

Sabre T • Model PD743

Temperature Meter

Instruction Manual



Sabre Series

- J, K, T, E Thermocouple & 100 Ω Pt RTD
- Pre-Calibrated for All Input Types
- Type 4X, NEMA 4X, IP65 Front
- Shallow Depth Case 3.2" Behind Panel
- 4 Digit Display, 0.56" (14 mm) High, Red LEDs
- Easy Front Panel Programming
- Maximum/Minimum Display
- Universal Power Supply 85-265 VAC
- 12-36 VDC/12-24 VAC Power Option

PRECISION DIGITAL CORPORATION
19 Strathmore Road • Natick MA 01760 USA
Tel (800) 343-1001 • Fax (508) 655-8990

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INTRODUCTION

The Sabre T model PD743 is an easy to use temperature meter. It accepts type J, K, T, E thermocouple and 100 Ω platinum RTD sensors. The four front panel buttons make the setup and programming an easy task.

ORDERING INFORMATION

| 85-265 VAC* Model | 12-36 VDC* Model | Description |
|--|---------------------|-------------------|
| PD743-6R0-0 | PD743-7R0-0 | Temperature Meter |
| *All models may be powered from AC or DC, see Specifications for details. | | |

NEMA 4 & NEMA 4X Enclosures

| Model | # of Meters | Description | Mounting |
|---------|-------------|-----------------------------------|---------------|
| PDA2501 | 1 | Plastic NEMA 4X Enclosure | Through Door |
| PDA2502 | 2 | Plastic NEMA 4X Enclosure | Through Door |
| PDA2503 | 3 | Plastic NEMA 4X Enclosure | Through Door |
| PDA2504 | 4 | Plastic NEMA 4X Enclosure | Through Door |
| PDA2505 | 5 | Plastic NEMA 4X Enclosure | Through Door |
| PDA2506 | 6 | Plastic NEMA 4X Enclosure | Through Door |
| PDA2601 | 1 | Stainless Steel NEMA 4X Enclosure | Through Door |
| PDA2602 | 2 | Stainless Steel NEMA 4X Enclosure | Through Door |
| PDA2603 | 3 | Stainless Steel NEMA 4X Enclosure | Through Door |
| PDA2604 | 4 | Stainless Steel NEMA 4X Enclosure | Through Door |
| PDA2605 | 5 | Stainless Steel NEMA 4X Enclosure | Through Door |
| PDA2606 | 6 | Stainless Steel NEMA 4X Enclosure | Through Door |
| PDA2701 | 1 | Steel NEMA 4 Enclosure | Through Door |
| PDA2702 | 2 | Steel NEMA 4 Enclosure | Through Door |
| PDA2703 | 3 | Steel NEMA 4 Enclosure | Through Door |
| PDA2704 | 4 | Steel NEMA 4 Enclosure | Through Door |
| PDA2705 | 5 | Steel NEMA 4 Enclosure | Through Door |
| PDA2706 | 6 | Steel NEMA 4 Enclosure | Through Door |
| PDA2801 | 1 | Plastic NEMA 4X Enclosure | Through Cover |

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SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C.

General

| | |
|------------------------------|--|
| DISPLAY | 0.56" (14 mm) high, red LED Four digits, automatic lead zero blanking. |
| DISPLAY UPDATE RATE | RTD: 5/second Thermocouple: 2.5/second |
| OVERRANGE | Display flashes 9999 |
| UNDERRANGE | Display flashes - 1999 |
| PROGRAMMING METHODS | Four front panel buttons |
| RECALIBRATION | All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months. |
| MAX/MIN DISPLAY | Max/min readings reached by the process are stored until reset by the user or until power to the meter is turned off. |
| PASSWORD | Programmable password restricts modification of programmed settings. |
| NON-VOLATILE MEMORY | All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost. |
| POWER OPTIONS | 85-265 VAC, 50/60 Hz; 90-265 VDC, 8 W max or 12-36 VDC, 12-24 VAC, 6 W max |
| FUSE | Required fuse: UL Recognized, 5 A max, slow blow Up to 6 meters may share one 5 A fuse |
| NORMAL MODE REJECTION | 64 dB at 50/60 Hz |
| ISOLATION | 4 kV input-to-power line |
| OVERVOLTAGE CATEGORY | Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III. |
| ENVIRONMENTAL | Operating temperature range: 0 to 65°C Storage temperature range: -40 to 85°C Relative humidity: 0 to 90% non-condensing |
| CONNECTIONS | Removable screw terminal blocks accept 12 to 22 AWG wire, RJ11 for factory use only. |
| ENCLOSURE | 1/8 DIN, high impact plastic, UL 94V-0, color: gray |
| MOUNTING | 1/8 DIN panel cutout required. Two panel mounting bracket assemblies provided |

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| | |
|---------------------------|---|
| TIGHTENING TORQUE | Screw terminal connectors: 4.5 lb-in (0.5 Nm) |
| OVERALL DIMENSIONS | 2.45" x 4.68" x 3.79" (62 mm x 119 mm x 96 mm) (H x W x D) |
| WEIGHT | 8.5 oz (241 g) |
| WARRANTY | 1 year parts & labor |
| EXTENDED WARRANTY | 1 or 2 years, refer to the Price List for details. |

Temperature Inputs

| | |
|-------------------|---|
| INPUTS | Field selectable: Type J, K, T, or E thermocouples; 100 Ω platinum RTD (0.00385 or 0.00392 curve) |
| RESOLUTION | 1° for all thermocouples and RTD inputs 1° or 0.1° for Type T thermocouple |

ACCURACY

| Input Type | Range | Accuracy |
|--------------------|---|--|
| Type J | -58° to 1382° F -50° to 750°C | $\pm 2^\circ\text{F}$ $\pm 1^\circ\text{C}$ |
| Type K | -58° to 2300° F -50° to 1260°C | $\pm 2^\circ\text{F}$ $\pm 1^\circ\text{C}$ |
| Type T | -292° to 700° F -180° to 371°C | $\pm 2^\circ\text{F}$ $\pm 1^\circ\text{C}$ |
| Type T 0.1° Res | -199.9° to 700.0° F -180.0° to 371.0°C | $\pm 1.8^\circ\text{F}$ $\pm 1.0^\circ\text{C}$ |
| Type E | -58° to 1700° F -50° to 927°C | $\pm 2^\circ\text{F}$ $\pm 1^\circ\text{C}$ |
| 100 Ω RTD | -328° to 1382°F -200° to 750°C | $\pm 1^\circ\text{F}$ $\pm 1^\circ\text{C}$ |

| | |
|--------------------------------|--|
| COLD JUNCTION REFERENCE | Automatic, fixed, no user calibration needed |
| TEMPERATURE DRIFT | $\pm 2^\circ\text{C}$ maximum 0 to 65°C ambient temperature |
| INPUT IMPEDANCE | Greater than 100 k Ω |

COMPLIANCE INFORMATION

Safety

| | |
|------------------------------|---|
| UL LISTED | USA and Canada UL 508 Industrial Control Equipment |
| UL FILE NUMBER | E160849 |
| FRONT PANEL | UL Type 4X, NEMA 4X, IP65; panel gasket provided |
| LOW VOLTAGE DIRECTIVE | EN 61010-1:2001 (UL 61010C-1) Safety requirements for measurement, control, and laboratory use |

Electromagnetic Compatibility

| | |
|--------------------------------|---|
| EMISSIONS | EN 55011:1998 Group 1 Class A ISM emissions requirements |
| Radiated Emissions | Class A |
| AC Mains Conducted Emissions | Class A |
| IMMUNITY | EN 61000-6-2:2001 EMC heavy industrial generic immunity standard |
| RFI - Amplitude Modulated | 80 -1000 MHz 10 V/m 80% AM (1 kHz) |
| Electrical Fast Transients | ±2kV AC mains, ±1kV other |
| Electrostatic Discharge | ±4kV contact, ±8kV air |
| RFI - Conducted | 10V, 0.15-80 MHz, 1kHz 80% AM |
| AC Surge | ±2kV Common, ±1kV Differential |
| Surge | 1KV (CM) |
| Power-Frequency Magnetic Field | 3 A/m 70%V for 0.5 period |
| Voltage Dips | 40%V for 5 & 50 periods |
| Voltage Interruptions | <5%V for 250 periods |

Note:

Testing was conducted on PD743 meters installed through the covers of grounded metal enclosures with cable shields grounded at the point of entry representing installations designed to optimize EMC performance.

Declaration of Conformity available at www.predig.com

SAFETY INFORMATION

CAUTION: Read complete instructions prior to installation and operation of the meter.



WARNING: Risk of electric shock.

**WARNING**

Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

INSTALLATION

There is no need to remove the meter from its case to complete the installation, wiring, and setup of the meter.

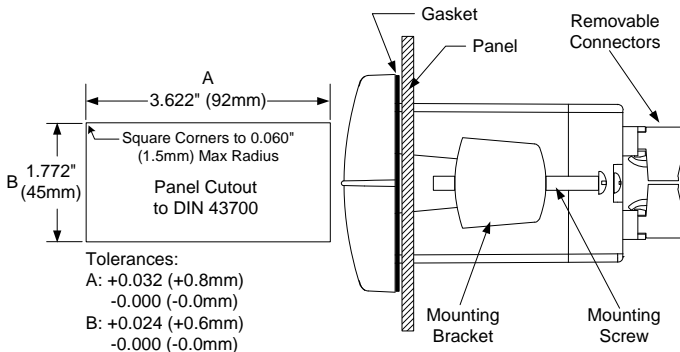
Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

Panel Mounting

- Prepare a standard 1/8 DIN panel cutout – 3.622" x 1.772" (92 mm x 45 mm). Refer to *Mounting Dimensions*, page 29 for more details.
- Clearance: allow at least 4" (102 mm) behind the panel for wiring.
- Panel thickness: 0.04" - 0.25" (1.0 mm - 6.4 mm).
Recommended minimum panel thickness to maintain Type 4X rating: 0.06" (1.5 mm) steel panel, 0.16" (4.1 mm) plastic panel.
- Remove the two mounting brackets provided with the meter (back-off the two screws so that there is ¼" (6.4 mm) or less through the bracket. Slide the bracket toward the front of the case and remove).
- Insert meter into the panel cutout.
- Install mounting brackets and tighten the screws against the panel. To achieve a proper seal, tighten the mounting bracket screws evenly until meter is snug to the panel along its short side. **DO NOT OVER TIGHTEN**, as the rear of the panel may be damaged.



Connections

All connections are made to removable screw terminal connectors located at the rear of the meter.



Use copper wire with 60°C or 60/75°C insulation for all line voltage connections. Observe all safety regulations. Electrical wiring should be performed in accordance with all applicable national, state, and local codes to prevent damage to the meter and ensure personnel safety.

Connector Labeling

The connectors label, affixed to the meter, shows the location of the connectors. It also identifies the location of the RTD/TC selector switch.

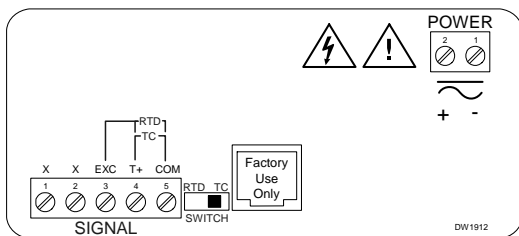


Figure 2. Connector Labeling

Power Connections

Power connections are made to a two-terminal connector labeled POWER on Figure 2. The meter will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention.

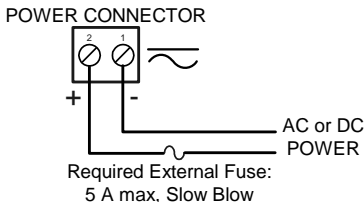


Figure 3. Power Connections

Signal Connections

Signal connections are made to a five-terminal connector labeled SIGNAL on Figure 2. The COM (common) terminal is the return for all types of input signals.

Thermocouple and RTD Connections

The following figures show examples for thermocouple and RTD connections.

The RTD/TC selector switch must be set to the proper position for the meter to accept the selected temperature input.

The input type is selected using the *Setup* menu.

The selected thermocouple input must correspond to thermocouple sensor and wire type used.

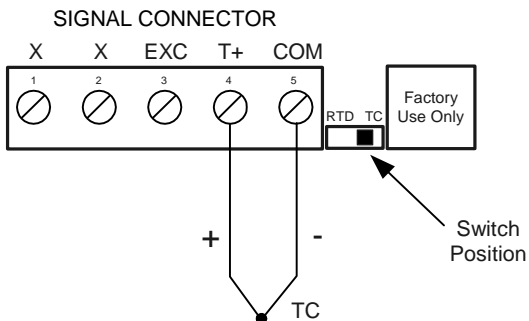


Figure 4. Thermocouple Input Connections

X = No connection

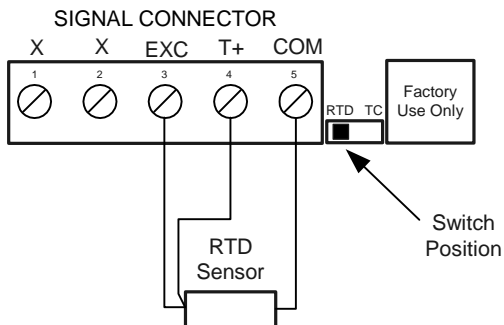


Figure 5. Three-Wire RTD Input Connections

The meter accepts two, three, or four-wire RTDs. The three-wire RTD connection has built-in lead wire compensation.

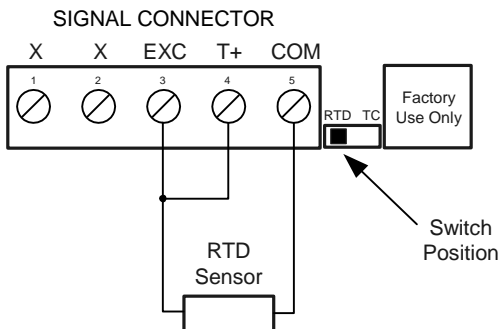


Figure 6. Two-Wire RTD Input Connections

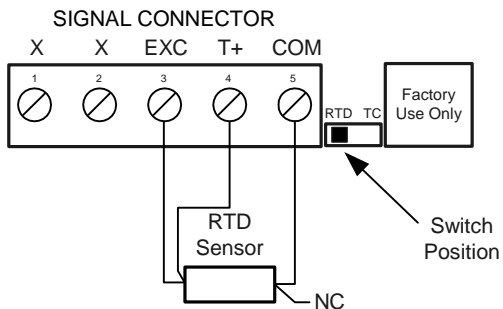


Figure 7. Four-Wire RTD Input Connections

The four-wire RTD connection is similar to the three-wire. One of the leads of a four-wire RTD is not connected, and may be clipped off. The three-wire connection provides sufficient lead wire compensation to provide accurate readings even with long leads.

SETUP AND PROGRAMMING

- There is **no need to recalibrate** the meter when first received from the factory.
- The meter is **factory calibrated** prior to shipment, for all input types, in degrees Fahrenheit. The calibration equipment is certified to NIST standards.

Overview

There are no jumpers involved in the setup process of the meter. The RTD/TC selector switch, located between the SIGNAL and RJ11 connectors, must be set accordingly for the meter to accept RTD or thermocouple inputs, Figure 2.





Setup and programming is done through the front panel buttons.

After power and signal connections have been completed and verified, apply power to the meter.

For
Quick User Interface Reference Guide
go to page 31

Front Panel Buttons and Status LED Indicators



| Button Symbol | Description |
|---|-------------------|
|  | Menu |
|  | Right arrow/Reset |
|  | Up arrow/Max |
|  | Enter/Ack |

- Press the **Menu** button to enter or exit the Programming Mode at any time.
- Press the **Right** arrow button to move to the next digit during digit programming.
- Press the **Up** arrow button to scroll through the menus, decimal point, or to increment the value of a digit.
- Press the **Enter/Ack** button to access a menu or to accept a setting.

Display Functions and Messages

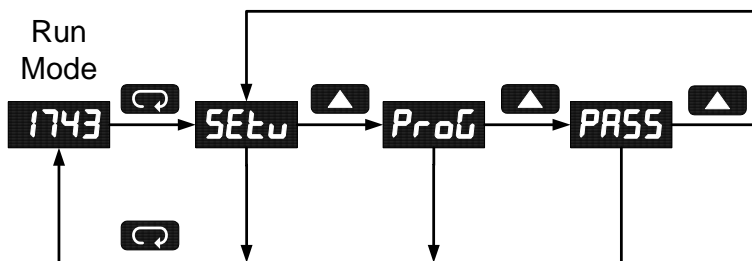
The meter displays various functions and messages during setup/programming and operation. The following table shows the displayed functions and messages with their action/setting description.

| Display | Parameter | Action/Setting |
|---------|------------------|--|
| SEtU | Setup | Enter Setup menu |
| inP1 | Input | Enter Input menu |
| rtd | RTD | Set meter for RTD input |
| R385 | Alpha 385 | Set $\alpha = 0.00385$ European curve 100 Ω RTD |
| R392 | Alpha 392 | Set $\alpha = 0.00392$ American curve 100 Ω RTD |
| tC | TC | Set meter for TC input |
| 0 J | 0 J | Type J |
| 1 K | 1 K | Type K |
| 2 T | 2 T | Type T |
| 3 T.0 | 3 T.0 | Type T, 0.1° resolution |
| 4 E | 4 E | Type E |
| F C | °F or °C | Set temperature scale |
| °F | °F | Set meter to Fahrenheit |
| °C | °C | Set meter to Celsius |
| ProG | Program | Enter the Program menu |
| CR | Calibrate | Enter the Calibrate menu |
| inP 1 | Input 1 | Calibrate input 1 signal |
| d 1 | Display 1 | Program display 1 value |
| inP 2 | Input 2 | Calibrate input 2 signal |
| d 2 | Display 2 | Program display 2 value |
| Err | Error | Error, calibration not successful, check signal |
| PASS | Password | Enter the Password menu |
| unL | Unlocked | Program password to lock meter |
| LoCd | Locked | Enter password to unlock meter |
| 9999 | Flashing display | Overrange condition |
| - 1999 | | Underrange condition |
| oPEr | | Open TC or RTD sensor |

Main Menu

The main menu consists of the following functions: *Setup*, *Program*, and *Password*.

- Press **Menu** button to enter Programming Mode then press **Up** arrow button to scroll main menu.



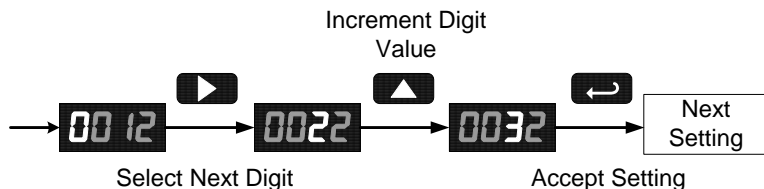
- Press **Menu**, at any time, to exit and return to Run Mode. Changes made to settings prior to pressing **Enter/Ack** are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/Ack**.
- The display moves to the next menu every time a setting is accepted by pressing **Enter/Ack**.

Setting Numeric Values

The numeric values are set using the **Right** and **Up** arrow buttons. Press **Right** arrow to select next digit and **Up** arrow to increment digit value.

The digit being changed is displayed brighter than the rest.

Press the **Enter/Ack** button, at any time, to accept a setting or **Menu** button to exit without saving changes.

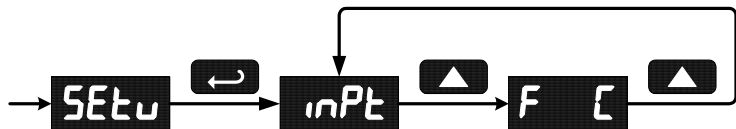


Setting Up the Meter (SEtU)

The *Setup* menu is used to select:

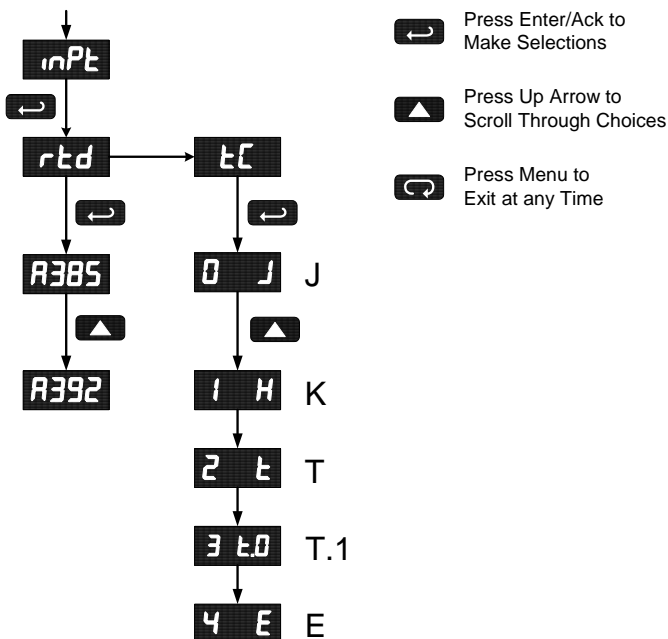
1. Input signal the meter will accept
2. Units ($^{\circ}\text{F}$ or $^{\circ}\text{C}$) for temperature inputs

Press the **Enter/Ack** button to access any menu or press **Up** arrow button to scroll through choices. Press the **Menu** button to exit at any time.



Setting the Input Signal (inPt)

Enter the *Input* menu to set up the meter to display thermocouple (tC) or RTD (rtd) inputs.



If RTD is selected, the display shows **R385** or **R392**. Select the coefficient to match the RTD sensor, either 0.00385 (European curve) or 0.00392 (American curve).

If TC is selected, scroll through the thermocouple types and select the type matching the TC sensor.

The input signal must be connected to the appropriate input terminals and the RTD/TC selector switch must be set accordingly, see Figure 4 on page 12.

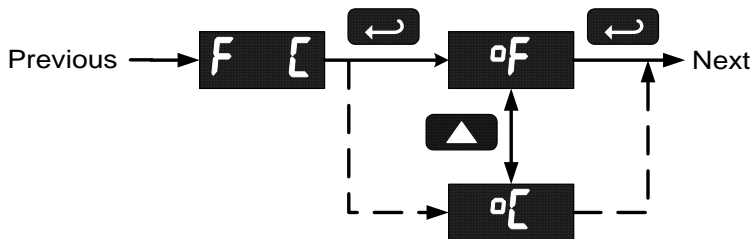
For thermocouple inputs, allow at least 30 minutes warm-up time for meter to reach specified accuracy.

Setting the Temperature Scale (F °C)

The meter can be set to display temperature in degrees Fahrenheit or Celsius.

Press **Up** arrow to change selection.

Press **Enter/Ack** to accept.



Programming the Meter (Prog)

It is **very important** to read the following information, before proceeding to program the meter:

- There is **no need to recalibrate** the meter when first received from the factory.
- The meter is **factory calibrated** prior to shipment, for all input types, in degrees Fahrenheit. The calibration equipment is certified to NIST standards.

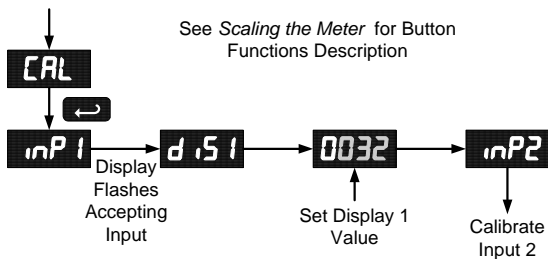
The *Program* menu contains the *Calibrate* menu.



Recalibrating Temperature Inputs (CAL)

Remember, the meter is **calibrated** at the factory prior to shipment. Recalibration is recommended at least every twelve months.

The *Calibration* (CAL) menu is used to **recalibrate** the thermocouple and RTD inputs.



Allow at least 30 minutes warm-up time before performing recalibration procedure to ensure specified accuracy.

Error Message (*Err*)

An error message indicates that the calibration process was not successful.

After the error message is displayed, the meter reverts to input 1, allowing the appropriate input signals to be applied.

The error message might be caused by any of the following conditions:

1. Input signal is not connected to the proper terminals or it is connected backwards.
2. Wrong signal selection in *Setup* menu.
3. Minimum input span requirements not maintained.
4. Input 1 signal inadvertently applied to calibrate input 2.

Minimum Input Span

The minimum input span is the minimum difference between input 1 and input 2 signals required to complete the calibration of the meter.

| Input range | Input 1 & input 2 span |
|-------------|------------------------|
| TC | 100°F (56°C) |
| RTD | 50°F (28°C) |

Recommended Calibration Points

To recalibrate the meter, it is recommended to use the Fahrenheit scale; this will give a greater degree of accuracy to the calibration. The scale can be changed to the Celsius scale after calibration is completed. The meter will display temperature accurately in any scale. The following table shows the recommended low and high calibration points for all types.

| Type of input | Input 1 (Low) | Input 2 (High) | Check (Middle) |
|------------------------|---------------|-------------------|------------------|
| Type J T/C | 32°F | 1182°F | 600°F |
| Type K T/C | 32°F | 1893°F | 960°F |
| Type T T/C | 32°F | 693°F | 360°F |
| Type T T/C | 32.0°F | 693.0°F | 360.0°F |
| Type E T/C | 32°F | 1652°F | 840°F |
| 100 Ω RTD (0.00385) | 32°F 100Ω | 1148°F 320.12Ω | 590°F 215.61Ω |
| 100 Ω RTD (0.00392) | 32°F 100Ω | 1127°F 320.89Ω | 580°F 215.87Ω |

Recalibration Procedure for Temperature Inputs

1. Connect signal to the meter using the appropriate wire (e.g. type J thermocouple wire to recalibrate type J input), see page 12.
2. Set up the meter to accept the selected input (e.g. type J T/C), see page 20.
3. Set up the meter to display temperature in degrees Fahrenheit, see page 21.
4. Apply signal corresponding to input 1 (e.g. 32°F) and program display 1 to read 32.
5. Apply signal corresponding to input 2 (e.g. 1182°F for type J) and program display 2 accordingly.
6. After the meter accepts input 2, the display flashes the message $\llcorner J_r$, indicating that the meter is sensing the cold junction reference. This completes the recalibration procedure for the selected input.

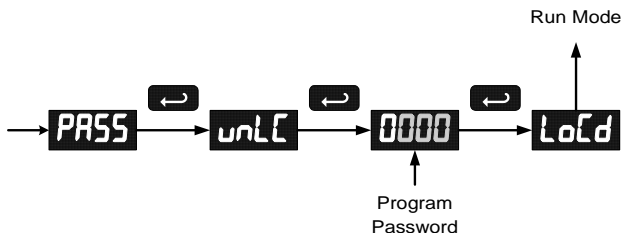
Setting Up the Password (PASS)

The *Password* menu is used to program a four-digit password to prevent unauthorized changes to the programmed parameter settings.

Locking the Meter

Enter the *Password* menu and program a four-digit password.

For instructions on how to program numeric values see *Setting Numeric Values*, page 19.

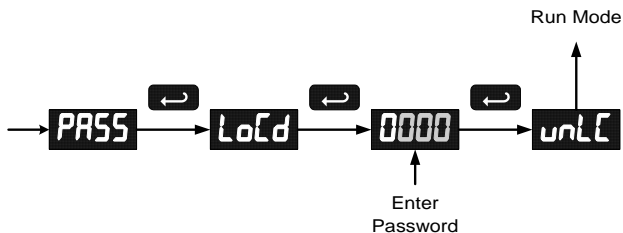


Record the password for future reference. If appropriate, it may be recorded in the space provided.

| | |
|----------------|-------------|
| Model: | |
| Serial Number: | |
| Password: | __ __ __ __ |

Unlocking the Meter

If the meter is password protected, the correct password must be entered in order to make changes to the parameter settings.



Entering the correct four-digit number sets the password to 0000, disabling the protection.

Changes to the programmed parameter settings are allowed only with the password set to 0000.

If the password entered is incorrect, the meter displays *LoCd* (Locked) for about two seconds, then it returns to Run Mode. To try again, press **Enter/Ack** while the *Locked* message is displayed.

Forgot the Password?





The password may be disabled by the following procedure:

1. Note display reading prior to pressing the Menu button. Ignore decimal point and sign.
2. Access the *Password* menu, add 2 to the noted reading and enter that number as the password (e.g. display reading = -1.23, password = 0125).

OPERATION

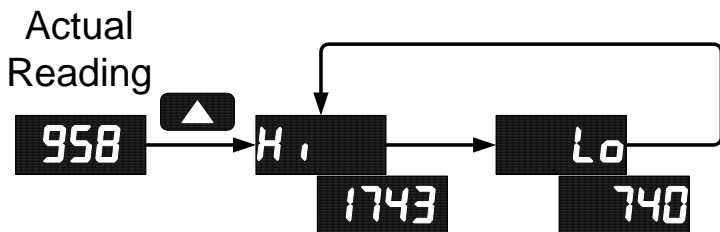
The temperature inputs are displayed according to the input type and temperature units (°F or °C) selected. Type T thermocouples can be displayed with either 1° or 0.1° resolution.

Front Panel Buttons Operation

| Button Symbol | Description |
|---|--|
|  | Press to enter or exit Programming Mode, view settings, or exit Max/Min readings |
|  | Press to reset Max/Min readings |
|  | Press to display Max/Min readings alternately |
|  | Press to display Max/Min reading indefinitely while displaying Max/Min |

Maximum/Minimum Readings

The main function of the front panel buttons during operation is to display the maximum and minimum readings reached by the process.



Press **Up** to Display and Toggle Max/Min



Press **Enter** to Hold Max/Min



Press **Right** to Reset Max/Min



Press **Menu** to Exit Max/Min



1. Press **Up** arrow/**Max** button to display maximum reading since the last reset/power-up.
2. Press **Up** arrow/**Max** again to display the minimum reading since the last reset/power-up.
3. Press **Enter/Ack** to hold Max/Min display reading, the meter will continue to track new Max/Min readings.
4. If **Enter/Ack** is not pressed, the Max/Min display reading will time out after ten seconds and the meter will return to display the actual reading.
5. Press **Right** arrow/**Reset** button to reset Max/Min while reading is being displayed. Max/Min display readings are reset to actual reading.

MOUNTING DIMENSIONS

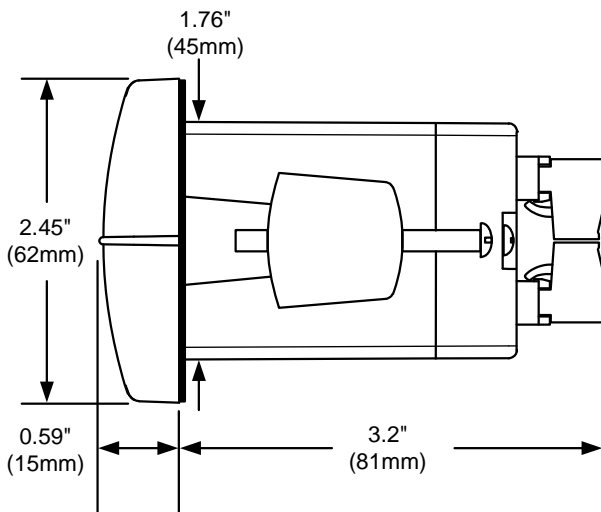


Figure 8. Meter Dimensions - Side View

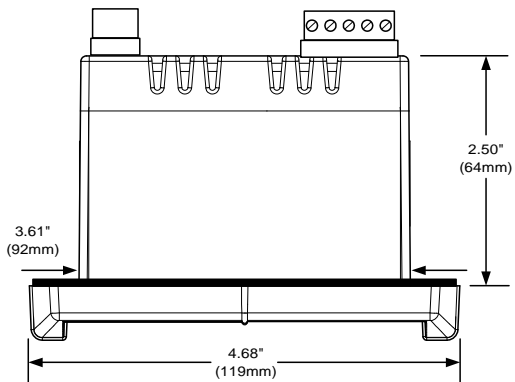


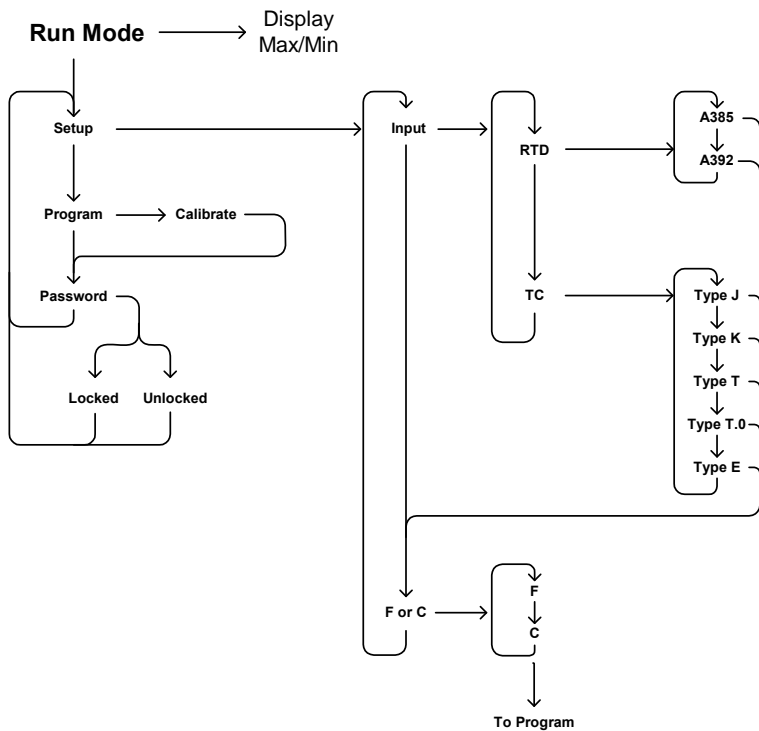
Figure 9. Case Dimensions - Top View

TROUBLESHOOTING

The rugged design and the user-friendly interface of the meter should make it unusual for the installer or operator to refer to this section of the manual.

Troubleshooting Tips

| Symptom | Check/Action |
|--|---|
| No display at all | Check power at power connector |
| Not able to change setup or programming, $L\alpha Ld$ is displayed | Meter is locked, enter correct four-digit password to unlock |
| Meter displays error message during calibration (Err) | Check: <ol style="list-style-type: none"> 1. Signal connections 2. Input selected in <i>Setup</i> menu 3. Minimum input span requirements |
| Meter displays <ul style="list-style-type: none"> • αPEn • 9999 • $- 1999$ • Displays negative number, not responding to RTD. | Check: <ol style="list-style-type: none"> 1. Input selected in <i>Setup</i> menu 2. TC/RTD Switch position 3. Corresponding signal at Signal connector |
| Display alternates between <ol style="list-style-type: none"> 1. $H \uparrow$ and a number 2. $L\alpha$ and a number | Press Menu to exit Max/Min display readings. |
| Inaccurate temperature reading | Check: <ol style="list-style-type: none"> 1. Temperature units ($^{\circ}F$ or $^{\circ}C$) 2. TC type or RTD curve selected 3. Type of TC wire used 4. Calibration |
| If the display locks up or the meter does not respond at all | Cycle the power to restart the microprocessor. |
| Other symptoms not described above | Call Technical Support for assistance. |

QUICK USER INTERFACE REFERENCE GUIDE

How to Contact Precision Digital

- For Technical Support please
Call: (800) 610-5239 or (508) 655-7300
Fax: (508) 655-8990
Email: support@predig.com
- For Sales Support or to place an order please
Call: (800) 343-1001 or (508) 655-7300
Fax: (508) 655-8990
Email: sales@predig.com
- For Calibration Services and Extended Warranty information visit
www.predig.com
- For the latest version of this manual please visit
www.predig.com

