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Sabre Series

PRECISION DIGITAL ✚

- 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

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.

Disclaimer

The information contained in this document is subject to change without notice. Precision Digital makes no representations or warranties with respect to the contents hereof, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose.

EU Declaration of Conformity

For shipments to the EU and UK, a Declaration of Conformity was printed and included with the product.

For reference, a Declaration of Conformity is also available on our website www.predig.com/docs.

Safety Information

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

⚠ WARNINGS
- Risk of electric shock or personal injury. Hazardous voltages exist within enclosure.
- Installation and service should be performed only by trained service personnel.
- This product is not recommended for life support applications or applications where malfunctioning could result in personal injury or property loss. Anyone using this product for such applications does so at their own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.

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
PDA2300	1 - 6	Plastic NEMA 4X Enclosure	Through Door
PDA2600	1 - 6	Stainless Steel NEMA 4X Enclosure	Through Door
PDA2700	1 - 6	Steel NEMA 4X Enclosure	Through Door
PDA2801	1	Plastic NEMA 4X Enclosure	Through Cover
PDA2812	2	Plastic NEMA 4X Enclosure	Through Cover
PDA3407	1	Plastic NEMA 4X Enclosure	Behind Clear Window
PDA3411	2	Plastic NEMA 4X Enclosure	Behind Clear Window
PDA3412	3	Plastic NEMA 4X Enclosure	Behind Clear Window

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. 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.

Front Panel

Buttons Operation

Button Symbol	Description
	Menu: Press the Menu button to enter or exit the Programming Mode at any time.
	Right Arrow: Press the Right arrow button to move to the next digit during digit or decimal point programming.
	Up Arrow: Press or hold the Up arrow button to scroll through the menus, decimal point, or to increment the value of a digit.
	Enter: Press the Enter button to access a menu or to accept a setting.

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
TIGHTENING TORQUE	Screw terminal connectors: 5 lb-in (0.56 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	1Ω for all thermocouples and RTD inputs 1Ω or 0.1Ω for Type T thermocouple

ACCURACY	Input Type	Range	Accuracy
	Type J	-58° to 1382° F -50° to 750°C	±2°F ±1°C
	Type K	-58° to 2300° F -50° to 1260°C	±2°F ±1°C
	Type T	-292° to 700° F -180° to 371°C	±2°F ±1°C
	Type T 0.1° Res	-199.9° to 700.0° F -180.0° to 371.0°C	±1.8°F ±1.0°C
	Type E	-58° to 1700°F -50° to 927°C	±2°F ±1°C
	100 Ω RTD	-328° to 1382°F -200° to 750°C	±1°F ±1°C

COLD JUNCTION REFERENCE	Automatic, fixed, no user calibration needed
TEMPERATURE DRIFT	±2°C maximum; 0 to 65°C ambient temperature
INPUT IMPEDANCE	Greater than 100 kΩ

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 Safety requirements for measurement, control, and laboratory use

Electromagnetic Capability

EMISSIONS	EN 55011 Group 1 Class A ISM emissions requirements
Radiated Emissions	Class A
AC Mains Conducted Emissions	Class A
IMMUNITY	EN 61326-1 Measurement, control, and laboratory equipment EN 61000-6-2 EMC heavy industrial generic immunity standard
RFI - Amplitude Modulated	80 -1000 MHz 10 V/m 80% AM (1 kHz) 1.4 - 2.0 GHz 3 V/m 80% AM (1 kHz) 2.0 - 2.7 GHz 1 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	30 A/m 70%V for 0.5 period
Voltage Dips	40%V for 5 & 50 periods 70%V for 25 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.

Installation

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

Panel Mounting Instructions

- Prepare a standard 1/8 DIN panel cutout - 3.622" x 1.772" (92 mm x 45 mm). Refer to Figure 1. 1/8 DIN Panel Cutout Dimensions below for more details.
- Clearance: allow at least 4.0" (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.
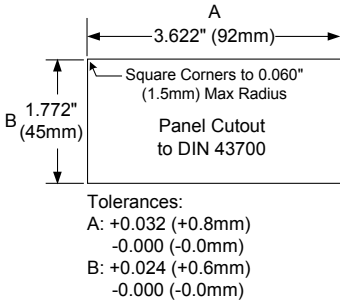

Tolerances:
A: +0.032 (+0.8mm)
    -0.000 (-0.0mm)
B: +0.024 (+0.6mm)
    -0.000 (-0.0mm)
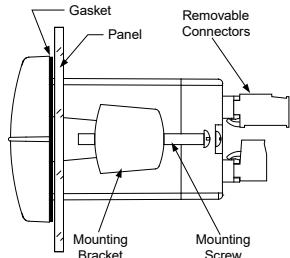
Figure 1. 1/8 DIN Panel Cutout Dimensions

Figure 2. Panel Mounting Details

Mounting Dimensions
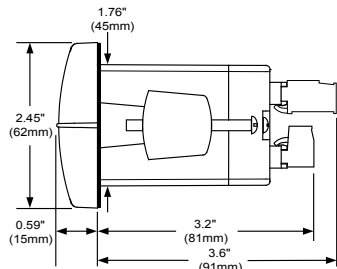
Figure 3. Meter Dimensions - Side View
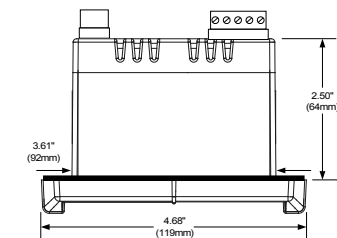

Figure 4. Meter Dimensions - Top View

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Connections

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

⚠ **CAUTION**

- 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.

Connectors 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.
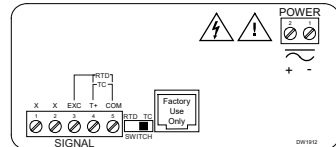

Figure 5. Connector Labeling for PD743-6R0-0 / 7R0

Power Connection

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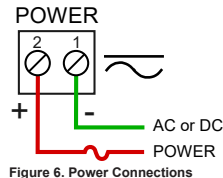

Figure 6. Power Connections

Signal Connections

Signal connections are made to a five-terminal connector labeled SIGNAL. 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.
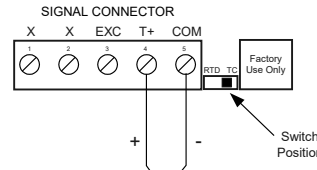

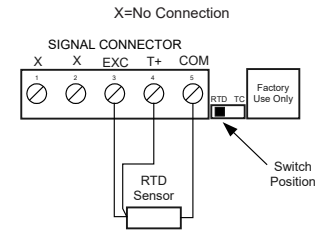**Figure 7. Thermocouple Input Connections**

Figure 8. 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.
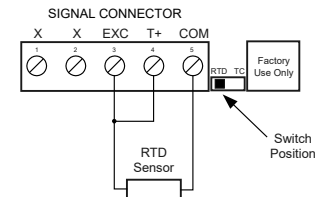

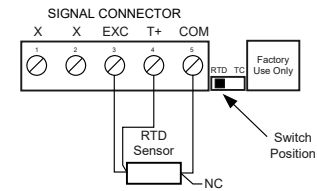**Figure 9. Two-Wire RTD Input Connections**

Figure 10. 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.

Display Function and Messages

Display	Parameter	Action/Setting
SEtu	Setup	Enter Setup menu
inPt	Input	Enter Input menu
rtd	RTD	Set meter for RTD input
A385	Alpha 385	Set α = 0.00385 European curve 100Ω RTD
A392	Alpha 392	Set α = 0.00392 American curve 100Ω RTD
tC	TC	Set meter for TC input
0 J	0 J	Type J
1 H	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
CAL	Calibrate	Enter the Calibrate menu
inP1	Input 1	Calibrate input 1 signal
dIS1	Display 1	Program display 1 value
inP2	Input 2	Calibrate input 2 signal
dIS2	Display 2	Program display 2 value
Err	Error	Error, calibration not successful, check signal
PASS	Password	Enter the Password menu
unLC	Unlocked	Program password to lock meter
LoCd	Locked	Enter password to unlock meter
9999 -1999 oPEn	Flashing display	Overrange condition Underrange condition Open TC or RTD sensor

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 1Ω or 0.1Ω resolution.

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

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.

Run Mode

`1743` → `SEtu` → `ProG` → `PASS`
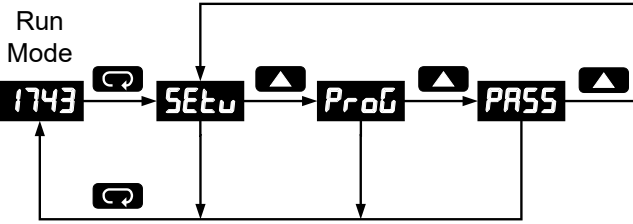
- Press **Menu**, at any time, to exit and return to Run Mode. Changes made to settings prior to pressing **Enter/Ack** are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/Ack**.
- The display moves to the next menu every time a setting is accepted by pressing **Enter/Ack**.

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.

Increment Digit Value

`0400` → `0400` → `0500` → Next Setting

Select Next Digit   Accept Setting
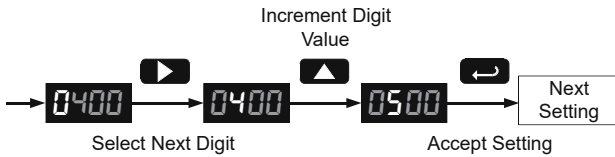
Setting Up the Meter

The Setup menu is used to select:
- Input signal the meter will accept
- Units (°F or °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.

`SEtu` → `inPt` → `F  C`
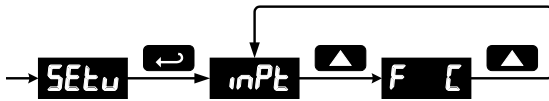
Setting the Input Signal

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

If RTD is selected, the display shows A385 or A392. 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.
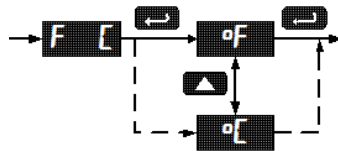
`inPt`
↓
`rtd` — `tC`
↓ `A385`   ↓ `0  J` J
↓ `A392`   ↓ `1  H` K
            ↓ `2  t` T
            ↓ `3  t.0` T.1
            ↓ `4  E` E
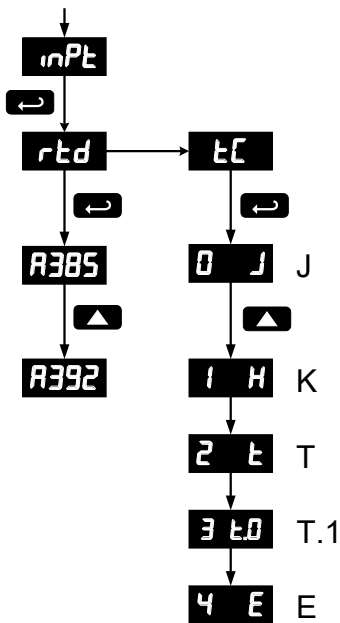
Setting the Temperature Scale

The meter can be set to display temperature in degrees Fahrenheit or Celsius.
Press **Up** arrow to change selection.
Press **Enter/Ack** to accept.

`F  C` → `°F` ⇅ `°C`

Programming the Meter

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.
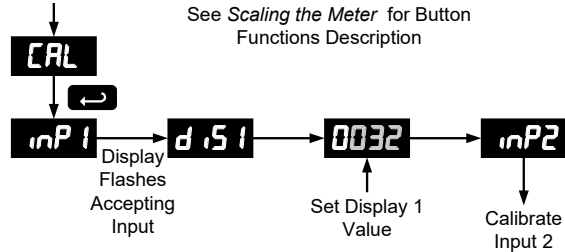
The Program menu contains the Calibrate menu.

`ProG` → `CAL` → `inP1`

Recalibrating Temperature Inputs

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.

See *Scaling the Meter* for Button Functions Description

`CAL`
↓
`inP1` → `d i51` → `0032` → `inP2`
   Display Flashes Accepting Input   Set Display 1 Value   Calibrate Input 2

Error Message

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.
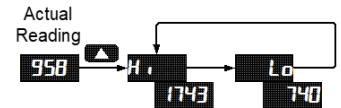
Minimum Input Span

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)
2. Set up the meter to accept the selected input (e.g. type J T/C)
3. Set up the meter to display temperature in degrees Fahrenheit
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 CJr, indicating that the meter is sensing the cold junction reference. This completes the recalibration procedure for the selected input.

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.

1. Press Up arrow/Max button to display maximum reading since the last reset/power-up.
2. Press Up arrow/Max again to display 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.

Actual Reading

`958` → `Hi 1743` → `Lo 740`

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

Setting Up the Password

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.

Run Mode

PASS → unLC → 0000 → LoCd

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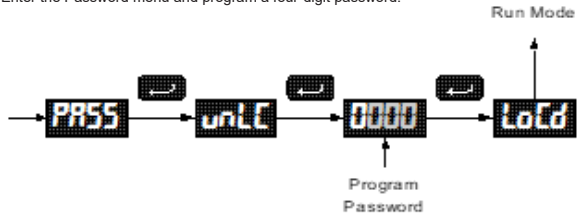
Record the password for future reference. If appropriate, it may be recorded in the space provided.

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.

Run Mode

PASS → LoCd → 0000 → unLC
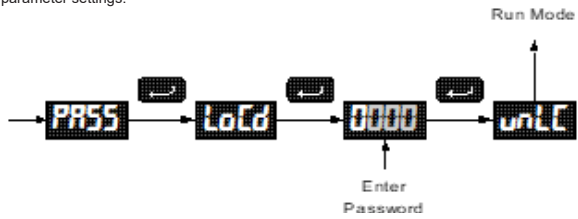
Enter Password

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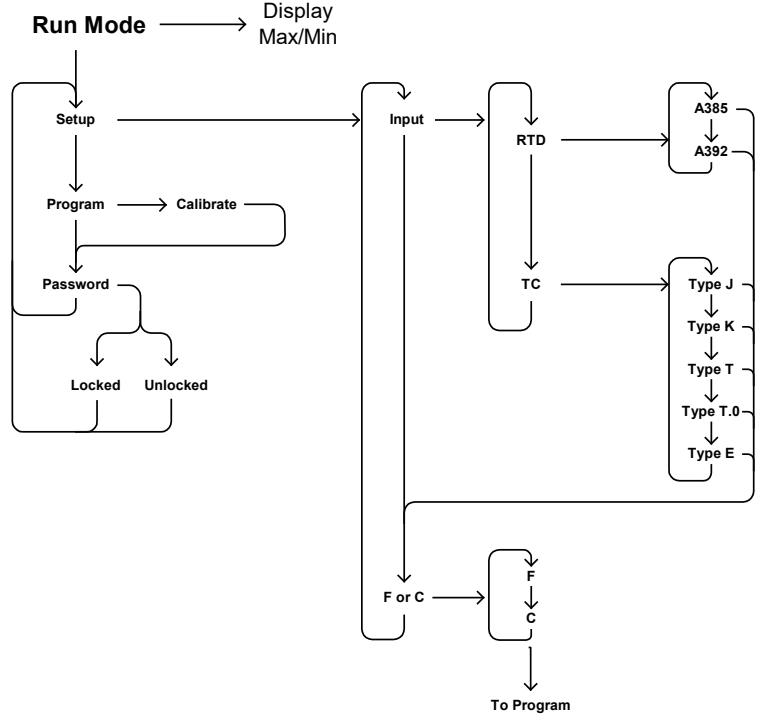
If the password entered is incorrect, the meter displays *LoCd* (Locked) for about two seconds, then it returns to Run Mode. To try again, press **Enter/Ack** while the Locked message is displayed.

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).

Quick User Interface Reference Guide

Run Mode → Display Max/Min

Setup → Input → RTD → A385 / A392

Program → Calibrate

Password → TC → Type J / Type K / Type T / Type T.0 / Type E

Locked   Unlocked

F or C → F / C

To Program

Troubleshooting Tips

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, *LoCd* is displayed	Meter is password-protected, enter correct four-digit password to unlock.
Meter displays error message during calibration (*Err*)	Check: 1. Signal connections 2. Input selected in Setup menu 3. Minimum input span requirements
Meter displays • *oPEn* • *9999* • *-1999* • Displays negative number, not responding to RTD	Check: 1. Input selected in Setup menu 2. TC/RTD Switch position 3. Corresponding signal at Signal connector
Display alternates between 1. *Hi* and a number 2. *Lo* and a number	Press Menu to exit Max/Min display readings.
Inaccurate temperature reading	Check: 1. Temperature units (°F or °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.

Limited Warranty

Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period as detailed in the "Specifications" section of the complete manual from the date of shipment from the factory. Precision Digital's liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Contact Precision Digital

Technical Support

Call: (800) 610-5239 or (508) 655-7300
Email: support@predig.com

Sales Support

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