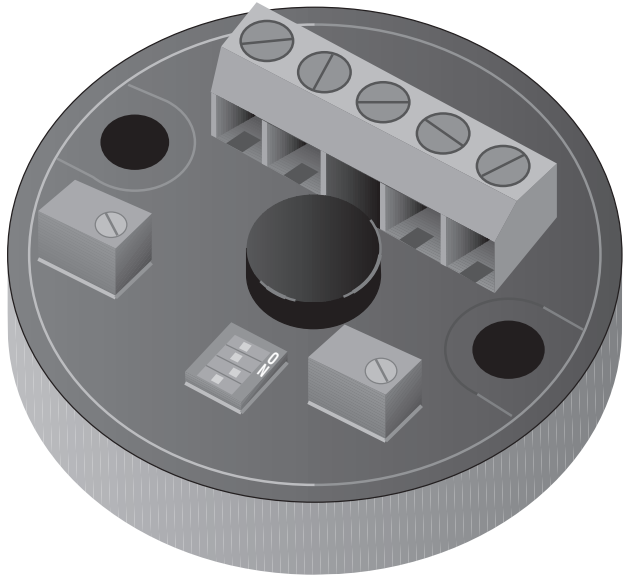
1 YEAR
WARRANTY



OMEGA®

User's Guide

TX904
Field Rangeable RTD Two-Wire Temperature Transmitter

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Unpacking Instructions

Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

- TX904 RTD Two-Wire Temperature Transmitter
- Operator's Manual

If you have any questions about the shipment, please call the OMEGA Customer Service Department.

When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Section **Page**

Introduction

1.1 General Description

The OMEGA® TX904 RTD Two-Wire Temperature Transmitters are field rangeable miniature two-wire temperature transmitters that are dip switch selectable for temperature range.

There are two models of the TX904 RTD transmitter, the low span (-1 suffix) and the high span (-2 suffix). The main feature of these units are their versatility in calibration. Each unit can be calibrated for a specific temperature range by setting a DIP switch, then adjusting potentiometers to bring the unit into calibration.

For the low span unit, the minimum temperature can be anywhere from 40°F to +40°F, while the maximum temperature can be anywhere from 150°F to 500°F above the minimum temperature. For the high span unit, the minimum temperature can be anywhere from -40°F to +40°F, while the maximum temperature can be anywhere from 300°F to 1000°F above the minimum temperature.

Unit Span	Model#	Min Span	Max Span	Increment	Min Base	Max Base
Low	TX904-1	150°F	500°F	50°F	-40F	+40°F
High	TX904-2	300°F	1000°F	100°F	-40F	+40°F

The TX904 Two-Wire RTD Transmitter will produce a standard 4-20 mA output signal proportional to that produced by its RTD input temperature sensor. Transmission of the proportional current output may be accomplished by using inexpensive copper wire. The TX904 RTD Transmitter accepts 100 Ohm, Platinum RTD sensors (PT100, alpha = 0.00385).

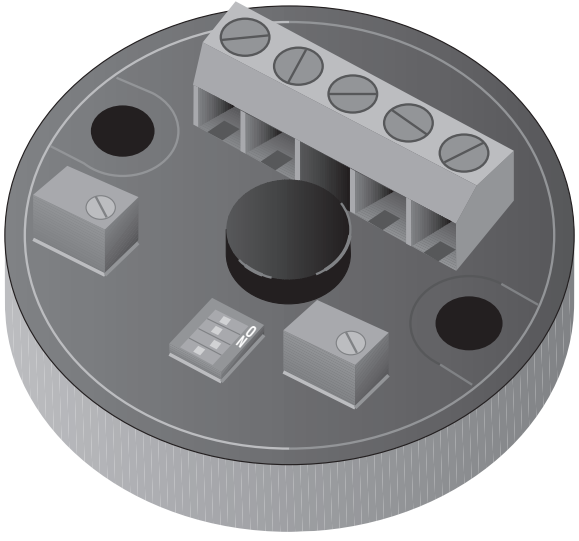


Figure 1-1 TX904 Transmitter

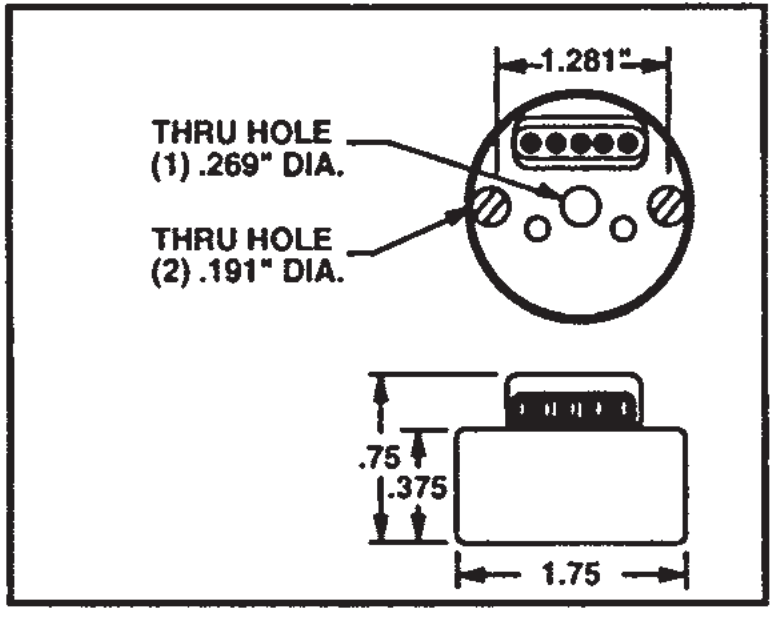


Figure 1-2 General Dimensions (in Inches)

The TX904 transmitter is normally powered by an unregulated power supply as shown in Figure 1-3. The proportionally-transmitted signal begins at 4 mA at the low end of its temperature range, and increases to 20 mA at the high end of its temperature range.

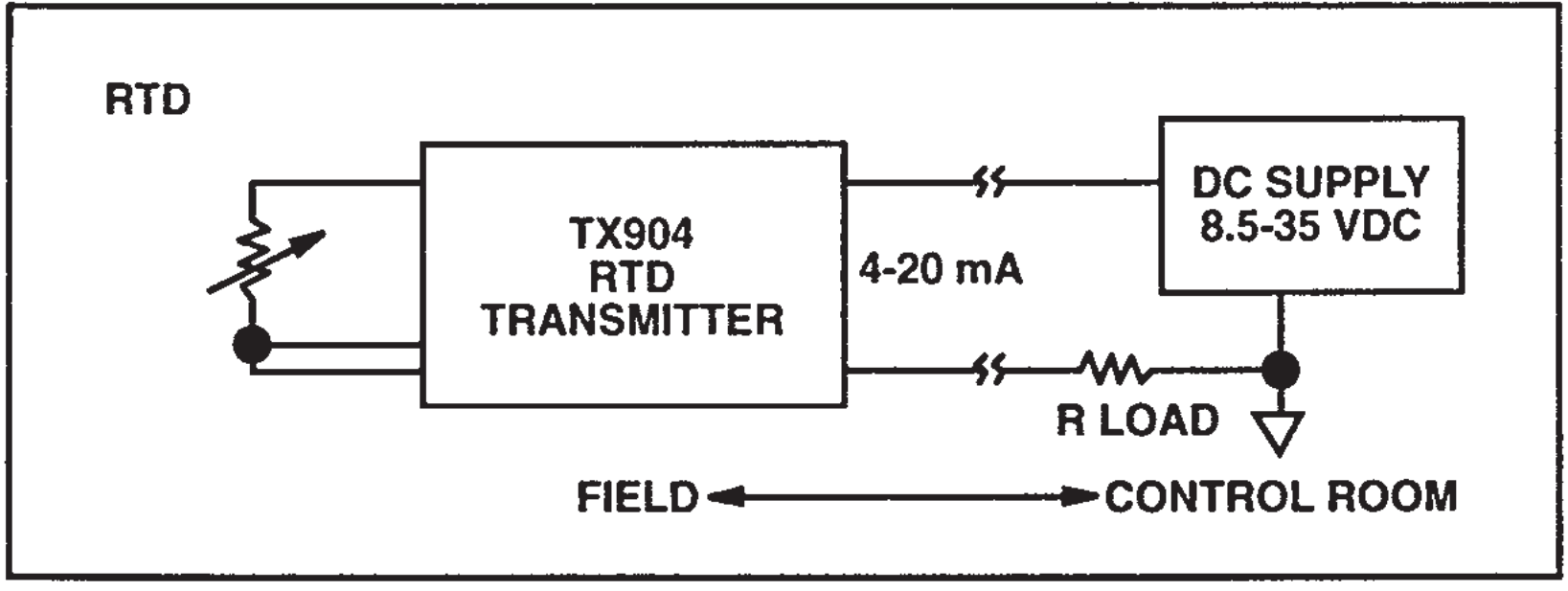


Figure 1-3 TX904 RTD Transmitter

The TX904 two-wire transmitter will work with 2-wire or 3-wire RTDs and provides an output current of 4-20 mA proportional to the RTD sensor. When the transmitter is mounted inside a protection head (such as OMEGA's NB1 Protection Head), two copper wires now carry the temperature signal and dc voltage to operate the transmitter, thereby reducing possible noise pick-up errors. The TX904 does NOT provide isolation between its input and the 4-20 mA output. Note, however, that the RTD element is electrically insulated.

1.2 Features

- 4-20 mA output
- ±0.1% full-scale accuracy (with respect to the RTD input resistance)
- Upscale break protection
- Low Cost

1.3 TX904 Models Available

Model Number	Description
TX904-1	100Ω Pt RTD input (α = 0.00385) field rangeable transmitter, non-isolated, 150-500°F overall range
TX904-2	100Ω Pt RTD input (α = 0.00385) field rangeable transmitter, non-isolated, 300-1000°F overall range

Model Number	Description
PRTX904-1	PR-12 RTD probe, 12" long, ¼" O.D., 304SS sheath, with TX904-1 transmitter
PRTX904-2	PR-12 RTD probe, 12" long, ¼" O.D., 304SS sheath, with TX904-2 transmitter

For complete information on PR-12 RTD Probes, see the OMEGA Temperature Measurement Handbook®.

2 Installation

2.1 Mounting the TX904

The TX904 transmitter may be:

1. surface mounted,
2. mounted inside a protection head (refer to Figure 2-1)
3. installed into OMEGA's mounting track (part number RT) using OMEGA's mounting bracket (part number TX90-BR).
4. installed into standard 35mm DIN rail using OMEGA's DIN rail mounting adapter (part number TX-90-DIN).

Figure 2-2 shows the RT mounting track. Figure 2-3 shows the TX90-BR mounting bracket.

Figure 2-4 shows a typical installation of two transmitters using the bracket and mounting track. Figure 2-5 shows the TX90-DIN rail mounting adapter.

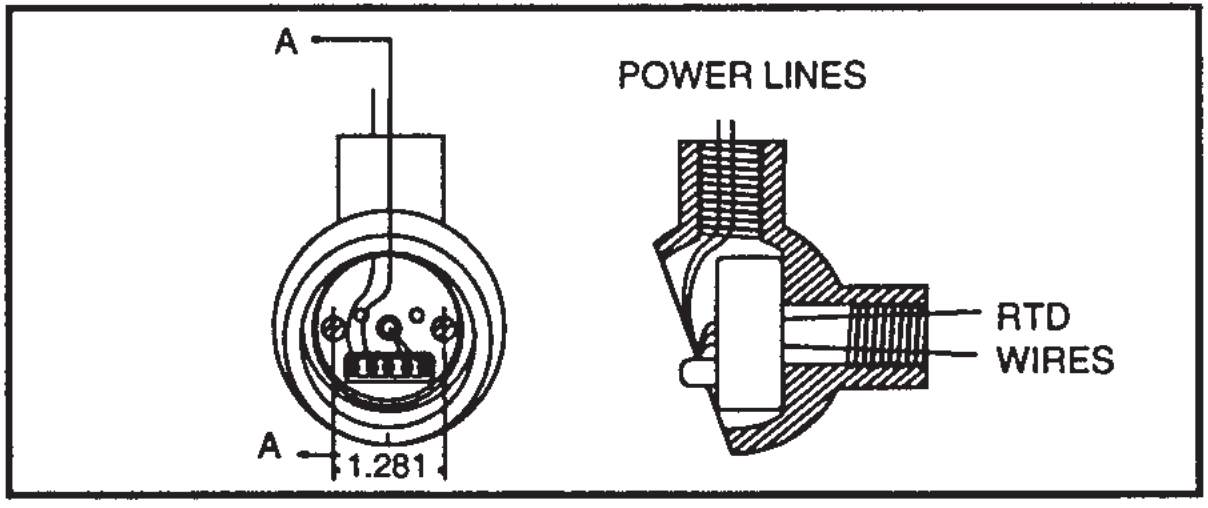
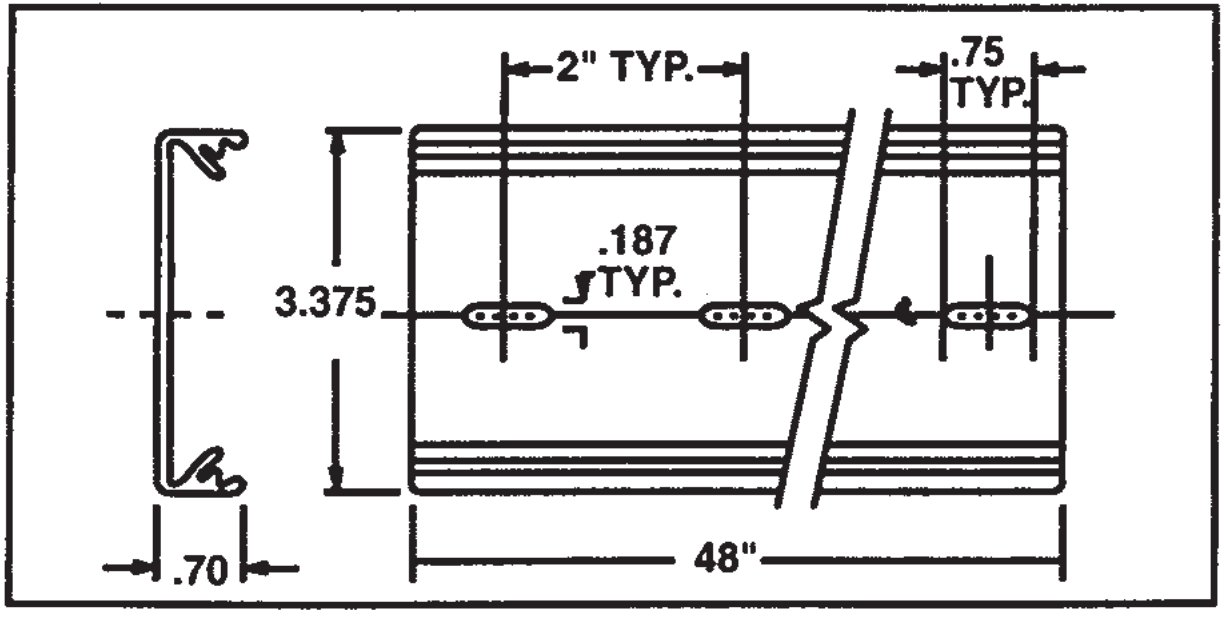


Figure 2-1 Assembly of the Transmitter inside OMEGA's NB1 Protection Head (Dimensions in Inches)



CAUTION

Hand tighten transmitter mounting screws only. Do not overtighten.

Figure 2-2 RT Mounting Track (Dimensions in Inches)

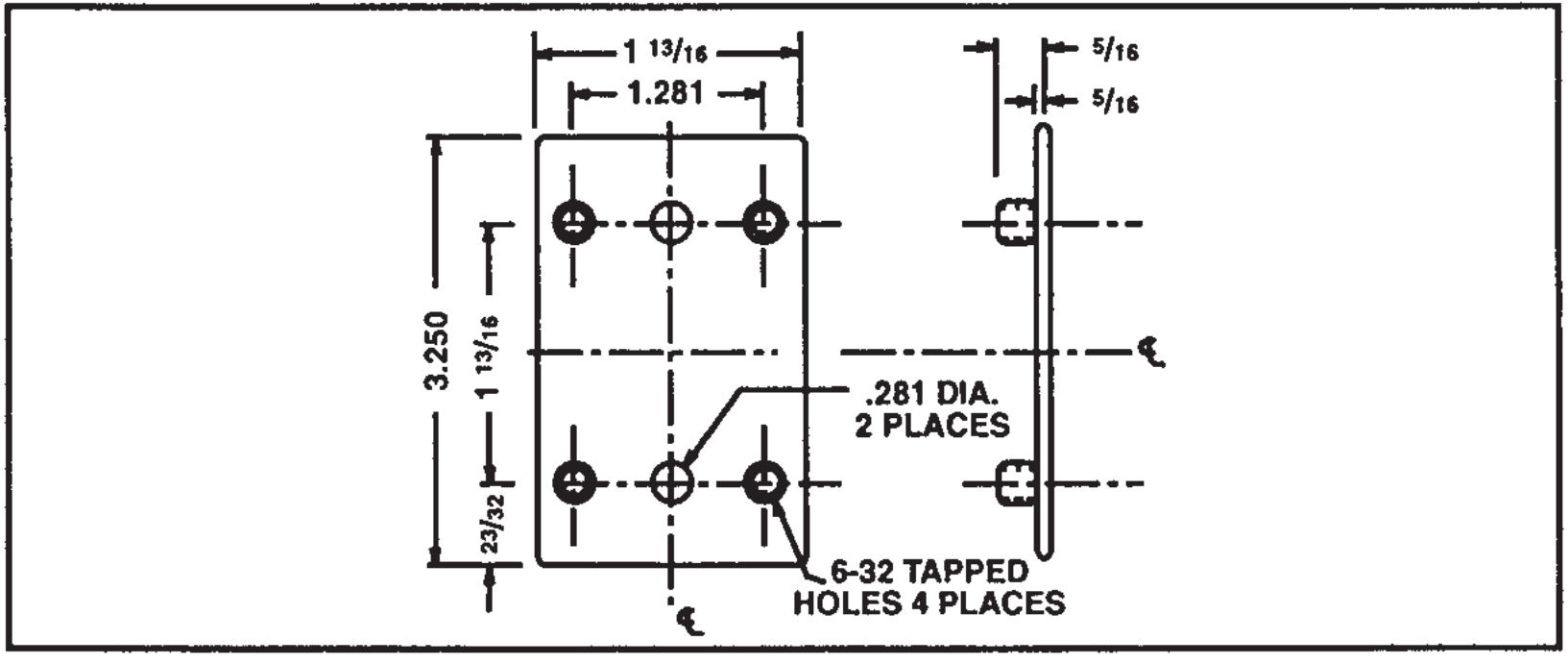


Figure 2-3 TX90-BR Mounting Bracket (Dimensions in Inches)

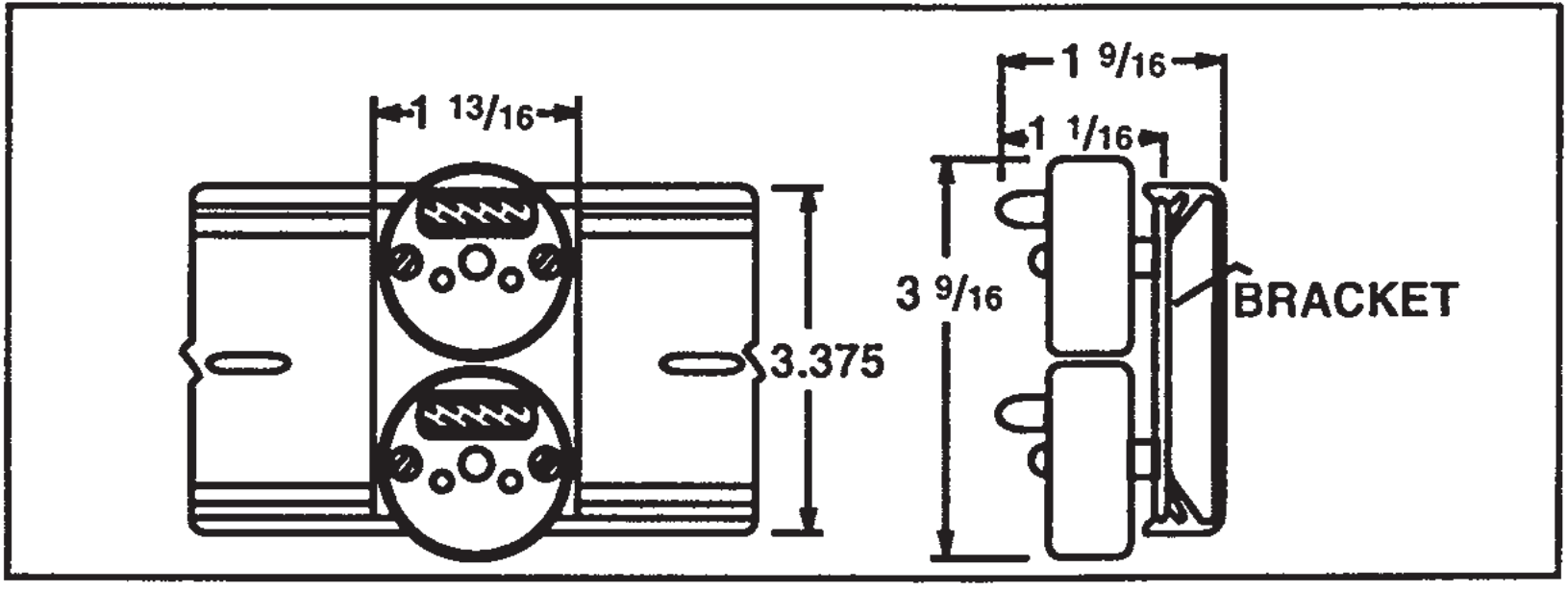


Figure 2-4 Installation with the Bracket and Track (Dimensions in Inches)

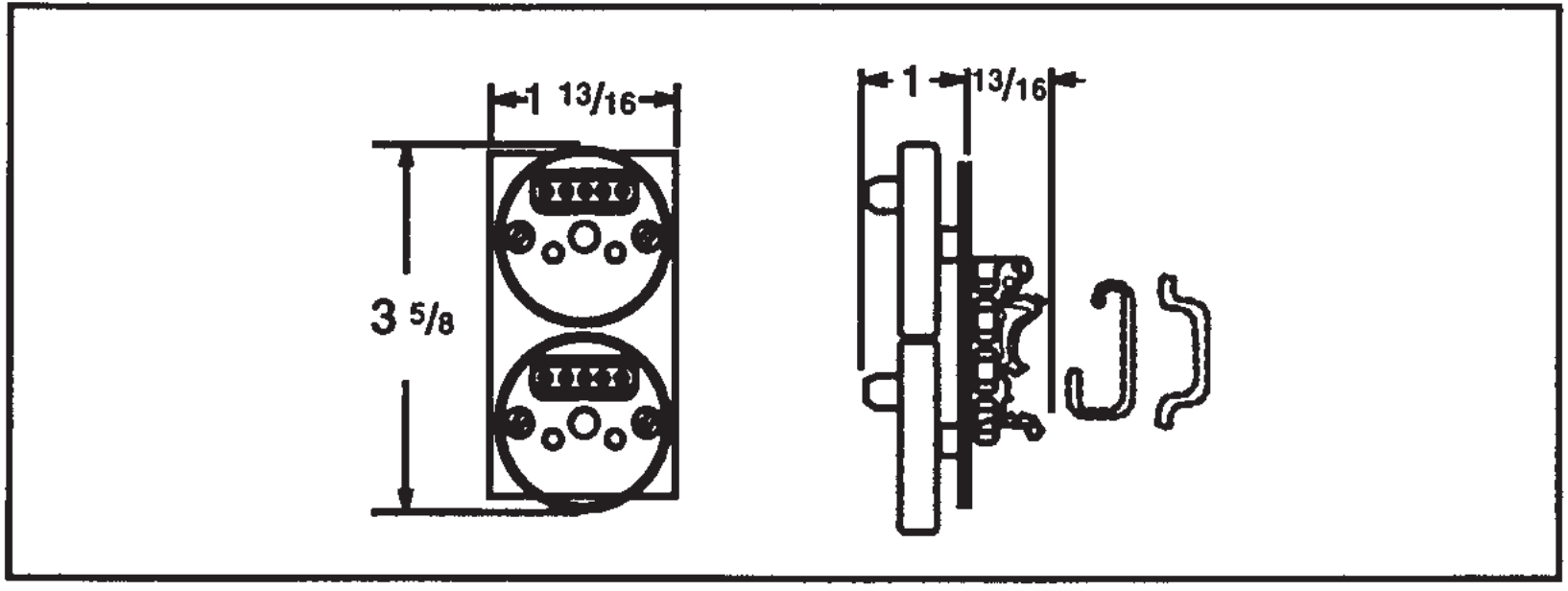


Figure 2-5 TX90-DIN DIN Rail Mounting Adapter (Dimensions in Inches)

2.2 Wiring the TX904 (Refer to Figure 2-6)

1. Connect a dc power supply in series with the load to the (+PS) and (-PS) power terminals. Note that the load (usually a monitoring instrument) may be connected to either the (+) or (-) power lead.
2. Connect the RTD element to the input terminals as shown.

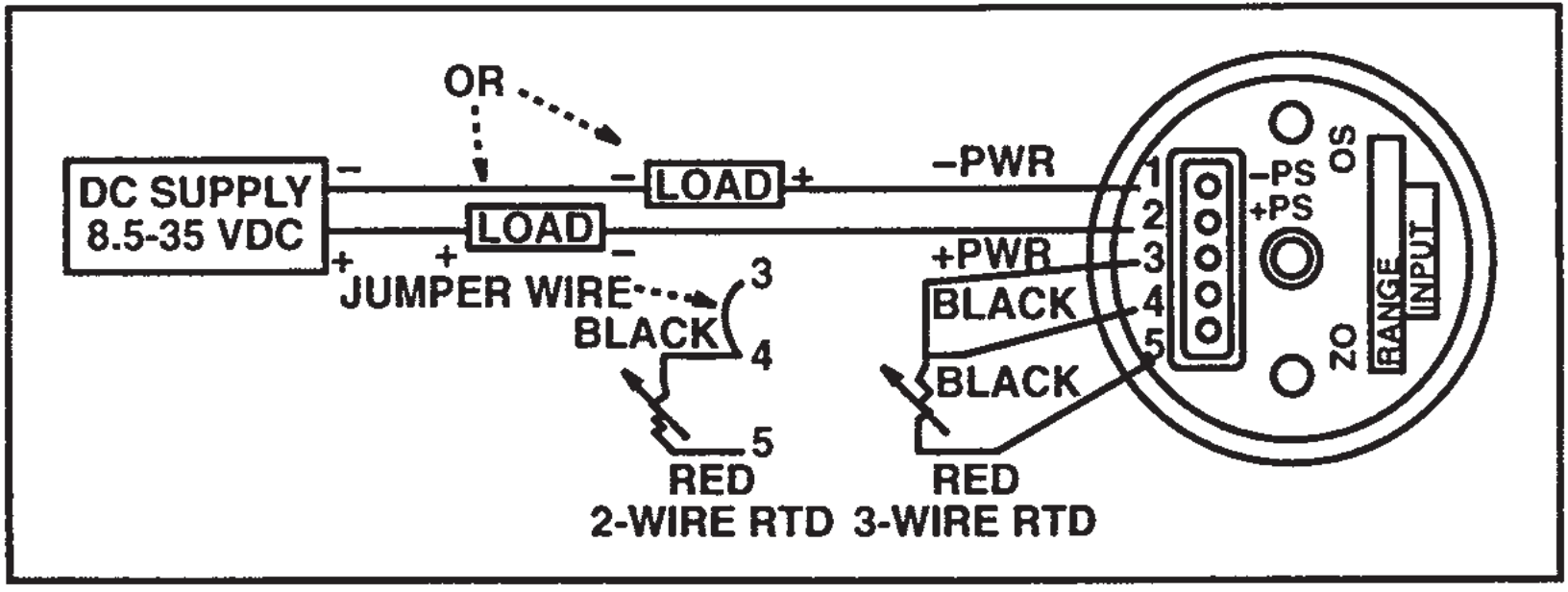


Figure 2-6 Wiring Diagram for the TX904

3 Calibration Instructions

3.1 Equipment Required

- Precision Decade Resistance Box, with 0.01 ohm resolution ±0.002 ohm accuracy or
- Precision RTD Simulator, such as the OMEGA® Model CL511 Precision Calibrator
- Precision DMM capable of measuring mA, with 0.001 mA resolution and ±0.002 mA accuracy
- 100Ω Pt RTD ($\alpha = 0.00385$) resistance vs temperature reference table (refer to the OMEGA Complete Temperature Measurement Handbook and Encyclopedia®)

3.2 Calibration Procedures (Refer to Figure 3-1)

Connect the calibration equipment according to Figure 3-1. Standard copper test leads are used with RTD instrumentation.

To check or adjust the calibration:

1. Locate the Z (zero) and S (span) potentiometers.
2. Select, from Table 3-1, the correct dip switch settings for your desired range for the TX904. After adjusting the dip switch settings , look up on your RTD reference table the correct resistance input values for the Z (zero) and S (span) adjustments that correspond to your selected input range. For example, if you selected an input range of 0 to 250°F, the Z input is 93.03 ohms, and the S input is 146.48 ohms.

If a Thermocouple/RTD Simulator is used, such as the OMEGA® Model CL511 Precision Calibrator, select the Temperature Input Z (zero) and S (span) values.

3. Set the decade box to the selected Z (zero) ohmic value. Adjust the Z potentiometer to read 4.000 mA on the monitoring instrument.
4. Set the decade box to the selected S (span) ohmic value. Adjust the S potentiometer to read 20.000 mA on the monitoring instrument.
5. Repeat steps 3 and 4, as required, until the readings are exactly 4.000 mA and 20.000 mA. This procedure is necessary since there is interaction between the two potentiometers.

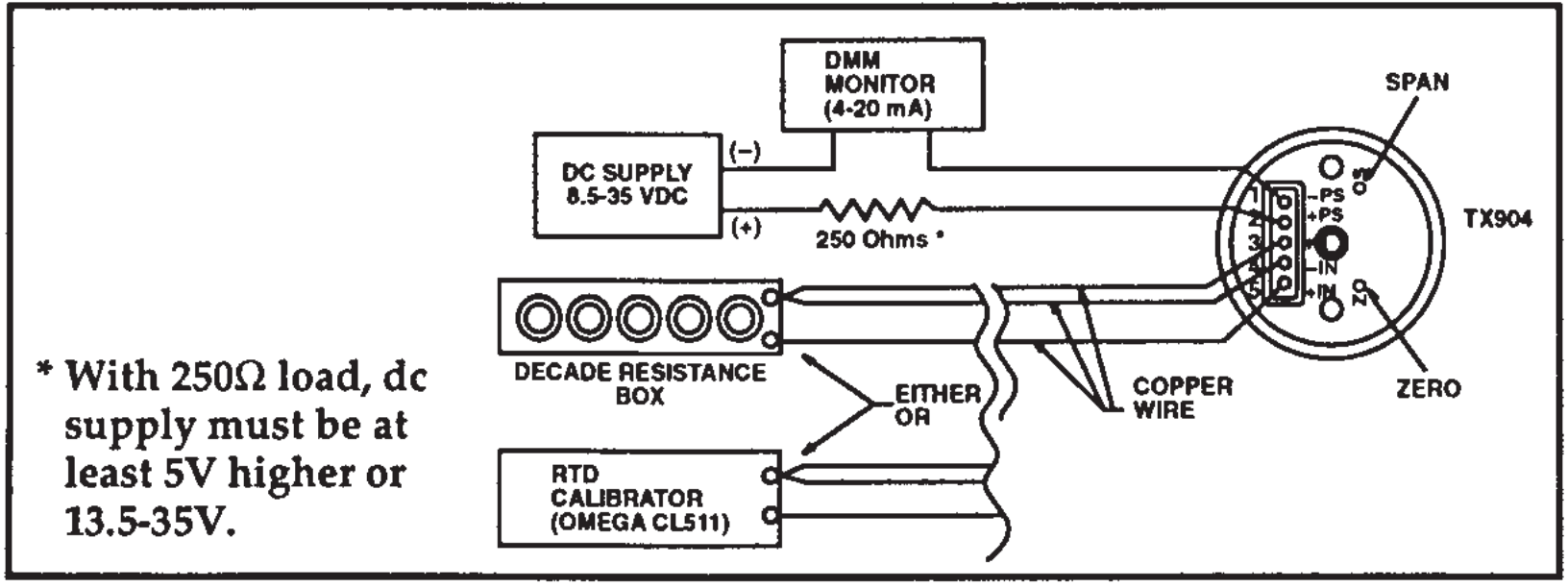


Figure 3-1 TX904 RTD Calibration Set-Up

Set DIP switch positions 1 through 3 for the desired span as indicated in the following table. The indicated span is the minimum span for that position. Select the switch positions that deliver the highest minimum span for the particular calibration. (example: if the desired span is 250°F for a TX904-1 transmitter, then select switch 1 on, switch 2 off, and switch 3 on.)

TABLE 3-1 DIP SWITCH SELECTABLE INPUT RANGES

SWITCH 3	ON	ON	ON	ON	OFF	OFF	OFF	OFF
SWITCH 2	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SWITCH 1	ON	OFF	ON	OFF	ON	OFF	ON	OFF
TX904-1	150°F	200°F	250°F	300°F	350°F	400°F	450°F	500°F
TX904-2	300°F	400°F	500°F	600°F	700°F	800°F	900°F	1000°F

Set DIP switch position 4 for the range that contains the desired calibration offset as indicated in the following table.

SWITCH 4	ON	OFF
OFFSET RANGE	-40°F to -1°F	0°F to 40°F

Troubleshooting Guide

Malfunction or incorrect operation may be caused by:

1. Incorrect Readings: Check for improper wiring. (Refer to Figure 2-6).
2. Loose or broken wires: Check each terminal connection for tightness. Move each wire back and forth and note any changes in operation.
3. Too high a load resistance in the output current loop or too low a current rating on the power supply:
   a) Measure the total resistance of each device (excluding the transmitter and power supply) in the 20 mA loop, including the resistance of the lead wires.

b) Calculate the maximum allowable loop resistance using the formula:

$$\text{Loop Resistance (maximum)} = \frac{V_{supply} - 8.5V}{0.020A}$$

For example, a 24V power supply would give a maximum loop resistance of: 15.5V/0.020A = 775 ohms.

c) Make sure the power supply is rated for at least 28 mA times the number of TX904 transmitters being powered. For example, if the supply is powering five transmitters, the supply should be rated for at least 140 mA.

5 Accessories

Model No.	Description
TX90-BR	Mounting Bracket
PSU-24B	Unregulated Power Supply, 24 Volts
TX82B	Process Loop-Powered Indicator
RT	48" Mounting Track
TX90-DIN	DIN Rail Mounting Adapter
RAIL-35-2	6.5' Section 35mm DIN Rail

6 Specifications

General

Size:	1.75" dia. X 0.75" high (includes terminal strip)		
Zero/Span Adjustment Range:	TX904-1	Zero	-40° to +40°F
		Span	150° to +500°F
	TX904-2	Zero	-40° to + 40°F
		Span	300° to +1000°F
Power Supply Voltage Operating Range:	+8.5 Vdc to +35 Vdc, 28 mA max required per transmitter		

Accuracy:	±0.1% of full scale (includes effects of hysteresis, repeatability and linearity proportional to the RTD input)
Frequency Response:	3dB@ 3Hz
Ambient Temperature:	-13°F to 185°F (-25°C to 85°C)
Storage Temperature Range:	-85°F to 257°F (-65°C to 125°C)
Thermal Zero Shift:	<0.02%/°F of span
Thermal Span Shift:	<0.02%/°F of span
Weight:	1.0 oz (29g)

Output

Current Output Span:	4-20 mA dc

Current Output Limits:	2 to 28 mA, typical
Maximum Loop Resistance:	$(V_{supply} - 8.5V)/0.020A$ = ohms
Load Resistance Effect:	0.005% of span per 300 ohms change
Power Supply Effect:	0.002% of output span per volt

Input

Sensor:	2 or 3-wire RTD
Maximum Bridge Current:	1 mA

Notes

MADE IN USA

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