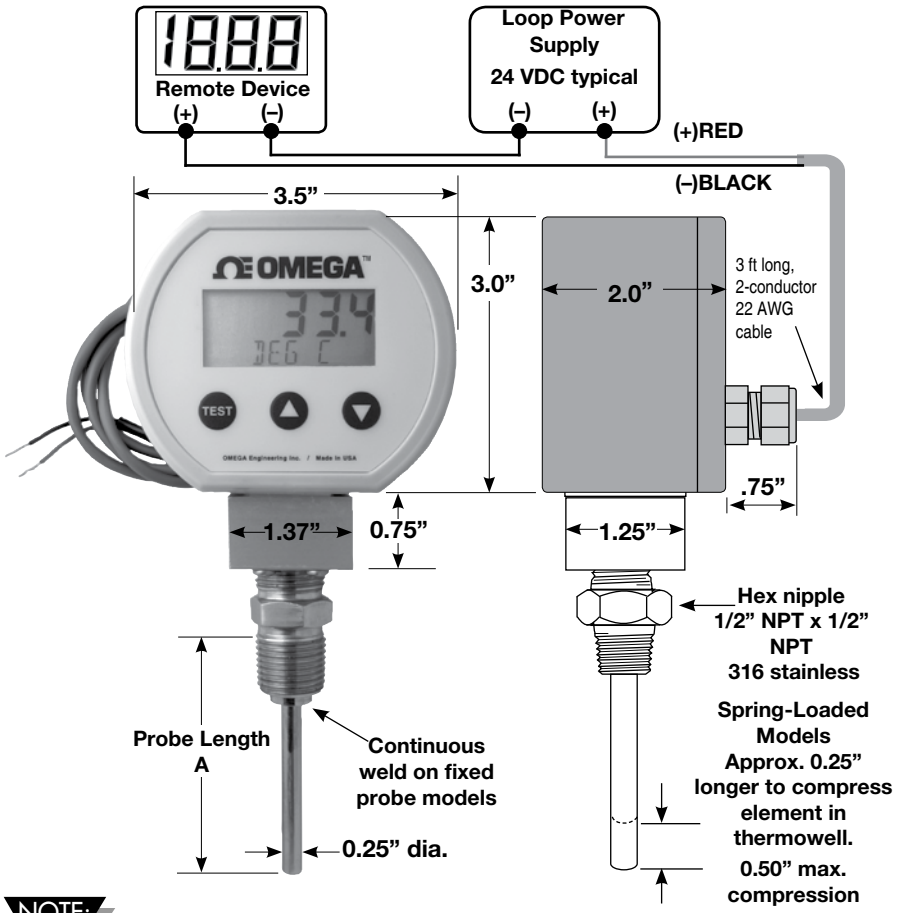
PRTXD Series
Loop Powered RTD Temperature Transmitters

M-4455/0818

PRTXD Series RTD Transmitters		
MODEL	PROBE LENGTH	PROBE TYPE
PRTXD-4	4”	Fixed
PRTXD-4-SL	4”	Spring-Loaded*
PRTXD-12	12”	Fixed
PRTXD-12-SL	12”	Spring-Loaded*

*Thermowell required for spring-loaded versions



NOTE:

Spring-loaded RTD probes MUST be used with a thermowell. Probe length is measured from top of full threads to tip of probe. Length = thermowell “A” or “element length” dimension. See the Omega thermowell specifications. Probe length is NOT the same as thermowell insertion depth.

OMEGA™

User's Guide

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1 YEAR WARRANTY

MADE IN USA

WARNING: This product can expose you to chemicals including lead, nickel and chromium, which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

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***Thermowell required for spring-loaded versions**

Range and Resolution
User selectable °F, °C or K
–58.0°F to 392.0°F
–50.0°C to 200.0°C
220.0K to 475.0K
0.1 degree resolution

Typical Accuracy
Includes linearity error and ±1 LSD
11-point linearization
±0.7°C at –50°C
±0.4°C at 0°C
±0.9°C at 100°C
±1.4°C at 200°C

Sensor
IEC-751 Class B 100 Ω Platinum RTD, 0.00385 alpha curve
½” NPT male, 316L stainless steel
All wetted parts are 316L stainless steel

Thermowell required for spring-loaded versions
Spring-loaded probe fits standard thermowells

Fixed probe pressure rating: 5000 psi max.
Fixed probes are welded to hex fitting

Display
4 readings per second nominal display update rate
4-1/2 digit LCD, 1/2” digit height, alphanumeric lower display for units

Out of Range Indication
ALARM1 on display above 392°F or 200°C
ALARM2 on display below –58°F or –50°C
Below approx. –103°F (–75°C) or above approx. 482°F (250°C), the display will indicate 1.-.-.-. and the loop current will go downscale or upscale depending on programmed burnout configuration.

Controls & Functions
TEST When held sets loop current and display to test level, independent of temperature input, to allow testing of system operation

▲ Up: increase output or calibration values during setup

▼ Down: decrease output or calibration values during setup

Loop Supply Voltage
Any DC supply/loop resistance that maintains 8 VDC to 32 VDC at gauge terminals. Erratic operation may occur if loop voltage falls below specifications.

Indication on display for low loop power

Reverse polarity protected

Loop Output Characteristics
4-20 mA output configurable to span any part of temperature range

0.0013 mA loop current resolution for spans greater than 164°F (90°C)
Output resolution is reduced for spans less than 164°F (90°C)

Updated approximately 4 times per second

Configurable for upscale or downscale burnout

Calibration
User settable passcode to enter calibration mode
Zero and span temperature calibration

Weight
Transmitter: Approx. 12 ounces
Shipping weight: Approx. 1 pound

Material and Color
NEMA 4X ABS/polycarbonate housing, light gray
Gasketed rear cover

Connection and Probe Material
1/2” NPT male hex nipple, 316 stainless steel
316 stainless steel probe sheath

Environmental
Storage: –40 to 203°F (–40 to 95°C) at housing
Operating: –4 to 185°F (–20 to 85°C) at housing

Description
The PRTXD series is microprocessor controlled industrial temperature indicator with a digital temperature display and 4-20 mA retransmission in a rugged NEMA 4X housing. The PRTXD has a 2-wire connection and all operating power is supplied by the 4-20 mA current loop.

The RTD temperature reading is linearized for both the digital display and the 4-20 mA output. The temperature display may be set up to read °F or °C and the 4-20 mA output may be set to correspond to a desired temperature range.

Installation and Precautions
A thermowell is required with flowing material, pressurized applications, and all applications using spring-loaded versions of the PRTXD.

Install or remove using wrench on probe hex fitting only. Do not attempt to tighten by turning housing or any other part of the transmitter. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

Electrical Connections
The 2-wire connection allows the PRTXD to be used as a temperature display powered by a low-voltage DC source, or as a loop-powered 4-20 mA transmitter. Connect the loop (+) supply to the RED lead and the loop (–) supply to the BLACK lead. Reversing the connections will not harm the transmitter but it will not operate with incorrect polarity.

Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the transmitter will have at least 8 VDC at its terminals. For correct operation and to avoid erratic or erroneous readings, the terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the output to “limit” or saturate before reaching its full 20 mA output.

The minimum loop supply voltage may be calculated from the formula:

Vmin = 8V + (20mA x Total loop resistance)

If the terminal voltage falls below about 7.8 VDC erratic operation may occur. This is an indication that the loop supply/resistance may not allow adequate power for reliable operation. This should never occur in normal use. If it does, examine the loop supply and resistance.

Operation
The PRTXD is designed for continuous operation. Warm-up time is negligible. When power is first applied, the PRTXD will set the loop current to maximum and check the voltage available. If there is sufficient voltage available to power the unit, all active segments will be displayed briefly. Then the display and the loop current will correspond to the temperature of the RTD probe.

At power-up, if the voltage available is not sufficient, only the low power segment will be displayed. This is an indication that the loop impedance is too high or the loop power supply voltage is too low. After successful power-up, if the loop voltage falls below the minimum required for reliable operation, the PRTXD will continue to indicate the temperature of the RTD with the low power segment blinking at a slow rate.

If the RTD temperature goes above 392°F or 200°C, ALARM1 will be displayed. If the RTD temperature goes below –58°F or –50°C, ALARM2 will be displayed.

If the RTD temperature continues beyond these limits, the display will eventually indicate 1.-.-.-. and the loop current will be minimum if downscale burnout is configured or maximum if upscale burnout is configured.

Functional Characteristics
The display and the 4-20 mA output are updated approximately 4 times per second. The RTD probe has a time constant of approximately 10 seconds, which is typical of an RTD probe in a stainless sheath.

Time constant is characterized as the RTD changing to 63.2% of its new temperature span in one time constant, and 95% of its new temperature span in three time constants.

The RTD resistance measurement is read by an A/D (analog to digital) converter, linearized by the microprocessor and displayed on the LCD.

The digitized and linearized RTD signal is also converted to an analog signal to produce the 4-20 mA output. The 4-20 mA output can be set to any range within the linearized range of the PRTXD. The 4-20 mA D/A (digital to analog) conversion will produce a loop current resolution of approximately 0.0013 mA for spans as small as 164 F° or 90 C°.

For smaller spans, the A/D resolution is smaller than the D/A resolution and loop current resolution will decrease. As the output span setting is further reduced, uneven “stair stepping” may become noticeable in the output signal. For this reason extremely small 4-20 mA span settings may be undesirable and should be avoided.

Passcode Entry
The PRTXD has a user configurable passcode (factory default 3510) that must be entered to access the configuration and calibration modes.

See the appropriate sections for details on accessing and using these modes.

Configuration: Hold s and press TEST to CFG

Calibration: Hold t and press TEST to CAL

When the buttons are released, the the upper display will indicate _ _ _ _ with the left-most position blinking, and the lower display will indicate PASS.

Pressing and releasing TEST exits passcode entry if no entry has been made.

Enter the user modifiable passcode.

Use the s up and t down buttons to set the left-most digit to 3.

Press and release the TEST pushbutton to move to the next position. The 3 will remain, and the second position will be blinking.

Use the s up and t down buttons to select 5.

Press and release the TEST button to move to the next position. 3 5 will remain, and the third position will be blinking.

Use the s up and t down buttons to select 1.

Press and release the TEST button to move to the next position. 3 5 1 will remain, and the fourth position will be blinking.

Use the s up and t down buttons to select 0.

Press and release the TEST button to continue with calibration procedures.

Note: If an incorrect passcode was entered, the gauge will exit to the normal operating mode.

Changing the User Passcode
The passcode can be changed only after entering the factory passcode as indicated below.

While pressing and holding the s up button, press the TEST button to enter the configuration mode. The upper section of the display will indicate CFG.

When all buttons are released, the upper section of the display will indicate _ _ _ _ with the left-most position blinking, and the lower section will indicate PASS.

To exit and return to the normal operating mode, press and release the TEST button.

Enter factory passcode 1220 as follows.

Use the s up and t down buttons to set the left-most digit to 1.

Press and release the TEST button to index to the next position. The 1 will remain, and the second position will be blinking.

Use the s up and t down buttons to select 2.

Press and release the TEST button to index to the next position. 1 2 will remain, and the third position will be blinking.

Use the s up and t down buttons to select 2.

Press and release the TEST button to index to the next position. 1 2 2 will remain, and the fourth position will be blinking.

Use the s up and t down buttons to select 0.

Press and release the TEST button to proceed to the passcode configuration.

Note: If an incorrect passcode was entered, the gauge will exit to the normal operating mode.

The upper display section will indicate the user modifiable passcode. The lower section will display UDPCD.

To change the user modifiable passcode, press and release either the s up or t down button.

The first character of the passcode will begin to blink.

Use the s up and t down buttons to set the blinking character to the desired value, then press and release the TEST button to move to the next character.

Repeat for each character position.

When the user modifiable passcode is displayed with no characters blinking, press and release the TEST button to save the new passcode and restart the gauge.

Note: To make a correction to the new passcode before saving and restarting, press either the s up or t down button to return to the UDPCD code entry sequence.

Configuration Mode

Press and hold the s up button and then press the TEST button until the upper display indicates CFG.

Enter the passcode as outlined in the the Passcode Entry section.

After the correct passcode is entered, press and release the TEST button to configure °F/°C, upscale/downscale burnout, 4 mA temperature, and 20 mA temperature.

Configuring Deg C or Deg F

The upper display section will be blank, and the lower section will display either DEG C or DEG F.

To change from °C to °F, press and release the s up button. The lower section of the display will change to DEG F.

To change from °F to °C, press and release the t down button. The lower section of the display will change to DEG C.

Note: whether or not a change is made, the Test value will be reset to 0.0°C or to 32.0°F.

Press and release the TEST button to move on to the next parameter.

Configuring Upscale or Downscale Burnout

The upper display section will be blank, and the lower section will display either DN BO or UP BO.

To change from downscale burnout to upscale burnout, press and release the s up button. The lower section of the display will change to UP BO.

To change from upscale burnout to downscale burnout, press and release the t down button. The lower section of the display will change to DN BO.

Press and release the TEST button to move on to the next parameter.

Configuring Range Lower Limit

The upper display section will indicate the temperature corresponding to a loop current of 4 mA. The lower section will display RNGLO.

To change the temperature corresponding to a loop current of 4 mA, use the s up and the t down buttons to set the desired value.

Press and release the TEST button to move on to the next parameter.

Configuring Range Upper Limit

The upper display section will indicate the temperature corresponding to a loop current of 20 mA. The lower section will display RNGHI.

To change the temperature corresponding to a loop current of 20 mA, use the s up and the t down buttons to set the desired value.

Exiting the Configuration Mode

Press and release the TEST button to save the configuration parameters and restart the gauge.

The configuration parameters will not be saved if the procedure is interrupted before completion.

TEST Button

When the front-panel TEST button is held depressed, the display and loop current are switched, independent of the temperature, to a test level determined by the setting of the Test adjustment.

To set the test output level, press and hold the front-panel TEST button and press the s up or t down button to adjust the test output to the desired temperature setting. This setting is stored in non-volatile memory.

Calibration

The PRTXD is factory calibrated and there is generally no need to alter calibration settings. Calibration should only be attempted if the user has access to a temperature reference of known accuracy.

The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the unit's accuracy.

Entering Calibration Mode

While pressing and holding the t down button, press the TEST button to enter the calibration mode.

The upper section of the display will indicate CAL.

Enter the passcode as outlined in the the Passcode Entry section.

After the correct passcode is entered, press and release the TEST button to continue with calibration procedures.

Loop Calibration

Upon successful passcode entry, the upper segments of the display will indicate the RTD probe temperature.

The lower segments of the display will alternate between CAL and either DEG C or DEG F. The loop current will correspond to the RTD probe temperature.

Note: To store the calibration parameters and exit calibration mode at any time, press and hold the TEST button until the display indicates - - - -.

The loop current calibration procedure coordinates the loop current to the display indication, and is performed independently of applied temperature. It requires a direct physical measurement of the loop current.

4 mA Loop Current

Press the TEST button and release it when the display indicates LCAL.

If the TEST button is held for longer than 2 seconds, the display will indicate - - - - and the gauge will exit the calibration mode when all buttons are released.

The upper display segments will indicate the preconfigured temperature corresponding to a 4 mA loop current. The lower display segments will alternate between CAL and 4 MA.

Use the s up and t down buttons to adjust the actual loop current to 4 mA.

Note: Only the loop current will change. The upper display segments will continue to indicate the preconfigured temperature.

20 mA Loop Current

Press the TEST button and release it when the display indicates HCAL.

If the TEST button is held for longer than 2 seconds, the display will indicate - - - - and the gauge will exit the calibration mode when all buttons are released.

The upper display segments will indicate the preconfigured temperature corresponding to a 20 mA loop current.

The lower display segments will alternate between CAL and 20 MA.

Use the s up and t down buttons to adjust the actual loop current to 20 mA.

Note: Only the loop current will change. The upper display segments will continue to indicate the preconfigured temperature.

Temperature Indication & Output Calibration

The temperature calibration procedure simultaneously adjusts both the display indication and the loop current to correspond to the actual applied temperature.

If the calibration is to be performed using an RTD simulator, open the rear cover of the enclosure, disconnect the RTD probe at the connector on the circuit board, and connect the simulator in its place.

Ice-Point Calibration

Press the TEST button and release it when the display indicates CAL.

If the TEST button is held for longer than 2 seconds, the display will indicate - - - - and the gauge will exit the calibration mode when all buttons are released.

Apply 0.0°C or 32.0°F to the RTD using a temperature bath with a known accurate reference thermometer. The lower display segments will alternate between CAL and DEG C or DEG F.

Use the s up and t down buttons to adjust the upper display segments to indicate 0.0°C or 32.0°F or a reading equal to the reference thermometer.

Span Calibration

Apply full-scale temperature to the RTD. The lower display segments will alternate between CAL and DEG C or DEG F.

Use the s up and t down buttons to adjust the upper display segments to indicate the applied temperature value.

To store the calibration parameters and exit calibration mode, press and hold the TEST button until the display indicates - - - - .

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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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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