# PD6602/3/4
## Loop Leader Loop-Powered Process Meter

**PD6602 Decimal Display**

**PD6604 Decimal Display w/Bargraph**

**PD6603 Feet & Inches Display**

*Loop Leader Series*

**LOOP-POWERED PROCESS**

- **Loop-Powered Backlight with Red Backlight for Alarm Conditions**
- **Loop-Powered Process Meter**
- **Loop-Powered Feet & Inches Level Meter (PD6603)**
- **Displays up to 999 Feet 11 & 15/16 Inches (PD6603)**
- **1.5 Volt Drop (4.5 Volt Drop w/ Backlight)**
- **IP65 Front**
- **-40 to 167°F (-40 to 75°C) Operating Temperature Range**
- **Five Digit Top Line**
- **Alphanumeric Tag Names**
- **Dual Line Display**
- **1/8 DIN Shallow Depth Case**
- **Optional Loop-Powered Solid State Relays**
- **Optional 4-20 mA Analog Output**
- **Open Collector Output Standard**
- **Optional Bargraph Display (PD6604)**
- **Timer Functions for Open Collectors and Relays**
- **Relay Pump Alternation Based on Level and Time**
- **Relay Runtime and Cycle Count**

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**PD6602 Process Meter with Decimal Display**

IP65 Front

Dual-Line LCD with 5 Digits on Top Line and 8 Digits on Bottom Line

Preprogrammed or Custom Engineering Units

Showing Red Backlight For Alarm Indication

PV, Max (Peak), Min (Valley)

Front Panel Buttons For Setup and Programming

Indicators For Alarm & Password Protection

## INTRODUCTION

The Loop Leader PD6600 is a general-purpose, loop-powered, 1/8 DIN process meter. The four front panel buttons make setup and programming of the meter simple and intuitive. A dual-line display featuring five digits on the top line and eight digits on the bottom line, preprogrammed engineering units, and optional bargraph display (PD6604) or feet and inches display (PD6603) provide a clear and attractive presentation of the process. The units of measure can be changed as needed within a unit class (e.g. volume, temperature, pressure) without the need to re-scale the meter.

The dual-line display can be customized by the user to operate in such a way as to satisfy a specific application. Typically, the top line is used for the process variable while the bottom line is used for engineering units, custom tag, or process variable percentage of full scale. Three programmable function keys and a digital input come standard and allow the meter to be customized for use in specialized applications.

All models come equipped with two open collector outputs and are available with two solid state relays and a 4-20 mA analog output. These outputs can be programmed for alarm indication, signal retransmission via pulse or analog signal, pump control, and a number of other useful features.

The fact that this meter is loop-powered means that there is no need to run additional, costly power lines; the meter gets all of the power it needs from the 4-20 mA loop. The Loop Leader loop-powered process meter is built in a shallow-depth case with an IP65 front and features loop-powered backlighting and a wide -40 to 167°F (-40 to 75°C) operating temperature range.

## KEY FEATURES

### Easy to Install Just About Anywhere

Indoors, outdoors, bright sunlight, dimly lit plant, wet, dirty, hot or cold, these indicators go just about anywhere. Their shallow-depth case, IP65 front, loop-powered backlighting, and wide operating temperature range are all standard features.

### Preprogrammed and Custom Units

The meter has six available preprogrammed unit classes, *volume*, *height*, *temperature*, *pressure*, *weight*, and *rate*. When the desired unit class or unit of measure within a class is not available, a custom unit may be programmed by using the (CUSTOM) menu.

### Front Panel Buttons for Easy Setup, Programming, and Other Functions

The PD6602/3/4 Loop Leader process meters include four front panel buttons for setup and programming. The front panel buttons along with the dual-line display makes the Loop Leader easy to set up & program. Three of these buttons are also function keys that can be programmed to trigger certain events (i.e. acknowledge alarms, reset max and/or min, disable/ enable output relays, or hold current relay states), provide direct menu access points, and more.

**Input Setup**     **Display Setup**

### Max/Min Display

The max & min readings (peak & valley) reached by the process can be displayed either continuously or momentary:
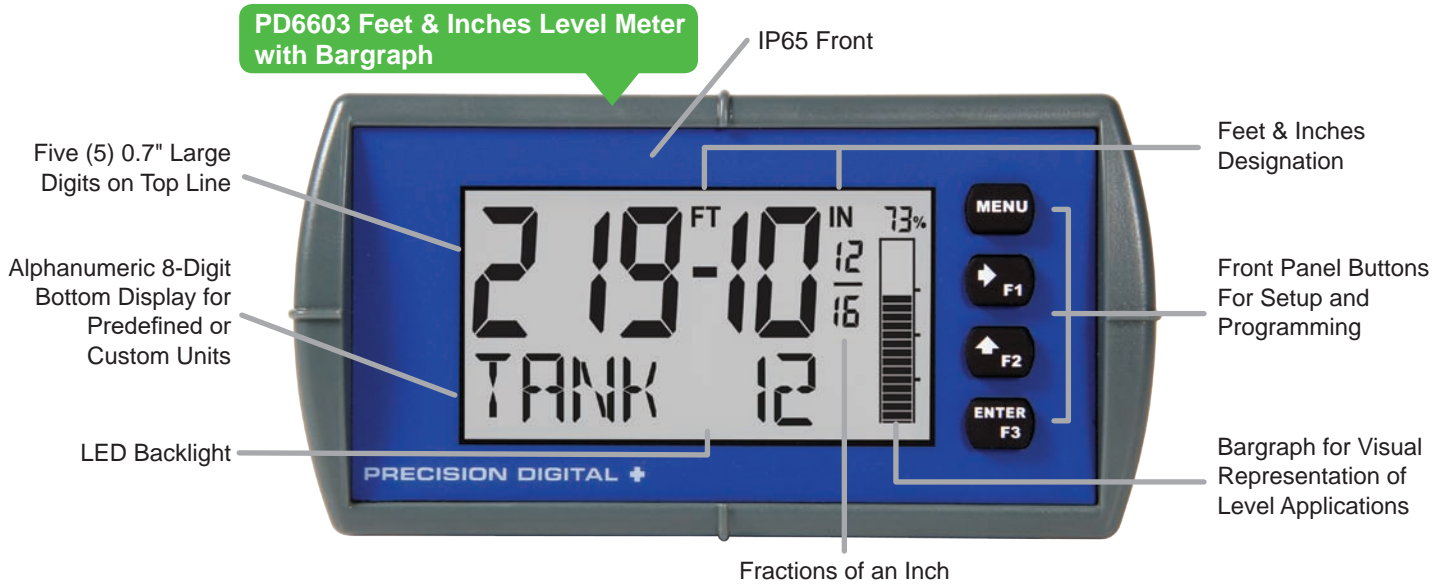1. Display briefly by pressing the F1 key (default) or assigning to any of the other function keys or to the digital input in the User menu.
2. Display continuously by pressing the *Enter* button while the max/ min is being displayed to lock the display. Press *Enter* again to unlock.

Any of the F1-F3 function keys (buttons) and the digital input can be programmed to reset the max & min readings.

### Change Between Units without Needing to Re-scale the Meter

It is possible to change the 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. If entering a custom unit (CUSTM), a custom conversion factor will need to be entered.

# PD6602/3/4 Loop Leader Loop-Powered Process Meter

PD6603 Feet & Inches Level Meter with Bargraph

IP65 Front

Five (5) 0.7" Large Digits on Top Line

Feet & Inches Designation

Alphanumeric 8-Digit Bottom Display for Predefined or Custom Units

Front Panel Buttons For Setup and Programming

LED Backlight

Bargraph for Visual Representation of Level Applications

Fractions of an Inch

## PD6603 Intuitive Display with Feet & Inches Indication and Bargraph

The Loop Leader PD6603 has all the features of the PD6602 and PD6604, but includes a unique display with clearly labeled feet & inches indicators on the top line and eight digits on the bottom line. It also includes a bargraph to provide a clear and immediately understood presentation of the process. The PD6603 display is ideal for level applications requiring a comprehensible display, as it shows feet, inches, and fractions of an inch to the nearest sixteenth of an inch. It can display a maximum of 999 ft 11 & 15/16 in.

## PD6604 Display with Bargraph Option

The Loop Leader offers not only the typical decimal display, but it offers another model with an added bargraph to provide a clear and attractive presentation of the process. This makes reading your process quick, convenient, and easy-to-understand.

**PD6602 Decimal Display**

**PD6604 Decimal w/Bargraph**

## Bargraph (PD6603/4)

The PD6603/4 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). If the meter is in dual-scale mode, the bargraph can be assigned to display either PV1 or PV2 using this menu.

## Configurable

The dual-line display can be customized by the user to operate in such a way as to satisfy a specific application. Typically, the top line is used for the process variable while the bottom line is used for engineering units, custom tag, or process variable percentage of full scale. See examples below.

**Temperature**

**Gallons & Setpoint**

**Level in Feet**

**Pressure Indication**

## Dual-Scale Display Feature

The Loop Leader has a very flexible dual-scale capability; a second scaled display can represent the measured input in a different form (i.e. gallons & height). This is of particular value in level applications. In the examples below, both displays are independently scaled based on the 4-20 mA input signal. Beyond level, this function has been used for pressure & force, current & power, feet & meters, GPM & CFM, and more.

**Gallons & mA**

**Height & Gallons**

**Height & Percent**

**Gallons & Head PSI**

## Time and Level Based Relays for Pump Alternation

For pumps used in applications such as tank level, pump alternation can be used to turn the pumps on and off to prevent excessive wear and tear. 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. Relays may also be programmed to alternate with each level alarm occurance, regardless of run time. For more information on time-based relay/open collector functions, see the PD6602/4 or PD6603 manual.

## Red Backlight for Alarm Indication

When programming the Loop Leader relays for high or low alarms you can set the display to show the red backlight. This makes the display more noticable when an alarm is activated.

## OUTPUTS

### Open Collector Outputs Standard

The Loop Leader is equipped with two NPN open collector outputs that may be set up for pulse outputs, alarms, timed pulses, or turned off. 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. 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 turns the open collector on and off at a specified frequency to act as a timer.

### Optional Solid State Relay Outputs

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. A timer output turns the relay on and off at a specified frequency to act as a timer. Pump control allow the relay to turn on and off a pump at specified set and reset 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). The output may be disabled by selecting (DISABLE). The alarm outputs may be assigned to the PV or the digital input to perform the following actions:

- 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 button (or whichever function key is set to acknowledge).
- Latching (LATCH): Alarm will not reset automatically even if the alarm condition is cleared. Press the Enter button at any time to clear the alarm.
- Latching w/ Clear (L--CLEAR): Alarm will not reset automatically. Press the Enter button once the alarm condition has cleared to reset the alarm.

## SIGNAL INPUT CONDITIONING

The PD6602/3/4 Loop Leader process meter allows you to select the signal input conditioner applied to the input: linear, square root, programmable exponent, or round horizontal tank volume calculation.

### Programmable Exponent Linearization

The programmable exponent function is used to linearize the level signal in open channel flow applications using weirs and flumes and display flow rate in engineering units.
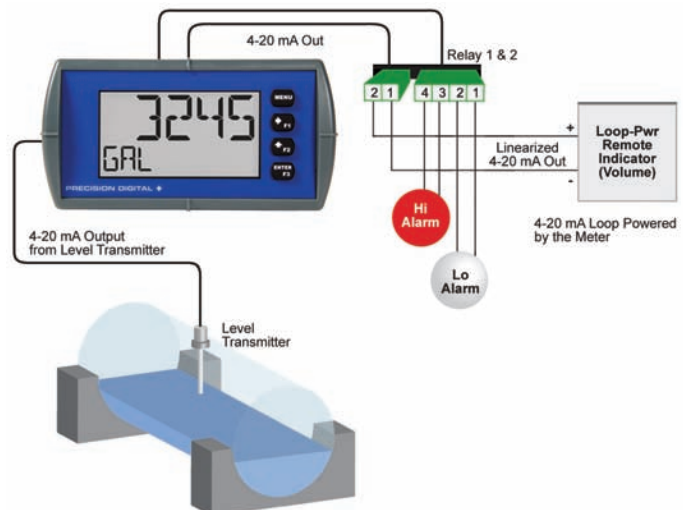
4-20 mA signal
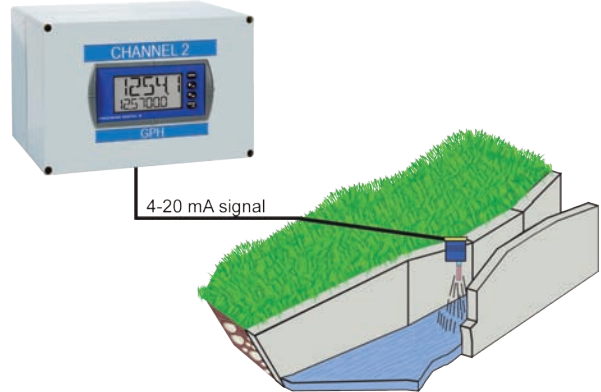
### Square Root Linearization

The square root function can be used to linearize the signal from a differential pressure transmitter and display flow rate in engineering units.

FLOW
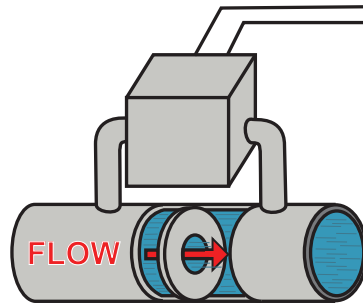
### Round Horizontal Tank Linearization

This function automatically calculates the volume in a round horizontal tank with flat ends.
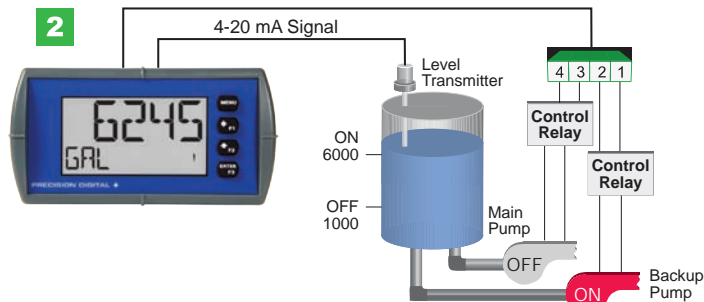
## APPLICATIONS

### Pump Alternation

The following is an example application where relays 1 & 2 are programmed for pump alternation. Below, the graphics provide a visual representation of a typical pump alternation application. *Note: Pump alternation can be based on level or time.*
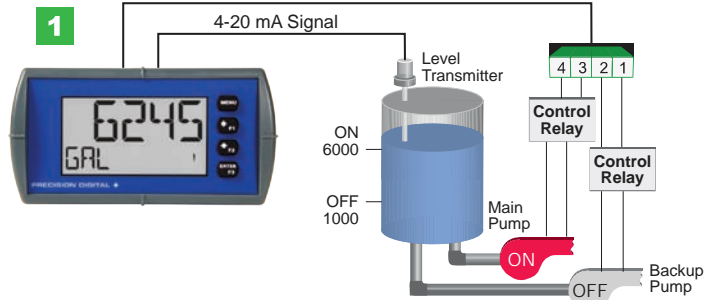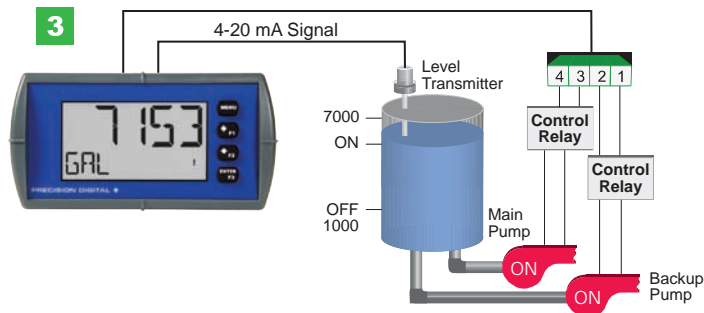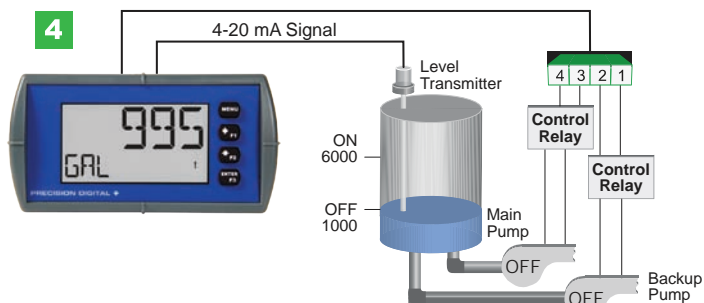


Relay #2 turns the main pump on at 6000 gallons and turns it off at 1000 gallons.



With the Pump Alternation feature activated, the next time the level reaches 6000 gallons, relay #1 transfers and starts the backup pump.



If the backup pump is not able to keep up, and the level reaches 7000 gallons, relay #2 transfers and starts the main pump as well.



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

## SPECIFICATIONS

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

### General

**Display:** *Top:* 0.7"(17.8 mm), *Bottom:* 0.4"(10.2 mm); 14-segment alphanumeric
**PD6602 & PD6604:** *Top:* 5 digits -9999 to 99999
**PD6603:** *Top:* 5 digits -99 ft. 11 in. 15/16 to 999 ft. 11 in. 15/16
*Bottom:* 8 digits -9,999,999 to 99,999,999
Bottom line separated by commas
**Display Update Rate:** Ambient > -10°C: 1 Update/Second
Ambient > -20°C: 1 Update/2 Seconds
Ambient -40°C: 1 Update/10 Seconds
**Overrange:** Top: 99999; Bottom: 99,999,999 (flashing)
**Underrange:** Top: -9999; Bottom: -9,999,999 (flashing)
**Programming Method:** Front panel
**Noise Filter:** 1, 2, 4, 8, 16 sec.
**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.
**Password:** Programmable password restricts modification of programmed settings.
**Non-Volatile Memory:** All programmed settings are stored in non-vol-atile memory for a minimum of ten years if power is lost.
**Normal Mode Rejection:** 64 dB at 50/60 Hz
**Environmental:** *Operating temperature range:* -40 to 75°C
*Storage temperature range:* -40 to 85°C
*Relative humidity:* 0 to 90% non-condensing
**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
**Enclosure & Materials:** 1/8 DIN, high impact plastic, NORYL® Polyphenylene Ether & Polystyrene blend (PPE PS) Resin, UL 94V-0, *Color:* gray, *Gasket:* Silicone Rubber, *Faceplate:* LEXAN® Polycarbonate (PC) Film, IP65 Front,
*Buttons:* Silicone rubber; *Color:* black
**Mounting:** 1/8 DIN panel cutout required. Two panel mounting bracket assemblies provided
**Tightening Torque:** *Screw terminal connectors:* 4.5 lb-in (0.5 Nm) *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) w/ option board
**Warranty:** 3 years parts and labor

## Process Input

**Accuracy:** ±0.02% of span ±1 count, Square root and programmable exponent: 10-100% FS
**Function:** *PV1:* Linear, square root, or programmable exponent
*PV2:* Linear or Round Horizontal Tank
**Low-Flow Cutoff:** 0.0 to 999,999.9
**Temperature Drift:** 25 PPM/°C from -40 to 75°C ambient
**Decimal Point:** Up to four decimal places: On top
Up to seven decimal places: On bottom
**Scaling and Display Range:** *Input:* 4-20 mA, *Scaling Range:* -999,999.9 to 999,999.9, *Display Range:* -9999 to 99999 on top line; -9,999,999 to 99,999,999 on bottom line
**Voltage Drop:** *Without Backlight:* 1.5 V max,
*With backlight:* 4.5 V max
**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

## Open Collector Output

**Rating:** Two NPN, Isolated open collector, 30 VDC @ 90 mA maximum
**Output Assignment:** Pulse, Alarm, Timer, or Disable
**Pulse Output Source:** PV (PV1, PV2) or Test Frequency
**Pulse Output Factor:** 0.000001 to 999,999.9
**Pulse Width:** 2 ms; 50% duty cycle
**Pulse Output Frequency:** 250 Hz maximum
**Quadrature Pulse Output:** Available for Output 2 (90° behind Output 1)
**Alarm Output Source:** Assign to PV (PV1, PV2) or Digital Input
**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 relay
**Alarm Operation:** Auto, Auto-man, Latch, Latch w/clear
**Alarm Indication:** Red backlight, Flashing display,
Alarm symbol (!)
**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, relays will reflect the state of the input to the meter
**Timer Output:** One-shot or Continuous

## Solid State Relays

**Rating:** *Resistive Load:* 250 VAC/DC @ 1 Amp
*Inductive Load:* 1/10 HP @ 125/250 VAC/DC
**Noise Suppression:** Metal oxide varistors across outputs
**Relay Assignment:** Alarm, Pump Control, Timer, or Disable
**Pump Alternation Time:** 0 to 999:59 (hrs:min)
**Alarm Output Source:** Assign to PV (PV1, PV2) or Digital Input
**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 relay
**Alarm Operation:** Auto, Auto-man, Latch, Latch w/clear
**Alarm Indication:** Red backlight, Flashing display,
Alarm symbol (!)
**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, 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)

## 4-20 mA Transmitter Output

**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
**Accuracy:** ±0.05% FS ±0.001mA
**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;
100-1100 Ω @ 30 VDC

## MOUNTING DIMENSIONS



▲ *Meter Dimensions - Side View*



▲ *Meter Dimensions - Front View*
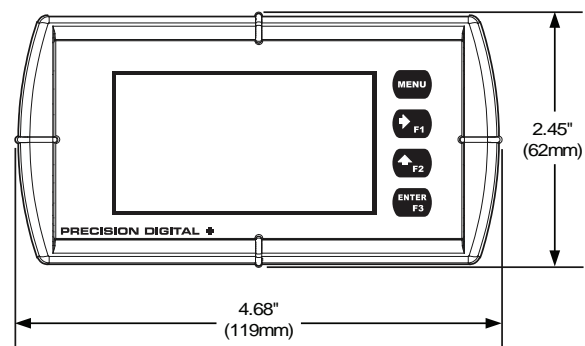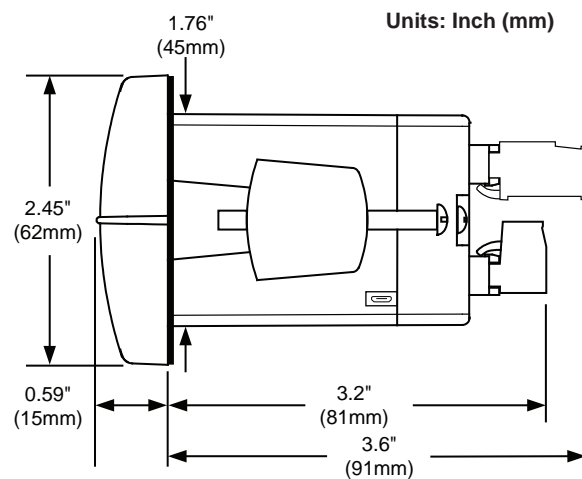
Notes:
1. Panel cutout required: 1.772" x 3.622" (45 mm x 92 mm)
2. Panel thickness: 0.040 - 0.250" (1.0 mm - 6.4 mm)
3. Mounting brackets lock in place for easy mounting
4. Clearance: Allow 6" (152 mm) behind the panel
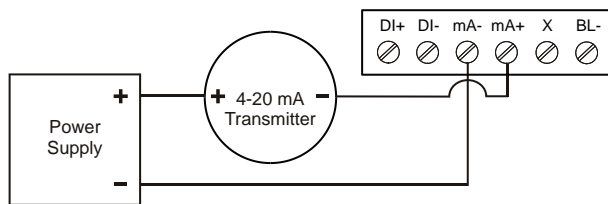
## CONNECTIONS

### Connectors Labeling

The connectors' label, affixed to the meter, shows the location of all connectors available with requested configuration.
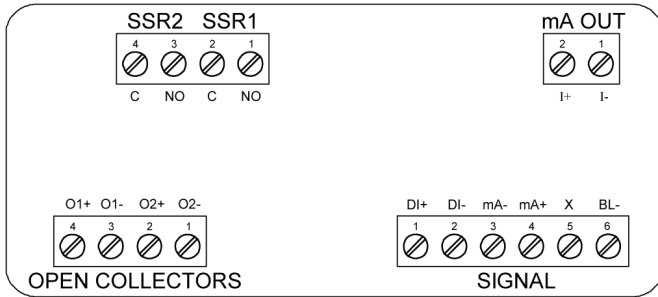


▲ *Connector Labeling for Fully Loaded PD6602/04*

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

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 meter is powered by the 4-20 mA current loop.
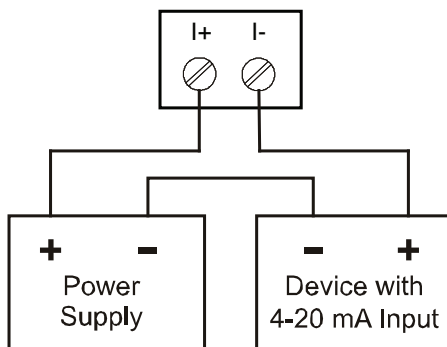


▲ *4-20 mA Input Connection without Backlight*
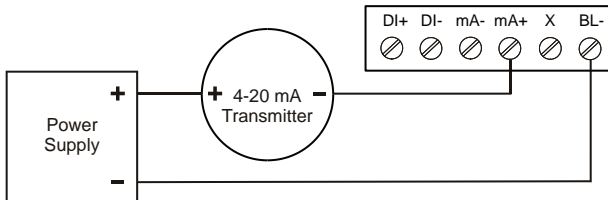


▲ *4-20 mA Input Connection with Backlight*

### 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
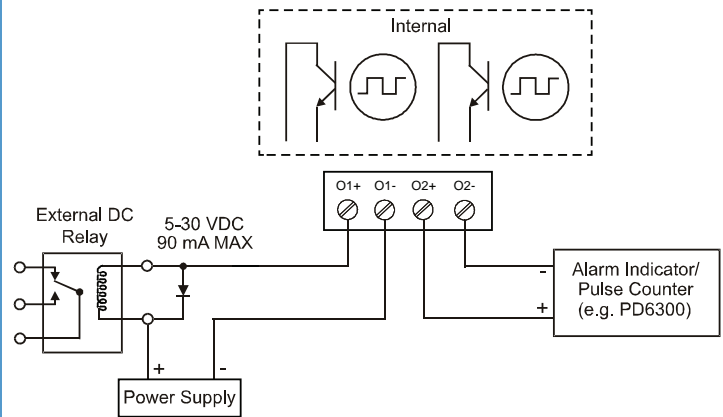


### Relay Connections

Relay connections are made to two four-terminal connectors. Each relay's C terminal is common only to the normally open (NO) contact of the corresponding relay.
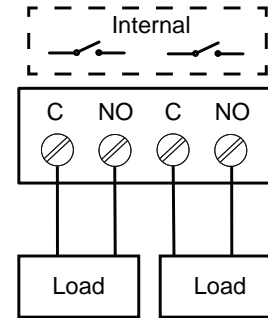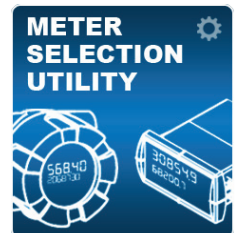


### Open Collector Outputs

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.



## Let Us Help You Select the Right
## Loop Leader For Your Application



Try our convenient meter selection utility
for all models at www.predig.com/msu

## NEMA 4 & 4X FIELD ENCLOSURES

Precision Digital offers a variety of rugged enclosures that provide a high degree of protection against harsh operating environments. Thermoplastic and stainless steel NEMA 4X, and painted steel NEMA 4X enclosures for up to 10 Loop Leader meters are available.

*Low-Cost NEMA 4X Enclosures*

*NEMA 4X Enclosures are Available in Plastic, Steel, & Stainless Steel*

See Our Complete Offering and Enclosure Selection Utility at www.predig.com/esu

**ENCLOSURE SELECTION UTILITY**

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## ORDERING INFORMATION

### Loop Leader PD6602 • Standard Decimal Models

| Model | Description |
|---|---|
| PD6602–LNN* | Loop-Powered, No Options |
| PD6602–L2N | Loop-Powered, Two Solid State Relays |
| PD6602–L3N | Loop-Powered, 4-20 mA Analog Output |
| PD6602–L5N* | Loop-Powered, Two Solid State Relays and 4-20 mA Analog Output |

Note: All models come with two open collector outputs standard.
* Quick Shipment Program product, typically ships within 2 working days.

### Loop Leader PD6603 • Feet & Inches Display Models

| Model | Description |
|---|---|
| PD6603–LNN* | Loop-Powered, No Options |
| PD6603–L2N | Loop-Powered, Two Solid State Relays |
| PD6603–L3N | Loop-Powered, 4-20 mA Analog Output |
| PD6603–L5N | Loop-Powered, Two Solid State Relays and 4-20 mA Analog Output |

Note: All models come with two open collector outputs standard.
* Quick Shipment Program product, typically ships within 2 working days.

### Loop Leader PD6604 • Standard Decimal/Bargraph Models

| Model | Description |
|---|---|
| PD6604–LNN* | Loop-Powered, No Options |
| PD6604–L2N | Loop-Powered, Two Solid State Relays |
| PD6604–L3N | Loop-Powered, 4-20 mA Analog Output |
| PD6604–L5N | Loop-Powered, Two Solid State Relays and 4-20 mA Analog Output |

Note: All models come with two open collector outputs standard.
* Quick Shipment Program product, typically ships within 2 working days.

### Your Local Distributor is:

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