# Loop Leader PD6600 Series Loop-Powered Feet & Inches Meter Instruction Manual

## Loop Leader Series

IECEx
PD6607 Only

CE

**Loop-Powered Level**

- 4-20 mA Input
- Loop-Powered Process Meter
- 1.5 Volt Drop (4.5 Volt Drop with Backlight)
- Loop-Powered Backlight with Red Backlight for Alarm Conditions
- NEMA 4X, IP65 Front
- -40 to 167°F (-40 to 75°C) Safe Area Operating Temperature Range
- Free PC-Based USB Programming Software
- Displays Level in Feet & Inches up to 999 Feet, 11 & 15/16 Inches
- 8-Digit Alphanumeric Bottom Line
- 20-Segment Bargraph with Numeric Percent Indication
- Conformal Coated PCBs for Dust & Humidity Protection
- Two Open Collector Outputs Standard
- Optional Loop-Powered Solid-State Relays
- Optional 4-20 mA Analog Output
- Relay Pump Alternation Based on Level and Runtime
- Display Relay Runtime and Cycle Count
- UL & C-UL 61010 Listed for Electrical Safety
- UL & C-UL Listed as Intrinsically Safe and Nonincendive
- ATEX and IECEx Certified as Intrinsically Safe

**Order from:**

## C A Briggs Company
622 Mary Street; Suite 101
Warminster, PA 18974
Phone: 267-673-8117 - Fax: 267-673-8118
Sales@cabriggs.com - www.cabriggs.com

## PRECISION DIGITAL

**www.predig.com**

## 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.

| ⚠ | ⚡ |
|---|---|
| **CAUTION**: *Read complete instructions prior to installation and operation of the meter.* | **WARNING**: *Risk of electric shock or personal injury.* |

| ⚡ **Warning!** | ***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 his/her own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.*** |
|---|---|

## Limited Warranty

Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period under "Specifications" 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.

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# Introduction

These loop-powered 1/8 DIN digital panel meters can be installed virtually anywhere to provide convenient and informative display of any 4-20 mA signal. One of the most convenient features of these instruments is their dual line display. The top line is used to display level in feet and inches while the 8-digit alphanumeric bottom line may be used to display a tag custom message. Another common setup is to display the input in one feet and inches on the top line and another scale on the bottom line (such as the volume in gallons). Further enhancing the display on these instruments is a 20-segment bargraph that also includes a numeric value of the percentage the bargraph represents.

These loop-powered meters can be installed virtually anywhere because they get their power from the 4-20 mA loop and therefore require no separate power source. And they only drop 1.5 V (4.5 V with backlight), so they add very little burden to the loop. Additional features that allow these instruments to be installed virtually anywhere include a NEMA 4X, IP65 front panel, an operating temperature range of -40 to 167°F (-40 to 75°C) (for safe area products), conformally coated PCBs, and a backlit LCD that can be read in bright sunlight or dimly lit areas. Finally, there are intrinsically safe and nonincendive versions of these instruments that can be installed in hazardous areas.

Free, PC-based, software that connects to the meter via a micro USB cable is available for programming and setup of the meters. In addition, the meter can be programmed, setup and operated via the four front panel buttons. Three of these buttons can be used as function keys. In addition, a digital input is standard and is particularly useful for remote reset of the alarms or to trigger an alarm.

All models come equipped with two open collector outputs and are available with two solid state relays and 4-20 mA analog output options. The open collector outputs are useful for alarm indication or pulse output. The relays can be programmed for alarm indication, on/off control, or pump alternation.

# Ordering Information

## General Purpose Instruments

| Loop Leader PD6603 • Feet & Inches Models – General Purpose | |
|---|---|
| Model | Description |
| PD6603–LNN | Loop-Powered, General Purpose, Feet & Inches, No Options |
| PD6603–L2N | Loop-Powered, General Purpose, Feet & Inches, Two Solid State Relays |
| PD6603–L3N | Loop-Powered, General Purpose, Feet & Inches, 4-20 mA Analog Output |
| PD6603–L5N | Loop-Powered, General Purpose, Feet & Inches, Two Solid State Relays and 4-20 mA Analog Output |

## Hazardous Area Instruments

| Loop Leader PD6607 • Feet & Inches Models – Hazardous Area | |
|---|---|
| Model | Description |
| PD6607–LNN | Loop-Powered, Hazardous Area, Feet & Inches, No Options |
| PD6607–L2N | Loop-Powered, Hazardous Area, Feet & Inches, Two Solid State Relays |
| PD6607–L3N | Loop-Powered, Hazardous Area, Feet & Inches, 4-20 mA Analog Output |
| PD6607–L5N | Loop-Powered, Hazardous Area, Feet & Inches, Two Solid State Relays and 4-20 mA Analog Output |

*Note: All models come with two open collector outputs standard.*

## Enclosures

| Enclosures | |
|---|---|
| Model | Description |
| PDA2301 | NEMA 4X Plastic Enclosure |
| PDA2501 | Plastic NEMA 4X Enclosure |
| PDA2601 | Stainless Steel NEMA 4X Enclosure |
| PDA2701 | Painted Steel NEMA 4 Enclosure |
| PDA2801 | Low-Cost Plastic NEMA 4X Enclosure |
| PDA3407 | Internally Mount NEMA 4X Plastic Enclosure |

# Specifications

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

## Input

| | |
|---|---|
| **Input** | 4-20 mA |
| **Accuracy** | ±0.02% of span ±1 count, Square root and programmable exponent: 10-100% FS |
| **Voltage Drop** | *Without Backlight*: 1.5 V maximum, *With backlight*: 4.5 V maximum |
| **Equivalent Resistance** | *With backlight off*: 75 Ω @ 20 mA *With backlight on*: 225 Ω @ 20 mA |
| **Input Overload** | Over current protection to 1 A maximum Over voltage protection to 30 VDC max (between mA+ and mA-/BL-) |
| **Temperature Drift** | 25 PPM/°C from -40 to 75°C ambient |
| **Function** | PV1: Linear PV2: Linear or Round Horizontal Tank |
| **Low-Flow Cutoff** | 0 to 999 FT 11 IN 15/16 |
| **HART Transparency** | Analog input will not interfere with existing HART communications on the wired 4-20 mA signal |

## Display

| | |
|---|---|
| **Display** | Dual-line LCD with backlight. Top line 7-segment numeric, bottom line 14-segment alphanumeric. Top: 0.7" (17.8 mm), Bottom: 0.4" (10.2 mm). Display may be programmed to turn red and flash a user-defined message on alarm condition. |
| **Backlight** | Powered by 4-20 mA loop. Intensity varies with signal level |
| **Top Line** | -99FT 11IN 15/16 to 999FT 11IN 15/16 |
| **Bottom Line** | 8 digits (-9,999,999 to 99,999,999; separated by commas) or 8 characters (all capital & most lower-case letters) |
| **Bargraph** | 20 segments, numeric percent indication at top |
| **Decimal Point** | Up to seven decimal places on bottom line |
| **Commas** | Commas to indicate 1000s (e.g. 88,987,628) on bottom line |
| **Dual-Scale Feature** | The input can be displayed in different scales on the top and bottom lines. For instance, the top line could display the input in height and the bottom line could display that same input in volume. |
| **Alarm Indication** | Red backlight, flashing display. Bargraph segment flashes on alarm. |
| **Alarm Message** | On or Off; user programmable, 8 characters maximum. Displayed every 10 seconds for 1 second on bottom line. |
| **Display Update Rate** | Ambient > -10°C: 1 Update/Second Ambient = -20°C: 1 Update/2 Seconds From -20°C to -40°C the update rate slows down 1 second for every -2°C (e.g. at -24°C, 1 update/4 seconds). |
| **Overrange** | Top: 999 11 15/16; Bottom: 99,999,999 (flashing) |
| **Underrange** | Top: -99 11 15/16; Bottom: -9,999,999 (flashing) |

## General

| | |
|---|---|
| **Environmental** | *Operating temperature range:* -40 to 75°C for safe area products -40 to 70°C for hazardous area products *Storage temperature range:* -40 to 85°C *Relative humidity:* 0 to 90% non-condensing; Printed circuit boards are conformally coated. |
| **Programming Method** | Front panel & Free PC-based USB programming software |
| **Enclosure & Materials** | Enclosure: 1/8 DIN, IP65, NEMA 4X front panel, high impact plastic, NORYL® polyphenylene ether & polystyrene blend (PPE PS) resin, UL 94V-0, Color: gray Gasket: Silicone Rubber Faceplate: LEXAN® polycarbonate (PC) Film Buttons: Silicone rubber |
| **Noise Filter** | Averages the input signal over a period of time between 1 and 16 seconds to dampen the effects of a noisy signal that causes a jumpy display. |
| **Filter Bypass** | 0.0 to 99.9% of full scale. Input signal changes greater than bypass value are displayed immediately. |
| **Recalibration** | 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. |
| **Tare** | Zeros out display |
| **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. |
| **Normal Mode Rejection** | 64 dB at 50/60 Hz |
| **Connections** | Removable screw terminals accept 12 to 22 AWG wire |
| **DI Digital Input Contacts** | 2.1 VDC on contact. Connect normally open contacts across DI+ to DI- |
| **DI Digital Input Logic Levels** | Logic High: 2.4 to 30 VDC (max) Logic Low: 0 to 0.9 VDC |
| **Tightening Torque** | *Screw terminal connectors:* 4.5 lb-in (0.5 Nm) *Mounting screws:* 8.0 lb-in max. (0.9 Nm) |
| **Overall Dimensions** | 4.68" x 2.45" x 3.79" (119 mm x 62 mm x 96 mm) (W x H x D) |
| **Weight** | 8.7 oz (247g) with option board |
| **Warranty** | 3 years parts and labor |

## Common Open Collector & Relay (Alarm) Specifications

| | |
|---|---|
| High or Low Alarm | User programmable for high or low alarm |
| Alarm Deadband | 0-100% FS, user programmable |
| On & Off Time Delay | 0 to 9,999 seconds |
| Fail-Safe Operation | Independent for each open collector and relay |
| | Fail-safe on, the output is on under normal conditions |
| | Fail-safe off, the output is on under alarm conditions |
| Alarm Operation | Automatic, automatic with manual override, latching (manual reset anytime), latching with reset after cleared (manual reset only after alarm has cleared) |
| Alarm Indication | Red backlight, Flashing display. Bargraph segment flashes on alarm. |
| Alarm Message | On or Off; User programmable, 8 characters maximum; Displayed every 10 sec for 1 sec on bottom |
| Alarm Acknowledge | Front panel ACK button or external digital input resets output and screen indication |
| Auto Initialization | When power is applied to the meter, open collectors and relays will reflect the state of the input to the meter |
| Timer Output | One-shot or Continuous |
| | Off Time Delay: 1 sec to 99:59:59 (hrs:min:sec) |
| | On Time: 1 sec to 99:59:59 (hrs:min:sec) |
| Stopwatch | Output turns on when started and off when stopped |

## Open Collector Output

| | |
|---|---|
| Rating | Two NPN, Isolated open collector, 5-30 VDC @ 150 mA maximum |
| Output Assignment | Pulse, Alarm, Timer, Stopwatch on/off, or Disable |
| Pulse Output Source | PV (PV1, PV2) or Test Frequency |
| Pulse Output Factor | 0.000001 to 999,999.9 |
| Pulse Width | 0.5 ms @ 1 kHz; 500 ms @ 1 Hz; 50% duty cycle |
| Pulse Output Frequency | 1,000 Hz maximum |
| Quadrature Pulse Output | Available for Output 2 (90° behind Output 1) |
| Alarm Output Source | Assign to PV (PV1, PV2) or Digital Input |

## Solid State Relays

| | |
|---|---|
| Rating | *250 VAC/VDC @ 1A resistive* |
| | *75VA; 250VAC; 0.6A pilot duty (inductive) – UL Code D300* |
| | *25VA; 250VDC; 0.6A pilot duty (inductive) – UL Code R300* |
| Noise Suppression | Metal oxide varistors across outputs |
| Relay Assignment | Pump Alternation, Alarm, Timer, Stopwatch on/off, or Disable |
| Alarm Output Source | Assign to PV (PV1, PV2) or Digital Input |
| Pump Alternation | Relays will alternate with each pump cycle and alternation can be based on elapsed time. Pump alternation time can be programed for: 0 to 999:59 (hrs:min) |
| Relay (Pump) Runtime | Meter will keep track of how long each relay (pump) has operated and display this information |
| Relay (Pump) Cycles | Meter will keep track of how many times the relays (pumps) have cycled and display this information |

## 4-20 mA Transmitter Output

| | |
|---|---|
| Accuracy | ±0.05% FS ±0.001mA |
| Output Source | PV1, PV2, re-transmit; reverse scaling allowed |
| Scaling Range | 1.00 to 23.0 mA |
| Disable | High impedance state, less than 1 mA |
| Calibration | Factory calibrated 4.00 to 20.00 mA |
| Underrange | 1.0 mA, 3.5 mA, or 3.8 mA (If input < 3.5 mA); or Off; user selectable |
| Overrange | 20.5 mA, 20.8 mA, or 23.0 mA (If input > 20.5 mA); or Off; user selectable |
| Isolation | 500 V input-to-output |
| Temperature Drift | 0.5 µA/°C max from -40 to 75°C ambient |
| External Loop Power Supply | 7.0 VDC to 30.0 VDC maximum |
| Output Loop Resistance | 10-750 Ω @ 24 VDC; 10-1100 Ω @ 30 VDC |

## MeterView XL Programming Software

| | |
|---|---|
| System Requirements | Microsoft® Windows® 7 & 10 |
| Communications | USB 2.0 (Standard USB A to Micro USB B) |
| Configuration | Configure meters one at a time |
| Configuration Files | Generate with or without meter connected; Save to file for later use |
| USB Power Connection | Meter is powered by USB connection during programming |

# General Compliance Information

## Electromagnetic Compatibility

| EMC Emissions | • CFR 47 FCC Part 15 Subpart B Class A emissions requirements (USA) |
|---|---|
| | • AS/NZS CISPR 11:2004 Class A ISM emissions requirements (Australia) |
| | • EN 55011:2009/A1:2010 Group 1 Class A ISM emissions requirements (EU) |
| | • ICES-001 Issue 4 ISM emissions requirements (Canada) |
| EMC Emissions and Immunity | EN 61326-1:2013 EMC requirements for Electrical equipment for measurement, control, and laboratory use – Inductrial Use |

# PD6607 Compliance Information

## Safety

| UL & C-UL Listed | USA & Canada |
|---|---|
| | UL 61010-1, 3rd Edition; CAN/CSA-C22.2 No. 61010-1-12, 3rd Edition |
| UL File Number | E160849 |
| Front Panel | UL Type 4X, NEMA 4X, IP65; panel gasket provided |
| Low Voltage Directive | IEC 61010-1:2010 (Third Edition) |
| | Safety requirements for electrical equipment for measurement, control, and laboratory use |
| Additional Standards | UL 50E |

## Hazardous Area Approvals

**ATEX**     **Certificate Number:** CML 17ATEX2015X

CE 0518     Ex ia IIC T4 Ga

Ex     II 1G     -40°C ≤ Ta ≤ 70°C

**IECEx**     **Certificate Number:** IECEx CML 17.0008X

Ex ia IIC T4 Ga

Tamb = -40°C to +70°C

**UL & C-UL**     **UL File Number:** E494837

Class I, Division 1, Groups A, B, C and D T4
Class I, Division 2, Groups A, B, C and D T4
Ex ia IIC T4 (Canada); Class I Zone 0, Zone 1,
AEx ia IIC T4 (U.S.);
Class I Zone 2, Group IIC T4 (U.S.)
PROCESS CONTROL EQUIPMENT FOR USE IN HAZARDOUS LOCATIONS

*ATEX/IECEx Assessment Standards*

| ATEX | IECEx |
|---|---|
| EN 60079-0:2012+A11:2013 EN 60079-11:2012 | IEC 60079-0:2011 Ed. 6 IEC 60079-11:2011 Ed. 6 |

*UL Assessment Standards*

| United States Standards | Canadian National Standards |
|---|---|
| UL 913, Eighth Edition UL 60079-0, Sixth Edition UL 60079-11, Sixth Edition Standard No. UL 121201, 9th Edition | CSA C22.2 No. 60079-0:15 CSA C22.2 No. 60079-11:14 CAN/CSA C22.2 No. 213-17 |

### ATEX/IECEx Special Conditions for Safe Use

The following conditions relate to safe installation and/or use of the equipment.

- The permitted ambient temperature range for the PD6606/PD6608 is -40°C to 70°C.
- The equipment must be installed in an enclosure which provides a minimum degree of protection of IP20 for the equipment connections.
- Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. This is particularly important if the equipment is installed in a zone 0 location. In addition, the equipment shall only be cleaned with a damp cloth.
- The equipment loop/power port must be connected to an intrinsically safe barrier with $U_o \geq 11V$.
- Entity parameters must meet the following requirements:
  $U_i$: 30 V; $I_i$: 175 mA; $C_i$: 0 µF; $L_i$: 0 µH; $P_i$: 1.0 W
- For ATEX Certification, barrier and transmitter must be ATEX Certified with Entity Parameters and must be connected per manufacturer's instructions.

### For European Community:

The PD6606/PD6608 must be installed in accordance with the Essential Health & Safety Requirements of Directive 2014/34/EU, the product certificates CML 17ATEX2015X and IECEx CML 17.0008X, and the product manual.

### UL/C-UL Special Conditions for Safe Use

- Associated apparatus may be in a Division 2 or Zone location if so approved.
- Under certain extreme circumstances, the non-metallic parts incorporated in the enclosure of this equipment may generate an ignition-capable level of electrostatic charge. Therefore the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. This is particularly important if the equipment is installed in a zone 0 location. In addition, the equipment shall only be cleaned with a damp cloth.
- The equipment shall be installed in a tool secured enclosure which provides a minimum degree of protection of IP20 for the equipment connections.
- Entity parameters must meet the following requirements:
  $U_i$: 30 V; $I_i$: 175 mA; $C_i$: 0 µF; $L_i$: 0 µH; $P_i$: 1.0 W

| I.S. Equipment Entity Parameters | Required Relationship Between Entity Parameters | I.S. Barrier Entity Parameters |
|---|---|---|
| V max (or Ui) | ≥ | Voc or Vt (or Uo) |
| I max (or Ii) | ≥ | Isc or It (or Io) |
| P max, Pi | ≥ | Po |
| Ci + Ccable | ≤ | Ca (or Co) |
| Li + Lcable | ≤ | La (or Lo) |

- **For Division 2 and Zone 2 Applications:** Division 2 and Zone 2 installations do NOT require the use of an intrinsically-safe barrier or intrinsically-safe entity parameters. Class I, Division 2, Groups A, B, C, and D T4 and Class I, Zone 2, Group IIC T4, -40C <= Ta <= +70C.
  Ratings: V = 30 V dc, I = 30 mA; Relay Ratings: 250V ac/dc 1A

### For North American Community:

Installation and service of this device and/or associated apparatus (barrier) should be performed only by trained service personnel and must be installed in accordance with the manufacturer's control drawing, Article 504 of the National Electric Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.

| ⚠ | WARNING! AVERTISSEMENT! | **EXPLOSION HAZARD** – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous **RISQUE D'EXPLOSION** – NE PAS BRANCHER NI DÉBRANCHER SOUS TENSION. |
|---|---|---|

### Year of Construction

This information is contained within the serial number with the first four digits representing the year and month in the YYMM format.

# Safety Information

| ! | ⚡ |
|---|---|
| **CAUTION**: *Read complete instructions prior to installation and operation of the meter.* | **WARNING**: ***Risk of electric shock or personal injury.*** |

⚡

**Warning!**

- *Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.*
- *Service requiring replacement of internal components must be performed at the factory.*
- *Control room equipment must not use or generate more than 250 VRMS or VDC.*
- *Hazardous location installation instructions for associated apparatus (barrier) must be followed when installing this equipment.*
- *For safe installation of an ATEX approved transmitter in series with PD6607 loop-powered meters, the hazardous location installation instructions for the transmitter, PD6607 loop-powered meter, and associated apparatus (barrier) must be compatible.*
- *PD6607 Series Loop-Powered meters do not add capacitance or inductance to the loop under normal or fault conditions.*
- *Substitution of components may impair hazardous location safety.*
- *Equipment contains non-metallic materials and therefore special care and consideration should be made to the performance of these materials with respect to chemicals which may be present in a hazardous environment.*

# Installation

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

**PD6607 installation must be performed in accordance with Control Drawing LIM6600-2 in order to meet agency approval ratings.**

## 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 Instructions

- Prepare a standard 1/8 DIN panel cutout – 3.622" x 1.772" (92 mm x 45 mm). Refer to Figure 1 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.
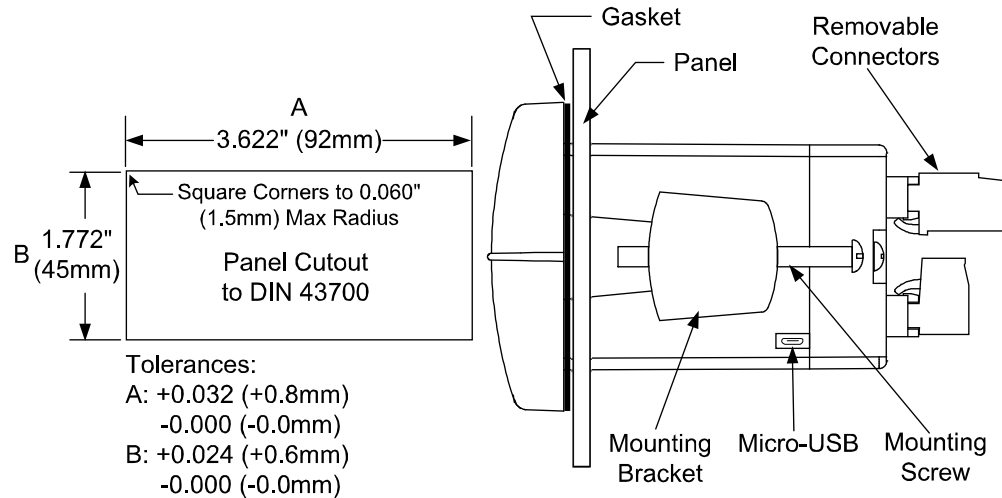


**Figure 1. 1/8 DIN Panel Cutout Dimensions and Panel Mounting Details**

## Mounting Dimensions
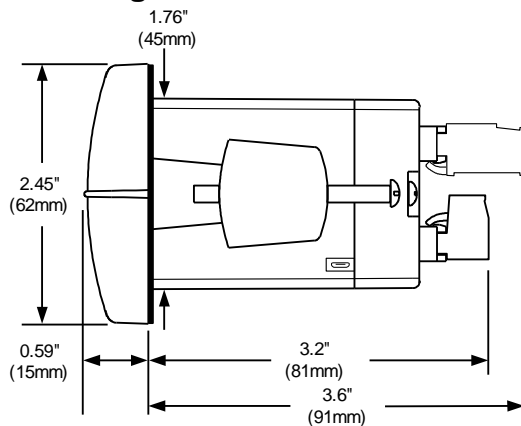


**Figure 2. Meter Dimensions - Side View**
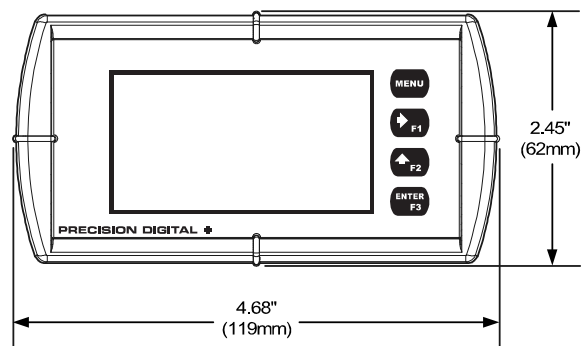


**Figure 3. Meter Dimensions - Front View**

## Connections

All connections are made to removable screw terminal connectors located at the rear of the meter.
*This section is only intended for PD6603 safe area installations.*

**PD6607 installation must be performed in accordance with Control Drawing LIM6600-2 in order to meet agency approval ratings.**

> ⚠️ *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 all connectors available with requested configuration.
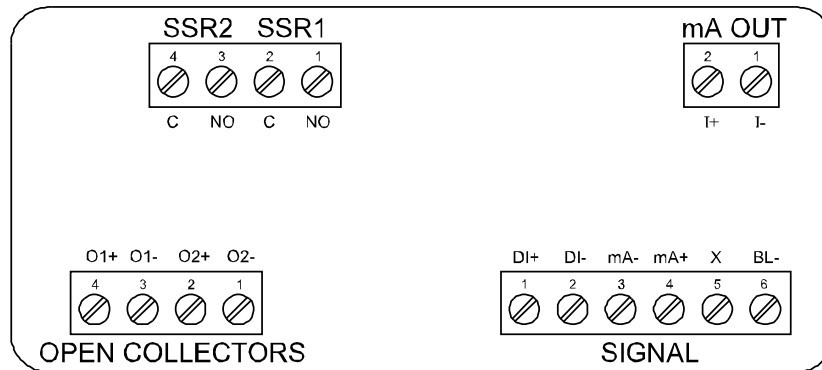


**Figure 4. Connector Labeling for Fully Loaded Meter**

### Safe Area Current Loop (4-20 mA) Connections

Signal connections are made to a six-terminal connector labeled SIGNAL on Figure 4. The following figures show a 4-20 mA current loop connected to the meter. The first figure shows the connection with the backlight disabled and the second shows the connection with the backlight enabled (the backlight can also be disabled in the system menu). The meter is powered by the 4-20 mA current loop.

There are no switches or jumpers to set up for the input. Setup and programming is performed through the front panel buttons or PC-based software.
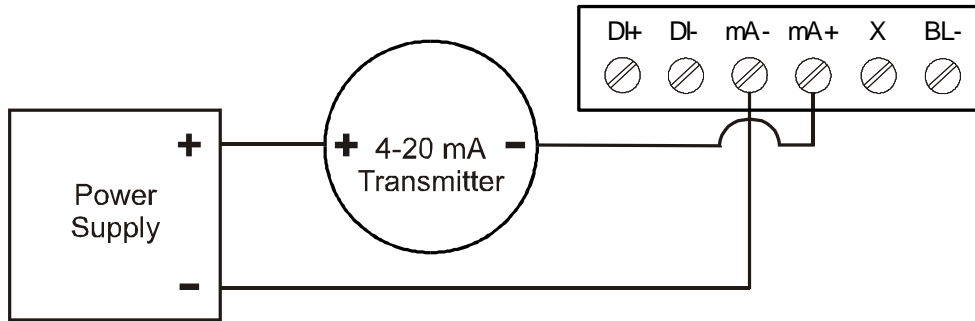
**Figure 5. 4-20 mA Input Connection without Backlight**
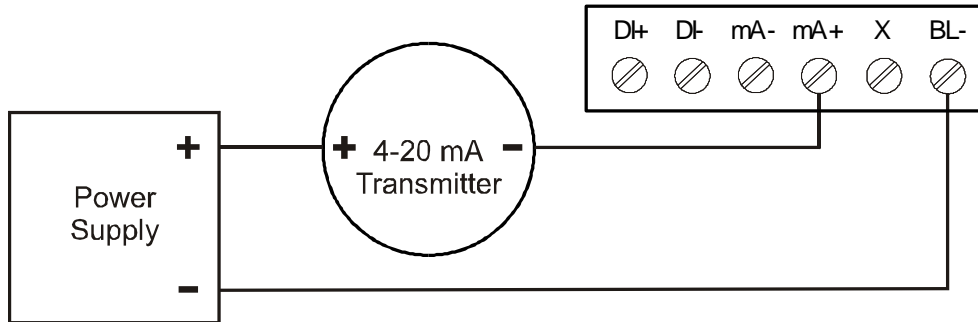
**Figure 6. 4-20 mA Input Connection with Backlight**

The current input is protected against current overload up to 1 amp. The display may or may not show a fault condition depending on the nature of the overload.

### Safe Area Digital Input Connection

A digital input is standard on the meter. This digital input is connected with a normally open contact across DI+ and DI-, or with an active low signal applied to DI+ and DI-.
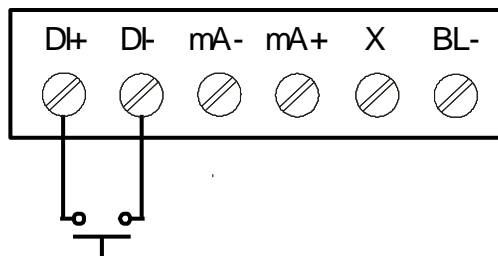
**Figure 7. Digital Input Connections**

### Safe Area 4-20 mA Output Connections

Connections for the 4-20 mA transmitter output are made to the connector terminals labeled mA OUT. The 4-20 mA output must be powered from an external power supply.
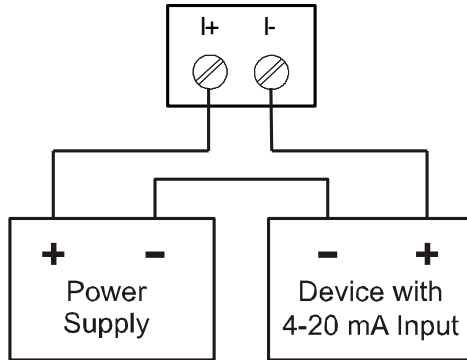
**Figure 8. 4-20 mA Output Connections**

### Safe Area Solid State Relay Connections

Relay connections are made to a four-terminal connector labeled SSR1 and SSR2 in Figure 4. Each relay's C terminal is common only to the normally open (NO) contact of the corresponding relay.
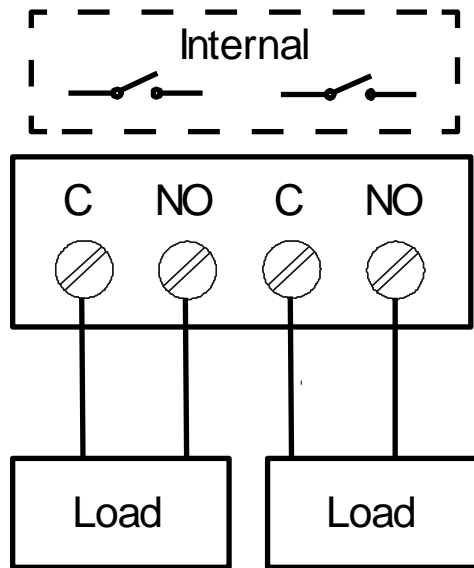
**Figure 9. Solid State Relay Connections**

### Safe Area Open Collector Outputs

Open collector output 1 and 2 connections are made to terminals labeled O1+ and O1-, and O2+ and O2-. Connect the alarm or pulse input device as shown below.
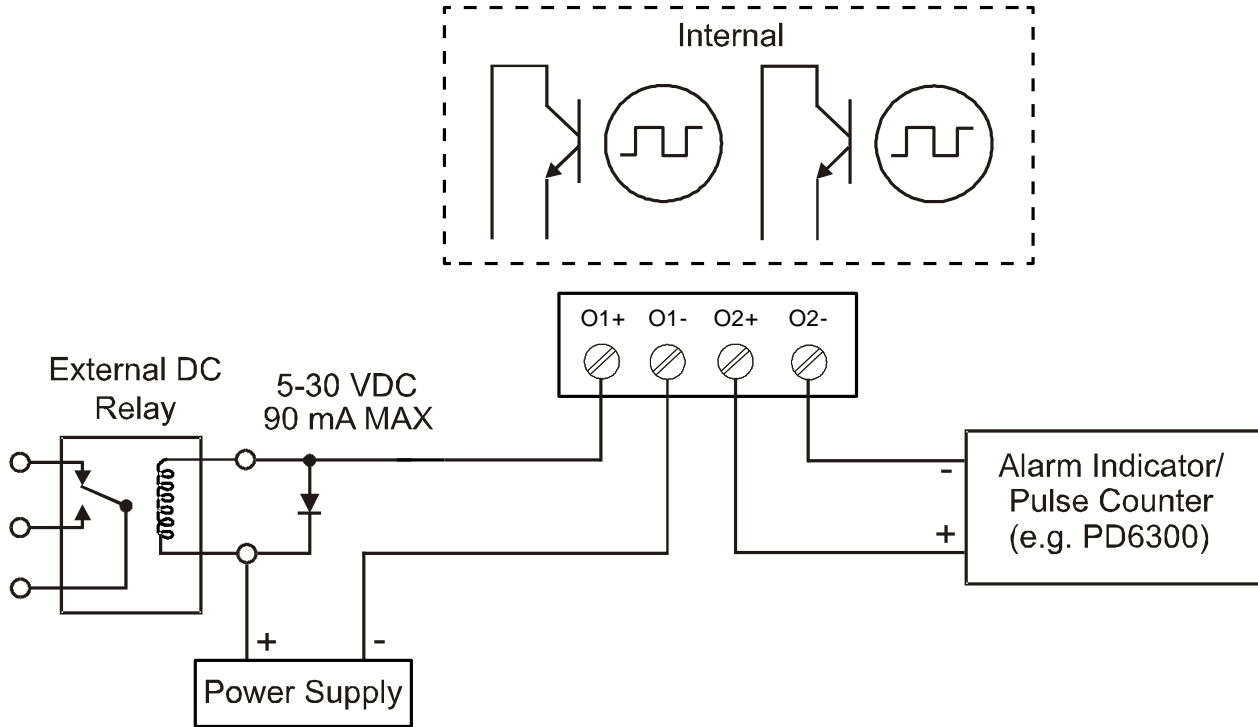


**Figure 10. Open Collector Output Connections**

# Setup and Programming

> The meter is factory calibrated prior to shipment to display 0 to 100, which corresponds to the 4-20 mA input. The calibration equipment is traceable to NIST standards.

## Overview

There are no jumpers to set; setup and programming is done through the front panel buttons or PC-based software.

The meter may be powered via the micro-USB connection located on the right side of the meter for the purposes of programming only. The backlight will not work while the meter is powered via the USB connection.

## Front Panel Buttons and Status LED Indicators



| Button Symbol | Description | | LED | Status |
|---|---|---|---|---|
| **MENU** | Menu | | **FT** | Feet Designation |
| **F1** | Right-Arrow/F1 | | **IN** | Inches Designation |
| **F2** | Up-Arrow/F2 | | | PV Bargraph |
| **ENTER F3** | Enter/F3 | | | |

- Press the *Menu* button to enter or exit the *Programming Mode* at any time.
- Press or hold the *Right Arrow* button to scroll forward through the menus, select digits during numeric programming, select characters during text programming, or decrement the value of a digit or character selected with the *Up-Arrow* button.
- Press and hold the *Right Arrow* button to zero or clear digits/characters while in data-entry mode.
- Press or hold the *Up-Arrow* button to scroll backwards through the menus or to increment the value of a digit or character.
- Press the *Enter* button to access a menu or to accept a setting or programmed digit/character value.

## MeterView XL Programming Software

The meter can also be programmed using PC-based MeterView XL software. This software greatly simplifies the programming process and also allows the user to save configuration files for later use.

The meter connects to the PC via a provided micro-USB cable and is powered by the USB connection so no additional power is needed during programming.



For detailed software instructions or to download MeterView XL software, visit **predig.com/meterviewxl**.

> ⚠ **CAUTION!** Care should be exercised to avoid ground loops when connecting the USB to an active loop (e.g. power supply, transmitter, loop-powered meter, etc.). It is recommended to connect the (mA+) terminal of the meter to the (-) terminal of a two-wire transmitter.

# Display Functions & Messages

The meter displays various functions and messages during setup, programming, and operation. The following table shows the main menu functions and messages in the order they appear in the menu.

| Parameter | Action/Setting Description | Parameter | Action/Setting Description |
|---|---|---|---|
| INPUT (PV 1 & PV2) | Program the meter 4-20 mA input (two menus, PV 1 and PV 2, are available if in dual scale mode; see PV 2 under advanced features menu) | STPWATCH | Program relay to turn on while the stopwatch is running |
| | | RELAY INFO | View relay run time and cycle count |
| UNITS | Set the scaling units. | 4-20 mA | Program the meter's 4-20 mA output |
| | **PV/PV1:** The meter can be scaled in any height units but will always be displayed in feet and inches. The value will automatically be converted to feet and inches. | PV | Program a range to transmit based on the display value |
| | | RETRANS | Retransmit the 4-20 mA input signal |
| | **PV2:** See page 22 for available PV2 units. | DISABLE | Disable the 4-20 mA output |
| INCH | Inches | CONTROL | Program manual or automatic operation for the outputs |
| FEET | Feet | OC 1 | Open collector 1 |
| FT-IN | Feet & Inches | OC2 | Open collector 2 |
| YARD | Yards | RELAY 1 | Relay 1 |
| CM | Centimeters | RELAY2 | Relay 2 |
| M | Meters | 4-20 mA | 4-20 mA output |
| INPUT 1 | Program input 1 value | AUTO | Set selected output to automatic operation |
| DISP 1 | Program display 1 value | | |
| INPUT 2 | Program input 2 value (up to 32 points) | MANUAL | Manually control selected output operation |
| DISP 2 | Program display 2 value (up to 32 points) | ADVANCED | Program the meter's advanced features |
| SAVE? | Press **Enter** to save programmed units, input, and display values. Press **Menu** to cancel. | ADV PV (PV 1 & PV 2) | Advanced 4-20 mA input programming (two menus, PV 1 and PV 2, are available if in dual scale mode; see PV 2 under advanced features menu) |
| OUTPUT | Program the meter's available outputs | | |
| OPEN COLLECTOR | Program the meter's available outputs | SOURCE | Select PV 2 source (dual-scale only; see PV 2 under advanced features menu) |
| OUTPUT 1 | Open collector 1 setup | | |
| OUTPUT2 | Open collector 2 setup | 4-20 mA | Source PV 2 from the 4-20 mA input |
| DISABLE | Disable the open collector | PV 1 | Source PV 2 from PV 1 |
| PULSE | Program the open collector for pulse output | FUNCTION | Select linear or round horizontal tank (PV2 only) |
| ALARM | Program the open collector for alarm output | LINEAR | Set meter for linear function and select number of linearization points |
| TIMER | Program the open collector as a timer | RH TANK | Round horizontal tank (dual-scale only; see PV 2 under advanced features menu) |
| STPWATCH | Program the open collector to turn on while the stopwatch is running | | |
| RELAY | Program the meter's relay outputs | SCALECAL | Scale or calibrate the 4-20 mA input |
| RELAY 1 | Relay 1 setup | SCALE PV (1 or 2) | Scale the input |
| RELAY 2 | Relay 2 setup | | |
| DISABLE | Disable the relay | CAL PV (1 or 2) | Calibrate the input |
| ALARM | Program relay for alarm functionality | | |
| PUMPCTRL | Program relay for pump control application | CUTOFF | Set low-flow cutoff |
| | | DISABLE | Disable low-flow cutoff |
| | | ENABLE | Enable low-flow cutoff |
| TIMER | Program relay as a timer | FILTER | Set noise filter value |

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| Parameter | Action/Setting Description | Parameter | Action/Setting Description |
|---|---|---|---|
| 1O SEC | 1 second | STR--STP | Start or stop the selected timer output |
| 2O SEC | 2 seconds | ALARMFN | Set the function key or digital input to acknowledge an alarm or access set points |
| 4O SEC | 4 seconds | | |
| 8O SEC | 8 seconds | | |
| 16O SEC | 16 seconds | ACK | Acknowledge all active alarms |
| OFF | Turn filter off | SETPOINT | Access all output set points |
| BYPASS | Set filter bypass (0.0 to 99.9% FS) | SETPOC 1 | Access open collector 1 set point |
| PASSWRD | Set a password for the meter | SETPOC2 | Access open collector 2 set point |
| USER | Assign function keys and digital input | SETPTR 1 | Access relay 1 set point |
| | | SETPTR2 | Access relay 2 set point |
| F 1 | Assign F1 function key | SWATCHFN | Set the function key or digital input to activate stopwatch |
| F2 | Assign F2 function key | | |
| F3 | Assign F3 function key | START | Start the stopwatch |
| DI | Assign digital input | STOP | Pause/Stop the stopwatch |
| | | STR--STP | Start or stop the stopwatch |
| DISP FN | Set the function key or digital input to display a value | TAREFN | Set the function key or digital input to tare the display |
| DISPLAY | Cycle max, min, and PV(s) | TARE | Tare the display value |
| DISP PV | Display the PV | RST TARE | Reset the display value |
| PCT PV | Display the PV's percentage of max (20 mA) | HOLD FN | Set the function key or digital input to hold an output |
| D UNITS | Display the PV's units | HOLDOUT | Hold all outputs |
| D TAG | Display the PV's tag | HLDUNHLD | Hold or un-hold all outputs |
| DISPMIN | Display the PV's minimum value | OC 1+2 | Hold/un-hold open collector outputs |
| DISPMAX | Display the PV's maximum value | | |
| MIN MAX | Display the PV's minimum and maximum value | RLY 1+2 | Hold/un-hold relay outputs |
| | | mAOUT | Hold/un-hold 4-20 mA output |
| D mA IN | Display the current mA input value | HOLD | Hold selected output |
| D mAOUT | Display the current mA output value | HLD UNHLD | Hold or un-hold selected output |
| MENU FN | Set the function key or digital input to access a menu | DISABLE | Disable the function key or digital input |
| RLYINFO | Go to relay information menu (INFO) | RST FN | Set the function key or digital input to reset a value |
| MANCTRL | Go to output control menu (CON--TROL) | RESET | Reset min, max, or max/min PV value |
| TIMR OC 1 | Open collector 1 timer | R MINMAX | Reset max and min PV value |
| TIMR OC2 | Open collector 2 timer | HINT | Display hint text on first key press and execute action on second key press |
| TIMER R 1 | Relay 1 timer | | |
| TIMER R2 | Relay 2 timer | | |
| TIMERFN | Set the function key or digital input to start or stop a timer | OFF | Turn the hint function off |
| | | ON | Turn the hint function on |
| STRTALL | Start all timers | SYSTEM | Program system settings |
| STOPALL | Stop all timers | AOUTCAL | Calibrate the analog output |
| SSTPALL | Start or stop all timers | DEFAULT | Reset meter to factory defaults |
| OC 1 | Start/stop open collector 1 timer | PV 2 | Enable the meter to scale a second PV based on the same 4-20 mA input |
| OC2 | Start/stop open collector 2 timer | | |
| RLY 1 | Start/stop relay 1 timer | DISABLE | Disable dual-scale feature (default) |
| RLY2 | Start/stop relay 2 timer | ENABLE | Enable dual-scale feature |
| START | Start the selected timer output | BACKLITE | Enable or disable the display backlight |
| STOP | Stop the selected timer output | | |
| | | ENABLE | Enable the backlight (default) |

| Parameter | Action/Setting Description | Parameter | Action/Setting Description |
|---|---|---|---|
| DISABLE | Disable the backlight | DISABLE | Disable comma |
| INFO | View meter software, version, and model, and change the meter identifier tag | BARGRAPH | Enable or display the use of the bargraph |
| SFT | The software ID number | ENABLE | Enable bargraph (default) |
| VER | The software version | DISABLE | Disable bargraph |
| MODEL | The meter hardware model number | BOTTOM | Set what to display on the bottom line |
| IDTAG | The meter identifier tag Press **Enter** to edit tag | TAG | Display the tag (default) |
| | | STPWATCH | Display the stopwatch |
| ICAL | Internal calibration used for scaling | TIMR OC1 | Display open collector 1 timer |
| DISPLAY | Program the meter's display | TIMR OC2 | Display open collector 2 timer |
| UNITS | Change the feet and inches display for PV (PV1) or PV2 units if enabled | TIMER R1 | Display relay 1 timer |
| | | TIMER R2 | Display relay 2 timer |
| | | OFF | Turn bottom line off |
| FT-IN/* | Display feet and inches with automatically reducing denominator up to sixteenths of an inch | PV PCT (1 or 2) | Display the process variable percentage of full scale |
| FT-IN/16 | Display feet and inches with sixteenths of an inch | mA IN | Display the current mA input value |
| FT-IN/8 | Display feet and inches with eighths of an inch | mA OUT | Display the current mA output value |
| FT-IN/4 | Display feet and inches with quarter inches | UNITS | Display the units |
| FT-IN/2 | Display feet and inches with half inches | PV (1 or 2) | Display the process variable |
| FT-IN | Display only feet and inches | PV+UNIT (1 or 2) | Display the process variable and unit alternating |
| DECPT | Change the decimal point location (dual-scale only; see PV 2 under advanced features menu) | PV+TAG (1 or 2) | Display the process variable and tag alternating |
| COMMA | Enable or disable the use of a comma (dual-scale only; see PV 2 under advanced features menu) | TAG+UNIT | Display the tag and unit alternating |
| | | PV+U+TAG (1 or 2) | Display the process variable, unit, and tag alternating |
| ENABLE | Enable comma (default) | PV1+PV2 | Display both process variables (dual-scale only; see PV 2 under advanced features menu) |

## Main Menu

The main menu consists of all the meter's programmable functions: *Input*, *Output, Advanced,* and *Display*.

- Press **Menu** button to enter *Programming Mode* then press the **Right Arrow** button to move forward through the menu and the **Up-Arrow** button to move back.
- Press **Menu** at any time to go back one level or press & hold to exit and return to *Run Mode*. Changes made to settings prior to pressing **Enter** are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/F3** to confirm the setting or pressing **Enter/F3** at the SAVE? screen when available.
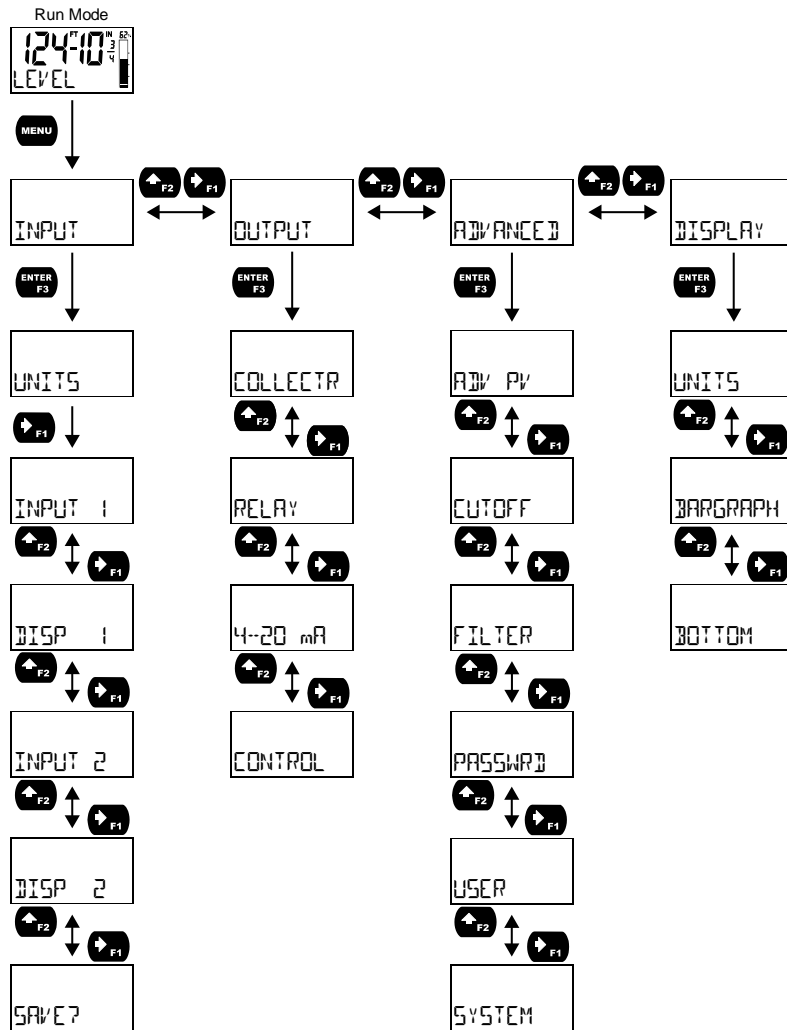


### Setting Numeric Values

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 selected digit will flash.

Press and hold **Up-Arrow** to auto-increment the display value. If you have made a mistake or would like to enter a new value, select the left-most digit and press and hold the **Right-Arrow** button until all digits reset to zero.

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

**Note:** the underscore in the graphic below is provided to show which digit would be flashing.
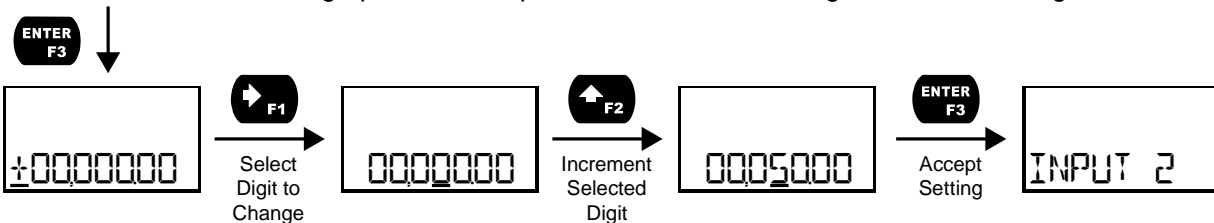
## Setting Up the Input Signal (INPUT)

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

- The meter is factory calibrated prior to shipment to display 0-100 feet, which corresponds to the 4-20 mA input. The calibration equipment is traceable to NIST standards.
- A calibrated signal source is not needed to scale the meter.
- The PD6603 is a single input meter with dual-scale capability.

Enter the *Input* menu to scale the meter to display the 4-20 mA input. The input is capable of accepting any signal from 4 to 20 mA.
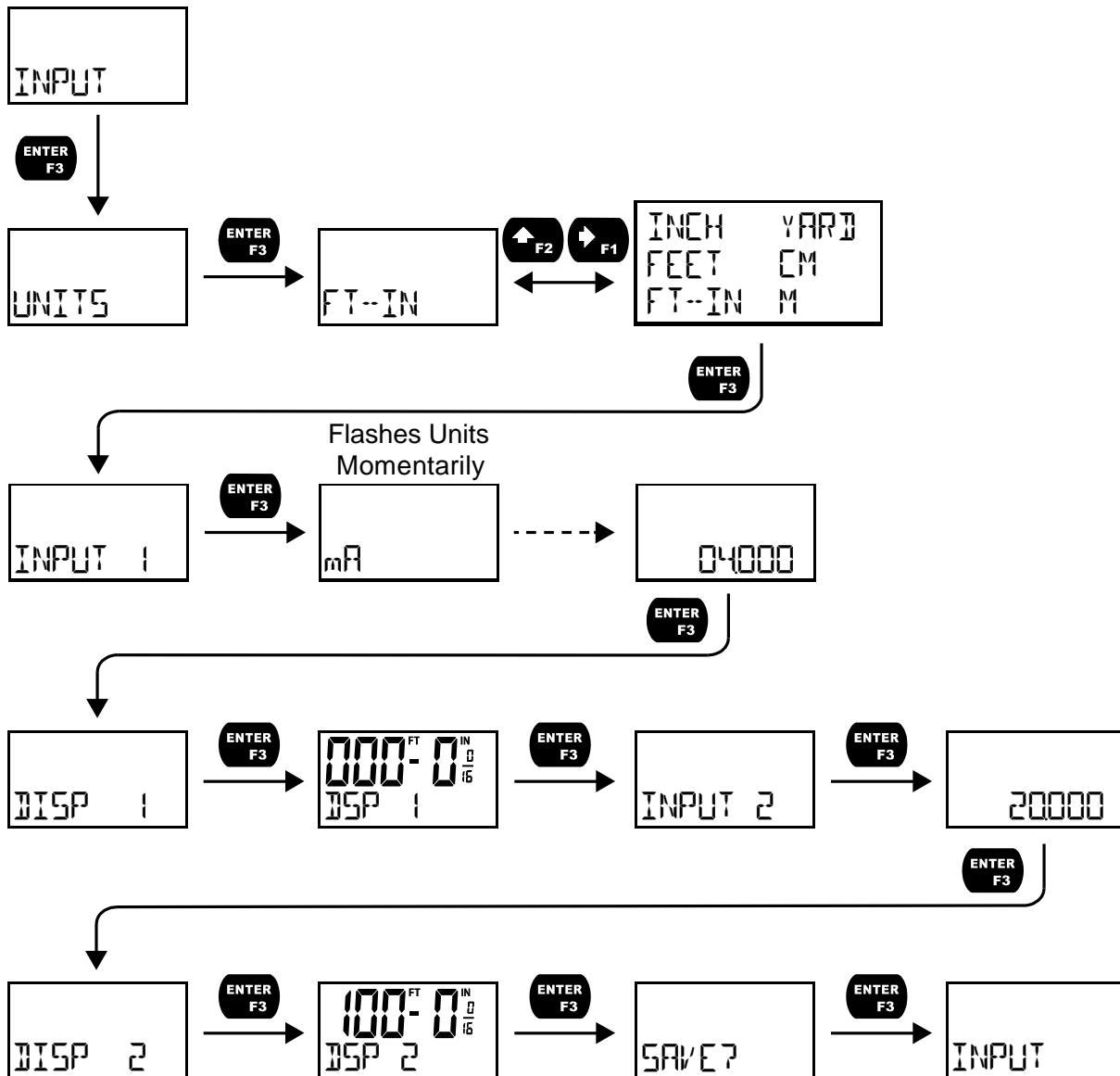
### Available Unit Classes and Units

The process variable (PV) can be scaled in a number of different height units. No matter the scaling units, the scaled value will be converted to feet & inches for display. The available scaling units for the PV (or PV 1 in dual-scale mode) are:

| INCH | Inches |
|------|--------|
| FEET | Feet |

| FT--IN | Feet & Inches |
|--------|---------------|
| YARD | Yards |

| CM | Centimeters |
|----|-------------|
| M | Meters |

The meter has six available preprogrammed unit classes when programming PV2: *volume*, *height*, *temperature*, *pressure*, *weight*, and *rate*. These units are only available when the meter is in dual-scale mode and PV 2 is being programmed. PV 1 can only be programmed with height units.

Each unit class has the following available units to choose from:

**Volume Units (VOLUME)**

| | |
|------|-------------|
| GAL | Gallons |
| L | Liters |
| IGAL | Imperial Gallons |
| M3 | Cubic Meters |
| BBL | Barrels |
| BUSH | Bushels |
| cuYD | Cubic Yards |
| cuFt | Cubic Feet |
| cuIn | Cubic Inches |
| L.BBL | Liquid barrels |
| BBBL | Beer barrels |
| HECLL | Hectoliter |
| AF | Acre-Foot |
| CUSTOM | Custom Unit |

**Height Units (HEIGHT)**

| | |
|------|-------------|
| INCH | Inches |
| FEET | Feet |
| FT--IN | Feet & Inches |
| YARD | Yards |
| CM | Centimeters |
| M | Meters |
| CUSTOM | Custom unit |

**Temperature Units (TEMP)**

| | |
|------|-------------------|
| °F | Degrees Fahrenheit |
| °C | Degrees Celsius |
| K | Kelvin |
| °RA | Degrees Rankine |

**Pressure Units (PRESSURE)**

| | |
|--------|-------------------------|
| PSI | Pounds per square inch |
| InHg | Inches of mercury |
| InH2O | Inches of water |
| mmHg | Millimeters of mercury |
| Kg/CM2 | Kilograms per square centimeter |
| Kg/M2 | Kilograms per square meter |
| mBAr- | Millibar |
| BAr- | Bar |
| PA | Pascal |
| hPA | Hectopascal |
| KPA | Kilopascal |
| MPA | Megapascal |
| CUSTOM | Custom unit |

**Weight Units (WEIGHT)**

| | |
|--------|----------------|
| gm | Grams |
| Kg | Kilograms |
| tonnE | Tonnes (metric) |
| oZ | Ounces |
| lb | Pounds |
| ton | Tons |
| CUSTOM | Custom unit |

**Rate Time Bases (TIME)**

| | |
|---------|------------------|
| /SECOND | Units per second |
| /MINUTE | Units per minute |
| /HOUR | Units per hour |
| /DAY | Units per day |

**Rate Units (RATE)**

| | |
|-------------|-----------------------------------|
| GAL/(T) | Gallons per time unit (T) |
| L/(T) | Liters per time unit (T) |
| IGAL/(T) | Imperial gallons per time unit (T) |
| M3/(T) | Cubic meters per time unit (T) |
| BBL/(T) | Barrels per time unit (T) |
| BUSH/(T) | Bushels per time unit (T) |
| cuYD/(T) | Cubic Yards per time unit (T) |
| cuFt/(T) | Cubic Feet per time unit (T) |
| cuIn/(T) | Cubic Inches per time unit (T) |
| L.BBL/(T) | Liquid barrels per time unit (T) |
| BBBL/(T) | Beer barrels per time unit (T) |
| HECLL/(T) | Hectoliter per time unit (T) |
| AF/(T) | Acre-Foot per time unit (T) |
| CUSTOM/ | Custom unit per time unit (T) |

### Setting Custom Units (CUSTOM)

When the desired unit class or unit of measure within a class for PV 2 is not available, a custom unit may be programmed. Select the CUSTOM menu (or the CUSTOM unit within a unit class) in order to enter a custom unit name.

Text values are set using the *Right* and *Up-Arrow* buttons. Press *Right-Arrow* to select next character and *Up-Arrow* to increment character value. The selected character will flash. Press and hold the *Up* or *Right-Arrow* buttons to auto-increment or decrement the character. Press *Enter* to accept the character.
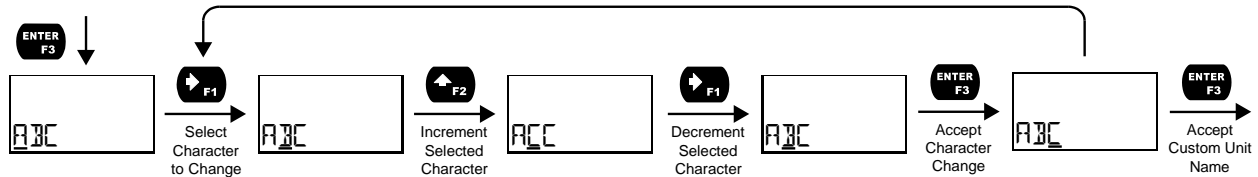


*Notes:*

- *Press and hold the **Right-Arrow** while no character is being edited to erase all characters to the right of the flashing character*
- *Press and hold **Up** or **Right-Arrow** to auto-increment or decrement a selected character.*

## Scaling the 4-20 mA Input

The 4-20 mA input can be scaled to the appropriate values for a given application. The 4-mA input (input 1) should have a corresponding display value (display 1) which represents the low end of the process value range being measured by the transmitter. Likewise, the 20-mA input (input 2) should have a display value (display 2) which represents the high end of the process value range.

**For example:** If the meter is used to display the level of a 100 ft tall tank, the transmitter should send a 4 mA signal when the tank is empty and a 20-mA signal when the tank is full. The meter should be programmed to interpret these inputs on a display range of 0-100, so that at 4-mA the meter will display 0 and at 20-mA the meter will display 100.

Processes which require a non-linear scale can be accommodated using multi-point linearization (LINEAR) and round horizontal tank (RH TANK) functions available in the Advanced menu. See Signal Input Conditioning Functions (FUNCTION) on page 39.

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

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## Setting the Display Features (DISPLAY)

The meter's display functions may be programmed using the *Display* menu. This menu consists of the following submenus: *Units*, *Decimal Point*, *Comma*, *Bargraph*, *Top*, and *Bottom*.
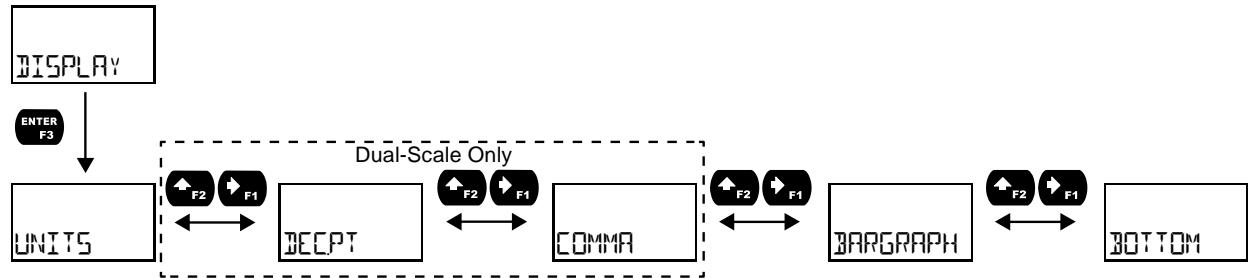


### Changing the Units (UNITS)

The UNITS menu is used to change how fractional inches are represented. The options are automatically reducing, sixteenths of an inch, eighths of an inch, quarter inches, half inches, or no fractional inches. The default setting (FT-IN/*) automatically reduces the fraction to the lowest denominator.

When in dual-scale mode, it is possible to change the PV 2 display units within the selected unit class without the need to re-scale the meter. When selecting a new unit from within the DISPLAY menu (e.g. changing from gallons (GAL) to liters (L)), the meter will automatically convert the display values to display the new unit. Enter the UNITS menu, select a new unit of measure from the list of predefined units, and press the **Enter** button. If entering a custom unit (CUSTOM), a custom conversion factor will need to be entered.

### Changing the Decimal Place Location (DECPT)

The decimal point for the bottom display may be set with up to seven decimal places or with no decimal point at all. Pressing the **Right Arrow** button moves the decimal point one place to the right until no decimal point is displayed, and then it moves to the leftmost position. Pressing the **Up-Arrow** button moves the decimal point one place to the left.
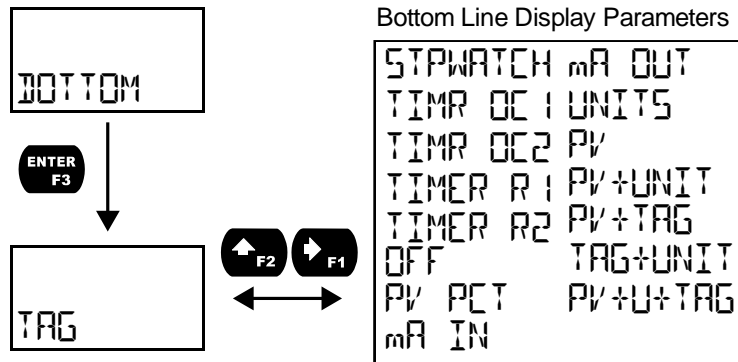**Note:** *This menu is only available if the meter is in dual-scale mode.*
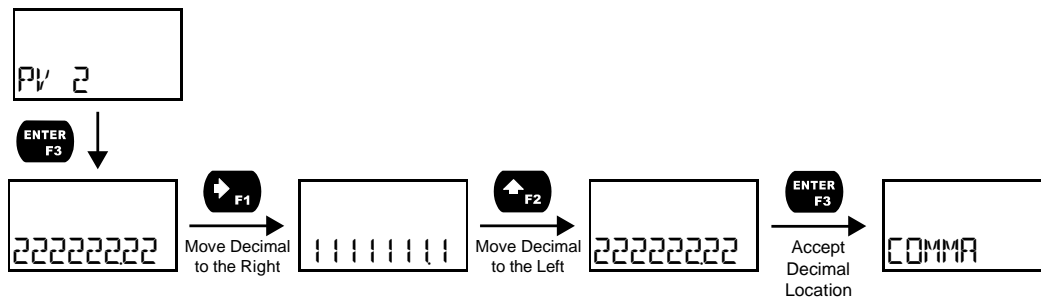


### Enabling or Disabling the Comma on the Bottom Display (COMMA)

The bottom display is set to show a comma separating the thousands and millions place by default if a numeric value is being displayed. This feature can be disabled or enabled using the *Comma* menu.
**Note:** *This menu is only available if the meter is in dual-scale mode.*

### Changing What is Displayed (BOTTOM)

The bottom display line (BOTTOM) can be programmed to display different values. Use the BOTTOM menu to make these changes. If PV2 is enabled, additional options will be available for displaying the second PV on the bottom display.

Bottom Line Display Parameters

| STPWATCH | mA OUT |
| TIMR OC1 | UNITS |
| TIMR OC2 | PV |
| TIMER R1 | PV+UNIT |
| TIMER R2 | PV+TAG |
| OFF | TAG+UNIT |
| PV PCT | PV+U+TAG |
| mA IN | |

The bottom line (BOTTOM) can be programmed to display:
- Tag (default)
- Stopwatch
- Open Collector 1 or 2 Timer
- Relay 1 or 2 Timer
- Off (Blank)
- PV's Percentage of Full Scale
- The mA Input
- The mA Output
- Units
- Process Value (PV)
- Process Value 2 (dual-scale only; see PV 2 under advanced features menu)
- Alternating PV and Units
- Alternating PV and Tag
- Alternating Tag and Units
- Alternating PV, Units, and Tag

### Programming the Bargraph

The meter comes equipped with a bargraph display for applications where a visual representation of the process variable's percentage of full scale is desirable. This feature can be enabled or disabled using the *Bargraph* menu (BARGRAPH). The value displayed on the bargraph can be the percentage of the full scale (PV PCT) or the percentage of a user-programmable range (PV). If the meter is in dual-scale mode, the bargraph can be assigned to display either PV1 or PV2 using this menu.
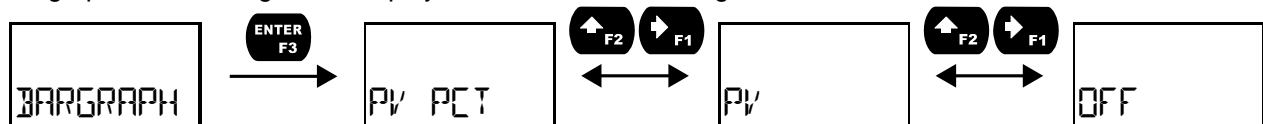
## Programming the Outputs (OUTPUT)

Depending on the purchased model, the meter may be available with two open collector outputs, two solid state relays, and one 4-20 mA output. The *Output* menu will only show options for the available outputs. See Ordering Information on page 4 for details.
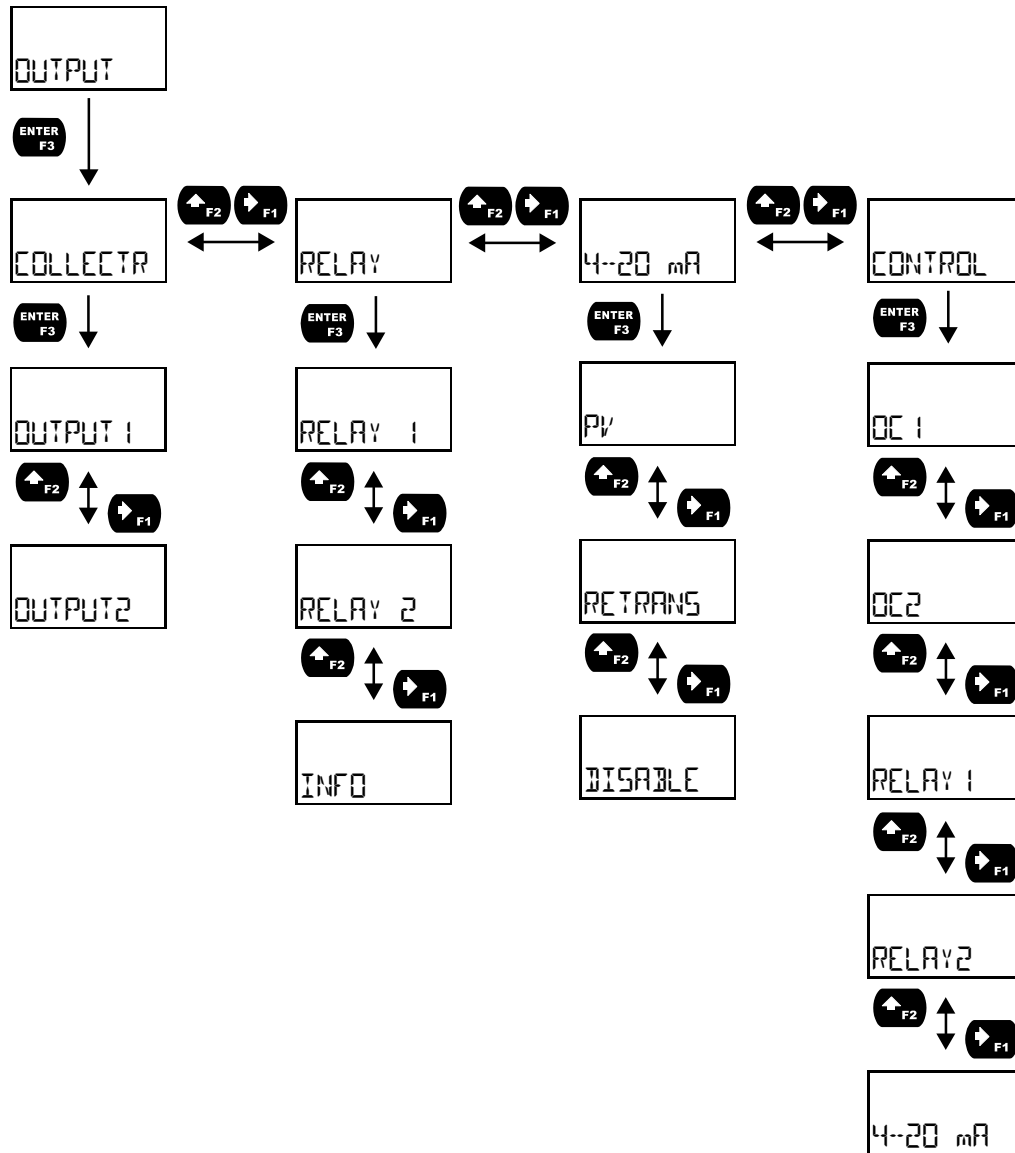
### Open Collector Outputs (OPEN COLLECTR)

The meter is equipped with two NPN open collector outputs that may be set up for pulse outputs, alarms, timed pulses, or disabled.

Pulse outputs can be set to transmit the PV value (PV1 or PV2 if meter is in dual-scale mode). Output 2 may be used to generate a quadrature output based on the other open collector output. An output test mode is also selectable to generate pulses at a constant programmable frequency.

Alarms are available based on the PV value or the digital input. The alarm status will show on the display even if the output is not wired.

A timer output (TIMER) turns the open collector on and off at the specified time intervals. The timer can be set as single-shot or continuous timer.

The stopwatch output (STPWATCH) allows the open collector to be manually activated by starting the stopwatch. The stopwatch count can be displayed on the bottom line.

The output may be disabled by selecting DISABLE.



*Available for output 2 only.
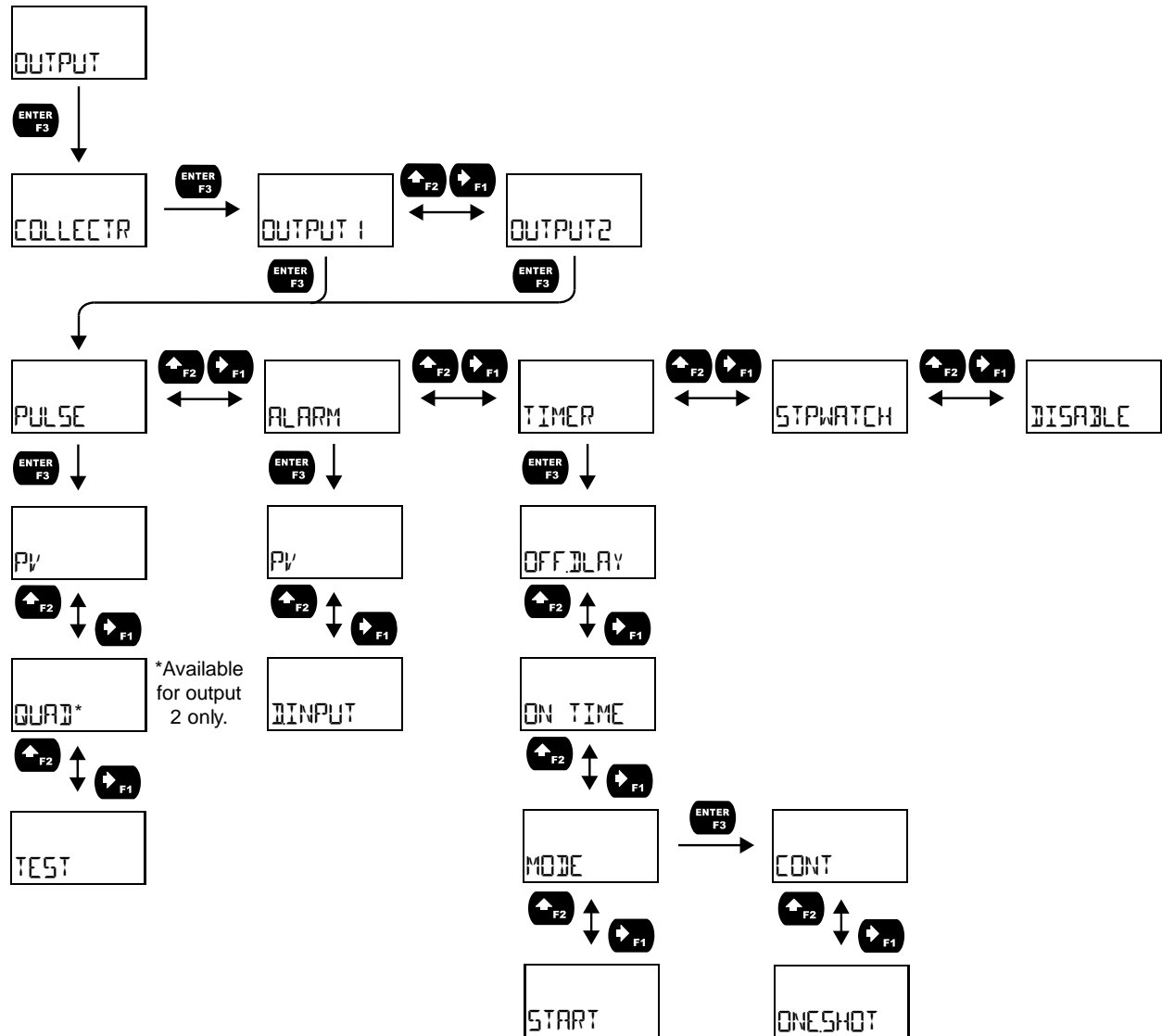
### Pulse (PULSE)

Pulse outputs may be assigned to output the PV at a programmable factor. The factor determines the number of pulses per second which should be generated per unit of measure. For example, if the meter display shows 100 gallons and the factor is set to 2, the number of pulses generated per second would be 200. The maximum frequency is 1,000 Hz.

Setting output 2 to quadrature will duplicate the other open collector output, but lag by 90 degrees out of phase. The other output should be programmed as desired for the quadrature output function and must be a pulse (PULSE) output selection. The quadrature maximum frequency for both outputs is 500 Hz.

The TEST option will output a fixed number of pulses per second based on the FREQ value entered.

### Alarm (ALARM)

Alarm outputs may be assigned to the PV or the digital input. When assigned to the PV, the alarm may be set as either a high alarm or a low alarm. Alarm actions (AUTO, AUTOMAN, LATCH, L-CLEAR) determine how and when the alarm should be reset. They operate as follows:
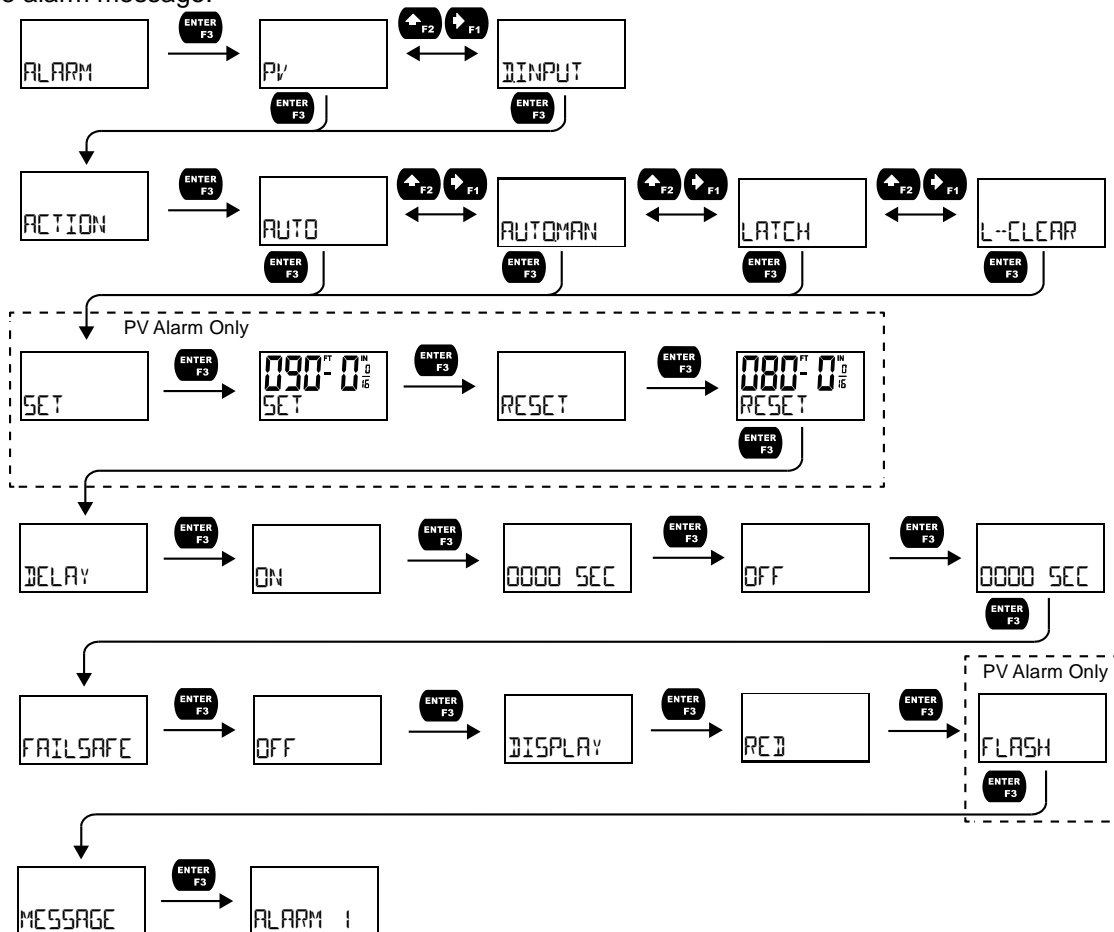
- **Automatic (AUTO):** Alarm will reset automatically once the alarm condition has cleared.
- **Automatic/Manual (AUTOMAN):** Alarm will reset automatically once the alarm condition has cleared but can also be reset using the *Enter* (ACK) button (or whichever function key is set to acknowledge) at any time.
- **Latching (LATCH):** Alarm must be reset manually and can be done so at any time. Press the *Enter* (ACK) button at any time to clear the alarm.
- **Latching with Reset after Clear (L-CLEAR):** Alarm must be reset manually and can only be done so after the alarm condition has cleared. Press the *Enter* (ACK) button after the alarm condition has cleared to reset the alarm.

If the alarm is set to PV, a set and reset point must be programmed. The set point is the display value at which the alarm will turn on and the reset point is the display value at which the alarm will turn off. If the set point is lower than the reset point, the alarm will be a low alarm; if the set point is higher than the reset point, the alarm will be a high alarm. The digital input alarm will trigger whenever the digital input is triggered.

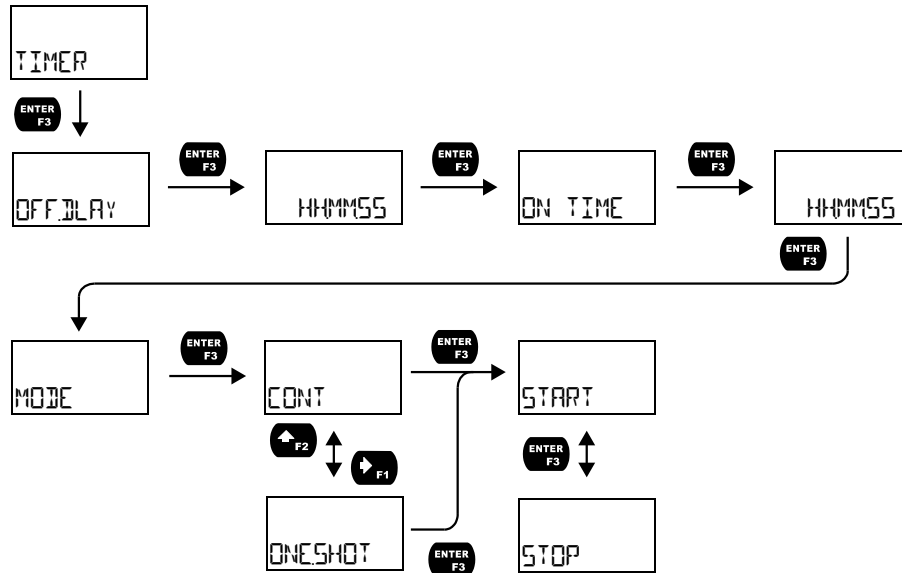For both the PV and digital input alarms, a delay before the alarm is turned on or off may be set, as well as a failsafe feature which will inverse the on/off programming.

Alarm states will be displayed on the meter even if no open collector output is physically connected. Optional alarm indication includes a red LED backlight, flashing PV value (PV alarm only), and a programmable alarm message.



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### Timer (TIMER)

The timer output may be set to generate the timed pulse only once (ONE5HOT) or continuously (CONT).

The timer output produces a constant width pulse at a constant frequency, if set as continuous timer. Program the *Off Delay* (OFF.DLAY) from 1 second to 99 hours 59 minutes and 59 seconds. This is the time it takes from selecting START to turning on the output and for how long the output is off in continuous mode. Program the *On Time* (ON TIME) for the active low pulse from 1 second to 99 hours 59 minutes and 59 seconds (pulse width). This is the period of time for which the output will remain on.

Select *Start* (START) to begin outputting the constant timed pulse.

Select *Stop* (STOP) to end outputting the constant timed pulse.

Function keys or the digital input may be assigned to start and stop timer functions (see the USER menu in *Advanced*).



### Stopwatch (STPWATCH)

The stopwatch function may be used to manually run and control a process for a specific time interval up to 99 hrs., 59 min, and 59 seconds. The stopwatch function may be assigned to any open collector. There are three settings needed to use the function effectively.

1. Assign stopwatch to either top or bottom display line
2. Assign the open collector or relay to control the process (on/off)
3. Assign a function key or digital input to start/stop the stopwatch

#### Application Example

In order to maintain consistency of a product, it is necessary to take and test samples at different times throughout the day. The stopwatch function is used to open and close a solenoid valve to know the exact amount of time needed to complete the desired sample. Once this is determined, the timer function can be used to automatically take a sample (batch) based on the time determined using the stopwatch function.

**Setup:** Assign the following to *Stopwatch Function*

- Bottom display line
- Relay 1
- F3: Start/Stop

**Procedure**

- Press F3 to start the stopwatch; relay 1 turns on and the process starts running.
- Press F3 to stop the stopwatch; relay 1 turns off and the process stops.
- The bottom display indicates the time it took to complete the sample.

### Solid State Relay Outputs (RELAY)

The meter is optionally equipped with two solid state relays that may be set up for alarms, timer, or pump control. Alternatively, they may be disabled.

Alarms are available based on the PV value or the digital input. The alarm status will show on the display even if the output is not wired.

Pump control allows the relay to turn on and off a pump at specified on and off points. This can be done using only one of the relays to control one pump (ON--OFF) or using both relays in tandem to alternate between two different pumps (ALTERN).

A timer output (TIMER) turns the relay on and off at the specified time intervals. The timer can be set as single-shot or continuous timer.

The stopwatch output (STPWATCH) allows the relay to be manually activated by starting the stopwatch. The stopwatch count can be displayed on the top or bottom line.

The output may be disabled by selecting DISABLE.

| ⚠ Caution! | *During setup, the relays do not follow the input and they will remain in the state found prior to entering the Relay menu.* |
|---|---|



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### Alarm (ALARM)

Alarm outputs may be assigned to the PV or the digital input. When assigned to the PV, the alarm may be set as either a high alarm or a low alarm. Alarm actions (AUTO, AUTOMAN, LATCH, L-CLEAR) determine how and when the alarm should be reset. They operate as follows:

* **Automatic (AUTO):** Alarm will reset automatically once the alarm condition has cleared.
* **Automatic/Manual (AUTOMAN):** Alarm will reset automatically once the alarm condition has cleared but can also be reset using the *Enter* (ACK) button (or whichever function key is set to acknowledge) at any time.
* **Latching (LATCH):** Alarm must be reset manually and can be done so at any time. Press the *Enter* (ACK) button at any time to clear the alarm.
* **Latching with Reset after Clear (L-CLEAR):** Alarm must be reset manually and can only be done so after the alarm condition has cleared. Press the *Enter* (ACK) button after the alarm condition has cleared to reset the alarm.

If the alarm is set to PV, a set and reset point must be programmed. The set point is the display value at which the alarm will turn on and the reset point is the display value at which the alarm will turn off. If the set point is lower than the reset point, the alarm will be a low alarm; if the set point is higher than the reset point, the alarm will be a high alarm. The digital input alarm will trigger whenever the digital input is triggered.

For both the PV and digital input alarms, a delay before the alarm is turned on or off may be set, as well as a failsafe feature which will inverse the on/off programming.

Alarm states will be displayed on the meter even if no relay output is physically connected. Optional alarm indication includes a red LED backlight, flashing PV value (PV alarm only), and a programmable alarm message.
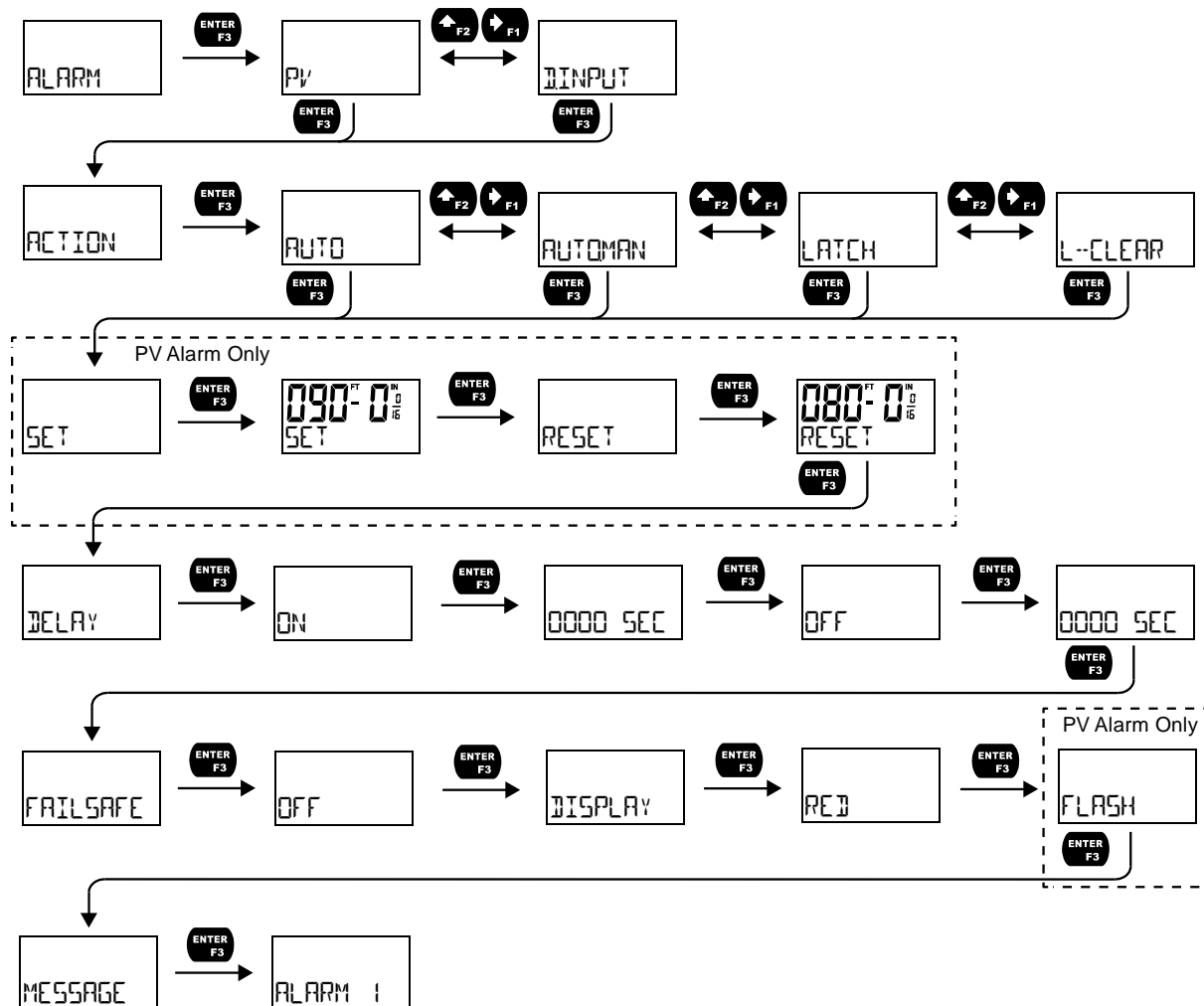
### Pump Control (PUMPCTRL)

The pump control output is used in situations where the relays are used to control pumps. There are two options available for controlling pumps: on-off (ON--OFF) and pump alternation (ALTERN).

ON--OFF will turn the relay on at a programmed *on* point and off at a programmed *off* point. Setting the *on* point higher than the *off* point will make the output activate on a high PV value; setting the *on* point lower than the *off* point will make the output active on a low PV value. The relay will reset automatically.

For pump control applications where two similar pumps are used to control the level of a tank or a well, it is desirable to have the pumps operate alternately. This prevents excessive wear and overheating of one pump over the lack of use of the other pump. Pump alternation uses both relays in tandem to alternate between two similar pumps. The ALTERN menu is only available under Output 1 and will automatically set Output 2 to pump alternation as well. Use the pump *Alternation Time* setting (ALTTIME) to control the alternation based on runtime in addition to level cycles.

### On/Off Pump Control (ON--OFF)

When programming a single pump to turn on and off, the *on* and *off* points must be programmed. The relay will activate at the *on* point and deactivate at the *off* point. On and off delays may optionally be programmed in order to delay the activation or deactivation of the relay by a certain number of seconds after reaching either the *on* point or *off* point.
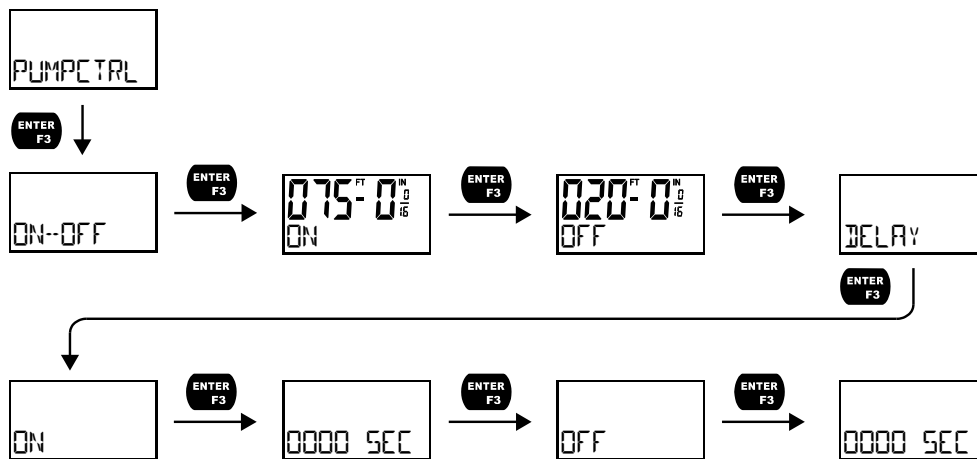
### Pump Alternation (ALTERN)

Pump alternation sets the two relays to alternate every time the first *on* point (ON 1) is reached. The active relay will turn off once the first *off* point (OFF 1) is reached. If the PV reaches the second *on* point (ON 2), the other relay will also turn on. The second relay will turn off once the second *off* point (OFF 2) is reached and the first relay will remain active until the first *off* point (OFF 1) is reached.

On and off delays may optionally be programmed for each *on* and *off* point in order to delay the activation or deactivation of the relays by a certain number of seconds after reaching either the *on* point or *off* point.

For pumps that typically remain on extensively, the alternation time (ALT.TIME) parameter sets a period of relay on-time after which the relays should alternate. For example, if the alternation time is set to 1 hour, the active relay will deactivate after 1 hour of runtime and the inactive relay will activate.
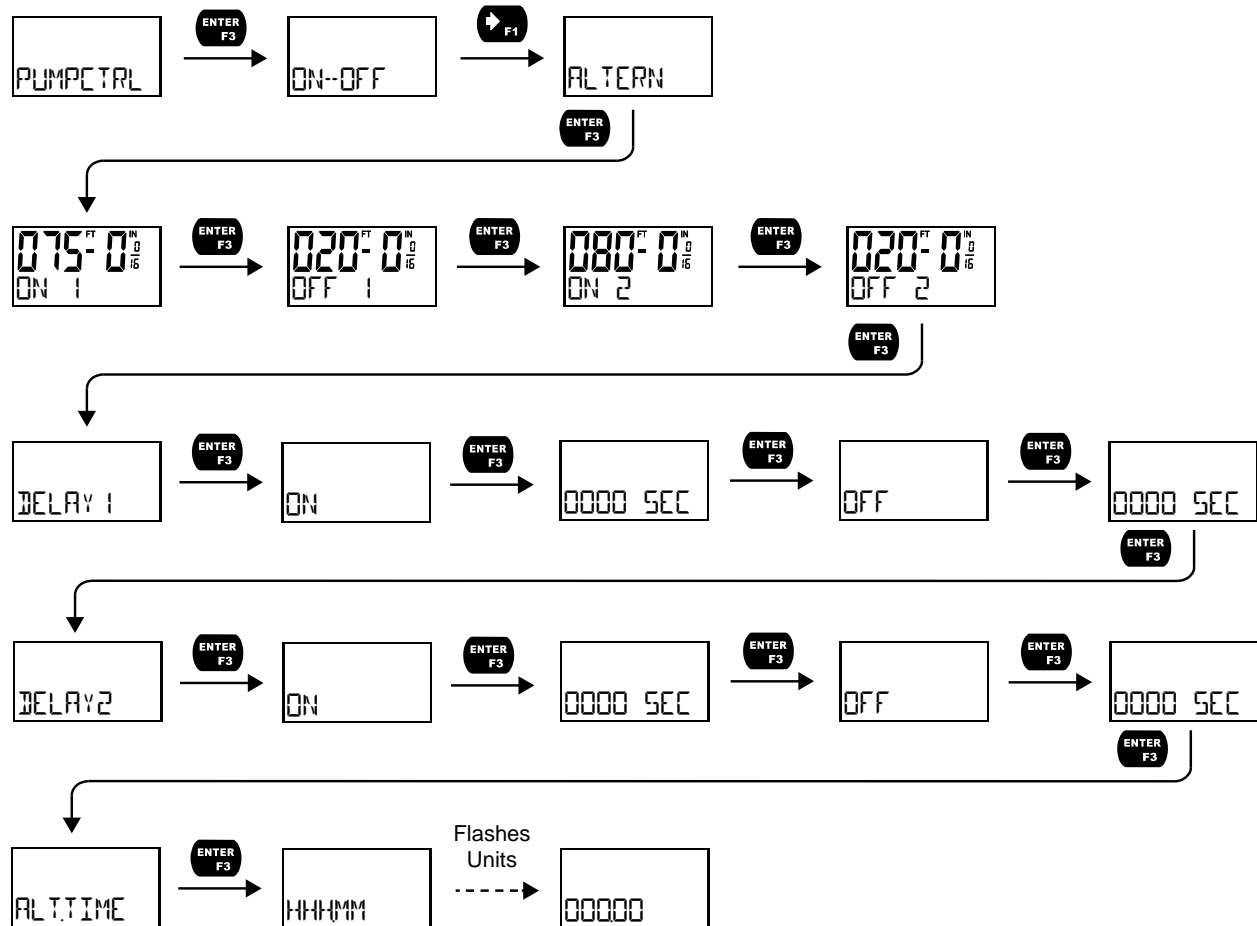
### Pump Alternation Example

The following is an example application where the relays are programmed for pump alternation.

| Set and Reset Point Programming | | | |
|---|---|---|---|
| Relay | On Point | Off Point | Function |
| 1 | 40 feet | 10 feet | Controls backup pump |
| 2 | 30 feet | 10 feet | Controls main pump |

The following graphics provide a visual representation of a typical pump alternation application:

1. Relay #2 turns the main pump on at 30 ft. and turns it off at 10 ft.
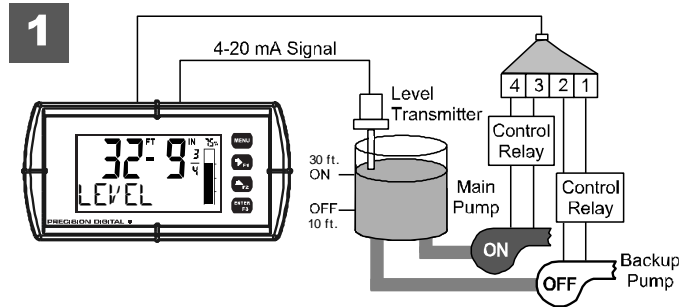
2. With the Pump Alternation feature activated, the next time the level reaches 30 ft., relay #1 transfers and starts the backup pump.
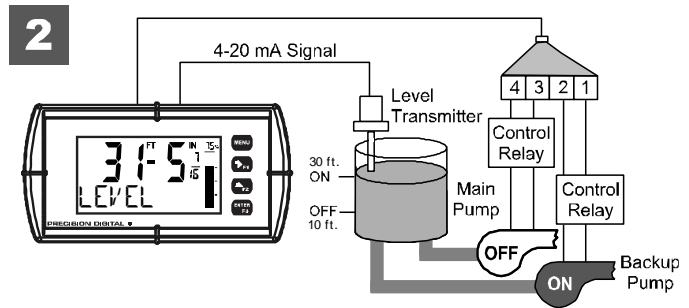
3. If the backup pump is not able to keep up, and the level reaches 40 ft., relay #2 transfers and starts the main pump as well.

4. Once the level has dropped below the reset points, both relays will turn off.

### Timer (TIMER)

The timer output may be set to generate the timed pulse only once (ONESHOT) or continuously (CONT). The timer output produces a constant width pulse at a constant frequency, if set as continuous timer. Program the *Off Delay* (OFF.DLAY) from 1 second to 99 hours 59 minutes and 59 seconds. This is the time it takes from selecting START to turning on the output and for how long the output is off in continuous mode. Program the *On Time* (ON TIME) for the active low pu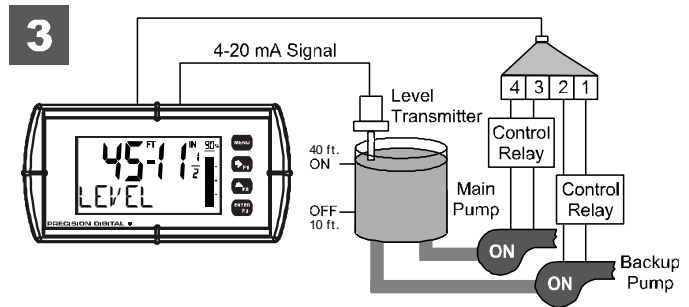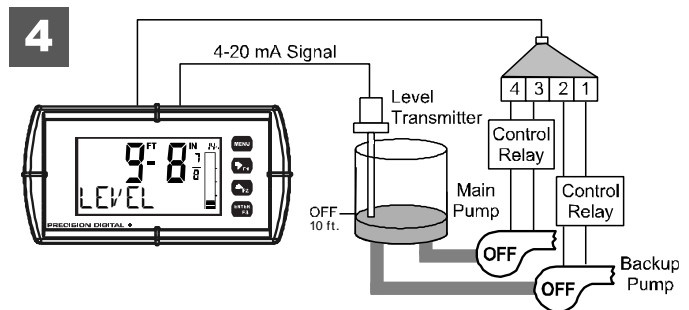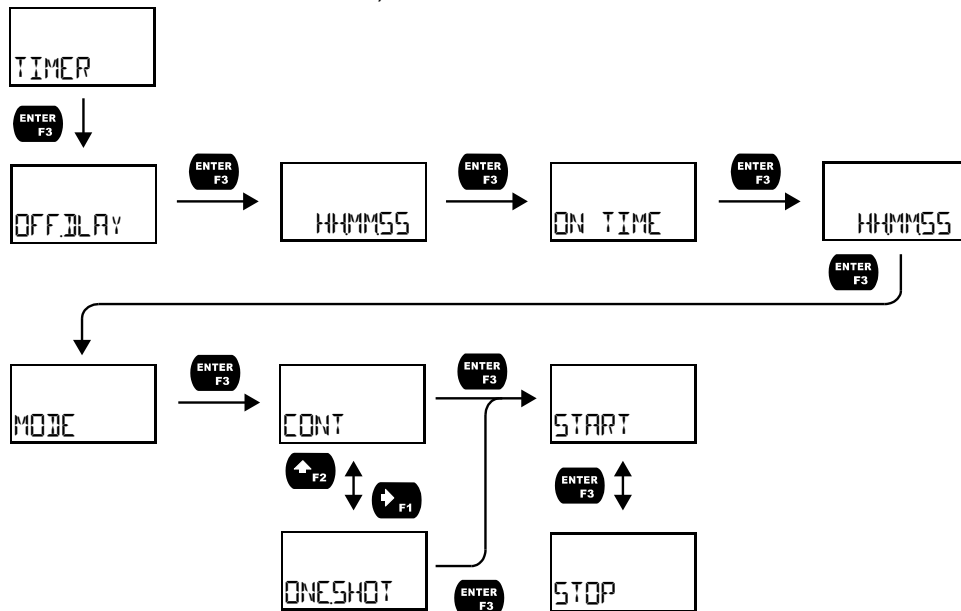lse from 1 second to 99 hours 59 minutes and 59 seconds (pulse width). This is the period of time for which the output will remain on.

Select *Start* (START) to begin outputting the constant timed pulse. Select *Stop* (STOP) to end outputting the constant timed pulse. Function keys or the digital input may be assigned to start and stop timer functions (see the USER menu in *Advanced*).



### Stopwatch (STPWATCH)

The stopwatch function may be used to manually run and control a process for a specific time interval up to 99 hrs., 59 min, and 59 seconds. The stopwatch function may be assigned to any relay. There are three settings needed to use the function effectively.

1. Assign stopwatch to either top or bottom display line
2. Assign the open collector or relay to control the process (on/off)
3. Assign a function key or digital input to start/stop the stopwatch

#### Application Example

In order to maintain consistency of a product, it is necessary to take and test samples at different times throughout the day. The stopwatch function is used to open and close a solenoid valve to know the exact amount of time needed to complete the desired sample. Once this is determined, the timer function can be used to automatically take a sample (batch) based on the time determined using the stopwatch function.

**Setup:** Assign the following to *Stopwatch Function*
- Bottom display line
- Relay 1
- F3: Start/Stop

**Procedure**
- Press F3 to start the stopwatch; relay 1 turns on and the process starts running.
- Press F3 to stop the stopwatch; relay 1 turns off and the process stops.
- The bottom display indicates the time it took to complete the sample.

### Relay Information (INFO)

The relay information menu shows run times and cycle counts for each relay. These values may be cleared at any time by selecting the *Clear* option (CLEAR?).



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### 4-20 mA Output (4-20 mA)

The *4-20 mA* menu is used to scale the 4-20 mA output based on display values. This menu is not present on models without a 4-20 mA output option.

The 4-20 mA analog output (if equipped) can be scaled to provide a 4-20 mA signal for the PV display range or to simply retransmit the 4-20 mA input. The output may be disabled (DISABLE), and will only output the minimum signal.

Overrange and underrange values determine what mA signal the meter will output if the mA input is underrange (<3.5 mA) or overrange (>20.5 mA). This value may be set to 1-mA, 3.5-mA, 3.8-mA, 20.5-mA, 20.8-mA, 23-mA, or disabled.

No equipment is needed to scale the analog output; simply program two display values and corresponding mA output signals.
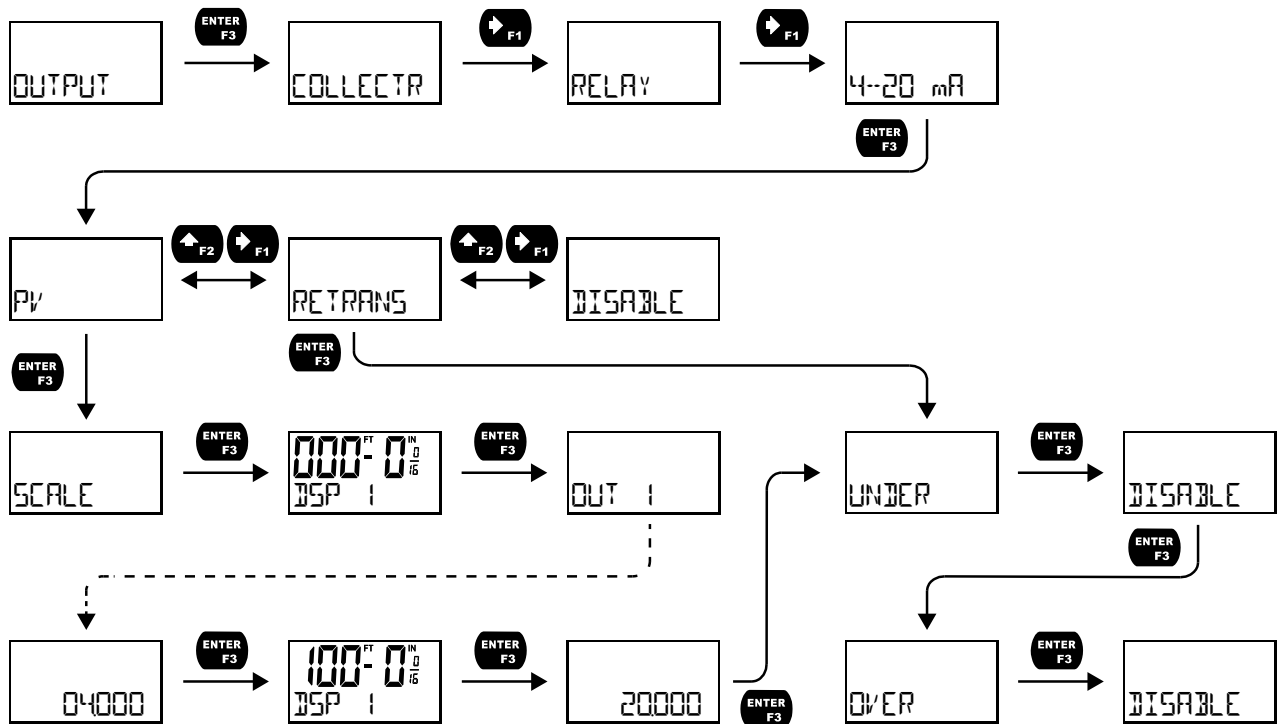


### Process Variable (PV)

To scale the analog output, enter display value 1 and a corresponding analog output value for this display, and enter display value 2 and a corresponding analog output value for this display value. This will provide a linearly scaled analog output.

### Retransmit (RETRANS)

This option will retransmit the 4-20 mA analog input without the need to scale the output.

### Output Control (CONTROL)

The *Control* menu is used to control the open collector outputs, 4-20 mA analog output, or the relays manually, ignoring the input. Each open collector, relay, and analog output can be programmed independently for manual control. Selecting automatic control sets all relays and analog output for automatic operation.

## Advanced Features Menu (ADVANCED)

To simplify the setup process, functions not needed for most applications are located in the *Advanced Features* menu. The options under advanced features include: *advanced PV setup*, *cutoff*, *filter*, *password*, *function key programming*, and *system settings*.
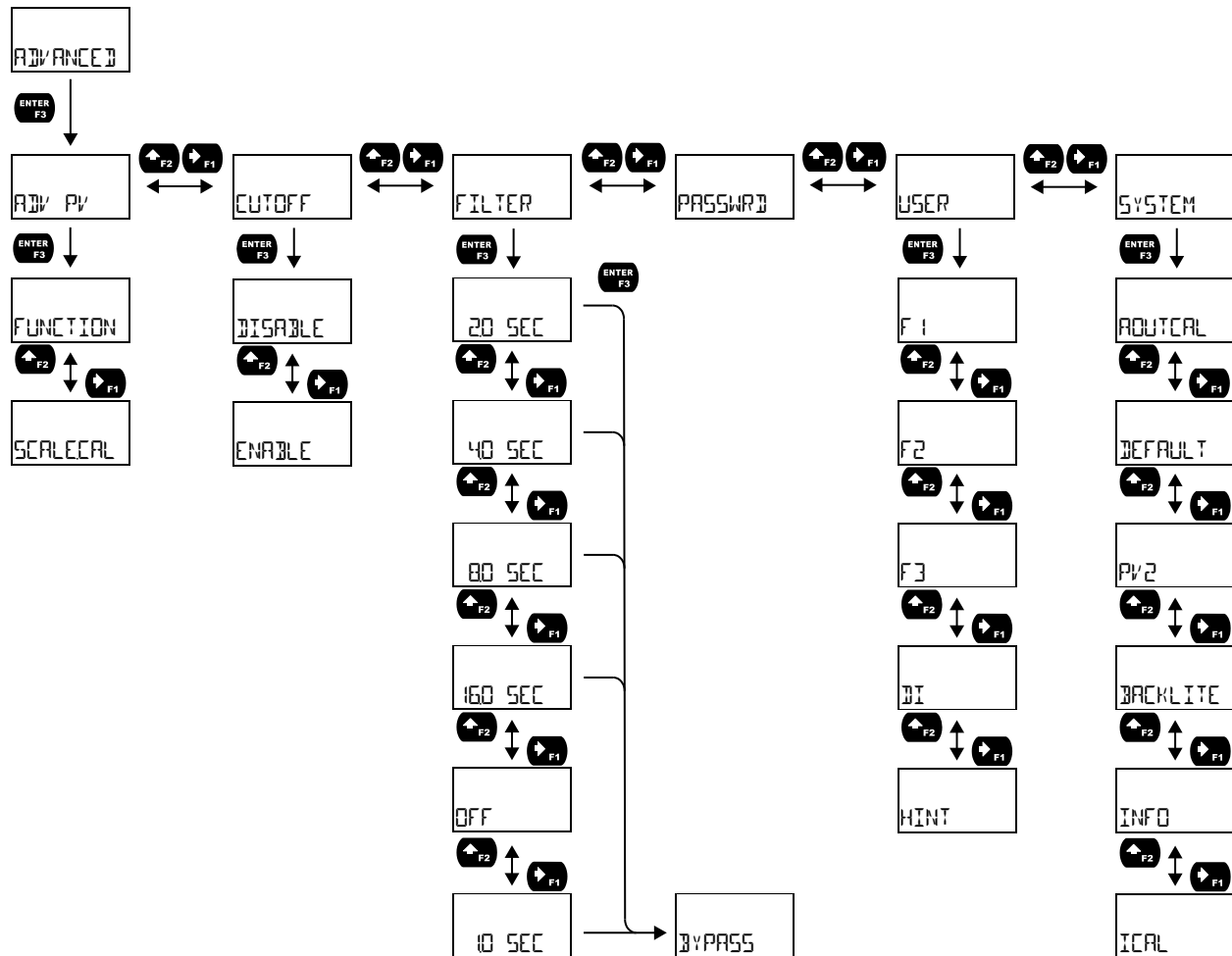
### Advanced Process Variable Setup (ADV PV)

The Advanced PV menu contains options to apply signal input conditioning functions to the input and scale/calibrate the input signal.



*Available for PV2 only.

### Signal Input Conditioning Functions (FUNCTION)

The *Function* menu is used to select the signal input conditioner applied to the input: linear or round horizontal tank volume calculation. Multi-point linearization is part of the linear function selection.
Meters are set up at the factory for linear function with 2-point linearization. The linear function provides a display that is linear with respect to the input signal.

#### Multi-Point Linearization (LINEAR)

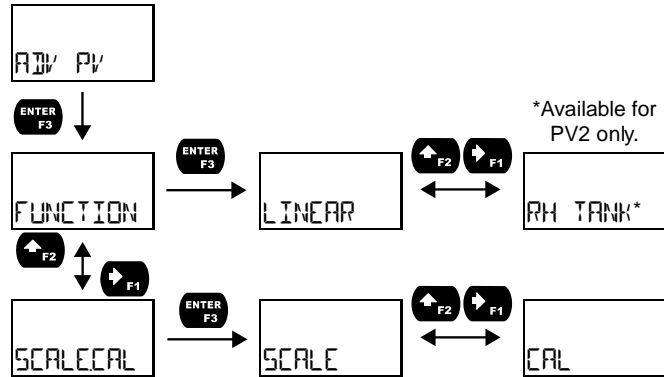Meters are set up at the factory for linear function with 2-point linearization. Up to 32 linearization points can be selected for PV1 and PV2 under the linear function. Multi-point linearization can be used to linearize the display for non-linear signals such as those from level transmitters used to measure volume in odd-shaped tanks or to convert level to flow using weirs and flumes with complex exponent.
If the dual-scale level feature has been selected, the menus for PV1 & PV2 are enabled.

#### Round Horizontal Tank Linearization (RH TANK)

This function automatically calculates the volume in a round horizontal tank with flat ends. It is only available for PV2 while the meter is in dual-scale mode.
Set the display for the desired decimal point and engineering units before entering the round horizontal tank function. Select units (inches or cm) for the tank dimensions. Enter the diameter and the length in inches or cm and the results will be calculated automatically in US gallons or liters. The unit of measure for the volume can be changed using the display menu. See Changing the Units (UNITS) on page 24 and Available Unit Classes and Units on page 22 for a list of available volume units. There is no need to enter scaling values.

### Advanced Scaling and Calibration (SCALECAL)

This menu offers options to scale or calibrate the meter.

#### Scaling the Input (SCALE)

The scale menu in the *Advanced* menu is the same as the scale menu in the *Input* menu. See Setting Up the Input Signal (INPUT) on page 21 for details about scaling the meter.

#### Calibrating the Input (CAL)

> To scale the meter without a signal source, refer to Setting Up the Input Signal (INPUT), page 21.

The meter can be calibrated to display the process in engineering units by applying the appropriate input signal and following the calibration procedure. The CAL menu should be used with a live signal coming from a 4-20 mA transmitter connected to the process being measured.

During calibration, the mA input value will be displayed as INP 1 and INP 2. Adjust the input source until the desired mA value is shown. The use of a calibrated signal source is strongly recommended.
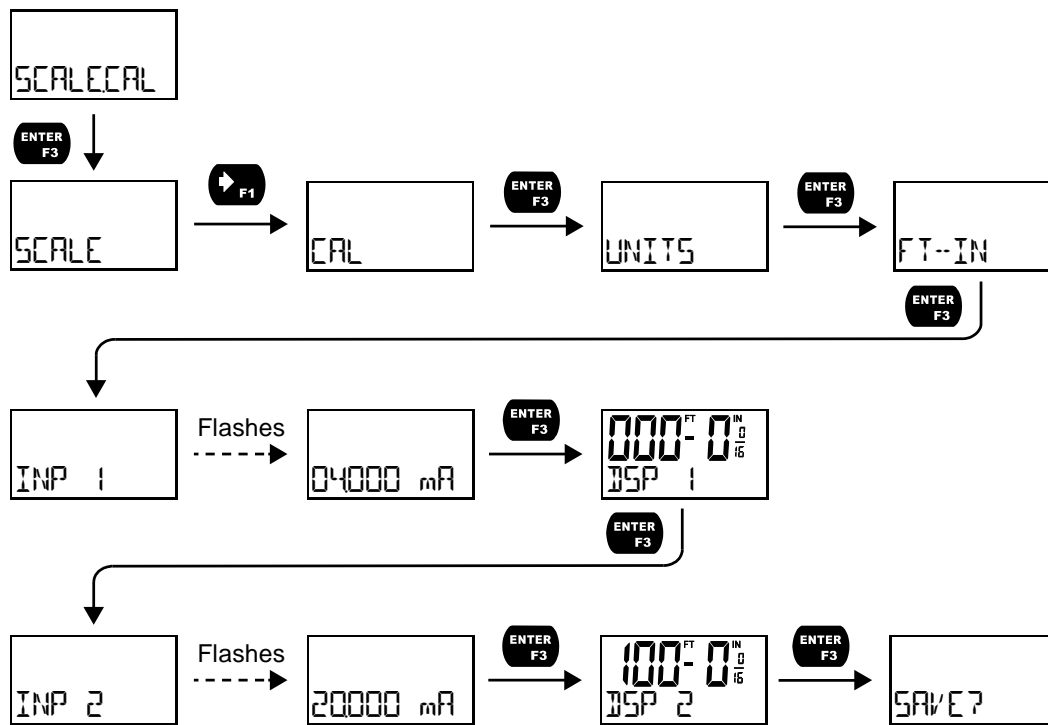


1. After accessing the SCALECAL menu, press the **Right-Arrow** button to scroll to the *Calibration* menu (CAL PV) and press *Enter*.
2. Select the appropriate units for the desired process variable, then press **Enter**. For information on units, see Available Unit Classes and Units on page 22.
3. The meter displays INP 1. Apply a known signal and press **Enter**. The display will flash while accepting the signal.
4. After the signal is accepted, the meter displays DSP 1. Enter a corresponding display value for the signal input, and press **Enter** to accept.
5. The meter displays INP 2. Apply a known signal and press **Enter**. The display will flash while accepting the signal.
6. After the signal is accepted, the meter displays DSP 2. Enter a corresponding display value for the signal input and press **Enter** to accept.
7. After completing calibration, the SAVE? display will need to be acknowledged using the **Enter** key before calibration will take effect.

### Low-Flow Cutoff (CUTOFF)

The low-flow cutoff feature allows the meter to be programmed so that the often-unsteady output from a differential pressure transmitter at low flow rates always displays zero on the meter.
The cutoff value may be programmed from 0 to 999999.9. The meter will display zero below the cutoff value. The cutoff may also be disabled to display negative values.

### Noise Filter (FILTER)

The noise filter is available for unusually noisy signals that cause an unstable process variable display. The noise filter averages the input signal over a certain period. The filter level determines the length of time over which the signal is averaged. The filter level can be set between 1 and 16 seconds or turned off. The higher the filter level, the longer the averaging time and so the longer it takes the display to settle to its final value. Setting the filter level to off disables the filter function.

### Noise Filter Bypass (BYPAS)

The noise filter bypass changes the behavior of the meter so that small variations in the signal are filtered out but large abrupt changes in the input signal are displayed immediately. The bypass value determines the minimum amount of signal change to be displayed immediately. All signal changes smaller than the bypass value are filtered or averaged by the meter. The noise filter bypass may be set between 0.1 and 99.9% of full scale.

### Enabling Password Protection (PASSWRD)

The *Password* menu is used for programming security to prevent unauthorized changes to the programmed parameter settings.
In order to set a password, enter the *Password* menu and program a five-digit password. When a password has been enabled the meter will display LOCKED when trying to access *Programming Mode*.
For instructions on how to program numeric values see *Setting Numeric Values*, page 20.
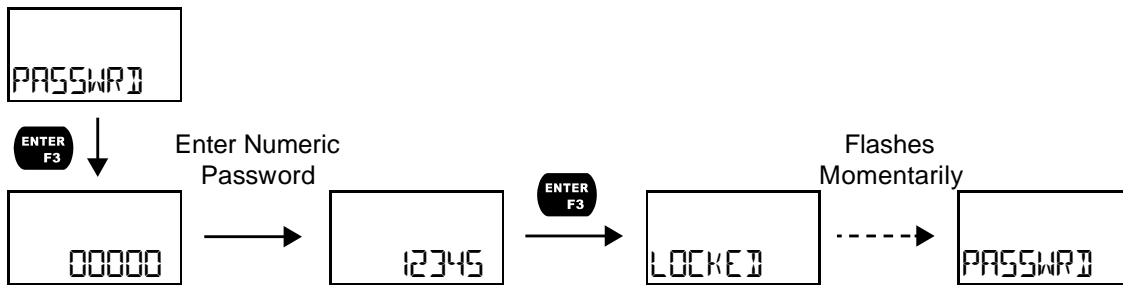


### Making Changes to a Password Protected Meter

If the meter is password protected, the meter will display the message LOCKED when the *Menu* button is pressed. Press the *Enter* button while the message is being displayed and enter the correct password to gain access to the menu. After exiting *Programming Mode*, the meter returns to its password protected condition.

### Disabling Password Protection

To disable password protection, access the *Password* menu and clear the entered password either by pressing and holding the *Right Arrow* button until all digits reset to zero or manually changing all of the digits to zero. When the *Enter* button is pressed, the meter will display UNLOCKED and will no longer require a password to access *Programming Mode*.

**Note:** If the meter is password protected and the password has been forgotten, the password may be overridden using the master password: **50865**

## Programmable Function Keys User Menu (USER)

The *User* menu allows the user to assign the front panel function keys F1, F2, and F3, and the digital input (a digital input located on the signal input connector) to access some of the menus or to activate certain functions immediately (e.g. reset max & min, hold relay states, etc.). This allows the meter to be greatly customized for use in specialized applications.

USER → F1 ↔ F2 ↔ F3 ↔ DI ↔ HINT

F1 → DISP FN ↔ MENU FN ↔ TIMERFN ↔ ALARMFN

HINT → OFF ↔ ON

DISP FN ↕ RST FN ↔ DISABLE ↔ HOLD FN ↔ TAREFN
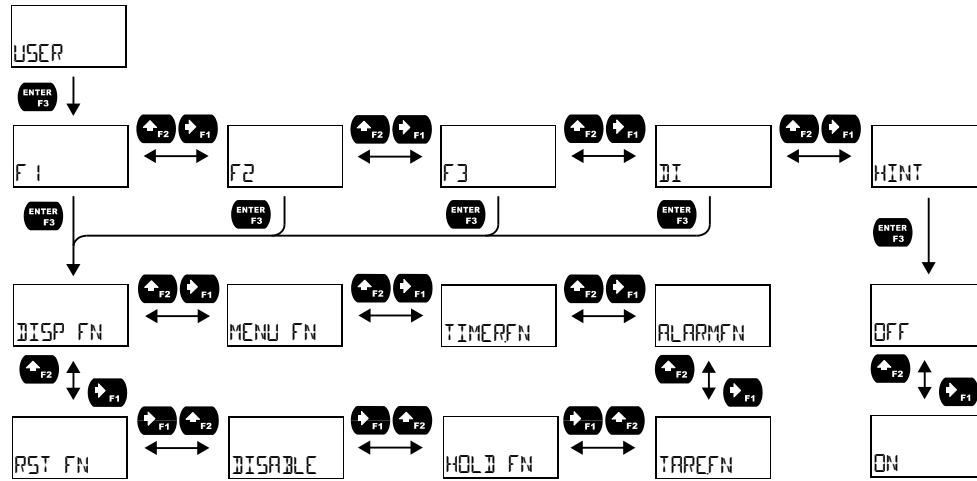
### Function Keys & Digital Input Available Settings

Refer to the following table for descriptions of each available function key or digital input setting.

| Display | Description | Display | Description |
|---|---|---|---|
| DISP FN | Set the function key or digital input to display a value | STR‑STP | Start or stop the selected timer output |
| DISPLAY | Cycle max, min, and PV(s) | ALARMFN | Set the function key or digital input to acknowledge an alarm |
| DISP PV | Display the PV | ACK | Acknowledge all active alarms |
| PCT PV | Display the PV's percentage of max (20 mA) | SETPOINT | View all output set points |
| D UNITS | Display the PV's units | SETPTOC1 | View open collector 1 set points |
| D TAG | Display the PV's tag | SETPTOC2 | View open collector 2 set points |
| DISPMIN | Display the PV's minimum | SETPTR1 | View relay 1 set points |
| DISPMAX | Display the PV's maximum | SETPTR2 | View relay 2 set points |
| MIN MAX | Display the PV's minimum and maximum value | SWATCHFN | Set the function key or digital input to activate stopwatch |
| D mA IN | Display the mA input value | START | Start the stopwatch |
| D mAOUT | Display the mA output value | STOP | Pause/Stop the stopwatch |
| MENU FN | Set the function key or digital input to access a menu | STR‑STP | Start or stop the stopwatch |
| RLYINFO | Go to relay information menu (INFO) | TAREFN | Set the function key or digital input to tare the display value |
| MANCTRL | Go to output control menu (CONTROL) | TARE | Tare the display value |
| TIMR OC1 | Open collector 1 timer | RST TARE | Reset the display value |
| TIMR OC2 | Open collector 2 timer | HOLD FN | Set the function key or digital input to hold an output |
| TIMER R1 | Relay 1 timer | HOLDOUT | Hold all outputs |
| TIMER R2 | Relay 2 timer | HLDUNHLD | Hold or un-hold all outputs |
| TIMERFN | Set the function key or digital input to start or stop a timer | OC 1+2 | Hold/un-hold open collector outputs |
| STRTALL | Start all timers | RLY 1+2 | Hold/un-hold relay outputs |
| STOPALL | Stop all timers | mAOUT | Hold/un-hold 4-20 mA output |
| SSTPALL | Start or stop all timers | HOLD | Hold selected output |
| OC 1 | Start/stop open collector 1 timer | HLDUNHLD | Hold or un-hold selected output |
| OC2 | Start/stop open collector 2 timer | DISABLE | Disable the function key or digital input |
| RLY 1 | Start/stop relay 1 timer | RST FN | Set the function key or digital input to reset a value |
| RLY2 | Start/stop relay 2 timer | RESET | Reset min, max, or max/min PV value |
| START | Start the selected timer output | R MINMAX | Reset max and min PV value |
| STOP | Stop the selected timer output | | |

### Enabling the Function Key Hint Feature (HINT)

Enabling the function key hint feature will cause a hint message to be displayed when pressing the F1, F2, or F3 function keys. This text gives a brief description of what the button is programmed to do. Pressing that function key a second time will execute that action.

The hint feature does not affect the digital input (DI) which is intended for immediate execution.

### Changing System Settings (SYSTEM)

The System menu contains the following menus: *Analog Output Calibration*, *Restore Factory Defaults*, *Dual-Scale (PV2)*, *Backlight*, *Information*, and *Internal Calibration*.
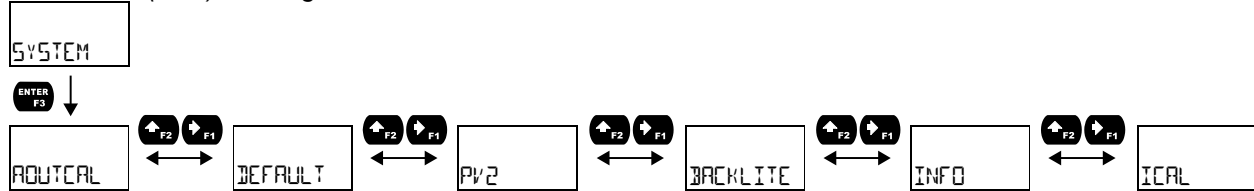


### Analog Output Calibration (AOUTCAL)

To perform the analog output calibration, it is recommended to use a milliamp meter with a resolution of at least 0.1 µA to measure the output current. The values saved internally during this procedure are used for scaling the 4-20 mA output in the *Setup* menu.

### Resetting the Meter to Factory Defaults (DEFAULT)

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. To load factory defaults, enter the DEFAULT menu under the SYSTEM menu and press enter twice in quick succession. The meter will load the default settings and restart.
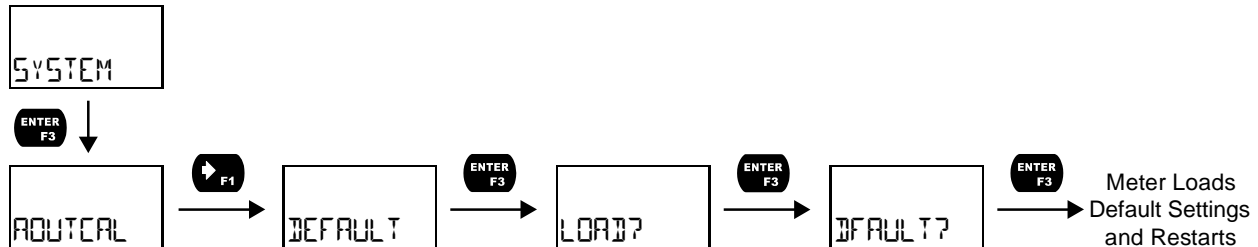


### Enabling the Dual-Scale Feature (PV2)

For some level applications, such as displaying the height and volume of a tank, it is possible to enable a second PV which can be scaled to display a different value based on the same 4-20 mA input. This is accomplished by enabling the dual-scale feature (PV2).

When the dual-scale feature is enabled, additional menus will be displayed to allow for the programming of the second PV. The input menu will display PV1 and PV2 for scaling and the display menu will allow both PVs to be displayed on either line, for example. See Display Functions & Messages on page 17 for additional information on where additional dual-scale specific menus will appear.

PV2 must be enabled in order to use the Round Horizontal Tank feature. See Round Horizontal Tank Linearization (RH TANK) on page 39.

### Enabling or Disabling the Backlight (BACKLITE)

The backlight may be enabled or disabled using the *Backlight* menu. The backlight is enabled by default, but the input must be wired appropriately in order for the backlight to function. See Safe Area Current Loop (4-20 mA) Connections on page 12. The voltage drop is the same if the backlight is not wired or if it is disabled in the software.

### Viewing System Information (INFO)

System information, such as software number, software version, model number, and system tag, may be viewed in the INFO menu. Press the *Right Arrow* button to cycle through all available meter information. Press **Menu** to go back to the previous menu.
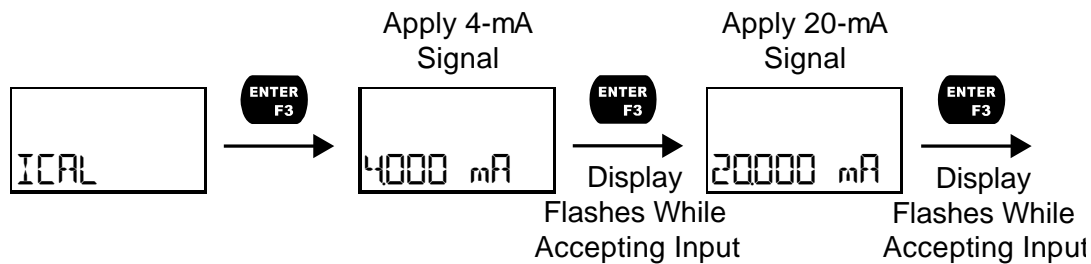
## Calibrating the Internal mA Reference (ICAL)

> The meter is factory calibrated prior to shipment to display 0 to 100, which corresponds to the 4-20 mA input. The calibration equipment is traceable to NIST standards.

The use of calibrated signal sources is necessary to calibrate the internal source of the meter. The meter's internal source is what allows the user to scale the meter without applying a signal.
Check calibration of the meter at least every 12 months.
**Note:** Allow the meter to warm up for at least 5 minutes before performing the internal source calibration procedure.
The *Internal Calibration* menu is part of the *Advanced* menu. Internal Calibration is performed as follows:
1.  Press the **Menu** button to enter *Programming Mode*.
2.  Press the **Up-Arrow** button **twice** and press **Enter** to access the **Advanced** menu.
3.  Press the **Up-Arrow** button and press **Enter** to access the **System** menu.
4.  Press the **Up-Arrow** button and press **Enter** to access the **ICAL** menu.
5.  The meter displays *low* input current message (4000 mA). Apply a 4-mA signal and press **Enter**. The display flashes for a moment while the meter is accepting the low input signal.
6.  After the display stops flashing, the display moves to the *high* input calibration (20000 mA). Apply the high input signal and press **Enter**. The display will flash again while the meter is accepting the high input signal.



Apply 4-mA Signal — Apply 20-mA Signal

ICAL → ENTER F3 → 4000 mA / Display Flashes While Accepting Input → ENTER F3 → 20000 mA / Display Flashes While Accepting Input → ENTER F3

# Meter Operation

The meter is capable of accepting a 4-20 mA current signal and displaying it in feet and inches from -99ft. 11 15/16 in. to 999 ft. 11 15/16 in. on the top line or from -9,999,999 to 99,999,999 on the bottom line. For example, a 4-20 mA signal could be displayed as -50 ft. to 100 ft.

The bottom display can be customized by the user to operate in such a way as to satisfy a specific level application. Typically, the top line is used for the feet and inches height variable while the bottom line is used for a custom tag, engineering units, or to display a second input scale such as volume.

The 4-20 mA input can be scaled to display the process in two different scales; for example: with *PV2* enabled, the main display could indicate level in feet and inches while the second display could indicate the volume in gallons.

## Front Panel Buttons Operation

| Button Symbol | Description |
|---|---|
| MENU | Press to enter or exit *Programming Mode*, view settings, or exit max/min readings |
| F1 | Press to display max/min readings or other parameter/function assigned through the *User* menu |
| F2 | Press to reset max/min readings or other parameter/function assigned through the *User* menu |
| ENTER F3 | Press to acknowledge alarms or other parameters/function assigned through the *User* menu |

## Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. The table above shows the factory default settings for F1, F2, and F3.

A hint message may be enabled in order to provide a description of what each function key does prior to executing their assigned function. See Enabling the Function Key Hint Feature (HINT) on page 43.

## Digital Input Operation

A digital input is standard on the meter. This digital input is programmed identically to function keys F1, F2, and F3. The input is triggered with a contact closure between DI+ and DI-, or with an active low signal. During operation, the digital input operates according to the way it has been programmed in the *Advanced Features – User* menu.

## Maximum/Minimum Readings

The max & min readings (peak & valley) reached by the process can be displayed either continuously or momentary:

1. Display briefly by pressing the F1 key (default) or assigning to any of the other function keys or to the digital input in the *User* menu.
2. Display continuously by pressing the **Enter** button while the max/min is being displayed to lock the display. Press **Enter** again to unlock.

Any of the F1-F3 function keys (buttons) and the digital input can be programmed to reset the max & min readings. The meters are set at the factory to display the max reading by pressing the *Right Arrow/F1* button and to use the *Up-Arrow/F2* button to access the *Reset* menu. Press the *Right Arrow* button to cycle through the available parameters to reset.

## Changing PV2 Engineering Units

It is possible to change PV2's display units within the selected unit class without the need to re-scale the meter. The UNITS menu in the DISPLAY menu allows the unit of measure to be changed (e.g. from gallons (GAL) to liters (L)) and the meter will automatically convert the display value to the new unit of measure. If entering a custom unit (CUSTOM), a custom conversion factor will need to be entered. See Changing the Units (UNITS) on page 24.

# Troubleshooting

Due to the many features and functions of the meter, it's possible that the setup of the meter does not agree with what an operator expects to see.
If the meter is not working as expected, refer to the recommendations below.

## 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.
To load factory defaults:
1. Press the *Menu* button to enter *Programming Mode*.
2. Press the *Up-Arrow* button **twice** and press *Enter* to access the *Advanced* menu.
3. Press the *Up-Arrow* button and press *Enter* to access the *System* menu.
4. Press the *Right-Arrow* button and press *Enter* to access the *Default* menu.
5. Press *Enter* twice in quick succession. The meter will load default settings and restart.
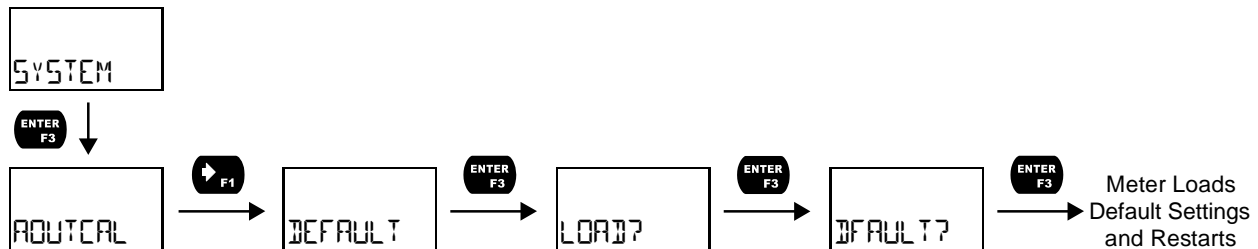


## Determining Software Version

To determine the software version of a meter:
1. Press the *Menu* button to enter *Programming Mode*.
2. Press the *Up-Arrow* button **twice** and press *Enter* to access the *Advanced* menu.
3. Press the *Up-Arrow* button and press *Enter* to access the *System* menu.
4. Press the *Up-Arrow* button **twice** and press *Enter* to access the *Info* menu.
5. Press the *Right-Arrow* button to cycle through the meter information. When done, press the *Menu* button to return to the previous menu.

## Factory Default Settings

The following table shows the factory setting for most of the programmable parameters on the meter.

| Parameter | Display | Default Setting |
|---|---|---|
| **Input Menu** | | |
| Unit of Measure | UNIT | Feet & Inches |
| Input 1 | INP 1 | 4.000 mA |
| Display 1 | DSP 1 | 0.00 |
| Input 2 | INP 2 | 20.000 mA |
| Display 2 | DSP 2 | 100.00 |
| **Output Menu** | | |
| Open Collector Output 1 | OUTPUT 1 | Disabled |
| Pulse Factor | FACTOR | 1.0 |
| Test Frequency | FREQ | 100 |
| Alarm | ALARM | PV |
| Alarm Action | ACTION | AUTO |
| Set Point | SET | 20.00 |
| Reset Point | RESET | 10.00 |
| Alarm On Delay | DELAY ON | 0 seconds |
| Alarm Off Delay | DELAY OFF | 0 seconds |
| Alarm Failsafe | FAILSAFE | OFF |
| Red LED | RED | ON |
| Flash PV | FLASH | ON |
| Alarm Message | MSG | ON |
| Message Text | MSG EDIT | ALARM 1 |
| Timer Off Delay | OFFDLAY | 1 minute |
| Timer On Time | ON TIME | 1 second |
| Timer Mode | MODE | Continuous |
| Open Collector Output 2 | OUTPUT 2 | Disabled |
| Set Point | SET | 40.00 |
| Reset Point | RESET | 30.00 |
| Message Text | MSG EDIT | ALARM 2 |
| Relay Output 1 | RELAY 1 | Disabled |
| Alarm | ALARM | PV |
| Alarm Action | ACTION | AUTO |
| Set Point | SET | 70.00 |
| Reset Point | RESET | 60.00 |
| Alarm On Delay | DELAY ON | 0 seconds |
| Alarm Off Delay | DELAY OFF | 0 seconds |
| Alarm Failsafe | FAILSAFE | OFF |
| Red LED | RED | ON |
| Flash PV | FLASH | ON |
| Alarm Message | MSG | ON |
| Message Text | MSG EDIT | ALARM 3 |
| Pump Ctrl On | ON | 70.00 |

| Parameter | Display | Default Setting |
|---|---|---|
| Pump Ctrl Off | OFF | 60.00 |
| Pump Ctrl On Delay | DELAY ON | 0 seconds |
| Pump Ctrl Off Delay | DELAY OFF | 0 seconds |
| Pump Alt On 1 | ON 1 | 70.00 |
| Pump Alt Off 1 | OFF 1 | 60.00 |
| Pump Alt On 2 | ON 2 | 90.00 |
| Pump Alt Off 2 | OFF 2 | 80.00 |
| Pump Alt On Delay 1 | DELAY 1 ON | 0 seconds |
| Pump Alt Off Delay 1 | DELAY 1 OFF | 0 seconds |
| Pump Alt On Delay 2 | DELAY 2 ON | 0 seconds |
| Pump Alt Off Delay 2 | DELAY 2 OFF | 0 seconds |
| Timer Off Delay | OFFDLAY | 1 minute |
| Timer On Time | ON TIME | 1 second |
| Timer Mode | MODE | Continuous |
| Relay Output 2 | RELAY 2 | Disabled |
| Set Point | SET | 20.00 |
| Reset Point | RESET | 10.00 |
| Message Text | MSG EDIT | ALARM 4 |
| 4-20 mA Output | 4-20 mA | PV |
| **Advanced Menu** | | |
| Signal Conditioning Function | FUNCTION | Linear (2 pts) |
| Low Cutoff | CUTOFF | Enabled: 0 |
| Filter | FILTER | 2.0 seconds |
| Filter Bypass | BYPAS | 0.4 PCT |
| Password | PASSWRD | 00000 (Unlocked) |
| Function Key 1 | F1 | Display |
| Function Key 2 | F2 | Reset |
| Function Key 3 | F3 | Acknowledge |
| Digital Input | DI | Acknowledge |
| Function Key Hint Feature | HINT | Disabled |
| Dual-Scale | PV 2 | Disabled |
| Backlight | BACKLIGHT | Enabled |
| **Display Menu** | | |
| Ft&In Display | UNITS | FT-IN/* |
| Bargraph | BARGRAPH | Percent of PV |
| Bottom Line | BOTTOM | Tag (LEVEL) |

## Troubleshooting Tips

| Symptom | Check/Action |
|---|---|
| No display at all | 1.  Check that the 4-20 mA current loop is providing at least 3.5 mA to the meter.<br>2.  Check that the voltage drop of all devices connected to the 4-20 mA current loop does not exceed the max rating of the loop power supply. |
| Not able to change setup or programming, LOCKED is displayed | Meter is password-protected, enter correct five-digit password to unlock. |
| Meter display flashes:<br>1.  999FT 11IN<br>2.  --99FT 11IN | Check that the number of digits required for the scaled value does not exceed the maximum digits for the display line. If it does, try adjusting the decimal point location for less precision or changing the PV display to the bottom line. |
| Display is unstable | Check:<br>1.  Input signal stability and value.<br>2.  Display scaling vs. input signal.<br>3.  Filter and bypass values (increase). |
| Display response is too slow | Check filter and bypass values |
| Display reading is not accurate | Check:<br>1.  Signal input conditioner selected: Linear, or RHT<br>2.  Scaling or calibration |
| Display does not respond to input changes, reading a fixed number | Check display assignment. It might be displaying max, min, or set point. |
| Display shows:<br>1.  MAX and a number<br>2.  MIN and a number | Press Menu to exit max/min display readings. |
| Relay operation is reversed | Check fail-safe settings in *Output* menu |
| Relays do not respond to signal | Check:<br>1.  Relay action in *Output* menu<br>2.  Set and reset points<br>3.  Check manual control menu |
| If the display locks up or the meter does not respond at all | Cycle the power to reboot the microprocessor. |
| Other symptoms not described above | Call Technical Support for assistance. |

*Note: Certain sequences of events can cause unexpected results. To solve these issues, it is best to start fresh from factory defaults and map changes ahead of time, rather than at random. See* Reset Meter to Factory Defaults *on page 46 for details on resetting the meter.*

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# EU Declaration of Conformity for PD6603

Issued in accordance with ISO/IEC 17050-1:2004.

We,

**Precision Digital Corporation**
**233 South Street**
**Hopkinton, MA 01748 USA**

as the manufacturer, declare under our sole responsibility that the product(s),

**Model PD6603 Loop-Powered Feet & Inches Meter**

to which this declaration relates, is in conformity with the European Union Directives shown below:

| | |
|---|---|
| **2014/35/EU** | **Low Voltage Directive** |
| **2014/30/EU** | **EMC Directive** |
| **2011/65/EU** | **RoHS Directive** |

This conformity is based on compliance with the application of harmonized or applicable technical standards and, when applicable or required, a European Union notified body certification.

**Standards:**

EN 55011:2016
EN 60079-0:2012+A11:2013
EN 60079-11:2012
EN 61010-1:2010
EN 61326-1:2013

**Product Markings:**       C E

Signed for and on behalf of Precision Digital Corporation:

| | |
|---|---|
| Name: | Jeffrey Peters |
| Company: | Precision Digital Corporation |
| Title: | President |
| Date: | 02/12/2018 |

Document No: DoC PD6603 {021218}

# PRECISION DIGITAL ÷

# EU Declaration of Conformity for PD6607

Issued in accordance with ISO/IEC 17050-1:2004 and ATEX Directive 2014/34/EU.

We,

**Precision Digital Corporation**
**233 South Street**
**Hopkinton, MA 01748 USA**

as the manufacturer, declare under our sole responsibility that the product(s),

**Model PD6607 Loop-Powered Feet & Inches Meter**

to which this declaration relates, is in conformity with the European Union Directives shown below:

| | |
|---|---|
| **2014/35/EU** | **Low Voltage Directive** |
| **2014/34/EU** | **ATEX Directive** |
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**Standards:**

EN 55011:2016
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EN 60079-11:2012
EN 61010-1:2010
EN 61326-1:2013

**EC Type Examination Certificate:**          CML 17ATEX2015X

**Product Markings:**          $\langle Ex \rangle$ II 1 G
Ex ia IIC T4 Ga
Tamb = -40°C to +70°C

**ATEX Notified Body for EC Type Examination Certificate:**  Certification Management Limited, NB 2503
Unit 1 Newport Business Park, New Port Road,
Ellesmere Port CH65 4LZ, UK

**ATEX Quality Assurance Notification No.:**          SIRA 10 ATEX M462

**ATEX Notified Body for Quality Assurance:**          Sira Certification Service, NB 0518
Unit 6, Hawarden Industrial Park
Hawarden, Deeside, CH5 3US, UK

Signed for and on behalf of Precision Digital Corporation:

Name:          Jeffrey Peters
Company:          Precision Digital Corporation
Title:          President
Date:          02/12/2018                    Document No: DoC PD6607 {021218}

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# How to Contact Precision Digital

- For Technical Support please

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    Fax: (508) 655-8990

    Email: support@predig.com

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