

# Installation of RTD Transmitter

## Models: RTDT Series

Please read the following information before installing. Visually inspect this product for any shipping damage. It is your responsibility to have a qualified person install this unit and make sure it conforms to NEC and local codes.

The FW Murphy RTD transmitter is designed to accept a signal from an RTD sensing element, and to provide a linearized 4 to 20 mA output current. The output current is directly proportional to the temperature of the RTD temperature sensor. Since the temperature is converted to a current signal, voltage drops in the power supply leads to the transmitter have no effect on the integrity of the signal. As long as the transmitter has sufficient DC voltage at its terminals, it will produce a current linearly proportional to temperature. This means that the transmitter may be remote mounted but should be near the sensor, reducing the effects of noise and minimizing errors due to long leads on the RTD sensor. The RTD instruments have screw terminal connections and accept 2 or 3 wire RTD's\*. They include high resolution, 24-turn zero and span potentiometers and each unit is calibrated after a minimum of 48 hours burn-in and checkout time.

## WARNING

BEFORE BEGINNING INSTALLATION OF THIS PRODUCT

- ✓ Disconnect all electrical power to the machine
- ✓ Make sure the machine cannot operate during installation
- ✓ Follow all safety warnings of the machine manufacturer
- ✓ Read and follow all installation instructions

### Specifications

- Sensor Input:** Platinum RTD 100 ohms
- Output Span:** 4 to 20 mA
- Loop Power Supply Voltage:** Typically 24 VDC; when using Loop Resistance Graph 13 - 40 VDC.
- Temperature Span:** 50° F (28° C) minimum; 1000° F (556° C) maximum
- Calibrated Accuracy:** 0.1 %
- Conformity:** 0.1 % of Span
- Ranges:** -60 to 140° F; 0 to 400° F
- Ambient Temperature Limits:** -30 to 165° F (-34 to 74° C)
- Power Supply Effect:** 0.001 % volt
- Current:** 3.4 mA minimum; 30 mA maximum.
- Upscale Burnout:** Standard
- Reversed Polarity Protection:** Standard
- Nominal Zero and Span Adjustments:** ±10%
- Connections:** Screw Terminal

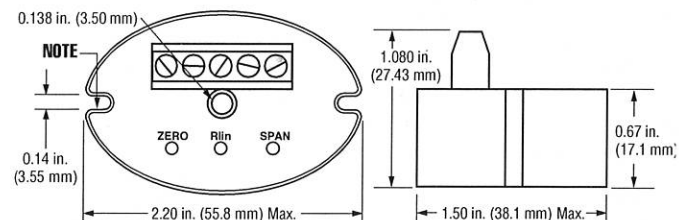
### Power Supply

Transmitters are designed for a nominal 24 VDC power supply. They will operate with a 13 to 40 VDC supply at the transmitter power supply terminals. Use the following formulas to determine maximum resistive loading (RL) allowed for the power supply used, or to determine minimum supply voltage M required for fixing resistive loads. Formulas assume a maximum current of 20 mA.

**NOTE:** Devices such as FW Murphy's EMS Series controllers, 400 and 500 Series PLC controllers, and the RMUJ 6 have 250 ohms resistors that add to the resistive loading.

Power Supply Voltage (Min)	Resistive Load (Max)
$V = (0.02 \text{ A} \times \text{RL}) + 13 \text{ V}$	$\text{RL} = (V - 13) / 0.02$
<b>Example:</b>	<b>Example:</b>
550 ohm load	24 VDC power supply
$V = 0.02 \times 550 + 13$	$\text{RL} = (24 \text{ V} - 13 \text{ V}) / 0.02$
$V = 24 \text{ VDC minimum power supply}$	$\text{RL} = 550 \text{ ohm maximum}$

### Dimensions

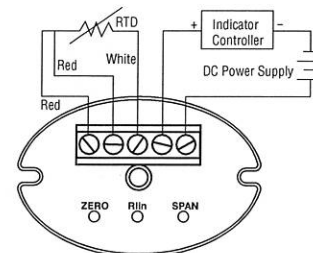


**NOTE:** Slot accepts 6-32 screw

### Wiring

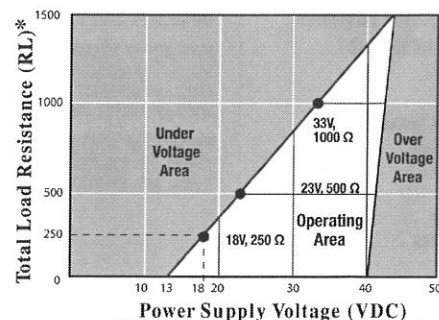
**CAUTION:** Do Not connect power to the RTD input. Do Not connect power to the RTD itself. Do Not use AC line power.

The terminal strip on the transmitter accepts 14 to 22 gauge wires. Copper wire is to be used since special compensation wire is not required. Route all transmitter wiring in separate conduit to isolate it from high voltage or high current carrying lines. It is also recommended that shielded wire be used for the 4-20 mA signal.



### Loop Resistance Graph

Supply voltage for the RTDT must be within 13-40 VDC. The figure below shows the minimum supply voltage (VDC) required for a given load resistance (RL).

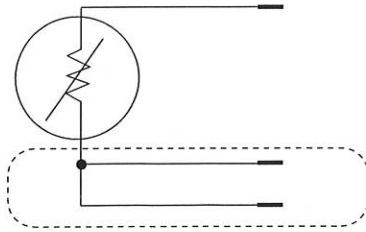


\*NOTE: Cable resistance effect included in RL.

# Installation

## Open Sensor Indication

When an RTD has failed due to an open sensor (broken path in the element), the transmitter will indicate an error. The way the error is produced is by driving the current high, above 20 mA (upscale burn-out). However, the burnout indication does not apply to breaks in the lead compensation loop.

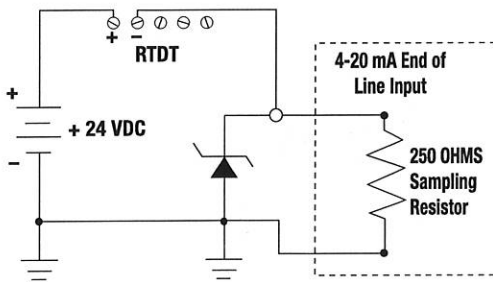


Lead Compensation

## Application Hints

The calibrated output of the FW Murphy Transmitter is 4.0 to 20.0 mA. However, the lower and upper limit of output current is approximately 3.4 and 30 mA respectively. This means that for the system using a 250 ohm resistor (1 to 5 V), the maximum voltage could be as high as 7.5 volts (30 mA x 250 ohms) in the case of an open RTD. Some computer-based systems will not tolerate input voltages greater than approximately 5.5 volts. Instead of selecting a different scaling resistor (167 ohms for example gives 5 V for an open RTD), a 5.1 V zener diode in parallel with the scaling resistor will clamp the voltage across the scaling resistor to 5.1 V while still allowing the calibrated range to remain 1 to 5 volts. See figure below.

The transmitter dissipates power according to the formula: Power = Volts x Amps. The dissipated power is equal to the voltage at the transmitter's terminals multiplied by the operating current. A transmitter with 24 volts at its terminal and with maximum current (30 mA for an open RTD) will dissipate 0.7 watts of power. This can be significant if the RTD sensor can be affected by thermal gradients from the transmitter.



## RTDT Calibration

FW Murphy RTD transmitter modules are factory calibrated. Please DO NOT attempt to recalibrate unless the proper equipment is available. If recalibration is necessary, a Zero, Rlin, and Span adjustment can be made from the top of the unit. A precision RTD simulator with a traceable calibration must be used. Consult a book of tables for resistance values.

1. With a resistance value corresponding with the temperature at 4.0 mA, adjust the zero potentiometer for 4.0 mA output.
2. With a resistance value corresponding with temperature at 12.0 mA, adjust the Rlin potentiometer for 12.0 mA output.
3. With a resistance value corresponding with the temperature at 20.0 mA, adjust the span potentiometer for 20.0 mA output.
4. The zero, Rlin and span adjustments are interactive. Repeat steps 1, 2, and 3 as necessary.

Example 1:

1. If range equals 50 - 250°, then span equals 200°
2. Divide 200° by 2:  $200° / 2 = 100°$
3. Add 100° to lower end of range:  $50° + 100° = 150°$
4. 50° equals the Zero point (4 mA)
5. 150° equals 50% of the Span (12 mA) (Rlin)
6. 250° equals the Span point (20 mA)

Example 2:

1. Set zero at 4.0 mA for -100° F (70.95 Q)
2. Set Rlin at 12.0 mA for 0° F (93.01 Q)
3. Set span at 20.0 mA for 100° F (114.68 Q)

## Troubleshooting

Problem	Possible Causes
No current flow on signal loop	<ul style="list-style-type: none"> <li>• Current loop open at some point</li> <li>• No voltage out at power supply</li> <li>• Wrong polarity on loop supply</li> </ul>
Current over 20 mA	<ul style="list-style-type: none"> <li>• RTD is open</li> <li>• Current loop connections shorted</li> </ul>
Erratic readings	<ul style="list-style-type: none"> <li>• Loose connection in RTD or signal loop</li> <li>• Damaged RTD</li> <li>• AC noise on loop connections</li> <li>• Exceeds loop resistance R</li> </ul>

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