1 YEAR
WARRANTY

OMEGA™

User's Guide

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TX94A
Ultra-Miniature Temperature Transmitters

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FIGURES & TABLES

1.1 Unpacking

Remove the packing list and verify that you have received all equipment. If you have any questions, contact the nearest Customer Service Department, as listed on the cover of this manual.

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

Note: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing materials and carton in the event reshipment is necessary.

1.2 Safety and EMC Considerations

This instrument is a Class III device (8 to 35 Vdc).
Always use a power supply, which complies with EN 60950 safety standard.

- Do not expose the transmitter to rain or condensing moisture.
- Do not operate the transmitter in flammable or explosive atmosphere.
- As with any electronic instrument, you may encounter high voltage exposure when installing, calibrating or removing parts of the transmitter.

EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

Failure to follow all instructions and warnings may result in injury!

1.3 General Description

The Two-Wire RTD Transmitter will produce a standard 4-20mA 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 RTD transmitter accepts two-wire or three-wire ohm platinum RTD sensors (PT100,alpha = 0.00385).

1.3 General Description

The transmitter is normally powered by an unregulated power supply as shown in **Figure 1-1**. The proportionally-transmitted signal begins at 4mA, at the low end of its temperature range, and increases to 20mA, at the high end of its temperature range. (There are various temperature ranges available for the transmitter. To order, refer to **Section 1.5** for correct Model Numbers and Range Codes.)

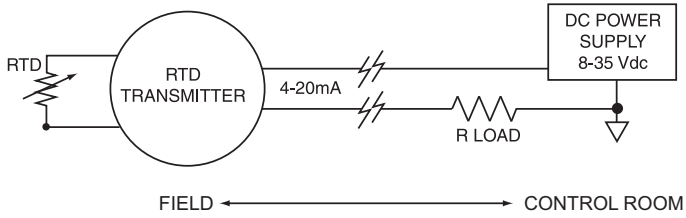

Figure 1-1 RTD Transmitter

The transmitter works with 2 or 3-wire RTDs and provides an output current of 4-20mA proportional to the RTD Sensor.

When the transmitter is mounted inside a protection head, (see **Figure 2-1**), two copper wires now carry the temperature signal and dc voltage to operate the transmitter, thereby reducing possible noise pick-up errors.

The transmitter does NOT provide isolation between its input and the 4-20 mA output. Note, however, that the RTD element is electrically insulated.

1.4 Features

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

1.5 Models Available

Table 1-1 Range Code

INPUT TYPES	
RANGE	**RTD**
-40 to 120 F (-40 to 49 C)	1
0 to 200 F (-18 to 93 C)	2
0 to 300 F (-18 to 149 C)	3
0 to 500 F (-18 to 260 C)	4
0 to 750 F (-18 to 399 C)	5
0 to 1000 F (-18 to 538 C)	6

Table 1-2 Model Numbers

Model Number	Description
TX94A-(*)	RTD Transmitter (100 ohm, Pt, alpha=0.00385)

*Insert range code from **Table 1-1**

2.1 Mounting

The transmitter may be:

1. surface mounted
2. mounted inside a protection head (shown in **Figure 2-1**)

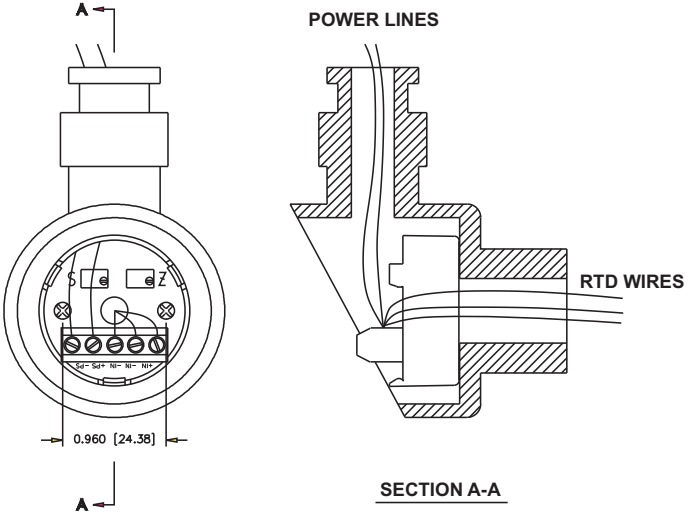

Figure 2-1 Assembly of the Transmitter inside an PR-14 Protection Head

2.2 Wiring

Refer to **Figure 2-2**

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 (+IN) and (-IN) input terminals.

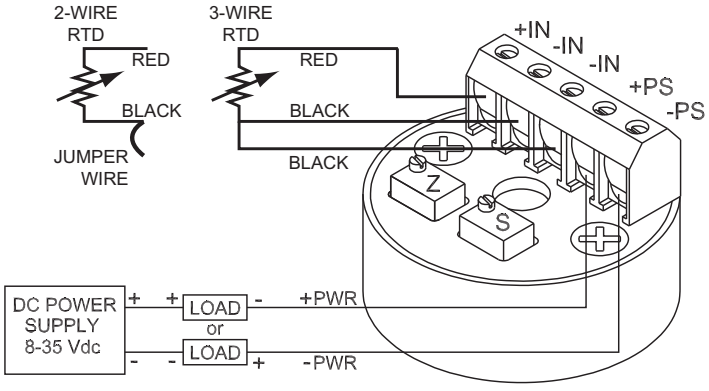

Figure 2-2 Wiring Diagram for RTD Transmitter

3.1 Equipment Required

- Precision Decade Resistance Box, with 0.01 ohm resolution and ±0.02 ohm accuracy

  or

- Precision RTD Simulator, such as OMEGA CL511 Precision Calibrator
- Precision DMM capable of measuring mA, within 0.001 mA resolution and ±0.002 mA accuracy

3.2 Calibration Procedures

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 ohmic values for the Z (zero) and S (span) adjustments that correspond to the model number. For example, for Model TX94A-2, the Z value is 92.95 ohms, and the S value is 135.84 ohms.

   If a Thermocouple/RTD Simulator is used, such as the 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.

3.2 Calibration Procedures (continued)

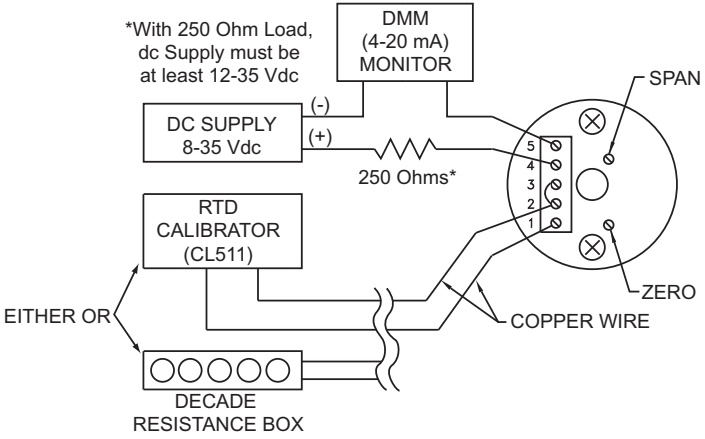

Figure 3-1 Transmitter Calibration Set-Up

Table 3-1. Calibration Values

Temperature Input Range Zero/Span	Model TX94A	Resistance Input (Ohms) Alpha=0.00385 Zero/Span
-40/120°F	-1	84.27 / 119.01
0/200°F	-2	92.95 / 135.84
0/300°F	-3	92.95 / 156.94
0/500°F	-4	92.95 / 197.69
0/750°F	-5	92.95 / 246.69
0/1000°F	-6	92.95 / 293.46

4.1 Troubleshooting Guide

Malfunction or incorrect operation may be caused by:

1. Incorrect Readings:

   Check for improper wiring using **Figure 2-2** as a guide.

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 maximum allowable loop resistance using the formula: Loop Resistance (maximum) = $\frac{\text{Vsupply} - 8\ \text{V}}{0.020\text{A}}$

   For example, a 24V power supply would give a maximum loop resistance of: 16 V/0.020A = 800 ohms.

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

5.1 Specifications

General

Size:

1.40” dia. x 0.93” high
(includes terminal strip)

Weight:

0.53 oz (15g);
0.83 oz (25g) if potted

Ambient Temperature:
-13°F to 185°F
(-25°C to 85°C)

Storage Temperature
-85°F to 257°F
(-65°C to 125°C)

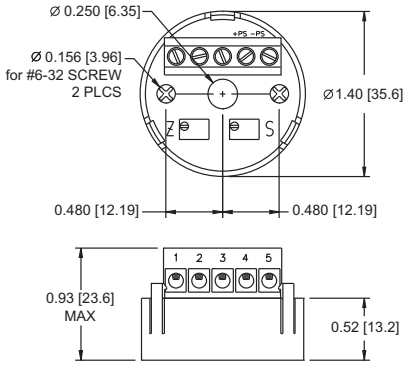

Figure 5-1 Dimensions

Zero/Span Adj Range:	±25%
Power Supply Voltage	
Operating Range:	+8 Vdc to +35 Vdc, 28 mA max required per transmitter
Accuracy:	±0.1% of full scale (includes effects of hysteresis, and repeatability)
Frequency Response:	3dB@ 3Hz
Thermal Zero Shift:	<0.01% / °F of span (span >10 mV) <0.02% / °F of span (4-10 mV span)
Thermal Span Shift:	<0.01% / °F of span

5.1 Specifications (continued)

Output

Current Output Span:	4-20 mA dc
Current Output Limits:	3 to 28 mA, typical
Max Loop Resistance:	(Vsupply – 8V) / 0.020A = ohms
Load Resistance Effect:	0.01% of span per 300 ohms change
Power Supply Effect:	0.002% of output span per volt

Input

Sensor:	2 or 3-wire RTD
Max. Bridge Current:	0.8 mA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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