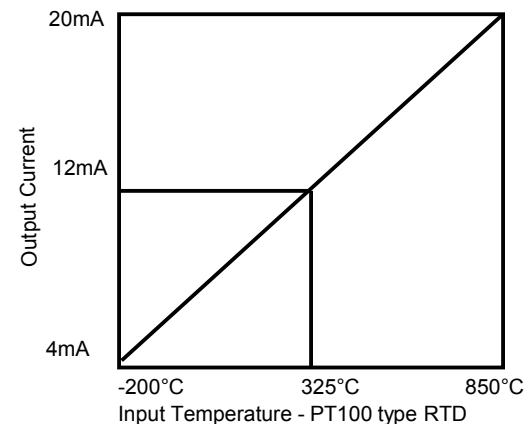
$$850^{\circ} - -200^{\circ} = 1050^{\circ} / 4095 = 0.256^{\circ}\text{C} / \text{count} - \text{resolution}$$

$$\text{Actual}_{\text{temp}} - \text{Min}_{\text{temp}} = \text{Total}_{\text{temp}} / \text{Resolution} = \text{Counts}$$

$$325^{\circ} - -200^{\circ} = 525^{\circ} / 0.256^{\circ} = 2050 \text{ counts}$$

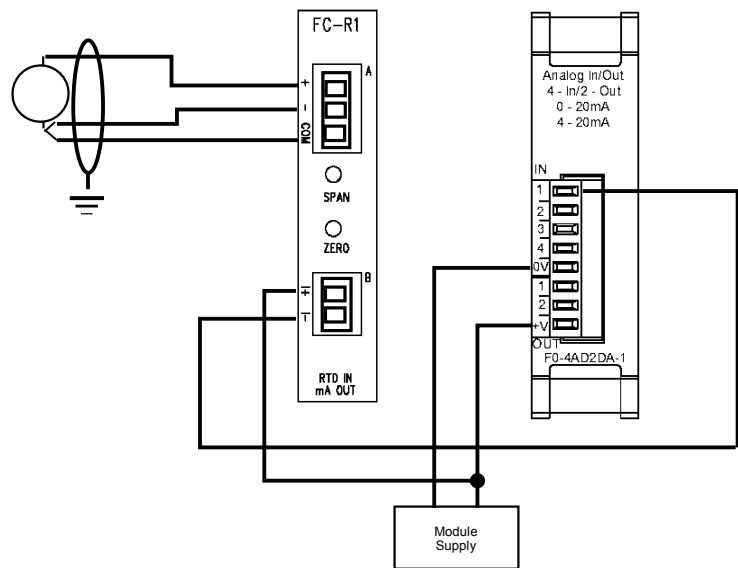
$$\text{Counts} \times \text{Resolution} = \text{Total}_{\text{temp}} + \text{Min}_{\text{temp}} = \text{Actual}_{\text{temp}}$$

$$2048 \times 0.256^{\circ} = 524.3^{\circ} + -200^{\circ} = 324.3^{\circ}\text{C}$$

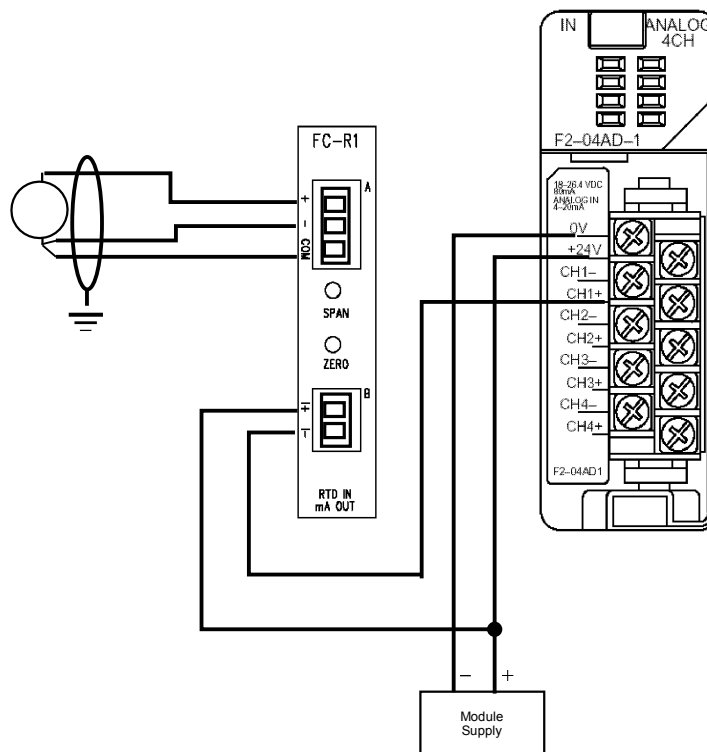


THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D OR NON-HAZARDOUS LOCATIONS ONLY.
WARNING – EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2 / ZONE 2.
WARNING – EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

Typical Connection -



RTD Signal Conditioner to 4 -20mA DL05/6 analog module



RTD Signal Conditioner to 4 -20mA DL205 analog module(example).