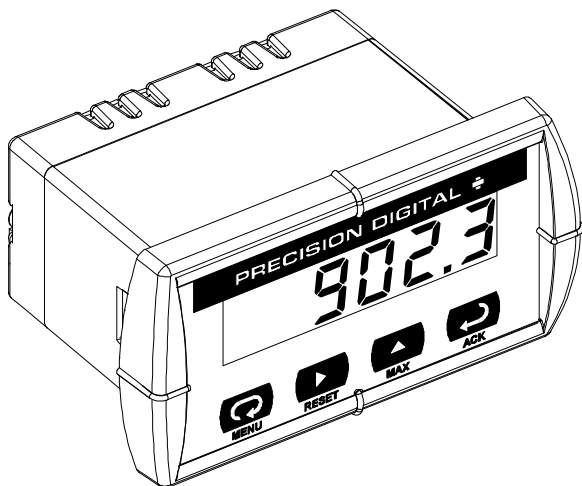# TRIDENT MODEL PD765
Instruction Manual

- Accepts Current, Voltage, TC, & RTD Inputs
- Factory Calibrated for All Inputs
- 4 Digit Display, 0.56" (14 mm) High, Red LEDs
- Maximum/Minimum Display
- NEMA 4X, IP65 Front
- Universal Power Supply 85-265 VAC or 90-265 VDC
- Optional 12-36 VDC or 12-24 VAC Power
- Two Relays Option
- 24 VDC Transmitter Power Supply Option
- Serial Communication Adapters
  RS-232 & RS-422/485 Options
- Copy Meter Settings to Other Meters
- 3 Year Warranty

PRECISION DIGITAL CORPORATION
19 Strathmore Road • Natick MA 01760 USA
Tel (800) 610-5239 • Fax (508) 655-8990

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INTRODUCTION

The Trident is a multipurpose, easy to use digital meter. It accepts current, voltage, thermocouple, and RTD signals. The four front panel buttons make the setup and programming an easy task.

The isolated 24 VDC transmitter power (optional) can be used to power the input transmitter or other devices.

The two relays (optional) can be used for alarm indication or process control applications, such as pump alternation control.

ORDERING INFORMATION

85-265 VAC* Model	12-36 VDC* Model	Description
PD765-6R0-0	PD765-7R0-0	No Options
PD765-6R0-1		24 VDC Output Option
PD765-6R2-0	PD765-7R2-0	2 Relays Option
PD765-6R2-1		2 Relays + 24 VDC Output Option
*All models may be AC or DC powered, see *Specifications* for details.		

Accessories

Model	Description
PDA7420	Standard Modular Cable, 7' (2.1 m)
PDA7232	RS-232 Serial Adapter with PDA7420 Included
PDA7422	RS-422/485 Serial Adapter with PDA7420 Included
PDA7502	MeterView Version 2.0 Software
PDX6901	Suppressor (snubber): 0.01 µF/470O, 250 VAC
Enclosures	NEMA 4 & Explosion-Proof Enclosures**
	Plastic, Steel, Stainless Steel & Aluminum
**Enclosures available for 1-6 meters. Consult Web page for availability.	

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Disclaimer

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SPECIFICATIONS

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

General

DISPLAY	0.56" (14 mm) high, high efficiency red LED. Four digits (-1999 to 9999), automatic lead zero blanking.
DISPLAY UPDATE RATE	Process/RTD: 3.7-5/second Thermocouple: 1.8-2.5/second
OVERRANGE	Display flashes 9999
UNDERRANGE	Display flashes - 1999
PROGRAMMING METHODS	Four front panel buttons, PC and MeterView software, or cloning using Copy function
NOISE FILTER	Programmable from 2 to 199 (0 will disable filter)
RECALIBRATION	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
MAX/MIN DISPLAY	The maximum and minimum 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	AC: 85-265 VAC, 50/60 Hz DC: 90-265 VDC Optional: 12-36 VDC, 12-24 VAC See table for power consumption (* X on Model number = 0 or 2)	Model	VA/W
		PD765-6RX-0*	8
		PD765-6RX-1*	20
		PD765-7RX-0*	6

TRANSMITTER POWER SUPPLY	24 VDC ± 10% @ 200 mA maximum (Optional)
FUSE	Recommended external fuse: 1 A, 250 V slow blow
NORMAL MODE REJECTION	64 dB at 50/60 Hz
ISOLATION	4 kV
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 26 AWG wire, RJ11 for serial communication adapters
ENCLOSURE	1/8 DIN, high impact plastic, UL 94V-0, color: gray
FRONT PANEL	NEMA 4X, IP65. Panel gasket provided
MOUNTING	1/8 DIN panel cutout required. Two panel mounting bracket assemblies provided
TIGHTENING TORQUE	Screw terminal connectors: 4.5 lb-in (0.5 Nm)
OVERALL DIMENSIONS	2.45" x 4.68" x 4.19" (62 mm x 119 mm x 106 mm) (H x W x D)
WEIGHT	8.0 oz (227 g) (no options) 9.7 oz (275 g) (2 relays & 24 V transmitter supply options)
WARRANTY	2 years parts and labor
EXTENDED WARRANTY	Warranty may be extended an additional 12 months by returning the Product Registration Form within 2 months from date of purchase. *Go to **www.predig.com** for online registration.*

Process Meter

INPUTS	Field selectable: ±20 mADC (0-20, 4-20 mA) and ±10 VDC (0-5, 1-5, 0-10 V)
ACCURACY	±0.05% of calibrated span ±1 count
TEMPERATURE DRIFT	50 PPM/°C from 0 to 65°C ambient
DECIMAL POINT	Up to three decimal places for process inputs: *d.ddd*, *dd.dd*, *ddd.d*, or *dddd*
CALIBRATION RANGE	An *Error* message will appear if input 1 signal and input 2 signals are too close together.

	Input Range	**Minimum Span Input 1 & Input 2**
	4-20 mA	0.40 mA
	±10 V	0.20 V

INPUT IMPEDANCE	Voltage ranges: greater than 1 MΩ Current ranges: 50 - 100 Ω (depending on resettable fuse impedance)
INPUT OVERLOAD	Current input protected by resettable fuse. Fuse resets automatically after fault is removed.

Temperature Meter

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	±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 E	−58° to 1578° F −50° to 870°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
OFFSET ADJUSTMENT	Programmable to ±19.9°. This parameter allows the user to apply an offset value to the temperature being displayed.
INPUT IMPEDANCE	Greater than 100 kΩ
SENSOR BREAK DETECTION	Open sensor circuit indicated by display flashing $oPEn$. All relays and alarm status LEDs go to alarm state.

Serial Communication

METER ADDRESS	Programmable between 0 and 99
TRANSMIT TIME DELAY	Programmable between 0 and 199 ms
TURN AROUND DELAY	Less than 2 ms (fixed)

Relays Option

RATING	2 SPDT (form C); rated 3 amps @ 30 VDC or 3 amps @ 250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive loads
ELECTRICAL NOISE SUPPRESSION	A suppressor (snubber) should be connected to each relay contact switching inductive loads, to prevent disruption to the microprocessor's operation. Recommended suppressor value: 0.01 µF/470 Ω, 250 VAC (PDX6901).
DEADBAND	0-100% of full scale, user selectable
HIGH OR LOW ALARM	User may program any alarm for high or low trip point.
RELAY OPERATION	1. Automatic (non-latching) 2. Latching 3. Pump alternation control
RELAY RESET	User selectable via front panel buttons or PC 1. Automatic reset only (non-latching) 2. Automatic + manual reset at any time (non-latching) 3. Manual reset only, at any time (latching) 4. Manual reset only after alarm condition has cleared (latching) **Automatic reset:** Relays will automatically reset when the input passes the reset point. **Manual reset:** Front panel ACK button. Pressing ACK resets all manually resettable relays.
TIME DELAY	0 to 199 seconds, on and off delays Programmable and independent for each relay
FAIL-SAFE OPERATION	Programmable Independent for each relay
AUTO INITIALIZATION	When power is applied to the meter, relays will reflect the state of the input to the meter.

Fail-safe operation: relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state.

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 54 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 NEMA 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.
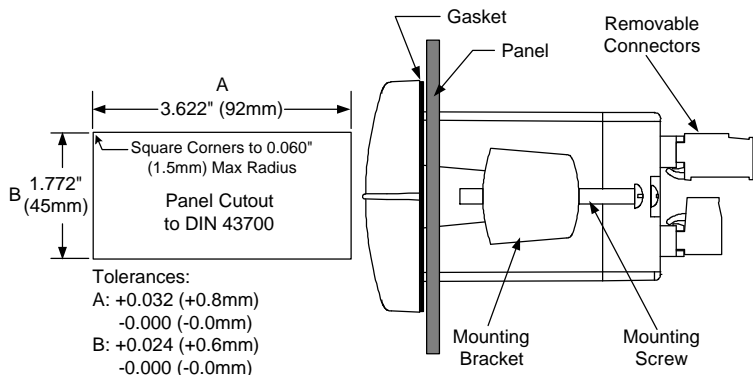
Figure 1. Panel Cutout and Mounting

Connections

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

> ⚠ 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 all connectors available with requested configuration. It also identifies the location of the RTD/TC selector switch.
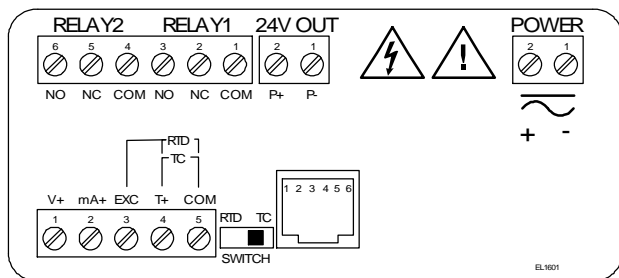
Figure 2. Connector Labeling for Two Relays & 24 V Output

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.

POWER CONNECTOR

AC or DC POWER

Recommended External
Fuse: 1 A, 250 V Slow Blow
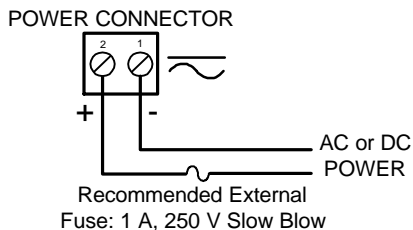
Figure 3. Power Connections

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.

Current and Voltage Connections

The following figures show examples for current and voltage connections.

There are no switches or jumpers to set up for current and voltage inputs. Setup and programming is performed through the front panel buttons.
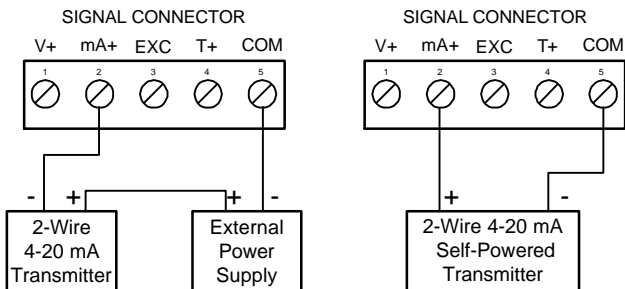
Figure 4. Transmitter Powered by Ext. Supply or Self-Powered
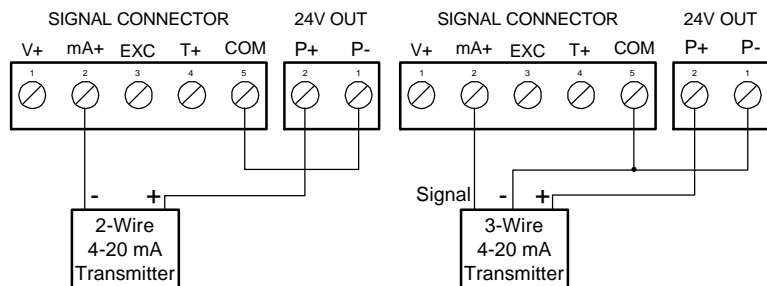
Figure 5. Transmitters Powered by Internal Supply (Optional)

The current input is protected against current overload by a resettable fuse. The display may or may not show a fault condition depending on the nature of the overload.

The fuse limits the current to a safe level when it detects a fault condition, and automatically resets itself when the fault condition is removed.
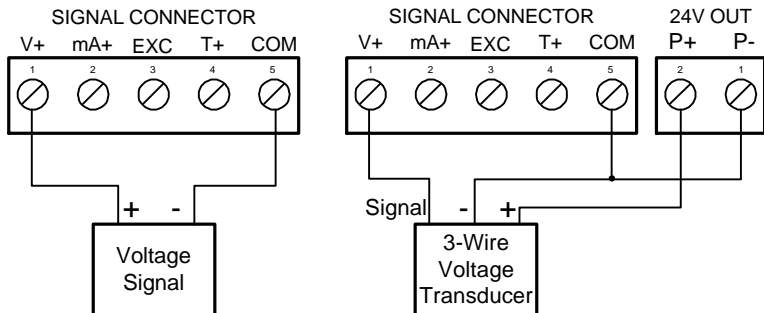
Figure 6. Voltage Input Connections

The meter is capable of accepting any voltage from –10 VDC to +10 VDC.

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.

Selected thermocouple input must correspond to thermocouple sensor and wire type used.
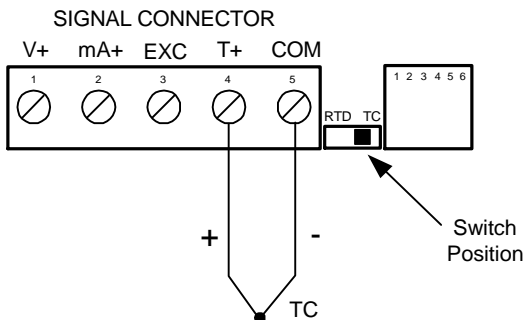
Figure 7. Thermocouple Input Connections
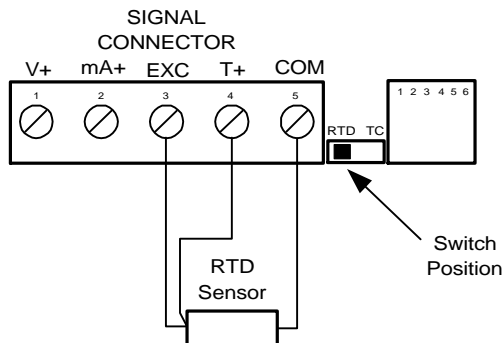
Figure 8. Three-Wire RTD Input Connections

The meter accepts two, three, or four-wire RTDs. The three-wire RTD connection has built-in lead wire compensation.
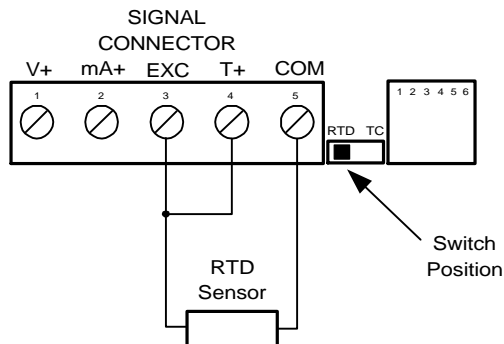
Figure 9. Two-Wire RTD Input Connections

Lead wire compensation for two-wire RTDs can be applied using the *Adjust* menu. See Offset Adjustment (*Ad J*), page 45.

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SIGNAL CONNECTOR
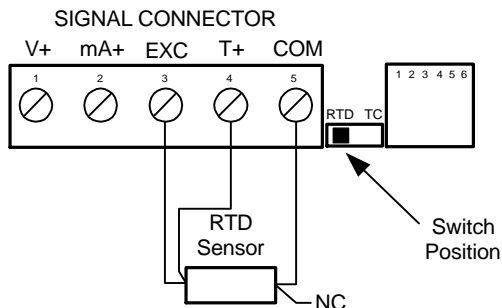
Figure 10. Four-Wire RTD Input Connections

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.

Serial Communication

Serial communication connection is made to an RJ11 connector labeled SERIAL on **Figure 2**. Use PDA7232 for RS-232 interfacing.

Use PDA7422 for RS-422/485 interfacing.

Use PDA7420 for meter-to-meter interfacing for cloning purposes (*i.e.* copying programmed settings from one meter to other meters).

Relays and 24 V Output Connections

Relay connections are made to a six-terminal connector labeled RELAY1, RELAY2 on Figure 2. The COM (common) terminals of the relays should not be confused with the COM (common) terminal of the SIGNAL connector. The 24 VDC output is available at the connector labeled 24V OUT, next to the relays connector.
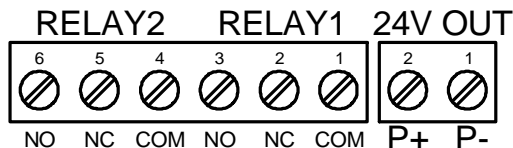
Figure 11. Relay & 24 V Output Connections

Switching Inductive Loads

The use of suppressors (snubbers) is strongly recommended when switching inductive loads to prevent disrupting the microprocessor's operation. The suppressors also prolong the life of the relay contacts. Suppression can be obtained with resistor-capacitor (RC) networks assembled by the user or purchased as complete assemblies. Refer to the following circuits for RC network assembly and installation:
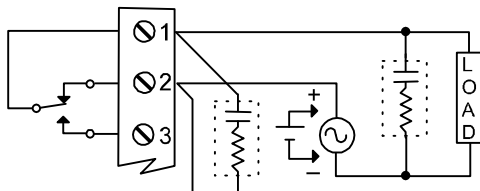
Figure 12. AC and DC Loads Protection

Choose R and C as follows:

R: 0.5 to 1 Ω for each volt across the contacts

C: 0.5 to 1 µF for each amp through closed contacts

Notes:

1.   Use capacitors rated for 250 VAC.
2.   RC networks may affect load release time of solenoid loads. Check to confirm proper operation.
3.   Install the RC network at the meter's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.
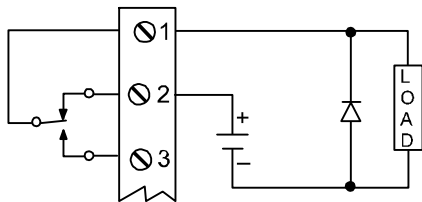
Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 13. Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

RC networks are available from Precision Digital and should be applied to each relay contact switching an inductive load. Part number PDX6901.

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 milliamps, volts, and degrees respectively. 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 SERIAL 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 the back-inside cover

Front Panel Buttons and Status LED Indicators
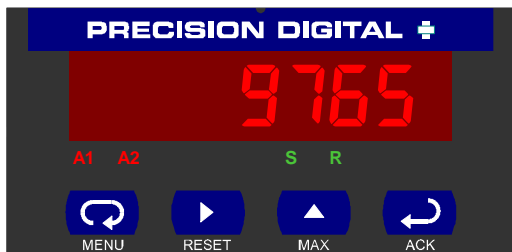
Button Symbol	Description		LED	Status
	Menu		A1	Alarm 1
	Right arrow/Reset		A2	Alarm 2
	Up arrow/Max		S	Set point indicator
	Enter/Ack		R	Reset point indicator

- 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.
- Press and hold the **Right** arrow and the **Menu** buttons, for three seconds, to access the Advanced features of the meter (Hint: press and hold **Right** arrow first then **Menu**).

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Display Functions and Messages

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

Display	Parameter	Action/Setting
5Etu	*Setup*	Enter *Setup* menu
inPt	*Input*	Enter *Input* menu
4-20	4-20 mA	Set meter for 4-20 mA input
0-10	0-10 VDC	Set meter for ±10 VDC input
dEc.P	Decimal point	Set decimal point for process inputs
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
rELY	*Relay*	Enter the *Relay* menu
rLY1	*Relay1*	Relay 1 setup
Act1	*Action1*	Set relay 1 action (automatic, latching, etc.)
Auto	*Automatic*	Set relay for automatic reset
A-m	*Auto-manual*	Set relay for automatic + manual reset any time
LtCH	*Latching*	Set relay for latching operation

Display	Parameter	Action/Setting
L-CL	*Latching-cleared*	Set relay for latching operation with manual reset only after alarm condition has cleared
ALtr	*Alternate*	Set relays for pump alternation control
oFF	*Off*	Disable relay and front panel status LEDs Disable relay's fail-safe operation
SEt1	*Set1*	Program set point 1
rSt1	*Reset1*	Program reset point 1
rLY2	*Relay2*	Setup relay 2
Act2	*Action2*	Set relay 2 action (automatic, latching, etc.)
SEt2	*Set2*	Program set point 2
rSt2	*Reset2*	Program reset point 2
FLSF	*Fail-safe*	Enter *Fail-safe* menu
FLS1	*Fail-safe1*	Set relay 1 fail-safe operation
on	*On*	Enable fail-safe operation
FLS2	*Fail-safe2*	Set relay 2 fail-safe operation
dLAY	*Delay*	Enter *Time Delay* menu
dLY1	*Delay1*	Enter relay 1 time delay setup
On1	*On1*	Set relay 1 On time delay
OFF1	*Off1*	Set relay 1 Off time delay
dLY2	*Delay2*	Enter relay 2 time delay setup
On2	*On2*	Set relay 2 On time delay
OFF2	*Off2*	Set relay 2 Off time delay
ProG	*Program*	Enter the *Program* menu
ScAL	*Scale*	Enter the *Scale* menu
CAL	*Calibrate*	Enter the *Calibrate* menu
inP1	Input 1	Calibrate input 1 signal or program input 1 value
di51	Display 1	Program display 1 value
inP2	Input 2	Calibrate input 2 signal or program input 2 value

Display	Parameter	Action/Setting
d ı52	Display 2	Program display 2 value
Err	Error	Error, calibration not successful, check signal
PRSS	*Password*	Enter the *Password* menu
unLC	Unlocked	Program password to lock
LoCd	Locked	Enter password to unlock
9999 - ı999	Flashing display	Overrange condition Underrange condition

Main Menu

The main menu consists of the most commonly used functions: *Setup*, *Program*, and *Password*.

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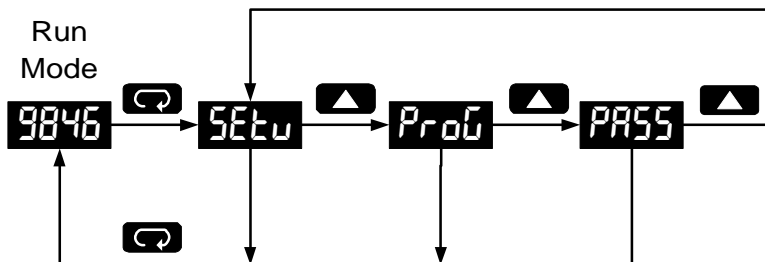
- Press **Menu**, at any time, to exit and return to Run Mode. Changes made to settings prior to pressing **Enter/Ack** are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/Ack**.
- The display moves to the next menu every time a setting is accepted by pressing **Enter/Ack**.

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.
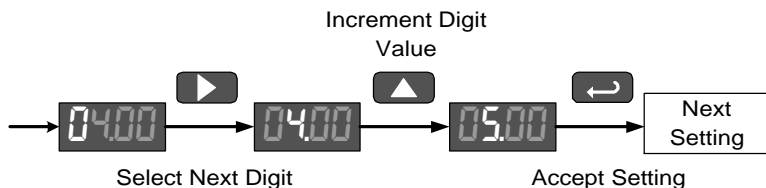
The decimal point is set using the **Up** arrow button in the *Setup-decimal point* menu.

Setting Up the Meter (5Etu)

The *Setup* menu is used to select:

1. Input signal the meter will accept
2. Decimal point position for process inputs
3. Units (°F or °C) for temperature inputs
4. Relay operation

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.
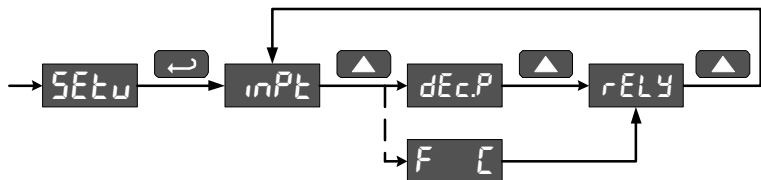
Setting the Input Signal (ɩnᴾᵗ)

Enter the *Input* menu to set up the meter to display current (4-20), voltage (0-10), thermocouple (ᵗC), or RTD (rᵗd) inputs.

The voltage input is capable of accepting any signal from -10 to +10 VDC. Select voltage input to accept 0-5, 1-5, 0-10, or ±10 VDC signals.

The current input is capable of accepting any signal from -20 to 20 mA. Select current input to accept 0-20 or 4-20 mA signals.
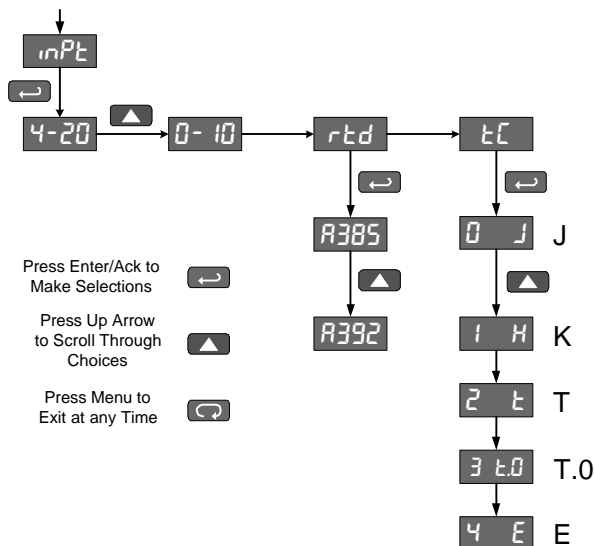
If RTD is selected, the display shows 8385 or 8392. Select the coefficient to match the RTD sensor, either 0.00385 (European curve) or 0.00392 (American curve).

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 7 on page 15.

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

Setting the Decimal Point (dc.Pt)

Decimal point for temperature inputs is fixed.

Decimal point for process inputs may be set with up to three decimal places or with no decimal point at all.

Pressing the **Up** arrow moves the decimal point one place to the right until no decimal point is displayed, then it moves to the leftmost position.
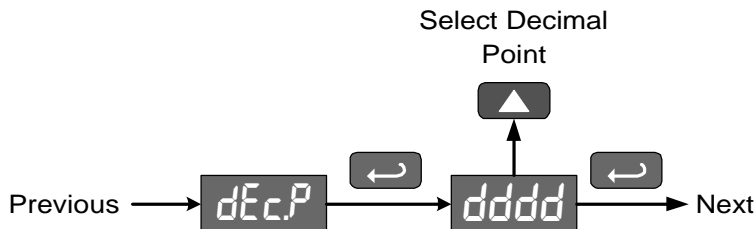
Setting the Temperature Scale (F C)

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

Press **Up** arrow to change selection.

Press **Enter/Ack** to accept.
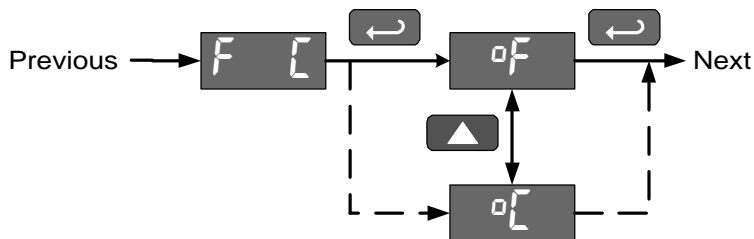
Setting the Relay Operation (rELY)

This menu allows you to set up the operation of the relays:

1. Relay action
   a. Automatic reset only (non-latching)
   b. Automatic + manual reset at any time (non-latching)
   c. Latching (manual reset only)
   d. Latching with Clear (manual reset only after alarm condition has cleared)
   e. Pump alternation control (automatic reset only)
   f. Off (relay and status LED disabled)
2. Set point
3. Reset point
4. Fail-safe operation
   a. On (enabled)
   b. Off (disabled)
5. Time delay
   a. On delay (0-199 seconds)
   b. Off delay (0-199 seconds)

Refer to page 21 for a description of *Display Functions and Messages*

Press **Enter/Ack** button to access any menu
Press **Menu** button to exit at any time
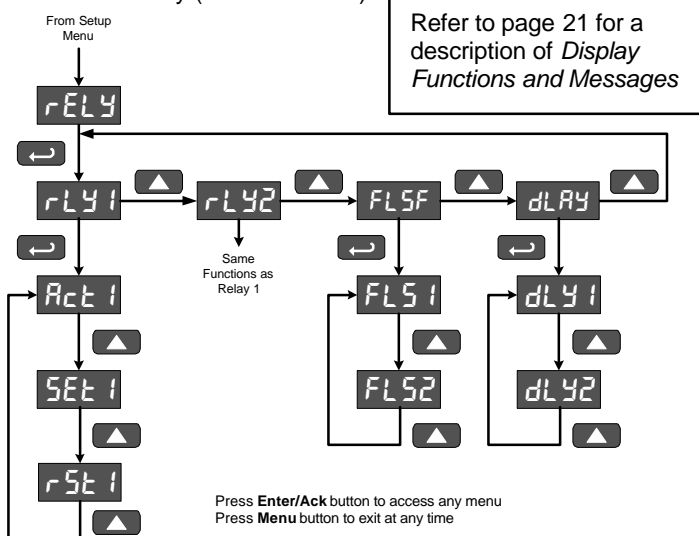
Setting the Relay Action

The relays' *Action* menu allows the user to set up the operation of the relays. The relays may be set up for any of the following modes of operation:

1. Automatic reset (non-latching)
2. Automatic + manual reset at any time (non-latching)
3. Latching (manual reset only, at any time)
4. Latching with Clear (manual reset only after alarm condition has cleared)
5. Pump alternation control (automatic reset only)
6. Off (relay and status LED disabled)

The following graphic shows relay 1 action setup; relay 2 is set up in a similar fashion.

From Relay 1 Menu

Press **Enter/Ack** button to accept setting
Press **Menu** button to exit at any time

$Act\ 1$

$Auto \rightarrow A\text{-}m \rightarrow LtCH \rightarrow L\text{-}CL$

$oFF \leftarrow ALtr$
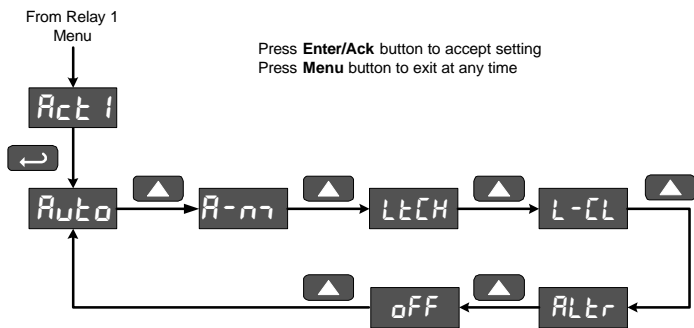
Programming Set and Reset Points

High alarm indication: program set point above reset point.

Low alarm indication: program set point below reset point.

The deadband is determined by the difference between set and reset points. Minimum deadband is one display count. If set and reset points are programmed the same, relay will reset one count below set point.

$SEt\ 1$ → Program Set Point

$rSt\ 1$ → Program Reset Point
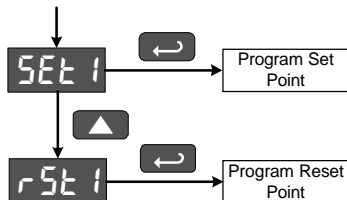
Quick Set Points

Press **Up** arrow and **Menu** at the same time to access set/reset points quickly.

Setting Fail-Safe Operation

The fail-safe operation is set independently for each relay. Select on to enable or select oFF to disable fail-safe operation.

Press **Enter/Ack** button to accept setting
Press **Menu** button to exit at any time
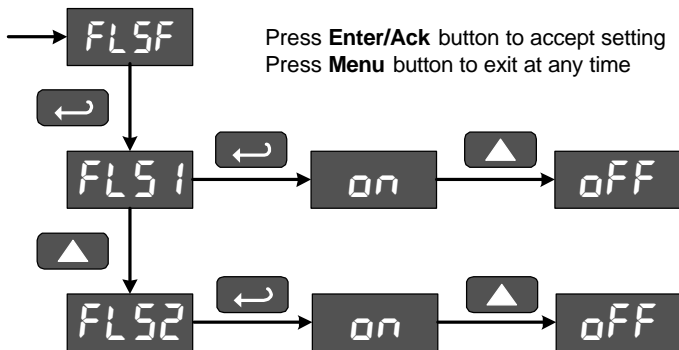
Programming Time Delay

The *On* and *Off* time delays may be programmed for each relay between 0 and 199 seconds. The relays will transfer only after the condition has been maintained for the corresponding time delay.

The *On* time delay is associated with the set point.

The *Off* time delay is associated with the reset point.
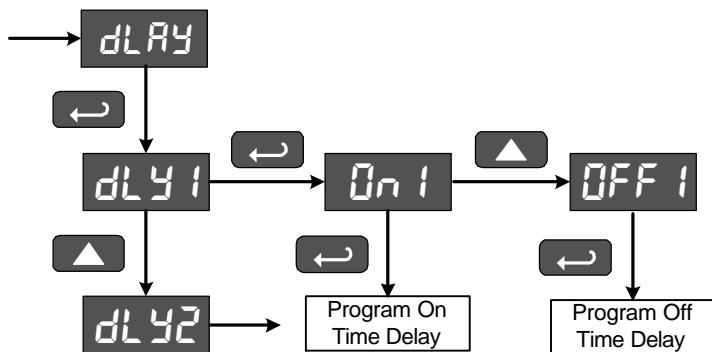
Relay and Alarm Operation

The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)
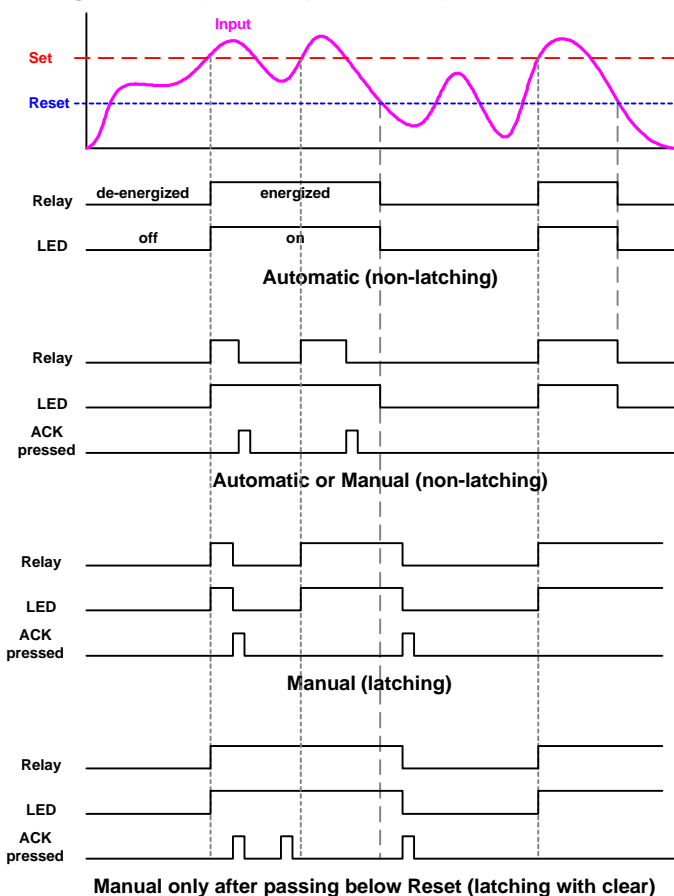
Automatic (non-latching)

Automatic or Manual (non-latching)

Manual (latching)

Manual only after passing below Reset (latching with clear)

For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go below set point, and then go above it.

Low Alarm Operation (Set < Reset)
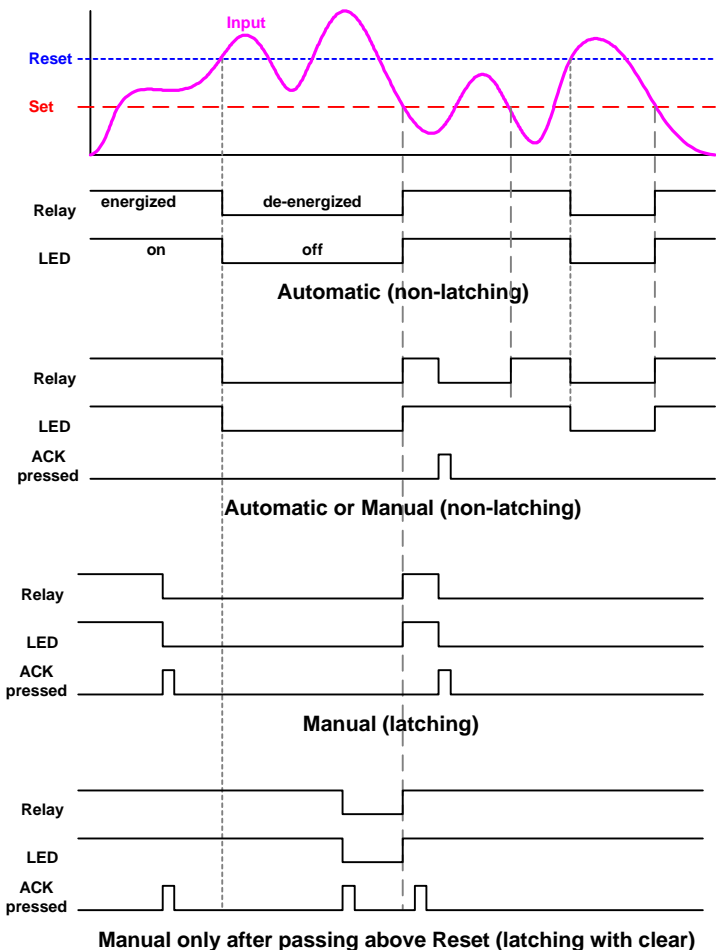
Automatic (non-latching)

Automatic or Manual (non-latching)

Manual (latching)

Manual only after passing above Reset (latching with clear)

For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point, and then go below it.

Time Delay Operation

The following graphs show the operation of the time delay function.

On Time Delay
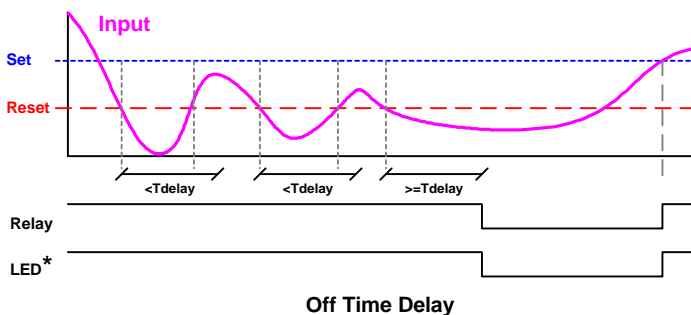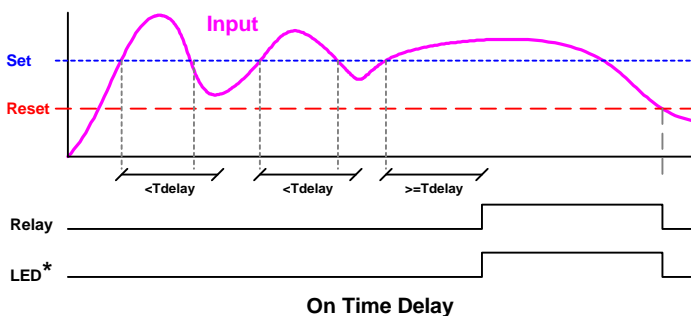
Off Time Delay

If the signal crosses the set point, the *On* time delay timer starts and the relay trips when the time delay has elapsed. If the signal drops below the set point (high alarm) before the time delay has elapsed, the *On* time delay timer resets and the relay does not change state. The same principle applies to the *Off* time delay.

* Note: The LED is not affected by Time Delay when *"Automatic or Manual"* reset mode is selected. Rather the LED follows the set and reset points.

High Alarm with Fail-Safe Operation (Set > Reset)
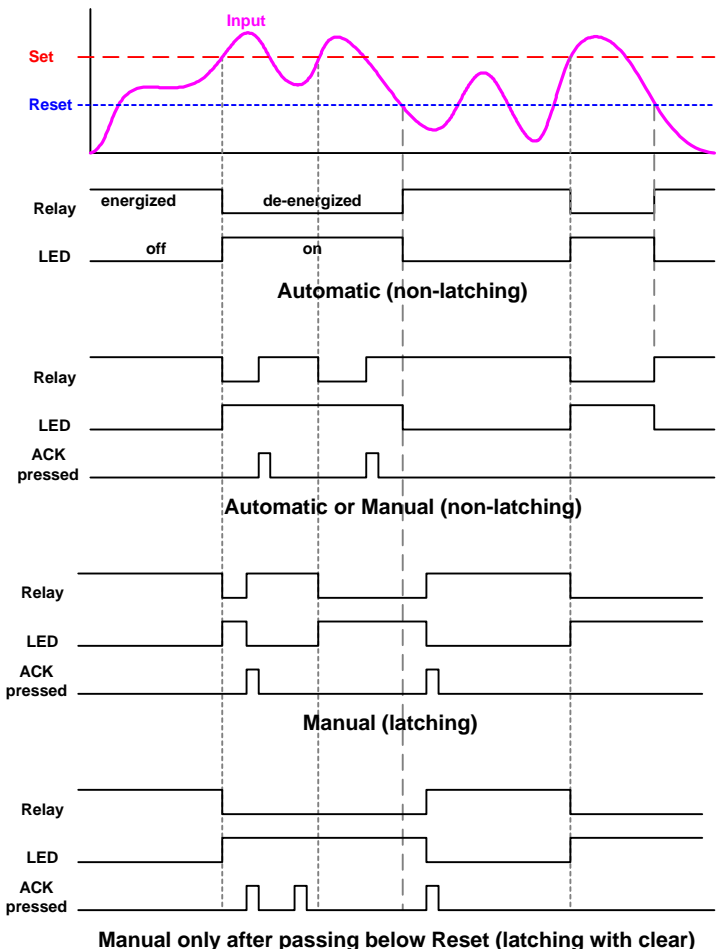
Automatic (non-latching)

Automatic or Manual (non-latching)

Manual (latching)

Manual only after passing below Reset (latching with clear)

Fail-safe operation: relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state.

Low Alarm with Fail-Safe Operation (Set < Reset)
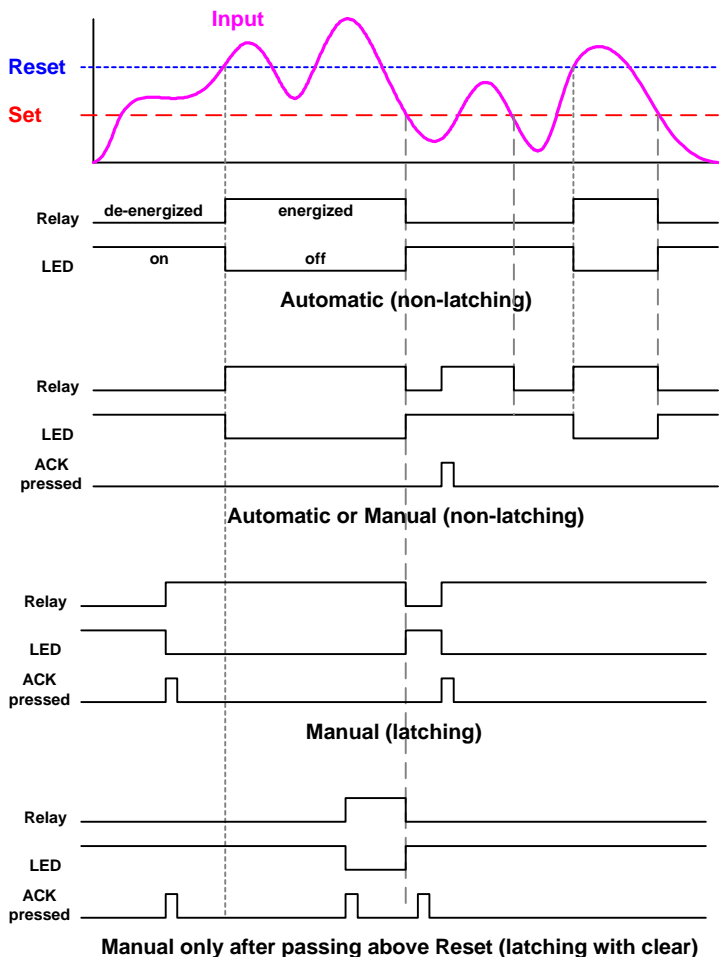
Fail-safe operation: relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state.

Pump Alternation Control Operation

LEDs indicate the relay status

Input

Relay2 Set
Relay1 Set
Relay1 & Relay2 Reset

Pump 1
Pump 2

de-energized / energized

Input

Relay2 Set
Relay1 Set
Relay1 Reset
Relay2 Reset

Pump 1
Pump 2

de-energized / energized

Input

Relay2 Set
Relay1 Set
Relay2 Reset
Relay1 Reset

Pump 1
Pump 2

de-energized / energized
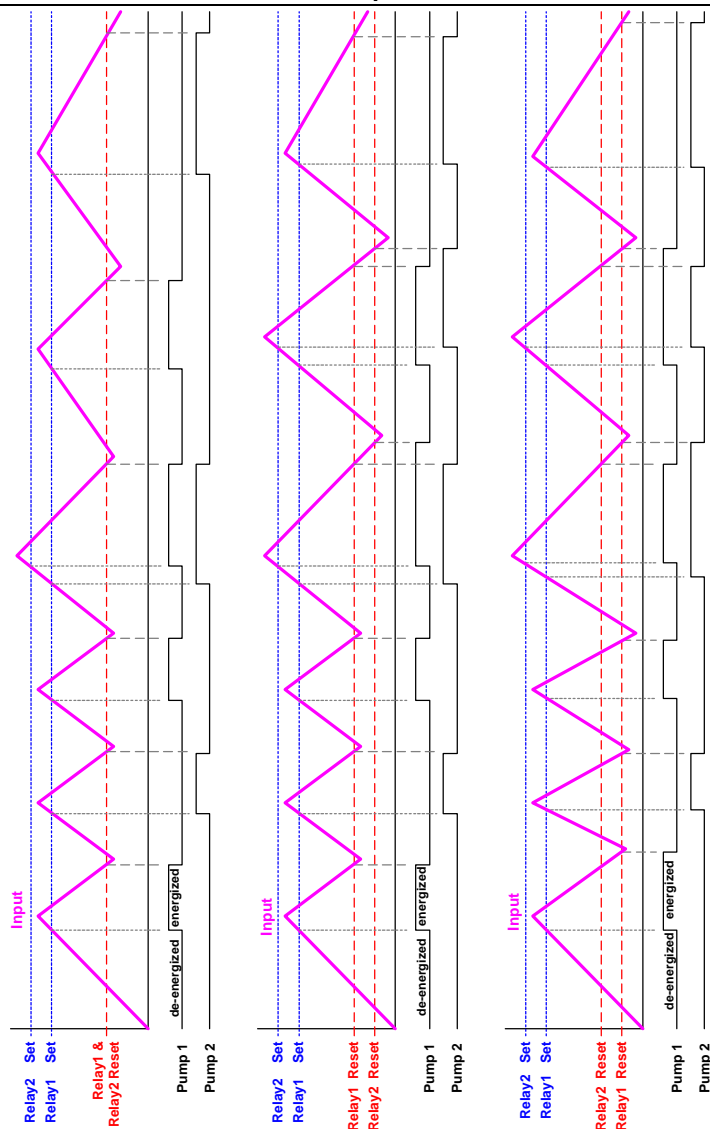
Programming the Meter ($Pro\bar{G}$)

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 milliamps, volts, and degrees respectively. The calibration equipment is certified to NIST standards.
- Use the *Scale* menu to scale process inputs (e.g. 4-20 mA). A calibrated signal source is not needed to scale the meter.
- For thermocouple and RTDs, just connect the sensor to the proper terminals and turn the power on. ***No calibration needed!*** (when the meter is first received from the factory).

The *Program* menu contains the *Calibrate* and the *Scale* menus.

Process inputs may be calibrated or scaled to any display within the range of the meter.
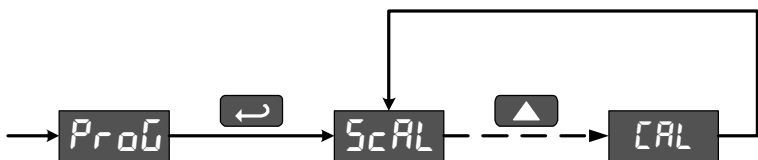
Additional parameters, not needed for most applications, are programmed with the *Advanced* features menu, see *Advanced Features Menu*, page 43.

Scaling the Meter (ScAL)

The process inputs (4-20 mA and ±10 VDC) can be scaled to display the process in engineering units.

A signal source is not needed to scale the meter; simply program the inputs and corresponding display values.

Press Enter to Accept Setting

Press Up to Set Digit Value

Press Right to Select Next Digit

Press Menu to Exit at any Time

Set Input 1 Value

Set Display 1 Value
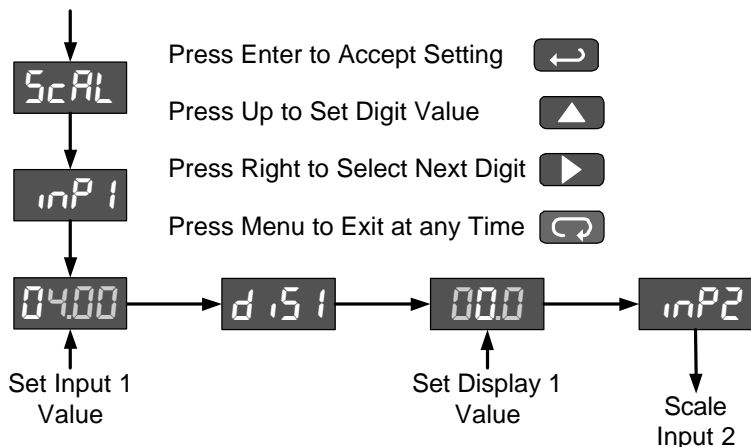
Scale Input 2

For instructions on how to program numeric values see *Setting Numeric Values*, page 24.

Note:

The *Scale* menu is not available for temperature inputs.

Error Message (Err)

An error message indicates that the calibration or scaling 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 or scaling of the meter.

Input range	Input 1 & input 2 span
4-20 mA	0.40 mA
±10 VDC	0.20 VDC
TC	100°F (56°C)
RTD	50°F (28°C)

Calibrating the Meter (*CAL*)

> To scale the meter without a signal
> source refer to Scaling the Meter
> (*ScAL*), page 37.

The meter can be calibrated to display the process in engineering units
by applying the appropriate input signal and following the calibration
procedure.

The use of a calibrated signal source is strongly recommended to cali-
brate the meter.

See *Scaling the Meter* for Button
Functions Description

Display
Flashes
Accepting
Input

Set Display 1
Value
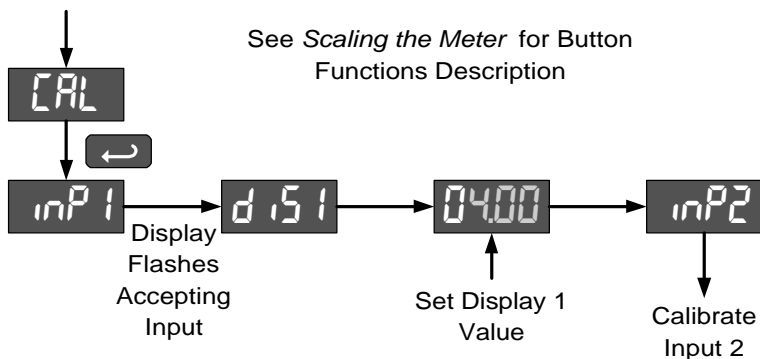
Calibrate
Input 2

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 proce-
> dure to ensure specified accuracy.***

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 15.
2. Set up the meter to accept the selected input (e.g. type J T/C), see page 25.
3. Set up the meter to display temperature in degrees Fahrenheit, see page 26.
4. Apply signal corresponding to input 1 (32°F) and program display 1 to 32, see page 39.
5. Apply signal corresponding to input 2 (1182°F for type J) and program display 2 accordingly, see page 39.
6. After the meter accepts input 2, the display flashes the message $\mathit{C\,Jr}$ that indicates the meter is sensing the cold junction reference. This completes the recalibration procedure for the selected input.

Recalibrating Process Inputs (iCRL)

The *Internal Calibration* (iCRL) menu, located in the Advanced features menu, is used to recalibrate the current and voltage inputs. Recalibration is recommended at least every twelve months.

Refer to Internal Calibration (iCRL), page 49 for instructions.

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 24.

Run Mode

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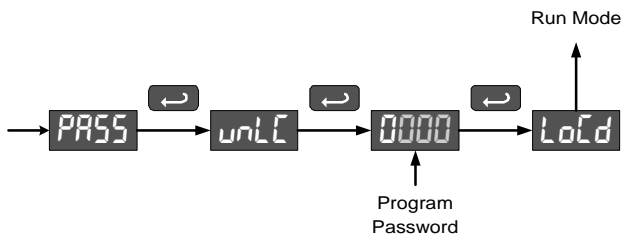
Record the password for future reference. If appropriate, it may be recorded in the space provided.

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
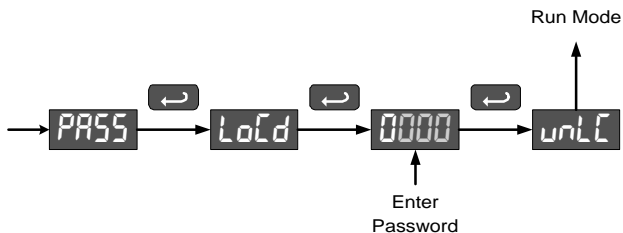
Enter
Password

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).

Advanced Features Menu

To simplify the setup process, functions not needed for most applications are located in the *Advanced* features menu.

Press and hold the **Right** arrow and the **Menu** buttons, for three seconds, to access the Advanced features of the meter (Hint: press and hold **Right** arrow first then **Menu).**
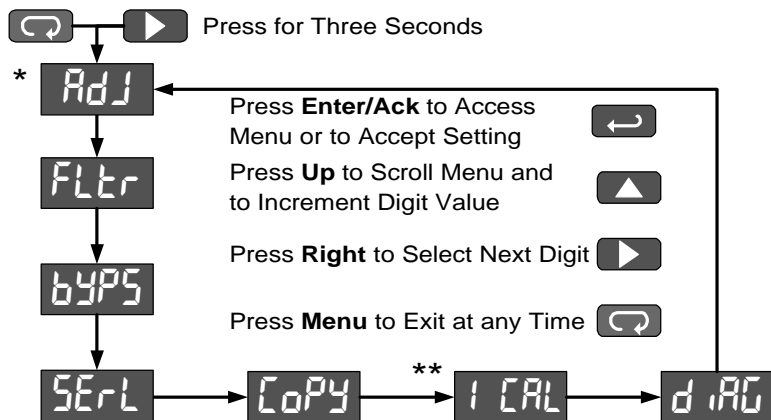
* Available for temperature inputs only

* * Available for process inputs only

Advanced Features Display Messages

Display	Parameter	Action/Setting
Ad J	Adjust	Set offset adjustment for temperature, not available for process inputs
FLtr	Filter	Set noise filter value
bYPS	By-pass	Set filter by-pass value
SErL	Serial	Set serial communication parameters
Addr	Address	Set meter address
trdE	Transmit delay	Set transmit delay for serial communication
CoPY	Copy	Enter copy function
SEnd	Send	Send meter settings to another meter
donE	Done	Copy function completed
ICAL	Initial calibration	Enter initial calibration for process inputs
Curr	Current	Calibrating current input
I Lo	I low	Calibrate low current input
I Hi	I high	Calibrate high current input
UoLt	Volt	Calibrating voltage input
uLo	V low	Calibrate low voltage input
uHi	V high	Calibrate high voltage input
d iAG	Diagnostics	Display parameter settings
LEd	LED	Test display
CJC	CJC	Display cold junction compensation voltage
CFG	CFG	Display meter configuration
PtS	Points	Display calibration points for process inputs
rELY	Relays	Display relay settings
GoFF	Gain/offset	Display gain and offset for process inputs
GA in	Gain	Display gain for process inputs
oFSt	Offset	Display offset for process inputs
SErL	Serial	Display serial communication settings
InFo	Information	Display software version and S/N information

> For instructions on how to pro-
> gram numeric values see *Setting
> Numeric Values,* page 24.

Offset Adjustment (Ad⅃)

This parameter allows the user to select an offset adjustment to the temperature being displayed. Offset adjustment values can be either positive or negative and can be any number within ±19.9°. The offset adjustment value is programmed through the *Adjust* menu.

The offset adjustment feature can be useful to compensate for errors due to thermocouple junctions or excessive lead wire resistance in RTDs.

The offset adjustment value is automatically reset to zero whenever the type of temperature sensor is changed (*i.e.* Thermocouple type or RTD curve).

Celsius/Fahrenheit conversion of the offset adjustment value is auto-matic, see note 2 below for important limitations.

Notes:
1. Offset adjustment is available only when TC or RTD input is se-lected.
2. If adjustment value is greater than 11°C and the temperature scale is changed to Fahrenheit, the maximum applied adjust-ment will be 19.9°F.

Noise Filter (FLtr)

Most applications do not require changing this parameter. It is intended to help attain a steady display with an unsteady (noisy) input signal.

The field selectable noise filter averages any minor or quick changes in the input signal and displays the reading with greater stability.

Increasing the filter value will help stabilize the display, however this will reduce the display response to changes on the input signal.

The filter level may be set anywhere from 2 to 199.

Setting filter value to zero disables filter function, and by-pass setting becomes irrelevant.

Noise Filter By-Pass (bYPS)

The meter can be programmed to filter small input changes, but allow larger input changes to be displayed immediately, by setting the by-pass value accordingly.

If the input signal goes beyond the by-pass value, it will be displayed immediately with no averaging done on it.

The noise filter by-pass value may be set anywhere from 0.2 to 99.9. It corresponds to percentage of full scale for process inputs and to degrees Fahrenheit for temperature inputs.

Increasing the by-pass value may slow down the display response to changes on the input signal.

Serial Communication (SErL)

The meter is equipped with serial communication capability as a standard feature.

To communicate with a computer or other data terminal equipment, an RS-232 or RS-422/485 adapter option is required, see *Ordering Information* on page 3 for details.
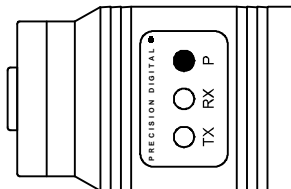
When using more than one meter in a multi-drop mode, each meter must be provided with its own unique address. The address may be programmed from 00 to 99. The transmit delay time may be set between 0 and 199 ms (see Serial Communication Adapter manual for more details).

The Trident can also be connected directly to another Trident meter through a cable assembly (PDA7420). This allows the user to copy all the settings from one meter to another, using the *Copy* function.

MeterView Software

Precision Digital's MeterView software allows the Trident to be pro-grammed from a PC and to act as a data logger.

MeterView software allows all setup parameters to be saved to a file for reporting, restoring, or programming other meters.

See *Ordering Information*, page 3 to order MeterView.

Meter Copy Function (*CoPY*)

The *Copy* function is used to copy (or clone) all the settings from one meter to other meters requiring exactly the same setup and program-ming (*i.e.* type of input, scaling, decimal point, filter, by-pass, etc.).
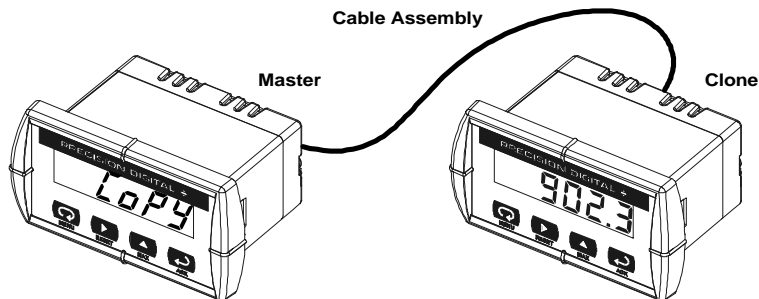

Figure 14. Meter Copy Connection

> *Software version must be the same on both meters to successfully copy set-tings from one meter to another!*
>
> See *Determining Software Version*, page 55 for instructions.

Meter Cloning Instructions

NOTICE!	*Do not connect the two meters to the same 4-20 mA loop while cloning. Internal calibration may be affected.*

1. Connect the two meters using cable assembly PDA7420 or equivalent (*e.g.* Digi-Key P/N H1663-07-ND). Cable should not exceed 7' (2.1 m).
2. Power up both meters. Leave Clone meter in Run Mode.
3. Enter the *Advanced* features menu of the Master meter, see *Advanced Features Menu*, page 43.
4. Scroll to *Copy* function using **Up** arrow button then press **Enter/Ack**.
5. The meter displays the message 5End. Press **Enter/Ack**, the display flashes while sending data. The message donE is displayed when copying is completed.
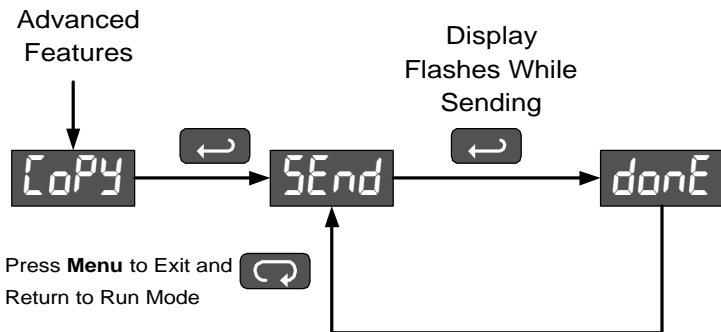
6. The Clone meter displays the memory address being programmed then the message donE when copying is completed. The meter initializes and returns to Run Mode using the same settings as the Master.

Internal Calibration (*iCAL*)

> - 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 milliamps, volts, and degrees respectively. The calibration equipment is certified to NIST standards.

The internal calibration allows the user to scale the meter without applying a signal. This menu is not available if the meter is set up for TC or RTD inputs.

The use of calibrated signal sources is necessary to perform the internal calibration of the meter.

Check calibration of the meter at least every 12 months. Each input type must be recalibrated separately, if meter will be used with all input types.

> Notes:
> - If meter is in operation and it is intended to accept only one input type (e.g. 4-20 mA), recalibration of other inputs is not necessary.
> - Allow the meter to warm up for at least 15 minutes before performing the internal calibration procedure.

The *Internal calibration* menu is part of the *Advanced* features menu.

1. Press and hold the **Right** arrow and the **Menu** buttons, for three seconds, to access the Advanced features of the meter (Hint: press and hold **Right** arrow first then **Menu).**
2. Press the **Up** arrow button to scroll to the *Internal calibration* menu and press **Enter/Ack**.
3. The meter displays either current (*Curr*) or voltage (*VoLt*), according to the meter input setup. Press **Enter/Ack** to start the calibration process.

Example for current input internal calibration:

4. The meter displays *Low* input current (*l Lo*). Apply the low input signal and press **Enter/Ack**. The display flashes for a moment while meter is accepting the low input.

5. After the display stops flashing, a number is displayed with the leftmost digit brighter than the rest. The bright digit is the active digit that can be changed by pressing the **Up** arrow button. Press the **Right** arrow button to move to the next digit.

6. Set the display value to correspond to the input signal being calibrated.

7. The display moves to the high input calibration (*l Hi*). Apply the high input signal and press **Enter/Ack**.

8. Set the display for the high input calibration in the same way as it was set for the low input calibration.

For instructions on how to program numeric values see *Setting Numeric Values,* page 24.
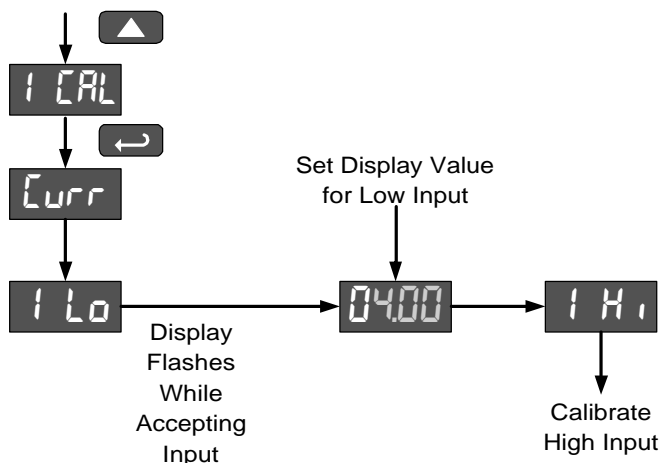
The graphic above shows the calibration of the current input. The voltage input is calibrated in a similar way.

Tips:

- Low and high input signals can be any valid values within the range of the meter.
- Observe minimum input span requirements between input 1 and input 2.
- Low input must be less than high input signal.

Error Message (Err)

An error message indicates that the calibration or scaling 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.

Minimum Input Span

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

Input range	Input 1 & input 2 span
4-20 mA	0.40 mA
±10 VDC	0.20 VDC

OPERATION

For process inputs, the meter is capable of accepting positive and negative signals and displaying these signals in engineering units from -1999 to 9999 (*e.g.* a signal from -10 to +10 VDC could be displayed as -10.00 to 10.00).

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 Press ACK to acknowledge relays

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 or temperature inputs.
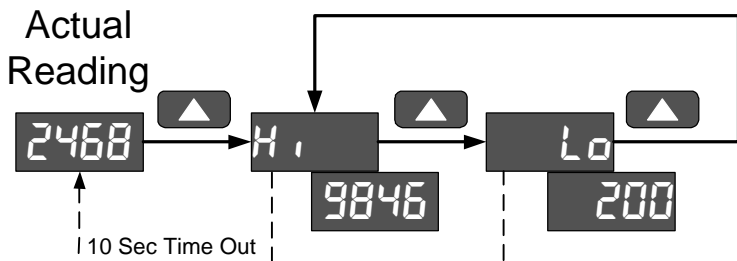
Press **Up** to Display and to Toggle Between Max & Min

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
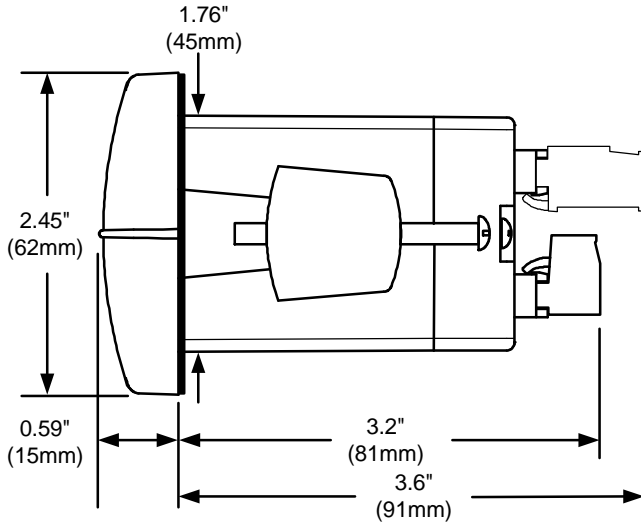
Figure 15. Meter Dimensions – Side View
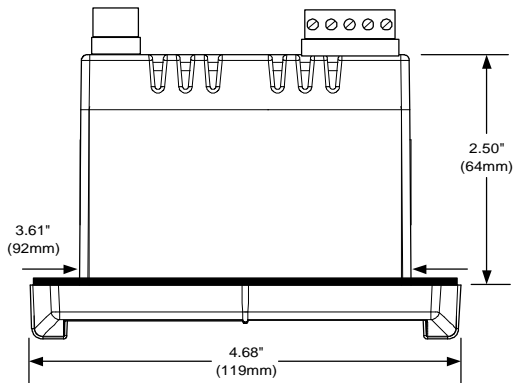
Figure 16. Case Dimensions - Top View

TROUBLESHOOTING

> For *Interactive VirtualMeter*
> *Demo* visit
> **www.predig.com**

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.

If the meter is not working as expected, refer to the *Diagnostic* menu and recommendations below.

Diagnostic Menu (d iAG)

The *Diagnostic* menu is located in the *Advanced* features menu, to access *Diagnostic* menu see *Advanced Features Menu*, page 43.

It provides an easy way to view the programmed parameter settings for troubleshooting purposes. Press the **Enter/Ack** button to view the settings and the **Menu** button to exit at any time.

For a description of the diagnostic messages *see Advanced Features Display Messages*, page 44.

Determining Software Version

To determine the software version of a meter:
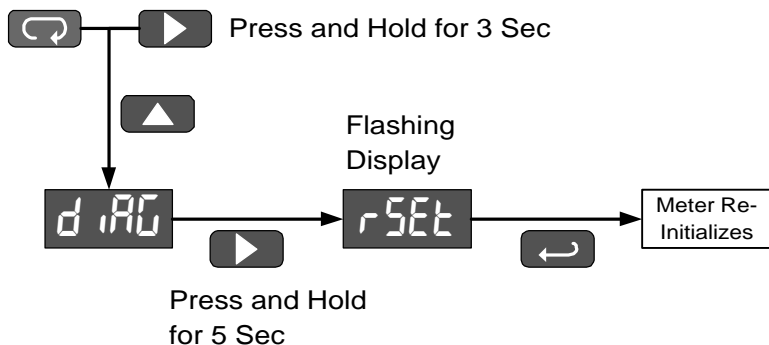
1. Go to the *Diagnostic* menu (d iAG) and press **Enter/Ack** button.
2. Press **Up** arrow/**Max** button and scroll to Information menu (InFo).
3. Press **Enter/Ack** to access the software number (5Ft), version (UEr), and serial number (5n) information. Write down the information as it is displayed. Continue pressing **Enter/Ack** until all the information is displayed.

Reset Meter to Factory Defaults

When the parameters have been changed in a way that is difficult to determine what's happening, it might be better to start the setup process from the factory defaults.

Instructions to load factory defaults:

1. Enter the *Advanced* features menu. See *Advanced Features Menu*, page 43.
2. Press **Up** arrow to go to *Diagnostics* menu
3. Press and hold **Right** arrow/Reset for five seconds, press **Enter/Ack** when display flashes r E 5 E t.
   Note: If **Enter/Ack** is not pressed within three seconds, display returns to *Diagnostic* menu.
4. The meter goes through an initialization sequence (same as on power-up), and loads the factory default settings.
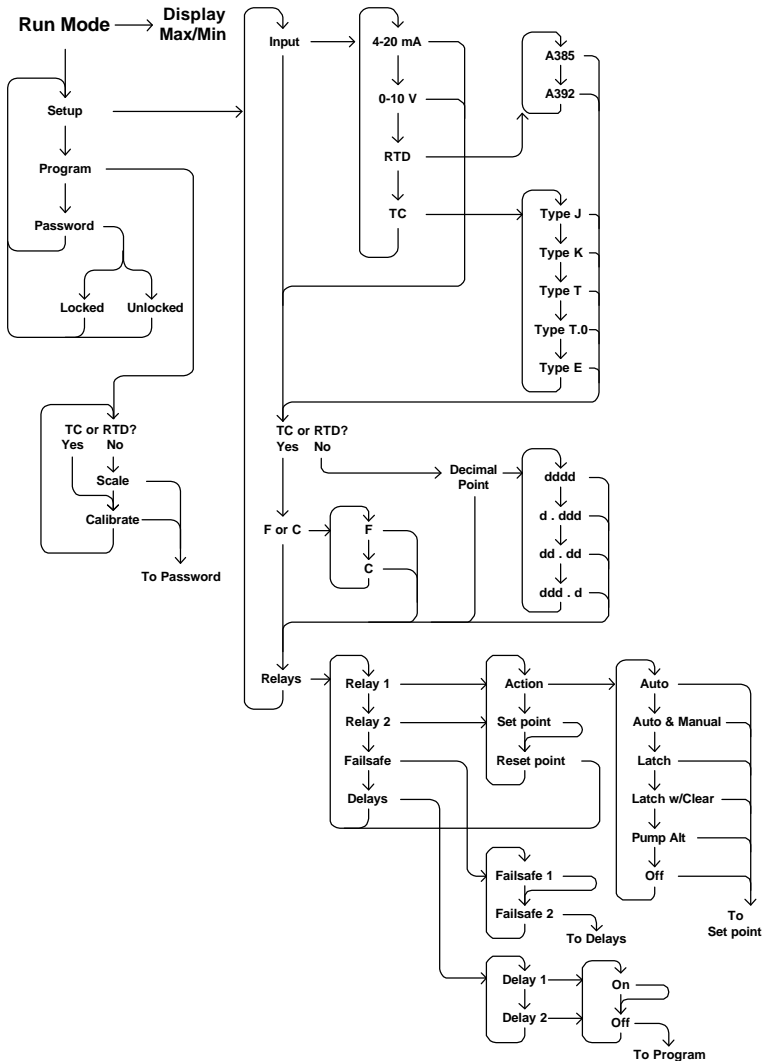

Press and Hold for 3 Sec

Flashing
Display

Meter Re-
Initializes

Press and Hold
for 5 Sec

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 locked, 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.
Display response is too slow	Check Filter and by-pass values
Inaccurate temperature reading	Check: 1. Temperature units (°F or °C) 2. TC type or RTD curve selected 3. Offset adjustment 4. TC wire used 5. Calibration
If the display locks up or the meter does not respond at all	Cycle the power to reboot the microprocessor.
Relay operation is reversed	Check: 1. Fail-safe in *Setup* menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in *Setup* menu 2. Set and reset points
Other symptoms not described above	Call Technical Support for assistance.

QUICK USER INTERFACE REFERENCE GUIDE

Run Mode → **Display Max/Min**

Input → **4-20 mA**

Setup

Program

Password

Locked   **Unlocked**

0-10 V

RTD

TC

A385

A392

Type J

Type K

Type T

Type T.0

Type E

TC or RTD?
Yes   No

Scale

Calibrate

TC or RTD?
Yes   No

Decimal Point

dddd

d . ddd

dd . dd

ddd . d

F or C

F

C

To Password

Relays

Relay 1

Relay 2

Failsafe

Delays

Action

Set point

Reset point

Auto

Auto & Manual

Latch

Latch w/Clear

Pump Alt

Off

To Set point

Failsafe 1

Failsafe 2

To Delays

Delay 1

Delay 2

On

Off

To Program

| Pushbutton	Function
Menu	Go to Programming Mode or leave Programming, Advanced Features, and Max/Min Modes.
Right Arrow	Move to next digit.
Up Arrow	Move to next selection or increment digit.
Enter/Ack	Accept selection/value and move to next selection.

Right Arrow & **Menu** held for 3 seconds enters Advanced Features

Max/Min Mode
While in Run Mode, pressing **Up** Arrow will initiate Max/Min Mode. **Up** Arrow toggles between Max & Min displays, and **Right** Arrow resets the Max/Min to the current value. Press **Menu** or wait 10 seconds to return to Run Mode. Pressing **Enter/Ack** will disable the 10 second timeout and continuously display Max or Min.

Press & hold **Right** arrow and **Menu** for 3 seconds to access Advanced Features Menu

When the meter is locked, Adjust, Filter and By-Pass can only display their settings, and the Copy and ICAL functions are not available.

Operational Modes
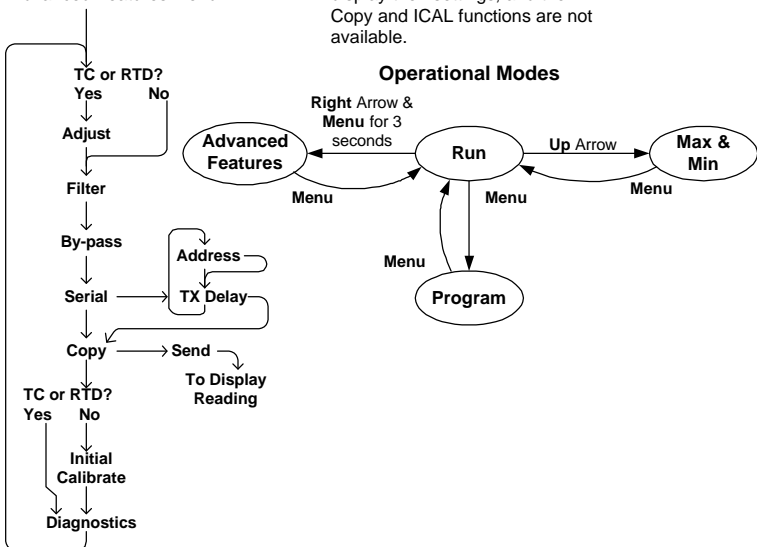
How to Contact Precision Digital

- For Technical Support please

  call: (800) 610-5239

  fax: (508) 655-8990

  e-mail: support@predig.com

- For Sales Support or to place an order please

  call: (800) 343-1001

  fax: (508) 655-8990

  e-mail: sales@predig.com

- For Warranty Registration and to Extend Your Warranty on-line visit

  www.predig.com

- For an online version of this Instruction Manual please visit

  www.predig.com

- For *Interactive VirtualMeter Demo* please visit

  www.predig.com