

# PROVU™ PD6060 Dual Analog Input Process Meter

## Instruction Manual



**PROVU**  
SERIES



**MeterView Pro**

USB Install

- 1/8 DIN Digital Panel Meter with NEMA 4X, IP65 Front
- Dual 0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and  $\pm 10$  V Inputs with Math Functions
- Addition, Difference, Average, Multiplication, Div, Min, Max, Ratio, & More
- Dual-Line 6-Digit Display, 0.6" (15 mm) & 0.46" (12 mm)
- Isolated 24 VDC @ 200 mA Transmitter Power Supply
- Easy Field Scaling in Engineering Units without Applying an Input
- 2 or 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Options
- Free PC-Based, On-Board, MeterView Pro USB Programming Software
- No Assembly Required
- Optional SunBright Display Models for Outdoor Applications
- Operating Temperature Range: -40 to 65°C (-40 to 149°F)
- UL & C-UL Listed. E160849; 508 Industrial Control Equipment
- Input Power Options: 85-265 VAC / 90-265 VDC or 12-24 VDC / 12-24 VAC
- Display Input in Two Different Scales Simultaneously - Great for Level Applications
- Multi-Pump Alternation Control
- Round Horizontal Tank Function; Just Enter Diameter & Length
- 32-Point Linearization, Square Root Extraction and Programmable Exponent Function
- Programmable Display, Function Keys & Digital Input
- External 4-Relay, Dual 4-20 mA Outputs & Digital I/O Expansion Modules
- Password Protection
- RS-232 & RS-485 Serial Communication Options with Modbus RTU
- Wide Assortment of NEMA 4X Enclosures for up to Ten Meters
- Light / Horn & Reset Button Accessory
- Control Station Accessory for Remote Operation of PROVU
- 3-Year Warranty

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**CAUTION**

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

**WARNINGS**

- Risk of electric shock or personal injury.
- 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.

**WARNING**  
Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

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**FREE MeterView Pro Programming Software**



*The meter can be powered from the USB connection. When using the USB connection, **DO NOT** apply AC or DC power to the meter.*

The easiest and quickest way to program your PROVu meter is to use the FREE MeterView Pro programming software. This software is loaded into the meter and connects and installs directly to your PC with a USB cable. We recommend that the first thing you do after taking the meter out of the box is connect the PROVu to your PC with the provided USB cable – do not use a different cable. **DO NOT** apply AC or DC power to the meter while your PC is connected to the meter as it will disrupt the USB connection. You don't even have to apply an input signal.

MeterView Pro programming software is intuitive, and most customers can get their meter programmed as they like without even looking in the manual.

**Watch MeterView Pro Software Video at [www.prediq.com/meterviewpro](http://www.prediq.com/meterviewpro)**

In addition to programming, the software may be used for:

- Monitoring
- Datalogging using your PC
- Generating and saving programming files for later use

Once your meter is programmed the way you want it, you can wire it up for your application per the instructions in this manual and install it. If you find that you need to make adjustments to the programming after the meter is installed, you can use the front panel buttons and the instructions in this manual to do so.

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## Introduction

The ProVu PD6060 is a multipurpose, easy to use digital dual-input process meter ideal for level, flow rate, temperature transmitter, or pressure transmitter applications. Its superluminous LED digits make it easily readable in smoke, dust, fog, and, with the optional SunBright display, even direct sunlight. It accepts current and voltage signals (e.g. 4-20 mA, 0-10 V). Various math functions may be applied to the inputs including addition, difference, absolute difference, average, weighted average, multiplication, division, minimum, maximum, draw, ratio, and concentration. This is in addition to the input signal conditioning functions (linear, square root, programmable exponent, or round horizontal tank calculations).

The displays, relays, and the analog output may be assigned to input channels A or B, or math result channel C.

Three of the front panel buttons can be custom-programmed for a specific operation.

The basic model includes an isolated 24 VDC transmitter power supply that can be used to power the input transmitters or other devices. An additional isolated 24 VDC power supply is included with the 4-20 mA output option. A digital input is standard.

A fully loaded PD6060 meter has the following: four SPDT relays, 4-20 mA output, and two 24 VDC power supplies. The PD6060 capabilities may be enhanced by adding the following external expansion modules: four SPST relays –creating an eight-relay dual-input process meter, two digital I/O modules with four inputs and four outputs each, serial communication adapters for use with MeterView Pro or Modbus RTU, and a dual 4-20 mA output expansion module.

## Ordering Information

### Standard Models

| 85-265 VAC Model | 12-24 VDC Model | Options Installed         |
|------------------|-----------------|---------------------------|
| PD6060-6R0       | PD6060-7R0      | No options                |
| PD6060-6R2       | PD6060-7R2      | 2 relays                  |
| PD6060-6R3       | PD6060-7R3      | 4-20 mA output            |
| PD6060-6R4       | PD6060-7R4      | 4 relays                  |
| PD6060-6R5       | PD6060-7R5      | 2 relays & 4-20 mA output |
| PD6060-6R7       | PD6060-7R7      | 4 relays & 4-20 mA output |

### SunBright Display Models

| 85-265 VAC Model | 12-24 VDC Model | Options Installed         |
|------------------|-----------------|---------------------------|
| PD6060-6H0       | PD6060-7H0      | No options                |
| PD6060-6H2       | PD6060-7H2      | 2 relays                  |
| PD6060-6H3       | PD6060-7H3      | 4-20 mA output            |
| PD6060-6H4       | PD6060-7H4      | 4 relays                  |
| PD6060-6H5       | PD6060-7H5      | 2 relays & 4-20 mA output |
| PD6060-6H7       | PD6060-7H7      | 4 relays & 4-20 mA output |

### Accessories

| Model                     | Description                                 |
|---------------------------|---|
| <a href="#">PDA1002</a>   | DIN rail mounting kit for two devices       |
| <a href="#">PDA1004</a>   | 4 SPST (Form A) relays                      |
| <a href="#">PDA1011</a>   | Dual isolated analog output                 |
| <a href="#">PDA1044</a>   | 4 digital inputs & 4 digital outputs        |
| <a href="#">PDA1232</a>   | RS-232 serial adapter                       |
| <a href="#">PDA1485</a>   | RS-485 serial adapter                       |
| <a href="#">PDA7485-I</a> | RS-232 to RS-485 isolated converter         |
| <a href="#">PDA8008</a>   | USB Adapter                                 |
| <a href="#">PDA8232-N</a> | USB to RS-232 non-isolated converter        |
| <a href="#">PDA8485-I</a> | USB to RS-485 isolated converter            |
| <a href="#">PDA-LH</a>    | Light / horn accessory                      |
| <a href="#">MOD-LH</a>    | Light / horn / enclosure modification       |
| <a href="#">PD659</a>     | Signal isolators, splitters, & conditioners |
| <a href="#">PDA2360</a>   | Plastic control stations series             |
| <a href="#">PD9501</a>    | Multi-function calibrator                   |
| <a href="#">PD9502</a>    | Low-cost signal generator                   |
| <a href="#">PDX6901</a>   | Snubber: 0.01 µF/470 Ω, 250 VAC             |

### Enclosures

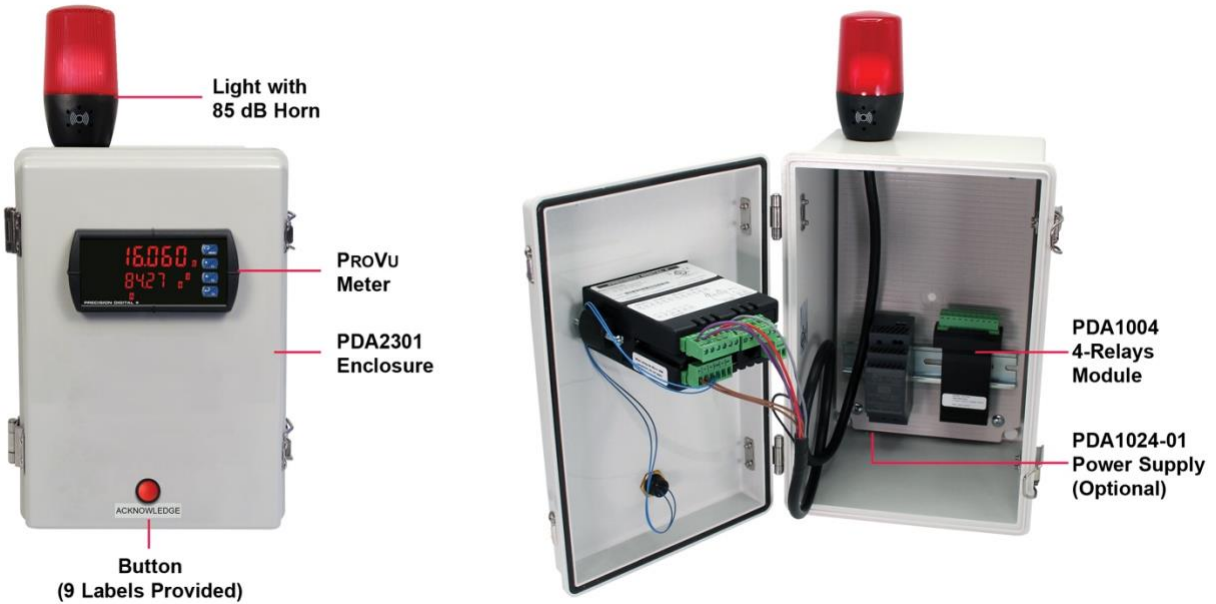
| Series                  | Meters | Material                |
|-------------------------|--------|-------------------------|
| <a href="#">PDA2300</a> | 1-10   | Plastic NEMA 4X         |
| <a href="#">PDA2500</a> | 1-6    | Plastic NEMA 4X         |
| <a href="#">PDA2600</a> | 1-6    | Stainless Steel NEMA 4X |
| <a href="#">PDA2700</a> | 1-6    | Painted Steel NEMA 4    |
| <a href="#">PDA2800</a> | 1-2    | Plastic NEMA 4X         |
| <a href="#">PDA3400</a> | 1-3    | Plastic NEMA 4X         |

**Need help selecting the right enclosure?**  
Go to [www.prediq.com/esu](http://www.prediq.com/esu)

### Replacement Option Cards

| Model                  | Options Installed         |
|------------------------|---------------------------|
| <a href="#">PD1102</a> | 2 relays                  |
| <a href="#">PD1103</a> | 4-20 mA output            |
| <a href="#">PD1104</a> | 4 relays                  |
| <a href="#">PD1105</a> | 2 relays & 4-20 mA output |
| <a href="#">PD1107</a> | 4 relays & 4-20 mA output |

Light / Horn Accessories



PROVu Meter Shown in a PDA2301 Enclosure with MOD-LHRB1 Red Light / Horn and Button. Meter & Enclosure Sold Separately. Assembly Required.

MOD-LH



PDA-LH & PDA-BUTTON



| Model                      | Description   |
|----------------------------|---|
| <a href="#">MOD-LHRB1</a>  | Red Light / Horn and Button with Holes Drilled in Enclosure <sup>(1)</sup>  |
| <a href="#">MOD-LHGB1</a>  | Green Light / Horn and Button with Holes Drilled in Enclosure <sup>(1)</sup>  |
| <a href="#">MOD-LHYB1</a>  | Yellow Light / Horn and Button with Holes Drilled in Enclosure <sup>(1)</sup>   |
| <a href="#">MOD-LHBB1</a>  | Blue Light / Horn and Button with Holes Drilled in Enclosure <sup>(1)</sup>   |
| <a href="#">MOD-LHWB1</a>  | White Light / Horn and Button with Holes Drilled in Enclosure <sup>(1)</sup>  |
| <a href="#">MOD-LH5CB1</a> | Light / Horn with User Choice of Red, Green, Yellow, Blue or White Light, Button, and Holes Drilled in Enclosure <sup>(1)</sup> |

| Model                        | Description  |
|------------------------------|--|
| <a href="#">PDA-LHR</a>      | Red Light / Horn   |
| <a href="#">PDA-LHG</a>      | Green Light / Horn   |
| <a href="#">PDA-LHY</a>      | Yellow Light / Horn  |
| <a href="#">PDA-LHB</a>      | Blue Light / Horn  |
| <a href="#">PDA-LHW</a>      | White Light / Horn   |
| <a href="#">PDA-LHW</a>      | White Light / Horn   |
| <a href="#">PDA-LH5C</a>     | Light / Horn with User Choice of Red, Green, Yellow, Blue or White Light |
| <a href="#">PDA-BUTTON1R</a> | Red Button   |
| <a href="#">PDA-BUTTON1G</a> | Green Button   |
| <a href="#">PDA-BUTTON1B</a> | Blue Button  |

Note:

- This MOD supplies the Light / Horn and Button. The enclosure comes pre-drilled with holes for Light / Horn and Button and the user performs the installation and wiring. Controller and enclosure are sold separately. The Light / Horn hole is in the back left corner of the enclosure and the Button is centered on the cover of the enclosure below the controller about an inch off the bottom of the cover except on the PDA3400 series where it is mounted on the side of the enclosure.

**PDA2360 Control Stations**



| Model                        | Description                    |
|------------------------------|--------------------------------|
| <a href="#">PDA2360-E</a>    | Emergency button               |
| <a href="#">PDA2361-A</a>    | Ack button                     |
| <a href="#">PDA2361-B</a>    | Blank button                   |
| <a href="#">PDA2361-R</a>    | Reset button                   |
| <a href="#">PDA2361-T</a>    | Tare button                    |
| <a href="#">PDA2361-S</a>    | Stop button                    |
| <a href="#">PDA2361-Q</a>    | Silence button                 |
| <a href="#">PDA2362-AR</a>   | Ack and Reset buttons          |
| <a href="#">PDA2362-BB</a>   | Two blank buttons              |
| <a href="#">PDA2364-MRUE</a> | Menu, right, up, enter buttons |

Note: Control stations with one button may be connected directly to the meter via the F4 terminal. A PDA1044 (4) digital inputs & (4) digital outputs module is required to operate the control stations of more than one button. See *Remote Operation of Meter* on page 20 for details.

**Signal Splitter & Conditioner Accessories**



| Model                         | Description   |
|-------------------------------|---|
| <a href="#">PD659-1MA-1MA</a> | Signal Isolator with One 4-20 mA Input and One 4-20 mA Output     |
| <a href="#">PD659-1MA-2MA</a> | Signal Splitter with One 4-20 mA Input and Two 4-20 mA Outputs    |
| <a href="#">PD659-1V-1MA</a>  | Signal Conditioner with One 0-10 VDC Input and One 4-20 mA Output |
| <a href="#">PD659-1MA-1V</a>  | Signal Conditioner with One 4-20 mA Input and One 0-10 VDC Output |

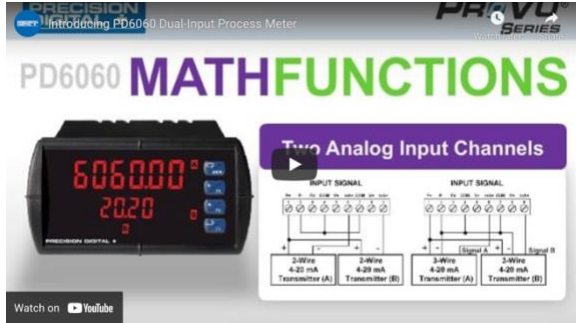


### Helpful Videos

Precision Digital's ProVu Series is a powerful line of 1/8 DIN meters that boasts advanced functionality for various applications. The following videos might be of interest.

#### Introducing PD6060 Dual-Input Process Meter

Learn about all the the dual-input display, math capabilities, and other great features.



<https://www.prediq.com/videos/fwgKilrMsbU>

#### ProVu Multi-Pump Alternation

Learn how to use the ProVu as a pump controller.



<https://www.prediq.com/videos/PumpControl>

#### ProVu Function Keys Tutorial

Learn how the ProVu's function keys increase the utility of the ProVu.



<https://www.prediq.com/videos/WMBYKlavW-Q>

#### Connect a ProVu to a PC Using MeterView Pro

Learn how easy it is to use MeterView Pro software.



[https://www.prediq.com/videos/PC\\_Connect](https://www.prediq.com/videos/PC_Connect)

#### Connect a 2-Wire 4-20 mA Transmitter to a ProVu

Learn how to connect your transmitter to a ProVu.



[https://www.prediq.com/videos/4-20\\_mA\\_Connections](https://www.prediq.com/videos/4-20_mA_Connections)

#### MeterView Pro USB Programming Software

Learn how easy it is to program a ProVu PD6000 process meter.



[https://www.prediq.com/videos/MVPro\\_SW](https://www.prediq.com/videos/MVPro_SW)

# Specifications

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

## General

|                              |  |
|------------------------------|--|
| <b>Display</b>               | Line 1: 0.60" (15 mm) high, red LEDs<br>Line 2: 0.46" (12 mm) high, red LEDs<br>6 digits each (-99999 to 999999), with lead zero blanking  |
| <b>Display Intensity</b>     | Eight user selectable intensity levels.<br>Default value is six.   |
| <b>Display Update Rate</b>   | 5/second (200 ms)  |
| <b>LED Status Indicators</b> | See <i>Front Panel Buttons and Status LED Indicators</i> on page 22 for details.   |
| <b>Overrange</b>             | Display flashes 999999   |
| <b>Underrange</b>            | Display flashes -999999  |
| <b>Display Assignment</b>    | Display Line 1:<br>Channels A (Ch-A), B (Ch-B), or C (Ch-C), toggle between (Ch-A & Ch-B, Ch-A & Ch-C, Ch-B & Ch-C, and Ch-A, Ch-B, & Ch-C), toggle between channel & units, channel gross weight, toggle net and gross weights, set points, max & min values, or Modbus input.<br>Display Line 2:<br>Same as Display Line 1; plus units, tag or turned off. |
| <b>Programming Methods</b>   | Four front panel buttons, digital inputs, PC and MeterView Pro software, or Modbus registers.  |
| <b>Noise Filter</b>          | Programmable from 2 to 199<br>(0 will disable filter)  |
| <b>Filter Bypass</b>         | Programmable from 0.1 to 99.9% of calibrated span  |
| <b>Recalibration</b>         | All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.   |
| <b>Max/Min Display</b>       | Max/min readings reached by the process are stored until reset by the user or until power to the meter is cycled.  |
| <b>Rounding</b>              | Select 1, 2, 5, 10, 20, 50, or 100<br>(e.g. rounding = 10, value = 123.45, display = 123.50).  |
| <b>Tare</b>                  | Tare function zeros out the meter to remove the weight of a container. Tare function can be assigned to a function key, F4 terminal, or a digital input. There are two tare functions: Capture Tare for channel A and B, and Reset Tare. See <i>Tare (t RrE R tRrE b)</i> on page 45 for details.  |
| <b>Reset Tare</b>            | Clears the tare function and returns the display to the value without tare (gross). Accessed via the Reset menu, function key, or digital input.   |

|                              |   |
|------------------------------|---|
| <b>Password</b>              | Three programmable passwords restrict modification of programmed settings.<br>Pass 1: Allows use of function keys and digital inputs<br>Pass 2: Allows use of function keys, digital inputs and editing set/reset points<br>Pass 3: Restricts all programming, function keys, and digital inputs. |
| <b>Non-Volatile Memory</b>   | All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.  |
| <b>Power Options</b>         | 85-265 VAC 50/60 Hz; 90-265 VDC, 20 W max; 12-24 VDC, 12-24 VAC, 15 W max.<br>Powered over USB for configuration only.  |
| <b>Fuse</b>                  | Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 meters may share one 5 A fuse  |
| <b>Normal Mode Rejection</b> | Greater than 60 dB at 50/60 Hz  |
| <b>Isolation</b>             | 4 kV input/output-to-power line<br>500 V input-to-output or output-to-P+ supply   |
| <b>Overvoltage Category</b>  | Installation Overvoltage Category II:<br>Local level with smaller transient overvoltages than Installation Overvoltage Category III.  |
| <b>Environmental</b>         | Operating temperature range:<br>-40 to 65°C (-40 to 149°F)<br>Storage temperature range:<br>-40 to 85°C (-40 to 185°F)<br>Relative humidity:<br>0 to 90% non-condensing   |
| <b>Connections</b>           | Removable screw terminal blocks accept 12 to 22 AWG wire, RJ45 for external relays, digital I/O, and serial communication adapters.   |
| <b>Enclosure</b>             | 1/8 DIN, high impact plastic, UL 94V-0, color: black  |
| <b>Front Panel</b>           | NEMA 4X, IP65   |
| <b>Mounting</b>              | 1/8 DIN panel cutout required:<br>3.622" x 1.772" (92 mm x 45 mm)<br>Two panel mounting bracket assemblies are provided.  |
| <b>Tightening Torque</b>     | Screw terminal connectors: 5 lb-in (0.56 Nm)  |
| <b>Overall Dimensions</b>    | 4.68" x 2.45" x 5.64"<br>(119 mm x 62 mm x 143 mm)<br>(W x H x D)   |
| <b>Weight</b>                | 9.5 oz. (269 g)   |
| <b>Warranty</b>              | 3 years parts & labor. See Warranty Information and Terms & Conditions on <a href="http://www.predig.com">www.predig.com</a> for complete details.  |

## Dual Process Input

|   |  |                    |             |
|---|--|--------------------|-------------|
| <b>Two Inputs</b>                                   | Two non-isolated inputs, independent, field selectable: 0-20 mA, 4-20 mA, ±10 V (0-5 V, 1-5 V, 0-10 V), Modbus PV (Slave)  |                    |             |
| <b>Isolated Transmitter Power Supply</b>            | Terminals P+ & P-: 24 VDC ±10%.<br>All models selectable for 24, 10, or 5 VDC supply (internal jumper J4). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max. 5 & 10 VDC supply rated @ 50 mA max. Refer to <i>Transmitter Supply Voltage Selection (P+, P-)</i> on page 17.<br>When the Light / Horn is powered by the transmitter power supply, see MOD-LH Light / Horn's transmitter power supply specification in MOD-LH manual for additional details. Light / Horn power not available for 5 or 10 VDC supplies. |                    |             |
| <b>Channels</b>                                     | Channel A, Channel B, Channel C (Math channel)   |                    |             |
| <b>Programmable Constants</b>                       | Constant P (Adder): -99.999 to 999.999, default: 0.000<br>Constant F (Factor): 0.001 to 999.999, default: 1.000  |                    |             |
| <b>Math Functions</b>                               | Name   | Function           | Setting     |
|   | Addition   | $(A+B+P)*F$        | 5u00        |
|   | Difference   | $(A-B+P)*F$        | d i F       |
|   | Absolute diff.   | $((Abs(A-B))+P)*F$ | d i F R b 5 |
|   | Average  | $((A+B)/2+P)*F$    | R u 0       |
|   | Multiplication   | $(A*B+P)*F$        | n r u L t i |
|   | Division   | $(A/B+P)*F$        | d i 0 d E   |
|   | Max of A or B  | $((AB-Hi)+P)*F$    | H i - R b   |
|   | Min of A or B  | $((AB-Lo)+P)*F$    | L o - R b   |
|   | Draw   | $(A/B-1)*F$        | d r R u j   |
|   | Weighted avg.  | $((B-A)*F)+A$      | u j R u 0   |
|   | Ratio  | $(A/B)*F$          | r R t i o   |
|   | Ratio 2  | $((B-A)/A+P)*F$    | r R t i o 2 |
|   | Concentration  | $A/(A+B)*F$        | C o n c E n |
|   | <i>Note: The F constant can be any value from 0.001 to 999.999. If the value is less than 1, it will have the same effect as a divider. For example, the average could also be derived by using <math>(A+B)*F</math>, where <math>F = 0.500</math>.</i>  |                    |             |
| <b>Sequence of Operations for Input Programming</b> | <ol style="list-style-type: none"> <li>1. Select Input for A and B</li> <li>2. Set up the engineering units for A, B, and C</li> <li>3. Set up decimal point for A, B, and C</li> <li>4. Program A &amp; B</li> <li>5. Set up the displays for A, B, or C</li> <li>6. Select the transfer function for A &amp; B (e.g. Linear)</li> <li>7. Select Math function for Channel C</li> <li>8. Program constants for Factor (F) and Adder (P).</li> <li>9. Program cutoff values for A and B</li> </ol>   |                    |             |
| <b>Accuracy</b>                                     | ±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span   |                    |             |
| <b>Temperature Drift</b>                            | 0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient   |                    |             |

|                                  |  |                             |
|----------------------------------|--|-----------------------------|
| <b>Input Signal Conditioning</b> | Linear, square root, programmable exponent, or round horizontal tank volume calculation  |                             |
| <b>Multi-Point Linearization</b> | 2 to 32 points for channel A and B   |                             |
| <b>Programmable Exponent</b>     | User selectable from 1.0001 to 2.9999 for open channel flow  |                             |
| <b>Low-Flow Cutoff</b>           | 0.1 to 999,999 (0 disables cutoff function). Point below at which display always shows zero.   |                             |
| <b>Decimal Point</b>             | Up to five decimal places or none: d d d d d d, d d d d d, d d d d, d d d, d d, or d d d d d d   |                             |
| <b>Calibration Range</b>         | Input Range  | Minimum Span<br>Input 1 & 2 |
|                                  | 4-20 mA  | 0.15 mA                     |
|                                  | ±10 V  | 0.10 V                      |
|                                  | An error message will appear if the input 1 and input 2 signals are too close together.  |                             |
| <b>Input Impedance</b>           | Voltage ranges: greater than 500 kΩ<br>Current ranges: 50 - 100 Ω (depending on internal resettable fuse impedance)  |                             |
| <b>Input Overload</b>            | Current input protected by an internal resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.  |                             |
| <b>HART Incompatible</b>         | <p>The meter can support ONLY one HART loop on either of the inputs. A signal isolator, such as the <a href="#">PD659</a> is required if two HART loops are being connected.</p> <p>Under the described conditions, the meter does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption. The meter is not affected if a HART communicator is connected to the loop. The meter does not display secondary HART variables.</p> |                             |

## Relays

|                                  |   |
|----------------------------------|---|
| <b>Rating</b>                    | 2 or 4 SPDT (Form C) internal and/or 4 SPST (Form A) external; rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads  |
| <b>Noise Suppression</b>         | Noise suppression is recommended for each relay contact switching inductive loads. See <i>Switching Inductive Loads</i> on page 18 for details.   |
| <b>Relay Assignment</b>          | Relays may be assigned to Ch-A, Ch-B, Ch-C, or Modbus input   |
| <b>Deadband</b>                  | 0-100% of span, user programmable   |
| <b>High or Low Alarm</b>         | User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turn off).   |
| <b>Relay Operation</b>           | <ul style="list-style-type: none"> <li>• Automatic (non-latching) and/or manual reset</li> <li>• Latching (requires manual acknowledge) with or without clear</li> <li>• Pump alternation control (2-8 relays)</li> <li>• Sampling (based on set point and time)</li> <li>• Off (disable unused relays and enable Interlock feature)</li> <li>• Manual on/off control mode</li> </ul> |
| <b>Relay Reset (Acknowledge)</b> | User selectable via front panel button, F4 terminal at back of meter, external contact closure on digital inputs, or through serial communications  |
| <b>Time Delay</b>                | 0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay   |
| <b>Fail-Safe Operation</b>       | Programmable and independent for each relay.<br><i>Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.</i>  |
| <b>Auto Initialization</b>       | When power is applied to the meter, relays will reflect the state of the input to the meter.  |
| <b>Additional Relays</b>         | An external module, model <a href="#">PDA1004</a> , is available to add 4 SPST 3 A relays to the meter.   |

## Isolated 4-20 mA Transmitter Output

| <b>Output Source</b>                     | Process channel A, B, or C, max or min for channel A, B, or highest or lowest of A and B, set points 1-8, Modbus input, or manual control mode  |              |         |         |        |      |       |                   |       |        |
|--|---|--------------|---------|---------|--------|------|-------|-------------------|-------|--------|
| <b>Scaling Range</b>                     | 1.000 to 23.000 mA for any display range  |              |         |         |        |      |       |                   |       |        |
| <b>Calibration</b>                       | Factory calibrated:<br>4.000 to 20.000 = 4-20 mA output   |              |         |         |        |      |       |                   |       |        |
| <b>Analog Out Programming</b>            | 23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break  |              |         |         |        |      |       |                   |       |        |
| <b>Accuracy</b>                          | ± 0.1% of span ± 0.004 mA   |              |         |         |        |      |       |                   |       |        |
| <b>Temperature Drift</b>                 | 0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient<br><i>Note: Analog output drift is separate from input drift.</i>   |              |         |         |        |      |       |                   |       |        |
| <b>Isolated Transmitter Power Supply</b> | Terminals I+ & R: 24 VDC ± 10%. May be used to power the 4-20 mA output or other devices.<br>All models rated @ 40 mA max.  |              |         |         |        |      |       |                   |       |        |
| <b>External Loop Power Supply</b>        | 35 VDC maximum  |              |         |         |        |      |       |                   |       |        |
| <b>Output Loop Resistance</b>            | <table border="1"> <thead> <tr> <th>Power supply</th> <th>Minimum</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>24 VDC</td> <td>10 Ω</td> <td>700 Ω</td> </tr> <tr> <td>35 VDC (external)</td> <td>100 Ω</td> <td>1200 Ω</td> </tr> </tbody> </table> | Power supply | Minimum | Maximum | 24 VDC | 10 Ω | 700 Ω | 35 VDC (external) | 100 Ω | 1200 Ω |
| Power supply                             | Minimum   | Maximum      |         |         |        |      |       |                   |       |        |
| 24 VDC                                   | 10 Ω  | 700 Ω        |         |         |        |      |       |                   |       |        |
| 35 VDC (external)                        | 100 Ω   | 1200 Ω       |         |         |        |      |       |                   |       |        |
| <b>0-10 VDC Output</b>                   | The <a href="#">PD659-1MA-1V</a> can convert the optional 4-20 mA output to a 0-10 VDC output   |              |         |         |        |      |       |                   |       |        |
| <b>Additional 4-20 mA Outputs</b>        | An external module, model <a href="#">PDA1011</a> , is available to add two 4-20 mA outputs to the meter.   |              |         |         |        |      |       |                   |       |        |

### USB Connection

|                       |   |
|-----------------------|---|
| <b>Function</b>       | Programming only  |
| <b>Compatibility</b>  | USB 2.0 Standard, Compliant   |
| <b>Connector Type</b> | Micro-B receptacle  |
| <b>Cable</b>          | USB A Male to Micro-B Cable   |
| <b>Driver</b>         | Microsoft® Windows® XP/Vista/7/8/10   |
| <b>Power</b>          | USB port provides power to the meter.<br><i><b>DO NOT</b> apply AC or DC power to the meter while the USB port is in use.</i> |

### On-Board Digital Input (F4)

|                       |  |
|-----------------------|--|
| <b>Function</b>       | Remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values. See <i>Function Keys &amp; Digital I/O Available Settings</i> on page 44 for a complete list of capabilities. |
| <b>Contacts</b>       | 3.3 VDC on contact. Connect normally open contacts across F4 to COM  |
| <b>Logic Levels</b>   | Logic High: 3 to 5 VDC<br>Logic Low: 0 to 1.25 VDC   |
| <b>Additional I/O</b> | Up to 2 external modules, model <a href="#">PDA1044</a> with 4 digital inputs and 4 digital outputs each can be added.   |

### Modbus® RTU Serial Communications

|                             |  |
|-----------------------------|--|
| <b>Slave Id</b>             | 1 – 247 (Meter address)                  |
| <b>Baud Rate</b>            | 300 – 19,200 bps                         |
| <b>Transmit Time Delay</b>  | Programmable between 0 and 199 ms        |
| <b>Data</b>                 | 8 bit (1 start bit, 1 or 2 stop bits)    |
| <b>Parity</b>               | Even, Odd, or None with 1 or 2 stop bits |
| <b>Byte-To-Byte Timeout</b> | 0.01 – 2.54 second                       |
| <b>Turn Around Delay</b>    | Less than 2 ms (fixed)                   |

*Note: Refer to the ProVu Modbus Register Tables located at [www.prediq.com](http://www.prediq.com) for details.*

### MeterView Pro Software

|                            |  |
|----------------------------|--|
| <b>Availability</b>        | Download directly from meter or from <a href="http://www.prediq.com/download_software">www.prediq.com/download_software</a>  |
| <b>System Requirements</b> | Microsoft® Windows® XP/Vista/7/8/10  |
| <b>Communications</b>      | USB 2.0 (for programming only) (Standard USB A to Micro USB B)<br>RS-232 adapter, RS-485 adapter and RS-485 to USB converter (programming, monitoring, and data logging) |
| <b>Configuration</b>       | Configure meters one at a time   |
| <b>Power</b>               | USB port provides power to the meter.<br><i><b>DO NOT</b> apply AC or DC power to the meter while the USB port is in use.</i>  |

## Compliance Information

### Safety

|                              |  |
|------------------------------|--|
| <b>UL &amp; c-UL Listed</b>  | USA & Canada<br>UL 508 Industrial Control Equipment                            |
| <b>UL File Number</b>        | E160849  |
| <b>Front Panel</b>           | UL Type 4X, NEMA 4X, IP65; panel gasket provided                               |
| <b>Low Voltage Directive</b> | EN 61010-1<br>Safety requirements for measurement, control, and laboratory use |

### Electromagnetic Compatibility

|                                |  |
|--------------------------------|--|
| <b>Emissions</b>               | EN 55022<br>Class A ITE emissions requirements   |
| Radiated Emissions             | Class A  |
| AC Mains Conducted Emissions   | Class A  |
| <b>Immunity</b>                | EN 61326-1<br>Measurement, control, and laboratory equipment<br>EN 61000-6-2<br>EMC heavy industrial generic immunity standard |
| RFI - Amplitude Modulated      | 80 -1000 MHz 10 V/m 80% AM (1 kHz)<br>1.4 - 2.0 GHz 3 V/m 80% AM (1 kHz)<br>2.0 - 2.7 GHz 1 V/m 80% AM (1 kHz)                 |
| Electrical Fast Transients     | ±2kV AC mains, ±1kV other  |
| Electrostatic Discharge        | ±4kV contact, ±8kV air   |
| RFI - Conducted                | 10V, 0.15-80 MHz, 1kHz 80% AM  |
| AC Surge                       | ±2kV Common, ±1kV Differential   |
| Surge                          | 1KV (CM)   |
| Power-Frequency Magnetic Field | 30 A/m 70%V for 0.5 period   |
| Voltage Dips                   | 40%V for 5 & 50 periods<br>70%V for 25 periods   |
| Voltage Interruptions          | <5%V for 250 periods   |

**Note:**

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

## EU Declaration of Conformity

EU Declaration of Conformity is available in the Documentation CD provided with the product under the EU DoC menu.

## Safety Information

### CAUTION

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

### WARNINGS

- Risk of electric shock or personal injury.
- Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

## 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.

Instructions are provided for changing the transmitter power supply to output 5 or 10 VDC instead of 24 VDC. See *Figure 5. Transmitter Supply Voltage Selection* on page 17.

## 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. 1/8 DIN Panel Cutout Dimensions below for more details.
- Clearance: allow at least 6.0" (152 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.

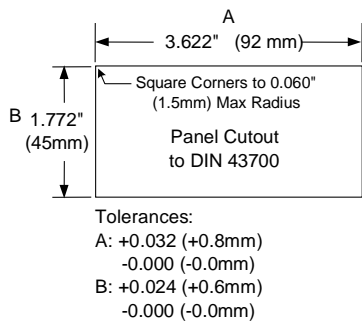
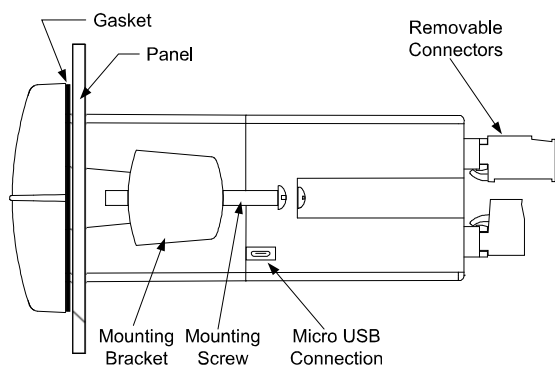


Figure 1. 1/8 DIN Panel Cutout Dimensions



**DO NOT** apply AC or DC power to the meter when using the USB connection.

Figure 2. Panel Mounting Details

### Mounting Dimensions

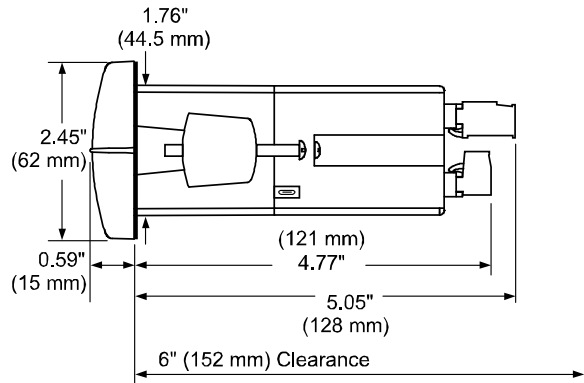


Figure 3. Meter Dimensions - Side View

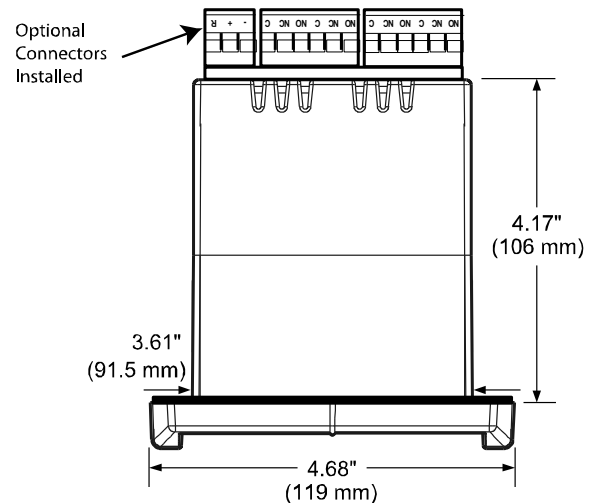


Figure 4. Meter Dimensions - Top View



Download free 3-D CAD files of these instruments to simplify your drawings!

[predig.com/documentation-cad](http://predig.com/documentation-cad)

## Installation Overview

We recommend the following sequence for getting the meter into service:

1. **DO NOT** apply AC or DC power to the meter.
2. Connect the meter to the PC with the USB cable provided. **DO NOT** use a different USB cable.
3. If MeterView Pro (MVPro) is already installed in your computer, then the program will launch automatically in most systems. If the program does not start automatically, double-click on the MVPro icon.
4. If MVPro is not installed, follow the instructions provided below.
5. Use MVPro to configure the meter for your application.
6. Disconnect the USB cable from the meter.
7. Apply power and signal and check operation of the meter.
8. Install the meter and put into service.
9. Make any programming adjustments using the front panel buttons.

## MeterView Pro Software

The easiest and quickest way to program your PROVu meter is to use the FREE MeterView Pro programming software. This software is loaded into the meter and connects and installs directly to your PC with the USB cable provided. **DO NOT** use a different USB cable. We recommend that the first thing you do after taking the meter out of the box is connect the PROVu to your PC with the provided USB cable. **DO NOT** apply AC or DC power to the meter while your PC is connected to the meter as it will disrupt the USB connection. It is not necessary to apply an input signal.

MeterView Pro programming software is intuitive, and most customers can get their meter programmed as they like without even looking in the manual.

Watch Meterview Pro Software Video at [www.prediq.com/meterviewpro](http://www.prediq.com/meterviewpro)

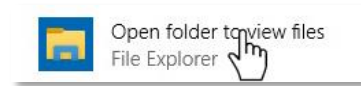
## MeterView Pro Installation

1. Connect one end of the provided USB cable to the meter and the other end to the computer. The computer will automatically install the driver software it needs to talk to the meter. Follow the on-screen instructions and allow sufficient time for the process to complete. This can take a few minutes. If the process is interrupted, then it could leave the system in an unstable condition.

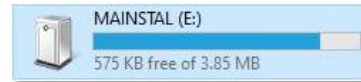
### ⚠ WARNINGS

- Only one meter may be connected at a time. Attaching multiple meters will cause a conflict with the meter software.
- **DO NOT** apply AC or DC power to the meter when using the USB connection.

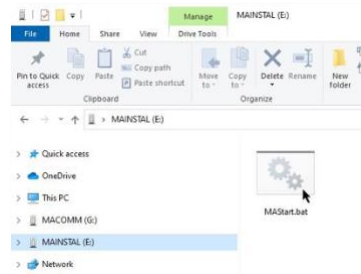
2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."



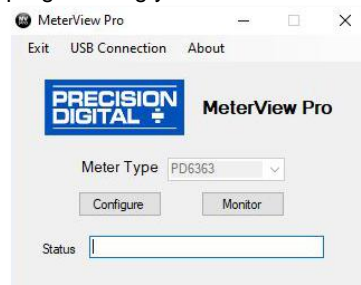
If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."



3. Double-click on the file named "MAStart." The program will open a few windows and install two programs on your computer. Simply follow the on-screen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."



4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your meter.



**Note:** If you decide to update your MeterView Pro software, once the installation has completed, you will be asked if you want to update the setup files located on the meter itself. This way, you will always have the most current version on the meter for future installs.

### ⚠ WARNING

- **DO NOT** unplug the meter while the new installation files are being written to it. The meter will display  $\text{E} \text{ } \text{E}$  during the process and you will receive an on-screen notification once the process is complete.



## Transmitter Supply Voltage Selection (P+, P-)

All meters, including models equipped with the 12-24 VDC power option, are shipped from the factory configured to provide 24 VDC power for the transmitter or sensor.

If the transmitter requires 5 or 10 VDC excitation, the internal jumper J4 must be configured accordingly.

To access the voltage selection jumper:

1. Remove all the wiring connectors.
2. Unscrew the back cover.
3. Slide out the back cover by about 1 inch.
4. Configure the J4 jumper, located behind the input signal connector, for the desired excitation voltage as shown.

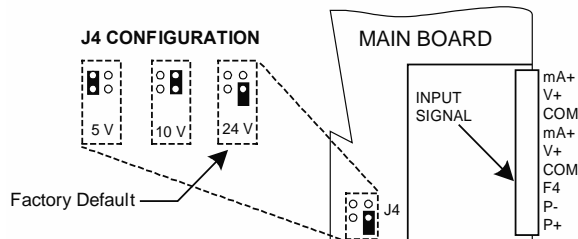


Figure 5. Transmitter Supply Voltage Selection

## Connections

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

### CAUTION

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

## Connectors Labeling

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

Note: ## on the following figures refers to power and display options. (Example: PD6060-6H5)

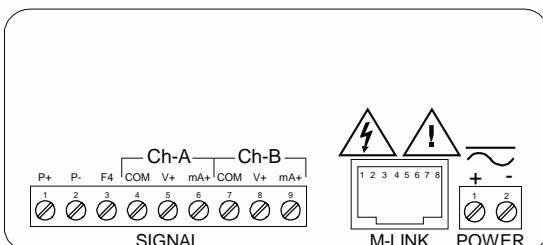


Figure 6. PD6060-##0 Connectors Label

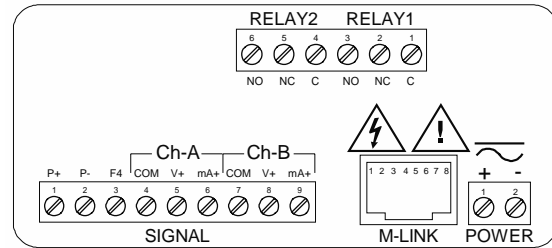


Figure 7. PD6060-##2 Connectors Label

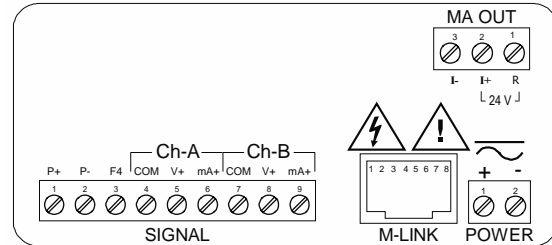


Figure 8. PD6060-##3 Connectors Label

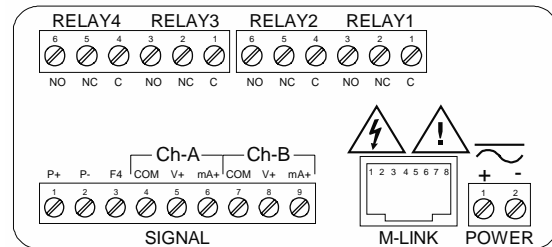


Figure 9. PD6060-##4 Connectors Label

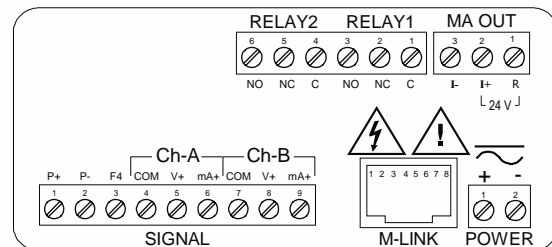


Figure 10. PD6060-##5 Connectors Label

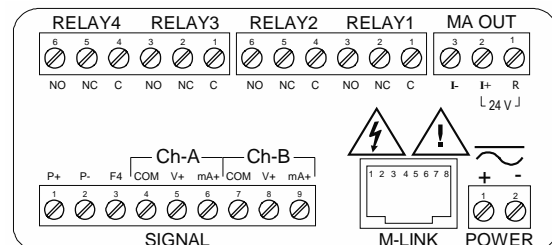


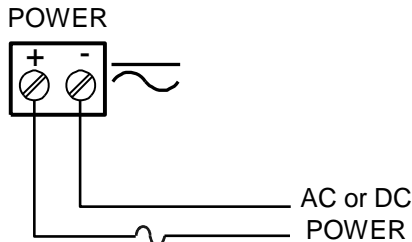
Figure 11. PD6060-##7 Connectors Label

### WARNING

- **DO NOT** connect any equipment other than Precision Digital's expansion modules, cables, or meters to the RJ45 M LINK connector. Otherwise damage will occur to the equipment and the meter.

### Power Connections

Power connections are made to a two-terminal connector labeled POWER. The meter will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention. There are separate models for low voltage and high voltage power. See *Ordering Information* on page 6 for details.



Required External Fuse:  
5 A max, 250 V Slow Blow

Figure 12. Power Connections

### Signal Connections

Signal connections are made to a nine-terminal connector labeled SIGNAL. The COM (common) terminals are the return for the 4-20 mA and the ±10 V input signals. The two COM terminals connect to the same common return, and are not isolated.

#### Current (mA) Connections

The following figures show examples of current connections. There are no switches or jumpers to set up for current inputs. Setup and programming is performed through the front panel buttons or MeterView Pro software.

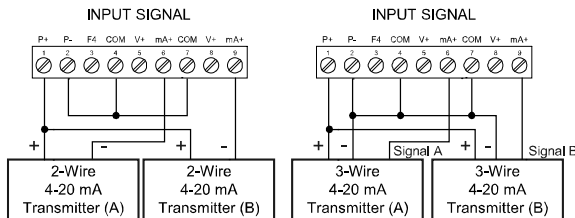


Figure 13. Transmitters Powered by Internal Supply

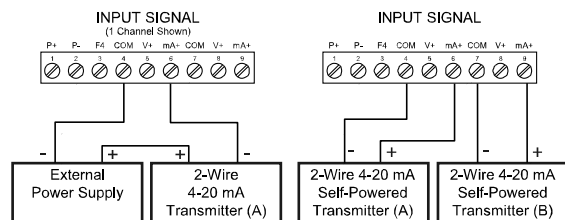


Figure 14. Transmitter Powered by Ext. Supply or Self-Powered

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

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

### Voltage (V) Connections

The following figures show examples of voltage connections.

There are no switches or jumpers to set up for voltage inputs. Setup and programming is performed through the front panel buttons or MeterView Pro software.

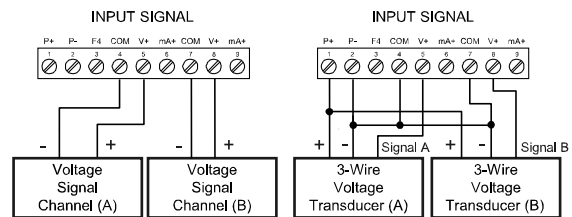


Figure 15. Voltage Input Connections

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

### Modbus RTU Serial Communications

Serial communications connection is made to an RJ45 connector labeled M-LINK. For interfacing to the PROVU, use the PDA1232 for RS-232 or the PDA1485 for RS-485. The same port is used for interfacing with all expansion modules (e.g. external relays, digital I/O).

### Relay Connections

Relay connections are made to two six-terminal connectors labeled RELAY1 – RELAY4. Each relay's C terminal is common only to the normally open (NO) and normally closed (NC) contacts of the corresponding relay. The relays' C terminals should not be confused with the COM (common) terminal of the INPUT SIGNAL connector.

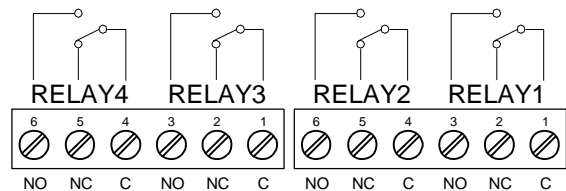


Figure 16. Relay Connections

### Switching Inductive Loads

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

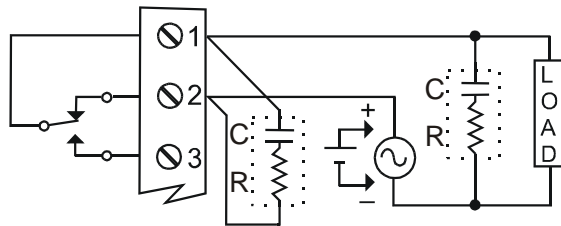


Figure 17. AC and DC Loads Protection

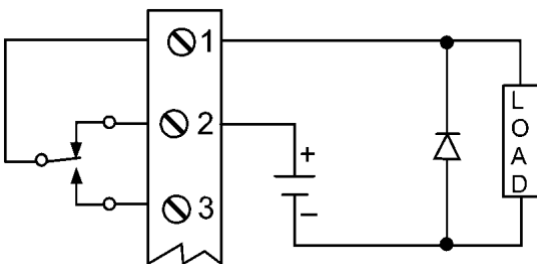
Choose R and C as follows:

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

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

Notes:

1. Use capacitors rated for 250 VAC.
2. RC networks may affect load release time of solenoid loads. Check to confirm proper operation.
3. Install the RC network at the meter's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.



Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 18. Low Voltage DC Loads Protection

### RC Networks (Snubbers) Available from Precision Digital

RC networks are available from Precision Digital and should be applied to each relay contact switching an inductive load. Part number: [PDX6901](#).

Note: Relays are de-rated to 1/14th HP (50 watts) with an inductive load.

### F4 Digital Input Connections

A digital input, F4, is standard on the meter. This digital input should be connected with a normally open contact across F4 and COM, or with an active low signal applied to F4. It can be used for remote operation of front-panel buttons, to acknowledge/reset relays, or to reset max/min values. See *Function Keys & Digital I/O Available Settings* on page 44 for a complete list of capabilities.

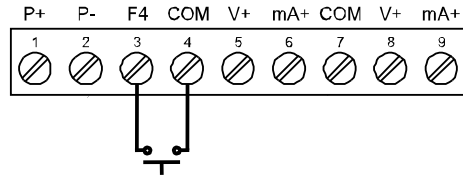


Figure 19. F4 Digital Input Connections

### 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 may be powered internally or from an external power supply.

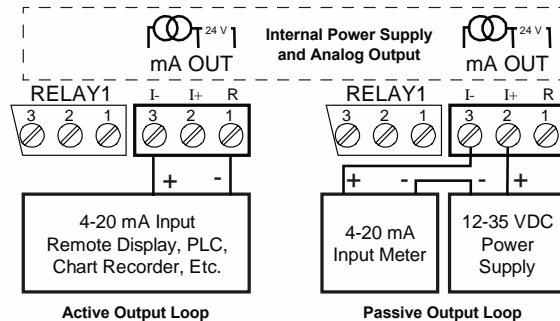


Figure 20. 4-20 mA Output Connections

### Analog Output Power Supply

The internal 24 VDC power supply powering the analog output may be used to power other devices, if the analog output is not used. The I+ terminal is the +24 V and the R terminal is the return.

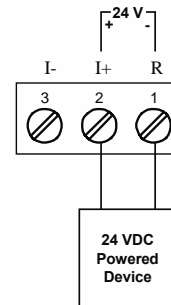


Figure 21. Analog Output Supply Powering Other Devices

### External Relay, Analog Output, & Digital I/O Connections

The relay, dual analog output, and digital I/O expansion modules PDA1004, PDA1011, and PDA1044 are connected to the meter using a CAT5 cable provided with each module. The two RJ45 connectors on the expansion modules are identical and interchangeable; they are used to connect additional modules to the system.

*Note: The jumper located between the RJ45 connectors of the PDA1044 must be removed on the second digital I/O module in order for the system to recognize it as module #2.*

**⚠ WARNING**

- **DO NOT** connect or disconnect the expansion modules with the power on! More detailed instructions are provided with each optional expansion module.



Figure 22. Expansion Module & DIN Rail Mounting Kit

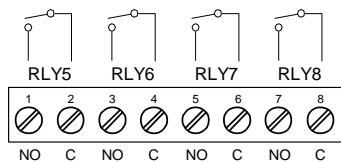


Figure 23. External Relays Module Connections

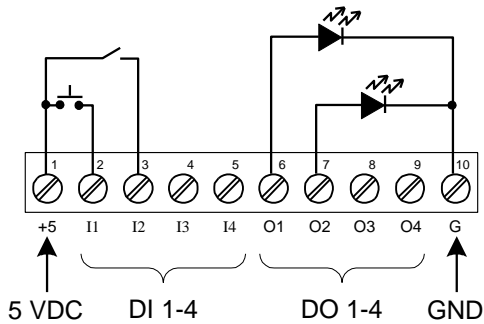


Figure 24. Digital I/O Module Connections

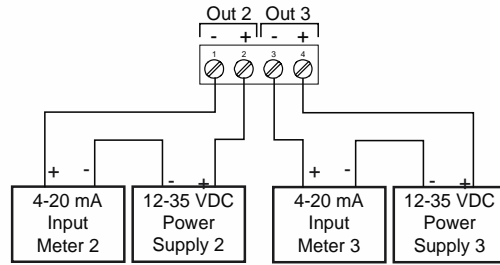


Figure 25. Dual 4-20 mA Output Module Connections

### Remote Operation of Meter

The meter can be operated via the front panel push buttons or a remote control station using the PDA1044 Digital I/O module as illustrated in Figure 26. Meter to Control Station Connection.



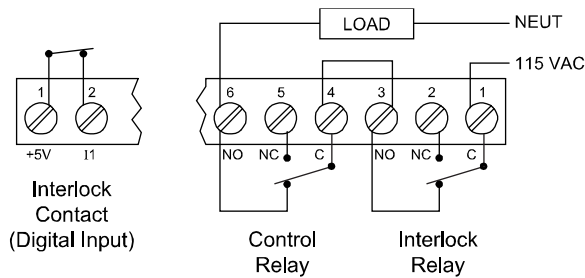
Figure 26. Meter to Control Station Connection

### Interlock Relay Feature

As the name implies, the interlock relay feature reassigns one, or more, alarm/control relays for use as interlock relay(s). Interlock contact(s) are wired to digital input(s) and activate the interlock relay. This feature is enabled by configuring the relay, and the corresponding digital input(s), see *Setting Up the Interlock Relay (Force On) Feature* on page 36.

In the example below, an Interlock Contact switch is connected to a digital input, which will be used to force on (energize) the Interlock Relay. The Interlock Relay and the Control Relay are connected in series with the load.

- When the Interlock Contact is closed (safe), the Interlock Relay energizes, allowing power to flow to the Control Relay; the corresponding front panel LED is on.
- When the Interlock Contact is open, the corresponding front panel LED flashes (locked out), the Interlock Relay is de-energized, preventing power from flowing to the Control Relay and the load.



**Figure 27. Interlock Connections**

## Setup and Programming

There is **no need to recalibrate** the meter when first received from the factory.

The meter is **factory calibrated** prior to shipment for milliamps and volts with calibration equipment that is certified to NIST standards.

## Overview

There are no jumpers to set for the meter input selection.

Setup and programming is done using MeterView Pro or through the front panel buttons.

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

## Front Panel Buttons and Status LED Indicators



| Button Symbol | Description    |
|---------------|----------------|
|               | Menu           |
|               | Right arrow/F1 |
|               | Up arrow/F2    |
|               | Enter/F3       |

| LED     | State    | Indication  |
|---------|----------|---|
| 1-8     | Steady   | Alarm condition based on set and reset points, independent of relay status in certain configurations. (Available on all meter configurations, including those without relays installed) |
| 1-8     | Flashing | Relay interlock switch open   |
| 1-8 & M | Flashing | Relay in manual control mode  |
| T       | Flashing | Meter in Tare mode  |
| M       | Flashing | Analog output in manual control mode  |
| A       | Steady   | Channel A displayed   |
| B       | Steady   | Channel B displayed   |
| C       | Steady   | Channel C displayed   |

- Press the Menu button to enter or exit the Programming Mode at any time.
- Press the Right arrow button to move to the next digit during digit or decimal point programming.
- Press or hold the Up arrow button to scroll through the menus, decimal point, or to increment the value of a digit.
- Press the Enter button to access a menu or to accept a setting.
- Press and hold the Menu button for three seconds to access the advanced features of the meter.

## Display Functions & Messages

The following table shows the main menu functions and messages in the order they appear in the menu.

| Display Functions & Messages |                   |   |
|------------------------------|-------------------|---|
| Display                      | Parameter         | Action/Setting Description  |
| SETUP                        | Setup             | Enter Setup menu  |
| INPUT                        | Input             | Enter Input selection menu  |
| Ch-A                         | Input             | Set input type for channel A (*or B)                                |
| mA                           | 4-20 mA           | Set meter for 4-20 mA input   |
| VOLT                         | 0-10 VDC          | Set meter for ±10 VDC input   |
| UNIT                         | Unit              | Select the display units/tags                                       |
| Ch-A                         | Unit              | Set unit or tag for channel A (*or B or C)                          |
| DEC Pt                       | Decimal point     | Set decimal point   |
| Ch-A                         | Decimal point     | Set decimal point for channel A (*or B or C)                        |
| PROG                         | Program           | Enter the Program menu  |
| INCAL                        | Input calibration | Enter the Input Calibration menu                                    |
| Ch-A                         | Input A           | Set input type for channel A (*or B)                                |
| SCALE A                      | Scale A           | Enter the Scale menu for channel A                                  |
| SCALE B                      | Scale B           | Enter the Scale menu for channel B                                  |
| CAL A                        | Calibrate A       | Enter the Calibration menu for channel A                            |
| CAL B                        | Calibrate B       | Enter the Calibration menu for channel B                            |
| INP 1                        | Input 1           | Calibrate input 1 signal or program input 1 value                   |
| DIS 1                        | Display 1         | Program display 1 value   |
| INP 2                        | Input 2           | Calibrate input 2 signal or program input 2 value (up to 32 points) |
| DIS 2                        | Display 2         | Program display 2 value (up to 32 points)                           |
| Error                        | Error             | Error, calibration not successful, check signal or programmed value |
| DISPLAY                      | Display           | Enter the Display menu  |
| LINE 1                       | Line 1            | Assign line 1 parameter   |
| LINE 2                       | Line 2            | Assign line 2 parameter   |
| Ch-A                         | Display Ch-A      | Assign display to channel A   |
| Ch-B                         | Display Ch-B      | Assign display to channel B   |
| Ch-C                         | Display Ch-C      | Assign display to channel C (math)                                  |
| AB                           | Display AB        | Alternate display of channel A & B                                  |
| AC                           | Display AC        | Alternate display of channel A & C                                  |
| BC                           | Display BC        | Alternate display of channel B & C                                  |

| Display Functions & Messages |                          |   |
|------------------------------|--------------------------|---|
| Display                      | Parameter                | Action/Setting Description                                    |
| ABC                          | Display ABC              | Alternate display of channel A, B, & C                        |
| REL 1                        | Display set 1*           | Displays relay 1(*through 8) set point.                       |
| Hi-A                         | Display high A           | Display high value of channel A                               |
| Lo-A                         | Display low A            | Display low value of channel A                                |
| Hi/Lo-A                      | Display hi/low A         | Alternate between high/low value of channel A                 |
| Hi-B                         | Display high B           | Display high value of channel B                               |
| Lo-B                         | Display low B            | Display low value of channel B                                |
| Hi/Lo-B                      | Display high/low B       | Alternate between high/low value of channel B                 |
| Hi-C                         | Display high C           | Display high value of channel C                               |
| Lo-C                         | Display low C            | Display low value of channel C                                |
| Hi/Lo-C                      | Display high/low C       | Alternate between high/low value of channel C                 |
| A-U                          | Display A and units/tags | Alternate display of channel A and the unit/tag               |
| B-U                          | Display B and units/tags | Alternate display of channel B and the unit/tag               |
| C-U                          | Display C and units/tags | Alternate display of channel C and the unit/tag               |
| A Gross                      | Display A gross          | Display input channel A gross (no tare)                       |
| A Net and Gross              | Display A net and gross  | Alternate display of channel A net (tare) and gross (no tare) |
| B Gross                      | Display B gross          | Display input channel B gross (no tare)                       |
| B Net and Gross              | Display B net and gross  | Alternate display of channel B net (tare) and gross (no tare) |
| MODBUS                       | Display Modbus           | Display Modbus input register                                 |
| OFF                          | Display off              | Display blank (line 2)  |
| UNIT                         | Display unit             | Display line 1 channel units                                  |
| INTEN                        | Display intensity        | Set display intensity level from 1 to 8                       |
| RELAY                        | Relay                    | Enter the Relay menu  |
| ASSIGN                       | Assignment               | Assign relays to channels or Modbus                           |
| ASSIGN 1                     | Assign 1                 | Relay 1 assignment  |
| Ch-A                         | Channel A*               | Assign relay to channel A (*or B or C)                        |
| MODBUS                       | Modbus                   | Assign relay to Modbus register                               |
| RELAY 1                      | Relay 1                  | Relay 1 setup   |
| ACTION 1                     | Action 1                 | Set relay 1 action  |

| Display Functions & Messages |                  |   |
|------------------------------|------------------|---|
| Display                      | Parameter        | Action/Setting Description  |
| RuLo                         | Automatic        | Set relay for automatic reset   |
| R-nrRn                       | Auto-manual      | Set relay for auto or manual reset any time   |
| LREtH                        | Latching         | Set relay for latching operation  |
| Lt-CLr                       | Latching-cleared | Set relay for latching operation with manual reset only after alarm condition has cleared |
| RLtErn                       | Alternate        | Set relay for pump alternation control  |
| SRnPL                        | Sample           | Set relay for sample time trigger control   |
| OFF                          | Off              | Turn relay off  |
| FRILSF                       | Fail-safe        | Enter Fail-safe menu  |
| FLS 1                        | Fail-safe 1      | Set relay 1 (*through 8) fail-safe operation  |
| on                           | On               | Enable fail-safe operation  |
| oFF                          | Off              | Disable fail-safe operation   |
| dELAY                        | Delay            | Enter relay Time Delay menu   |
| dLY 1                        | Delay 1          | Enter relay 1 time delay setup  |
| On 1                         | On 1             | Set relay 1 On time delay   |
| OFF 1                        | Off 1            | Set relay 1 Off time delay  |
| dLY 2                        | Delay 2          | Enter relays 2-8 time delay setup   |
| brERH                        | Loop break       | Set relay condition if loop break detected  |
| Ignore                       | Ignore           | Ignore loop break condition (Processed as a low signal condition)                         |
| On                           | On               | Relay goes to alarm condition when loop break detected                                    |
| OFF                          | Off              | Relay goes to non-alarm condition when loop break detected                                |
| Rout                         | Analog output    | Enter the Analog output scaling menu  |
| ROut 1                       | Aout channel     | Analog Output source channel (*1-3)   |
| d.S 1                        | Display 1        | Program display 1 value   |
| Out 1                        | Output 1         | Program output 1 value (e.g. 4.000 mA)  |
| d.S 2                        | Display 2        | Program display 2 value   |
| Out 2                        | Output 2         | Program output 2 value (e.g. 20.000 mA)   |
| rESEt                        | Reset            | Press Enter to access the Reset menu  |
| rSt H                        | Reset high       | Press Enter to reset max display  |
| rSt Lo                       | Reset low        | Press Enter to reset min display  |

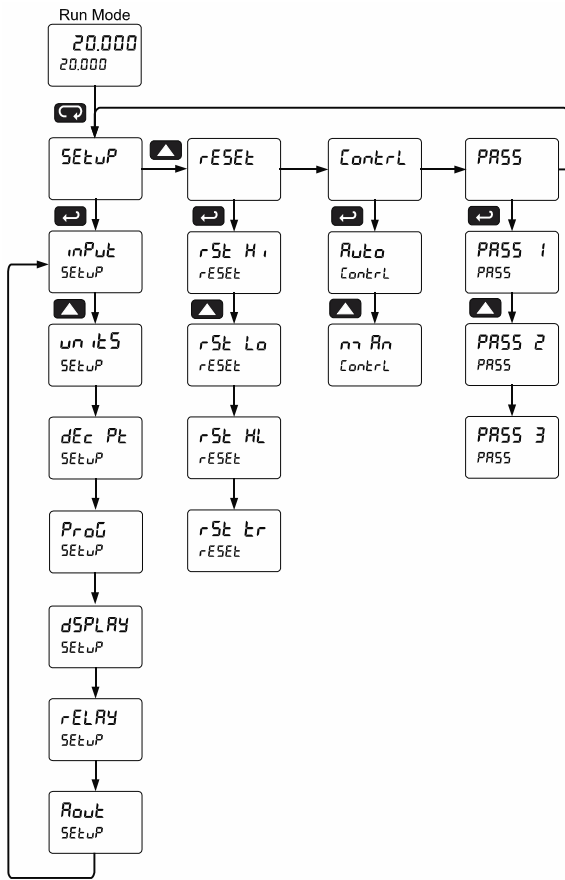
| Display Functions & Messages |                  |   |
|------------------------------|------------------|---|
| Display                      | Parameter        | Action/Setting Description  |
| rSt HL                       | Reset high & low | Press Enter to reset max & min displays                           |
| rSt tr                       | Reset tare       | Press Enter to reset (cancel) tare                                |
| Control                      | Control          | Enter Control menu  |
| RuLo                         | Automatic        | Press Enter to set meter for automatic operation                  |
| nrRn                         | Manual           | Press Enter to manually control relays or analog output operation |
| PRSS                         | Password         | Enter the Password menu   |
| PRSS 1                       | Password 1*      | Set or enter Password 1 (*through 3)                              |
| unLoc                        | Unlocked         | Program password to lock meter                                    |
| Locd                         | Locked           | Enter password to unlock meter                                    |
| 999999<br>-999999            | Flashing         | Over/under range condition  |



### Main Menu

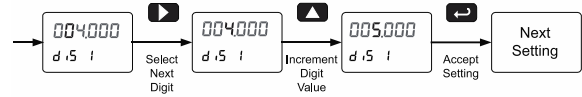
The main menu consists of the most commonly used functions: *Reset, Control, Setup, and Password.*

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



### Setting Numeric Values

The numeric values are set using the Right and Up arrow buttons. Press Right arrow to select next digit and Up arrow to increment digit value. The digit being changed is displayed brighter than the rest. Press and hold Up to auto-increment the display value. If negative numbers are allowed, the first digit position will include a negative symbol (-) after the 9. Press the Enter button, at any time, to accept a setting or Menu button to exit without saving changes.

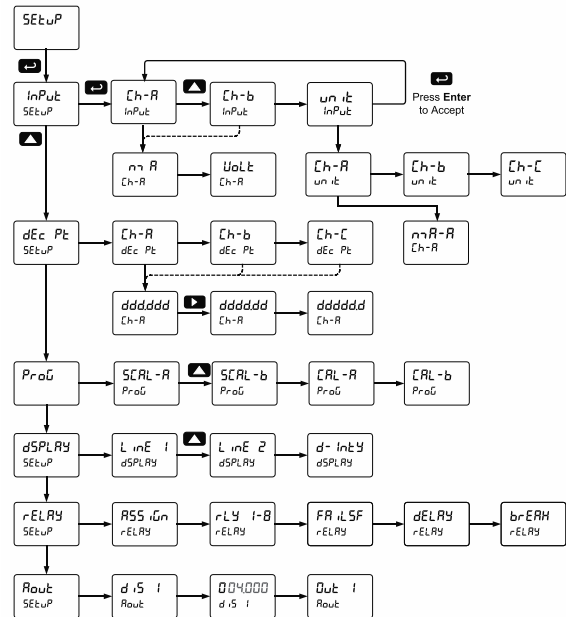


### Setting Up the Meter (SEtUP)

The *Setup* menu is used to select:

1. Input signal the meter will accept for channel A and channel B
2. Units for A, B, and C
3. Decimal point position for A, B, and C
4. Program the meter using the Scale or Calibrate functions
5. Display parameter and intensity
6. Relay assignment and operation
7. 4-20 mA analog output scaling

Press the Menu button to exit at any time.



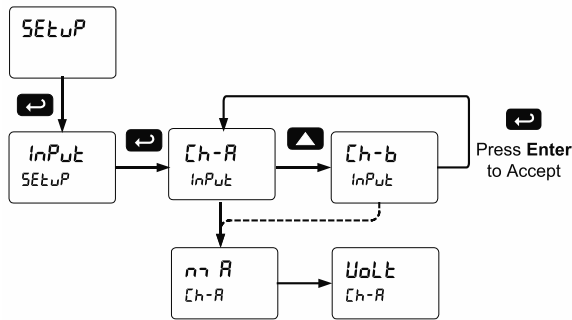
### Setting the Input Signal (Input)

Enter the *Input* menu to set up the meter to display current (mA) or voltage (VDC) inputs for channel A and channel B.

The current input is capable of accepting any signal from 0 to 20 mA. Select current input to accept 0-20 mA or 4-20 mA signals.

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

Channel C is the Math Function calculation, which is set up in the Advanced Features menu.



### Setting the Display Units or Custom Tags (Unit)

Enter the display unit or custom tag that will be displayed if alternating process input and units is selected in the unit menu, or if unit is selected as the lower display parameter. See the *Setting the Display Parameter & Intensity (DISPLAY)* flow chart on page 29 to access the display menu to show the unit or tag on display line 2. The engineering units or custom legends can be set using the following 7-segment character set:

| Display | Character |
|---------|-----------|
| 0       | 0         |
| 1       | 1         |
| 2       | 2         |
| 3       | 3         |
| 4       | 4         |
| 5       | 5         |
| 6       | 6         |
| 7       | 7         |
| 8       | 8         |
| 9       | 9         |
| A       | A         |
| b       | b         |
| C       | C         |
| c       | c         |
| d       | d         |
| E       | E         |
| F       | F         |
| G       | G         |
| g       | g         |
| H       | H         |
| h       | h         |
| l       | l         |
| i       | i         |
| J       | J         |

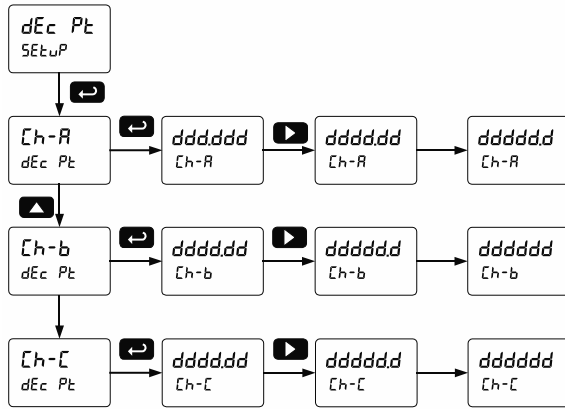
| Display   | Character |
|-----------|-----------|
| K         | K         |
| L         | L         |
| m         | m         |
| n         | n         |
| O         | O         |
| o         | o         |
| P         | P         |
| q         | q         |
| r         | r         |
| S         | S         |
| t         | t         |
| u         | u         |
| V         | V         |
| w         | w         |
| X         | X         |
| Y         | Y         |
| Z         | Z         |
| .         | .         |
| /         | /         |
| ]         | ]         |
| [         | [         |
| =         | =         |
| Degree(<) | Degree(<) |
| Space     | Space     |

Notes:

1. Degree symbol represented by (<) if programming with MeterView Pro.
2. The letters "m" and "w" use two 7-segment LEDs each; when selected the characters to the right are shifted one position.
3. Press and hold up arrow to auto-scroll the characters in the display.

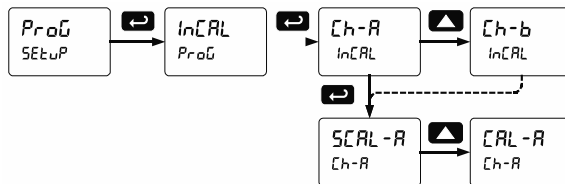
### Setting the Decimal Point (dEc Pt)

The decimal point may be set with up to five decimal places or with no decimal point at all. Pressing the Right arrow moves the decimal point one place to the right until no decimal point is displayed, and then it moves to the leftmost position. There are three decimal points to set up for three channels: Ch-A, Ch-B, and Ch-C. After the decimal points are set up, the meter moves to the *Program* menu.



### Programming the Meter (PrOg)

The meter may either be scaled (SCAL E) without applying an input or calibrated (CAL) by applying an input. The meter comes factory calibrated to NIST standards, so for initial setup, it is recommended to use the (SCAL E) function. The Program menu contains the Scale (SCAL E) and the Calibrate (CAL) menus. Process inputs may be scaled or calibrated to any display within the range of the meter. *Note: The Scale and Calibrate functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in the Advanced Menu prior to scaling and calibration of the meter. See Multi-Point Linearization (LINEAR) on page 42 for details.*



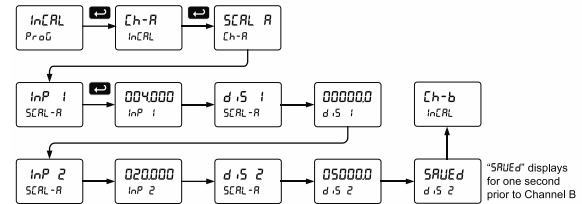
### Multi-Point Linearization (LINEAR)

The process inputs may be calibrated or scaled to any display value within the range of the meter. The meter is set up at the factory for 2-point linear calibration. Up to 32 linearization points may be selected. See *Multi-Point Linearization (LINEAR)* on page 42 for details.

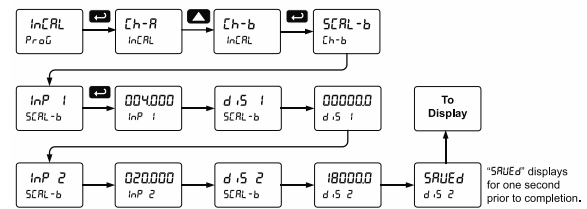
### Scaling the Meter (SCALE)

The process inputs (4-20 mA, ±10 VDC) can be scaled to display the process variables in engineering units. A signal source is not needed to scale the meter; simply program the inputs and corresponding display values.

#### Scaling the Meter for Channel A (SCALE-A)



#### Scaling the Meter for Channel B (SCALE-b)



For instructions on how to program numeric values see *Setting Numeric Values*, page 25.

### Error Message (Error)

An error message indicates that the calibration or scaling process was not successful. After the error message is displayed, the meter reverts to input 2 during calibration or scaling and to input 1 during internal calibration, allowing the appropriate input signal to be applied or programmed. The error message might be caused by any of the following conditions:

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

### Minimum Input Span

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

| Input Range | Input 1 & Input 2 Span |
|-------------|------------------------|
| 4-20 mA     | 0.15 mA                |
| ±10 VDC     | 0.10 VDC               |

### Calibrating the Meter with External Source (CAL)

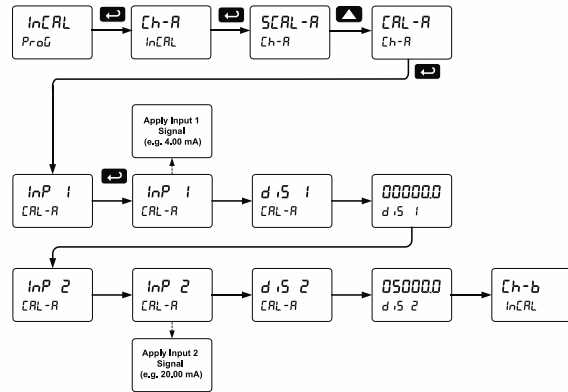
Note: To scale the meter without a signal source, refer to *Scaling the Meter (SCALE)* on page 27.

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

The use of a calibrated signal source is strongly recommended to calibrate the meter.

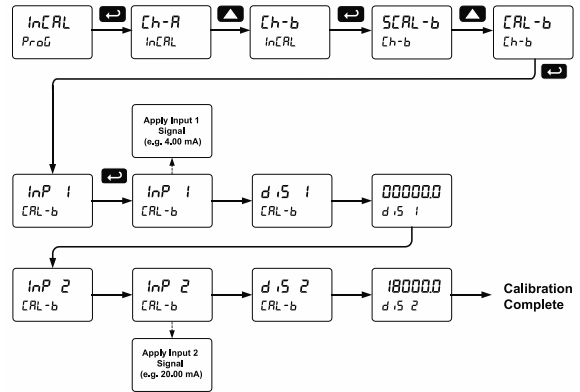
Warm up the meter for at least 15 minutes before performing calibration to ensure specified accuracy.

### Calibrating the Meter for Channel A (CAL - A)



Note: Inputs for the above example are:  
 Input 1: 4.00 mA; Display 1: 0.0 Gallons  
 Input 2: 20.00 mA; Display 2: 5000.0 Gallons

### Calibrating the Meter for Channel B (CAL - b)



Note: Inputs for the above example are:  
 Input 1: 4.00 mA; Display 1: 0.0 Gallons  
 Input 2: 20.00 mA; Display 2: 18000.0 Gallons

### Setting the Display Parameter & Intensity (dSPLeRY)

Display line 1 can be programmed to display:

1. Process value Ch-A
2. Process value Ch-B
3. Process value Ch-C
4. Toggle between Ch-A & Ch-B, Ch-A & Ch-C, Ch-B & Ch-C, and Ch-A, Ch-B, & Ch-C
5. Relay set points
6. Max & min values for each channel
7. Toggle between Channel & units
8. Channel gross value (no tare) or toggle net (tare) and gross values
9. Modbus input

Display line 2 can be programmed to display:

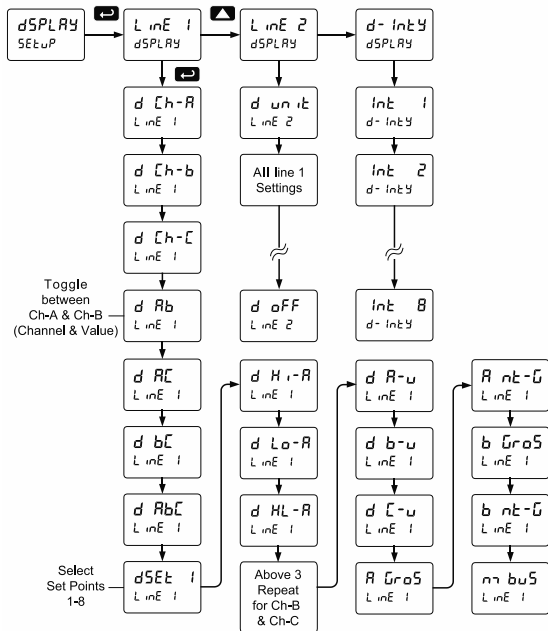
1. Process value Ch-A
2. Process value Ch-B
3. Process value Ch-C
4. Toggle between Ch-A & Ch-B, Ch-A & Ch-C, Ch-B & Ch-C, and Ch-A, Ch-B, & Ch-C
5. Relay set points
6. Max & min values for each channel
7. Toggle between Channel & units
8. Channel gross value (no tare) or toggle net (tare) and gross values
9. Modbus input
10. Off (no display)
11. Engineering units or custom legends

After setting up the input and display, press the Menu button to exit programming and skip the rest of the setup menu.

The displays can be set up to read channels A, B, or C, toggle between A & B, B & C, A & C, A & B & C, toggle between channels A, B, or C & units, the max/min of any of the channels, including the math channel (C), set points, gross (without tare) or net (with tare) & gross values of channel A or B, or the Modbus input. In addition to the parameters available on the Upper display, the Lower display can display Engineering units or it could be turned off.

### Display Intensity (d-IntY)

The meter has eight display intensity levels to give the best performance under various lighting conditions. Select intensity 8 for outdoor applications. The default intensity is 6.



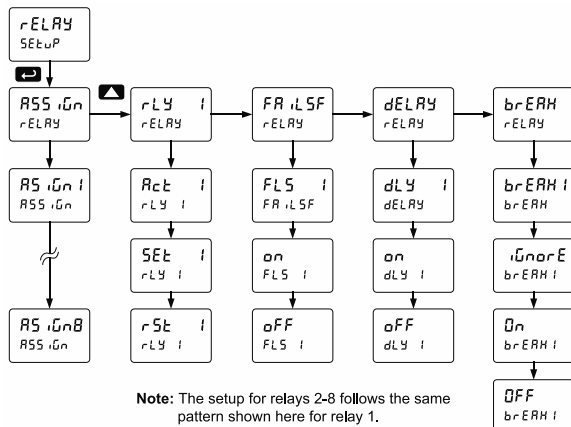
### Setting the Relay Operation (rELAY)

This menu is used to set up the assignment and operation of the relays.

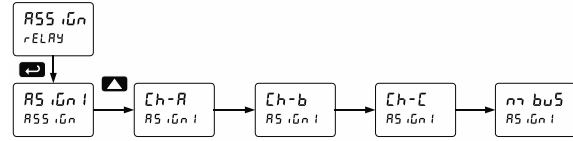
**CAUTION**

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

- Relay assignment
  - Channel A
  - Channel B
  - Channel C (Math channel)
  - Modbus
- Relay action
  - Automatic reset only (non-latching)
  - Automatic + manual reset at any time (non-latching)
  - Latching (manual reset only)
  - Latching with Clear (manual reset only after alarm condition has cleared)
  - Pump alternation control (automatic reset only)
  - Sampling (the relay is activated for a user-specified time)
  - Off (relay state controlled by Interlock feature)
- Set point
- Reset point
- Fail-safe operation
  - On (enabled)
  - Off (disabled)
- Time delay
  - On delay (0-999.9 seconds)
  - Off delay (0-999.9 seconds)
- Relay action for loss (break) of 4-20 mA input (ignore, on, off)



### Setting the Relay Assignment (ASSIGN)

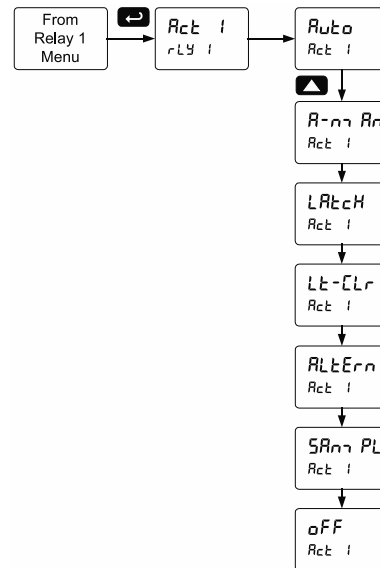


### Setting the Relay Action

Operation of the relays is programmed in the Action menu. The relays may be set up for any of the following modes of operation:

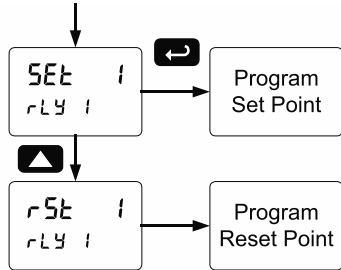
- Automatic reset (non-latching)
- Automatic + manual reset at any time (non-latching)
- Latching (manual reset only, at any time)
- Latching with Clear (manual reset only after alarm condition has cleared)
- Pump alternation control (automatic reset only)
- Sampling (the relay is activated for a user-specified time)
- Off (relay state controlled by Interlock feature)

The following graphic shows relay 1 action setup; relay 2-8 are set up in a similar fashion.



### Programming Set and Reset Points

High alarm indication: program set point above reset point.  
 Low alarm indication: program set point below reset point.  
 The deadband is determined by the difference between set and reset points. Minimum deadband is one display count. If the set and reset points are programmed with the same value, the relay will reset one count below the set point.



Note: Changes are not saved until the reset point has been accepted.

### Setting Fail-Safe Operation

In fail-safe mode of operation, the relay coil is energized when the process variable is within safe limits and the relay coil is de-energized when the alarm condition exists. The fail-safe operation is set independently for each relay. Select **on** to enable or select **off** to disable fail-safe operation.

### Programming Time Delay

The *On* and *Off* time delays may be programmed for each relay between 0 and 999.9 seconds. The relays will transfer only after the condition has been maintained for the corresponding time delay.

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

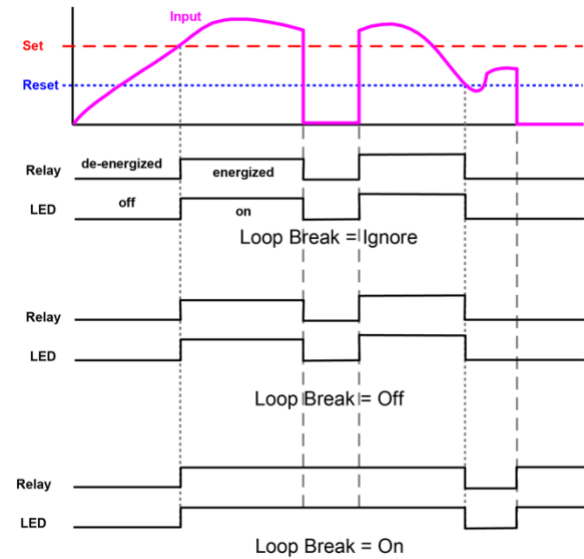
### Relay Action for Loss of 4-20 mA Input (Loop Break)

The loop break feature is associated with the 4-20 mA input. Each relay may be programmed to go to one of the following conditions when the meter detects the loss of the input signal (i.e. < 0.005 mA):

1. Turn *On* (Go to alarm condition)
2. Turn *Off* (Go to non-alarm condition)
3. Ignore (Processed as a low signal condition)

Note: This is not a true loop break condition; if the signal drops below 0.005 mA, it is interpreted as a "loop break" condition.

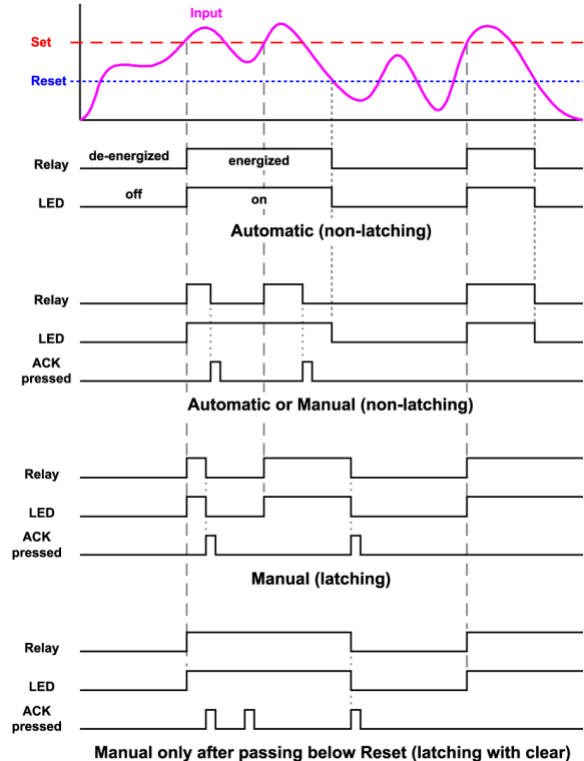
The following graph shows the loop break relay operation for a high alarm relay.



### Relay and Alarm Operation Diagrams

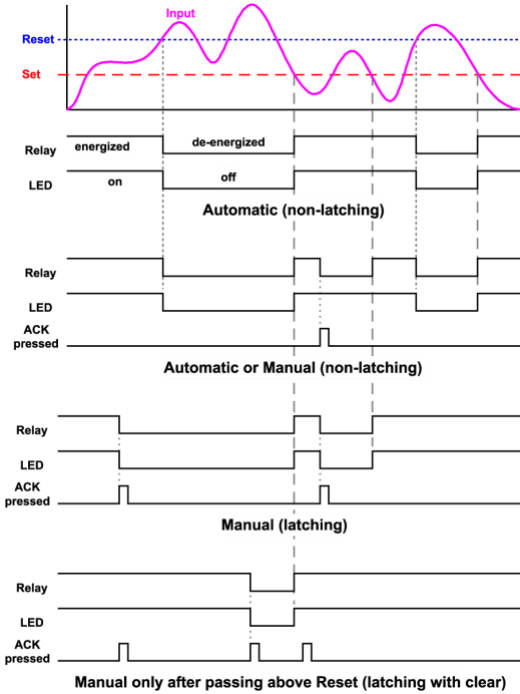
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

#### High Alarm Operation (Set > Reset)



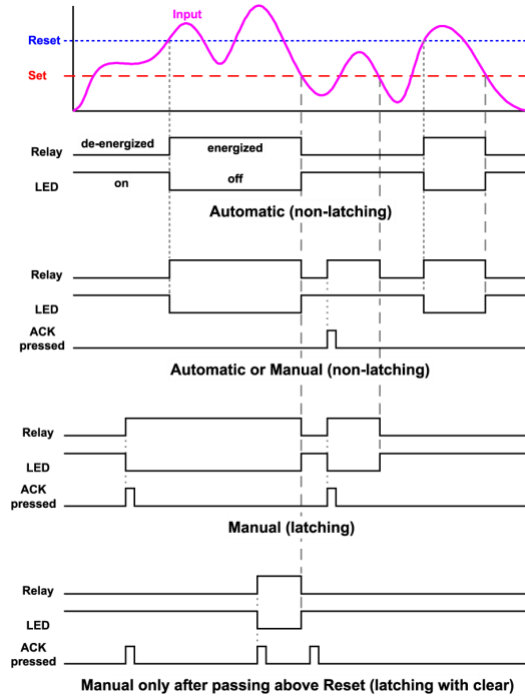
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

### Low Alarm Operation (Set < Reset)



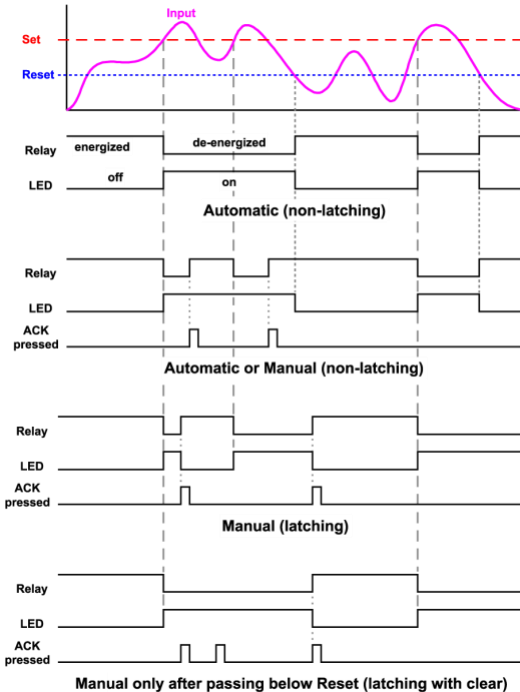
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point and then go below it.

### Low Alarm with Fail-Safe Operation (Set < Reset)



Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

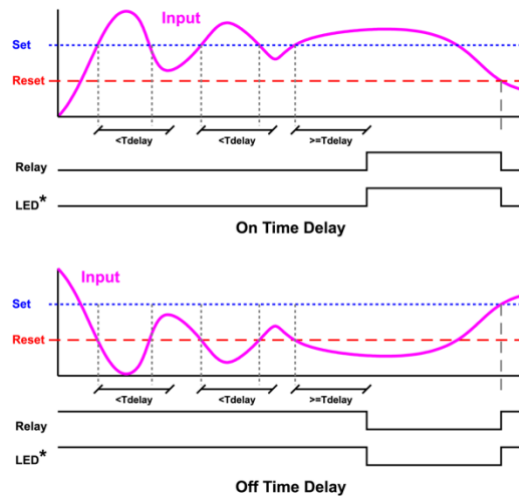
### High Alarm with Fail-Safe Operation (Set > Reset)



Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

### Time Delay Operation

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

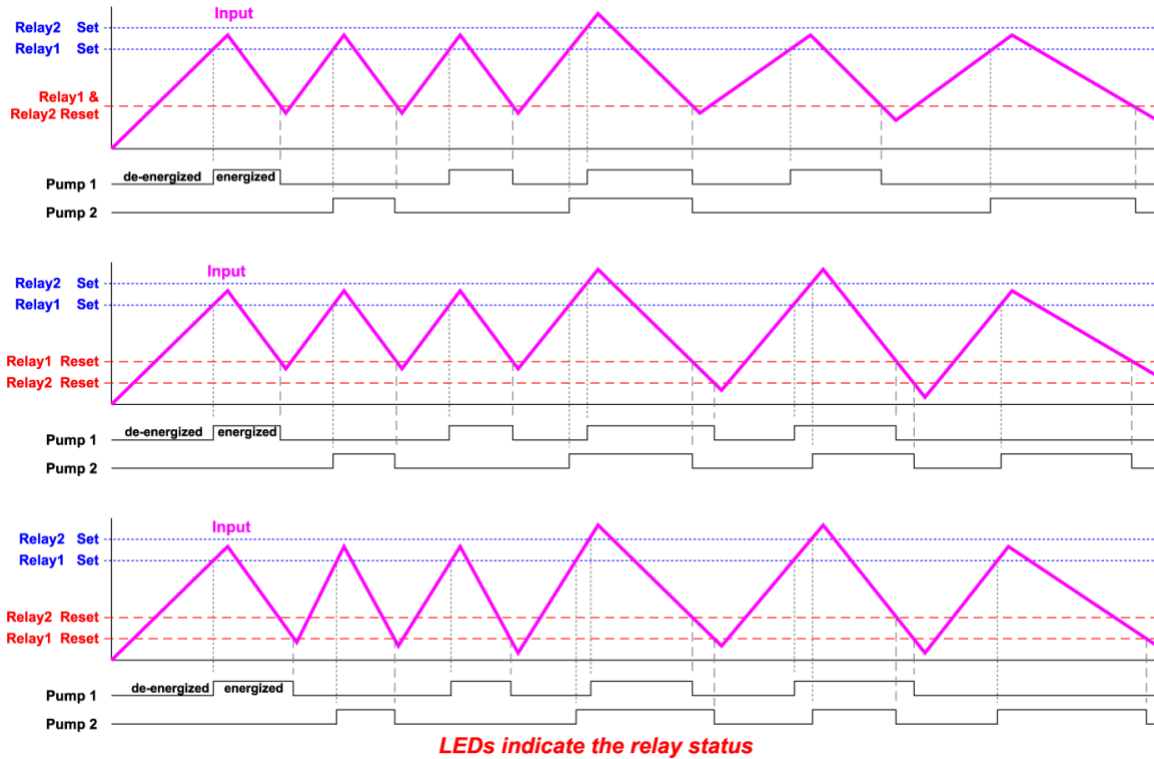


When the signal crosses the set point, the On time delay timer starts and the relay trips when the time delay has elapsed. If the signal drops below the set point (high alarm) before the time delay has elapsed, the On time delay timer resets and the relay does not change state. The same principle applies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

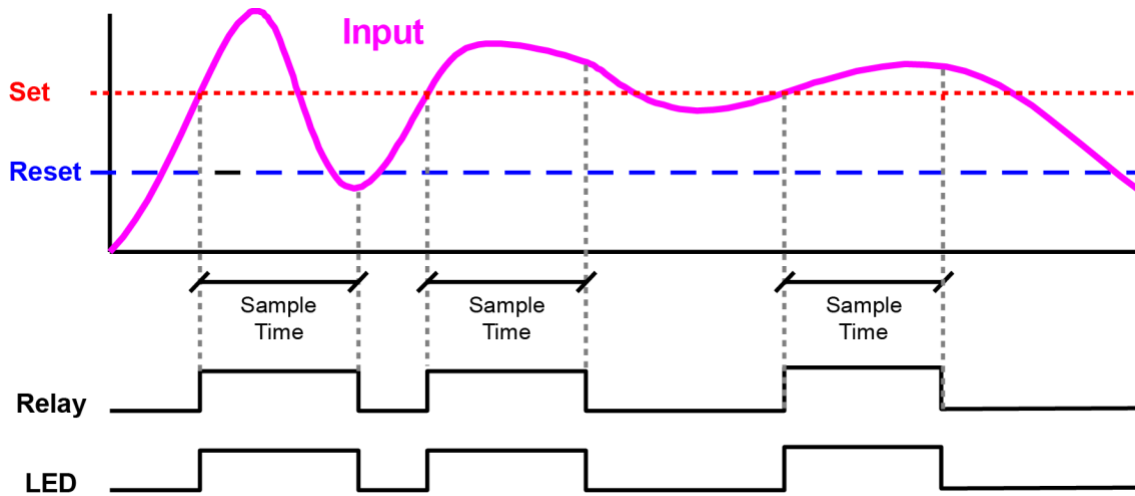
Note: If "Automatic or Manual (R-nRn)" reset mode is selected, the LED follows the reset point and not the relay state when the relay is acknowledged.



### Pump Alternation Control Operation



### Relay Sampling Operation



When the signal crosses the set point, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the set point is crossed, going up for high alarms and going down for low alarms.

The sample time can be programmed between 0.1 and 5999.9 seconds.

## Relay Operation Details

### Overview

The relay capabilities of the meter expand its usefulness beyond simple indication to provide users with alarm and control functions. These capabilities include front panel alarm status LEDs as well as either 2 or 4 optional internal relays and/or 4 external relays expansion module. Typical applications include high and low temperature, level, pressure or flow alarms, control applications such as simple on/off pump control, and pump alternation control for up to 8 pumps. There are four basic ways the relays can be used:

1. High and Low Alarms with Latching or Non-Latching Relays
2. Simple On/Off Control with 100% Adjustable Deadband
3. Sampling (Based on Time)
4. Pump Alternation Control for up to 8 Pumps

### Relays Auto Initialization

When power is applied to the meter, the front panel LEDs and alarm relays will reflect the state of the input to the meter. The following table indicates how the alarm LEDs and relays will react on power-up based on the set and reset points:

| Alarm # | HI or LO Alarm | Set Point | Reset Point | Power-Up Reading | Relay & LED |
|---------|----------------|-----------|-------------|------------------|-------------|
| 1       | HI             | 1000      | 500         | 499              | Off         |
| 2       | LO             | 700       | 900         | 499              | On          |
| 3       | LO             | 250       | 400         | 499              | Off         |
| 4       | HI             | 450       | 200         | 499              | On          |

### Fail-Safe Operation

The following table indicates how the relays behave based on the fail-safe selection for each relay:

| Fail-Safe Selection | Non-Alarm State |        | Alarm State |        | Power Failure                |
|---------------------|-----------------|--------|-------------|--------|------------------------------|
|                     | NO              | NC     | NO          | NC     |                              |
| Off                 | Open            | Closed | Closed      | Open   | Relays go to non-alarm state |
| On                  | Closed          | Open   | Open        | Closed | Relays go to alarm state     |

*Note: NO = Normally Open, NC = Normally Closed. This refers to the condition of the relay contacts when the power to the meter is off.*

## Front Panel LEDs

The alarm status LEDs on the front panel are available on all meters, even those without relays installed, and provide status indication for the following:

| LED | Status  | LED | Status  |
|-----|---------|-----|---------|
| 1   | Alarm 1 | 5   | Alarm 5 |
| 2   | Alarm 2 | 6   | Alarm 6 |
| 3   | Alarm 3 | 7   | Alarm 7 |
| 4   | Alarm 4 | 8   | Alarm 8 |

*Note: LEDs 5-8 require the external relay module PDA1004 to be connected.*

The meter is supplied with four alarm points that include front panel LEDs to indicate alarm conditions. This standard feature is particularly useful for alarm applications that require visual-only indication. The LEDs are controlled by the set and reset points programmed by the user. When the display reaches a set point for a high or low alarm, the corresponding alarm LED will turn on. When the display returns to the reset point the LED will go off. The front panel LEDs responds differently for latching and non-latching relays.

For non-latching relays, the LED is always off during normal condition and always on during alarm condition, regardless of the state of the relay (e.g. Relay acknowledged after alarm condition).

For latching relays, the alarm LEDs reflects the status of the relays, regardless of the alarm condition. The following tables illustrate how the alarm LEDs function in relation to the relays and the acknowledge button (Default: F3 key assigned to ACK).

### Latching and Non-Latching Relay Operation

The relays can be set up for latching (manual reset) or non-latching (automatic reset) operation.

| Relay terminology for following tables |                 |
|--|-----------------|
| Terminology                            | Relay Condition |
| On                                     | Alarm (Tripped) |
| Off                                    | Normal (Reset)  |
| Ack                                    | Acknowledged    |

The On and Off terminology does not refer to the status of the relay's coil, which depends on the fail-safe mode selected.

### WARNING

- In latching relay mode, if Fail-Safe is off, latched relays will reset (unlatch) when power is cycled.

### Non-Latching Relay (ᄁᄁᄁ)

In this application, the meter is set up for automatic reset (non-latching relay). Acknowledging the alarm while it is still present has no effect on either the LED or the relay. When the alarm finally goes away, the relay automatically resets and the LED also goes off.

| Automatic reset only |     |       |
|----------------------|-----|-------|
| Condition            | LED | Relay |
| Normal               | Off | Off   |
| Alarm                | On  | On    |
| Ack (No effect)      | On  | On    |
| Normal               | Off | Off   |

### Non-Latching Relay with Manual Reset (ᄁᄁᄁᄁ)

In this application, the meter is set up for automatic and manual reset at any time (non-latching relay). The LED and the relay automatically reset when the meter returns to the normal condition.

In addition, the relay can be manually reset while the alarm condition still exists, but the LED will stay on until the meter returns to the normal condition.

| Automatic + manual reset at any time |     |       |
|--------------------------------------|-----|-------|
| Condition                            | LED | Relay |
| Normal                               | Off | Off   |
| Alarm                                | On  | On    |
| Normal                               | Off | Off   |
| Next Alarm                           | On  | On    |
| Ack                                  | On  | Off   |
| Normal                               | Off | Off   |

### Latching Relay (ᄁᄁᄁᄁ)

In this application, the meter is set up for manual reset at any time. Acknowledging the alarm even if the alarm condition is still present resets the relay and turns off the LED.

| Manual reset any time |     |       |
|-----------------------|-----|-------|
| Condition             | LED | Relay |
| Normal                | Off | Off   |
| Alarm                 | On  | On    |
| Ack                   | Off | Off   |

### Latching Relay with Clear (ᄁᄁ-ᄁᄁᄁ)

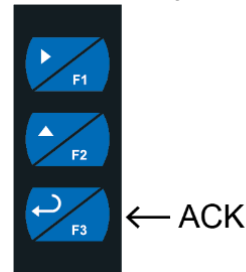
In this application, the meter is set up for manual reset only after the signal passes the reset point (alarm condition has cleared). Acknowledging the alarm while it is still present has no effect on either the LED or the relay. When the alarm is acknowledged after it returns to the normal state, the LED and the relay go off. Notice that the LED remains on, even after the meter returns to the normal condition. This is because, for latching relays, the alarm LED reflects the status of the relay, regardless of the alarm condition.

| Manual reset only after alarm condition has cleared |     |       |
|---|-----|-------|
| Condition   | LED | Relay |
| Normal  | Off | Off   |
| Alarm   | On  | On    |
| Ack (No effect)                                     | On  | On    |
| Normal  | On  | On    |
| Ack   | Off | Off   |

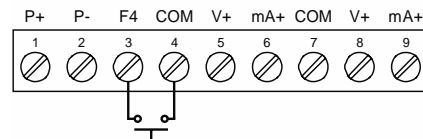
### Acknowledging Relays

There are three ways to acknowledge relays programmed for manual reset:

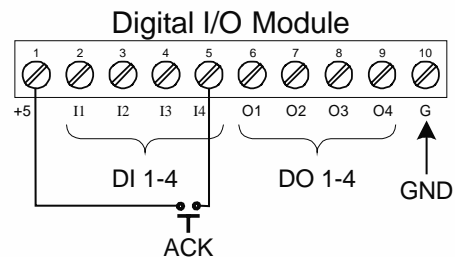
1. Via the programmable front panel function keys F1-F3 (Example: F3 assigned to ACK).



2. Remotely via a normally open push button wired to the F4 terminal at the rear of the instrument.



3. One of the digital inputs and the +5 V terminals on the digital I/O expansion module.



When the ACK button or the assigned digital input is closed, all relays programmed for manual reset are acknowledged.

### Pump Alternation Control Applications (Relay)

For pump control applications where two or more similar pumps are used to control the level of a tank or a well, it is desirable to have all the pumps operate alternately. This prevents excessive wear and overheating of one pump over the lack of use of the other pumps.

Up to 8 relays can be set up to alternate every time an on/off pump cycle is completed. The set points and reset points can be programmed, so that the first pump on is the first pump off.

#### Application #1: Pump Alternation Using Relays 1 & 2

1. Relays 1 and 2 are set up for pump alternation.
2. Relays 3 and 4 are set up for low and high alarm indication.

| Set and Reset Point Programming |           |             |                     |
|---------------------------------|-----------|-------------|---------------------|
| Relay                           | Set Point | Reset Point | Function            |
| 1                               | 30.000    | 10.000      | Controls pump #1    |
| 2                               | 35.000    | 5.000       | Controls pump #2    |
| 3                               | 4.000     | 9.000       | Controls low alarm  |
| 4                               | 40.000    | 29.000      | Controls high alarm |

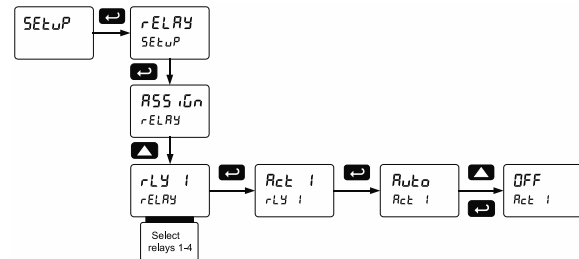
#### Pump Alternation Operation

1. Pump #1 turns on when level reaches 30.000, when level drops below 10.000 pump #1 turns off.
2. The next time level reaches 30.000, pump #2 turns on, when level drops below 10.000, pump #2 turns off.
3. If the level doesn't reach 35.000 pump #1 and pump #2 will be operating alternately.
4. If pump #1 cannot keep the level below 35.000 pump #2 will turn on at 35.000, then as the level drops to 10.000 pump #1 turns off, pump #2 is still running and shuts off below 5.000.
5. Notice that with the set and reset points of pump #2 outside the range of pump #1, the first pump on is the first pump to go off. This is true for up to 8 alternating pumps, if setup accordingly.
6. Relay #3 will go into alarm if the level drops below 4.000 and relay #4 will go into alarm if the level exceeds 40.000.
7. Adding the 4 external relays expansion module allows using the 4 SPDT internal relays for pump alternation and the 4 SPST external relays for high, high-high, low, and low-low alarm indication.

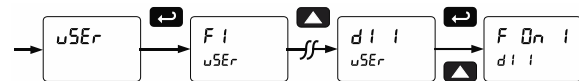
### Setting Up the Interlock Relay (Force On) Feature

Relays 1-4 can be set up as interlock relays. To set up the relays for the interlock feature:

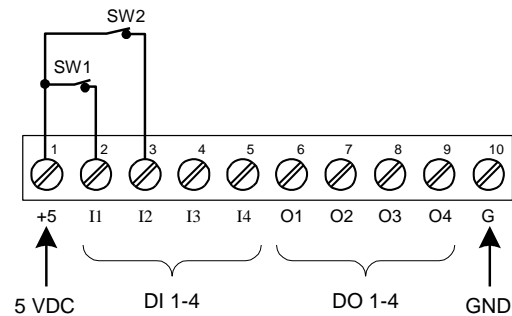
1. Access the Setup – Relay – Action menu and set the action to off.



2. In the Advanced features – User menu program any of the digital inputs to Force On any of the internal relays (1-4).



3. Connect a switch or dry contact between the +5V terminal and the corresponding digital input (dl-1 to dl-4) terminal.



#### Interlock Relay Operation Example

Relays 1 & 2 are configured to energize (their front panel LEDs are steady on) when SW1 & SW2 switches (above) are closed. If the contacts to these digital inputs are opened, the corresponding front panel LEDs flash, indicating this condition. The processes being controlled by the interlock relay will stop, and will re-start only after the interlock relay is re-activated by the digital inputs (switches).

*Note: If multiple digital inputs are assigned to the same relay, then the corresponding logic is (AND) – i.e. both switches must be closed to trip the relay.*

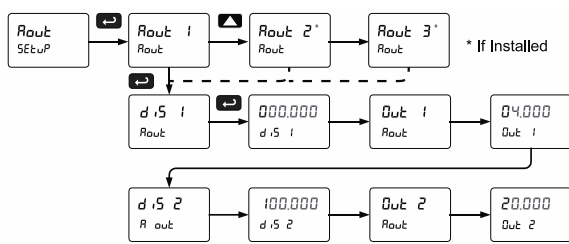
## Scaling the 4-20 mA Analog Output (Rout)

The 4-20 mA analog outputs can be scaled to provide a 4-20 mA signal for any display range selected. To select the channel and source assignments the analog outputs are assigned to, see *Analog Output Source* on page 43.

No equipment is needed to scale the analog outputs; simply program the display values to the corresponding mA output signal.

The *Analog Output* menu is used to program the 4-20 mA outputs based on display values.

For further details, see *Setting Numeric Values*, page 25, *Relay Action for Loss of 4-20 mA Input (Loop Break)*, page 31.

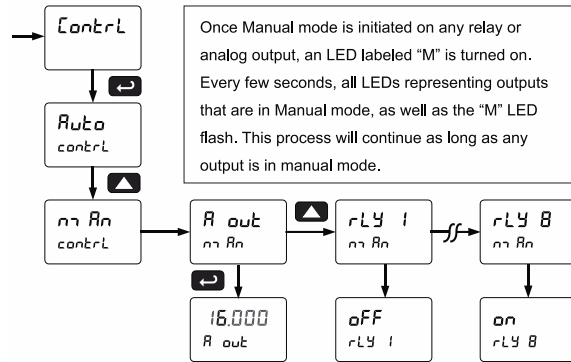


## Reset Menu (rESEt)

The *Reset* menu is used to reset the maximum or minimum reading (peak or valley) reached by the process; both may be reset at the same time by selecting “reset high & low” (rSEt HL). The tare value used to zero the display may be reset by selecting “reset tare” (rSEt tr).

## Manual Control Menu (Control)

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



## Setting Up the Password (PASS)

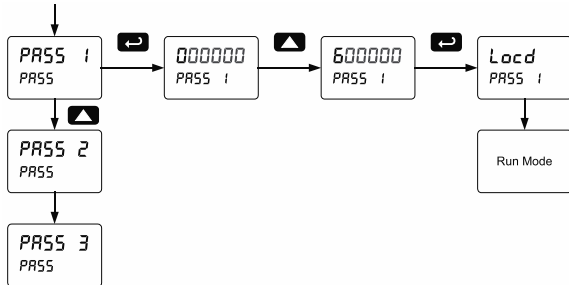
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings.

- Pass 1: Allows use of function keys and digital inputs
- Pass 2: Allows use of function keys, digital inputs and editing set/reset points
- Pass 3: Restricts all programming, function keys, and digital inputs.

### Protecting or Locking the Meter

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

For instructions on how to program numeric values see *Setting Numeric Values*, page 25.

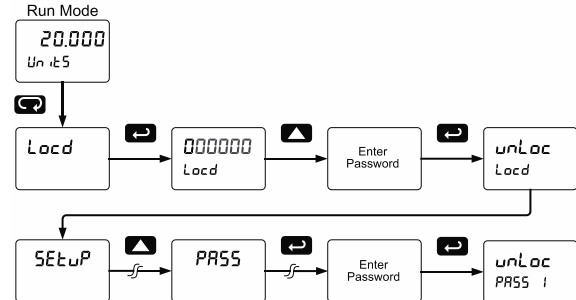


### Making Changes to a Password Protected Meter

If the meter is password protected, the meter will display the message *Locd* (*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 the programming mode, the meter returns to its password protected condition.

## Disabling Password Protection

To disable the password protection, access the *Password* menu and enter the correct password twice, as shown below. The meter is now unprotected until a new password is entered.



If the correct six-digit password is entered, the meter displays the message *unLoc* (*Unlocked*) and the protection is disabled until a new password is programmed.

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

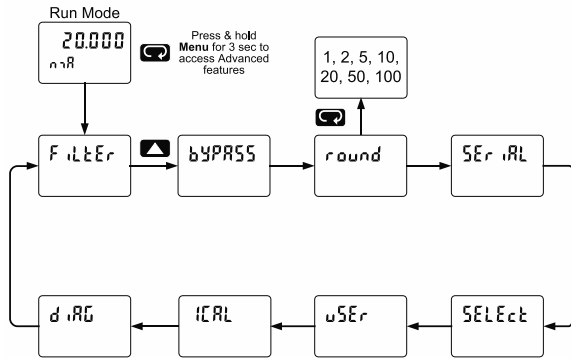
#### Did you forget the password?

The password may be disabled by entering a master password once. If you are authorized to make changes, enter the master password 508655 to unlock the meter.

### Advanced Features Menu

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

Press and hold the Menu button for three seconds to access the advanced features of the meter.



### Advanced Features Menu & Display Messages

The following table shows the functions and messages of the *Advanced Features* menu in the order they appear in the menu.

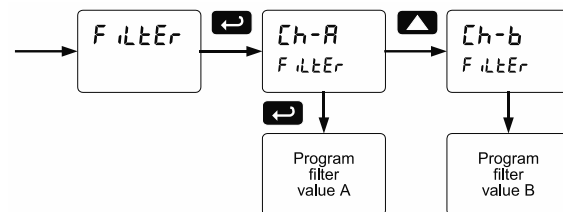
| Advanced Features Menu & Display Messages |                           |   |
|---|---------------------------|---|
| Display                                   | Parameter                 | Action/Setting  |
| F iLLEr                                   | Filter                    | Set noise filter value  |
| Ch-A                                      | Channel A                 | Set filter value for channel A  |
| Ch-B                                      | Channel B                 | Set filter value for channel B  |
| bYPASS                                    | Bypass                    | Set filter bypass value   |
| Ch-A                                      | Channel A                 | Set filter bypass value for channel A                                       |
| Ch-B                                      | Channel B                 | Set filter bypass value for channel B                                       |
| round                                     | Round                     | Set the rounding value for display variables                                |
| SErIAL                                    | Serial                    | Set serial communication parameters   |
| SLAVE ID                                  | Slave ID                  | Set slave ID or meter address   |
| baud                                      | Baud rate                 | Select baud rate  |
| tr dLY                                    | Transmit delay            | Set transmit delay for serial communication                                 |
| PRr iLY                                   | Parity                    | Select parity Even, Odd, or None with 1 or 2 stop bits                      |
| t-bYt                                     | Time byte                 | Set byte-to-byte timeout  |
| SELEct                                    | Select                    | Enter the Select menu (function, cutoff, out)                               |
| FuncEn                                    | Input signal conditioning | Select linear, square root, programmable exponent, or round horizontal tank |

| Advanced Features Menu & Display Messages |                       |   |
|---|-----------------------|---|
| Display                                   | Parameter             | Action/Setting  |
| Ch-A                                      | Channel A             | Select menu for channel A   |
| Ch-B                                      | Channel B             | Select menu for channel B   |
| LINEAR                                    | Linear                | Set meter for linear function and select number of linearization points |
| no Pts                                    | Number of points      | Set the number of linearization points (default: 2)                     |
| SQRtE                                     | Square root           | Set meter for square root extraction                                    |
| PrOG E                                    | Programmable exponent | Set meter for programmable exponent and enter exponent value            |
| rhT                                       | Round horizontal tank | Set meter for round horizontal tank volume calculation                  |
| LEnGth                                    | Length                | Enter the tank's length in inches                                       |
| d iAMtR                                   | Diameter              | Enter the tank's diameter in inches                                     |
| MAth                                      | Math                  | Enter the setup menu for channel C math functions                       |
| SuM                                       | Sum                   | Channel C = (A+B+P)*F   |
| d iF                                      | Difference            | Channel C = (A-B+P)*F   |
| d iFRbS                                   | Absolute difference   | Channel C = ((Absolute value of (A-B))+P)*F                             |
| Avg                                       | Average               | Channel C = (((A+B)/2)+P)*F   |
| MAult                                     | Multiplication        | Channel C = ((A*B)+P)*F   |
| d iVdE                                    | Divide                | Channel C = ((A/B)+P)*F   |
| MAx-AB                                    | Max of A or B         | C = ((High value of channel A or B)+P)*F                                |
| MAx-AB                                    | Min of A or B         | C = ((Low value of channel A or B)+P)*F                                 |
| dr RAt                                    | Draw                  | Channel C = ((A/B)-1)*F   |
| MAvg                                      | Weighted avg.         | Channel C = ((B-A)*F)+A   |
| rAt                                       | Ratio                 | Channel C = (A/B)*F   |
| rAt 2                                     | Ratio 2               | C = ((B-A)/A)+P)*F  |
| ConcEn                                    | Concentration         | Channel C = (A/(A+B))*F   |
| Const                                     | Constant              | Constant used in channel C math   |
| AddEr                                     | Adder                 | Addition constant used in channel C math calculations (P)               |
| FRctOr                                    | Factor                | Multiplication constant used in channel C math calculations (F)         |
| LOWOFF                                    | Cutoff                | Set low-flow cutoff   |
| Ch-A                                      | Channel A             | Set low-flow cutoff for Channel A                                       |
| Ch-B                                      | Channel B             | Set low-flow cutoff for Channel B                                       |

| Advanced Features Menu & Display Messages |                           |   |
|---|---------------------------|---|
| Display                                   | Parameter                 | Action/Setting  |
| RoutPr                                    | Analog output programming | Program analog output parameters  |
| Rout 1                                    | Analog output 1           | Program analog output 1 (*1-3) parameters   |
| Source                                    | Source                    | Select source for the 4-20 mA output  |
| brERR                                     | Loop break                | Set analog output value if input loop break is detected                                       |
| 0-rRng                                    | Overrange                 | Program mA output for display overrange   |
| u-rRng                                    | Underrange                | Program mA output for display underrange  |
| max                                       | Maximum                   | Program maximum mA output allowed   |
| min                                       | Minimum                   | Program minimum mA output allowed   |
| Calib                                     | Calibrate                 | Calibrate 4-20 mA output (internal reference source used for scaling the output)              |
| 4 mA                                      | 4 mA output               | Enter mA output value read by milliamp meter with at least 0.001 mA resolution                |
| 20 mA                                     | 20 mA output              | Enter mA output value read by milliamp meter with at least 0.001 mA resolution                |
| User                                      | User I/O                  | Assign function keys and digital I/O  |
| F1  | F1* function key          | Assign F1 function key (*F1/F2/F3)  |
| F4  | F4 function               | Assign F4 function (digital input)  |
| d1  | Digital input 1           | Assign digital input 1 – 8, if expansion modules are connected                                |
| d0  | Digital output 1          | Assign digital output 1 – 8, if expansion modules are connected                               |
| Cal                                       | Internal calibration      | Enter internal calibration (used for recalibrating the meter with a calibrated signal source) |
| Ch-A                                      | Channel A                 | Perform calibration on channel A  |
| Ch-b                                      | Channel B                 | Perform calibration on channel B  |
| Cal                                       | Current calibration       | Calibrate 4-20 mA current input (internal reference source used for scaling the input)        |
| Cl  | Current low               | Calibrate low current input (e.g. 4 mA)   |
| Ch  | Current high              | Calibrate high current input (e.g. 20 mA)   |
| VCal                                      | Voltage                   | Calibrate voltage input   |

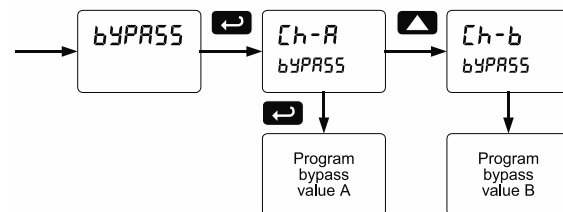
| Advanced Features Menu & Display Messages |              |  |
|---|--------------|--|
| Display                                   | Parameter    | Action/Setting                           |
| calibration                               |              |  |
| Cl  | Voltage low  | Calibrate low voltage input (e.g. 0 V)   |
| Ch  | Voltage high | Calibrate high voltage input (e.g. 10 V) |
| dCal                                      | Diagnostics  | Display parameter settings               |
| LED                                       | LED test     | Test all LEDs                            |
| Info                                      | Information  | Display software number and version      |

**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 2 and 199. 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 zero disables the filter function.

**Noise Filter Bypass (bYPASS)**



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.



### Rounding Feature (round)

The rounding feature is used to give the user a steadier display with fluctuating signals. Rounding is used in addition to the filter function.

Rounding causes the display to round to the nearest value according to the rounding selected. See examples below:

| Rounding Selection | Actual Value | Display Value | Actual Value | Display Value |
|--------------------|--------------|---------------|--------------|---------------|
| 1                  | 12.022       | 12.022        | 12.023       | 12.023        |
| 5                  | 12.022       | 12.020        | 12.023       | 12.025        |
| 10                 | 12.024       | 12.020        | 12.025       | 12.030        |

### Modbus RTU Serial Communications (Serial)

The meter is equipped with serial communications capability as a standard feature using Modbus RTU Serial Communication Protocol.

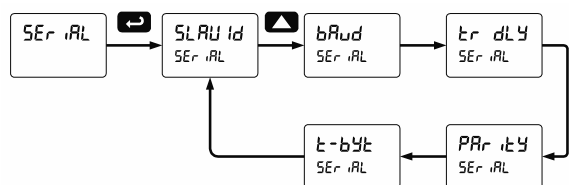
The meter may be connected to a PC for initial configuration via the on-board USB connection. For ongoing digital communications with a computer or other data terminal equipment, an RS-232, or RS-485 option is required; see *Ordering Information* on page 6 for details.

#### CAUTION

- DO NOT connect any equipment other than Precision Digital’s expansion modules, cables, or meters to the RJ45 M LINK connector. Otherwise damage will occur to the equipment and the meter.

#### Notes:

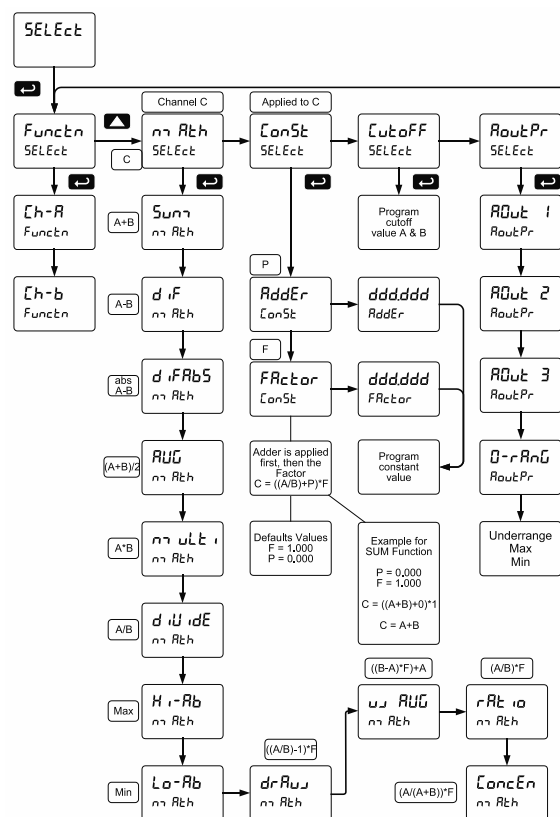
- More detailed instructions are provided with each optional serial communications adapter.
- Refer to the ProVu Modbus Register Tables located at [www.predig.com](http://www.predig.com) for details.



When using more than one meter in a multi-drop mode, each meter must be provided with its own unique address. The meter address (Slave ID) may be programmed between 1 and 247. The transmit delay may be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop bits.

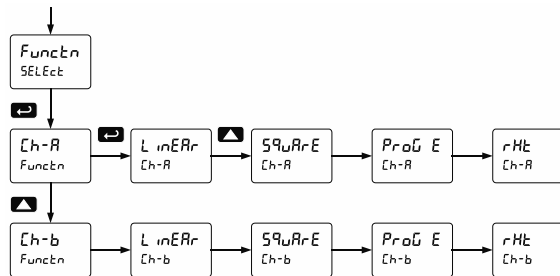
### Select Menu (Select)

The *Select* menu is used to select the input signal conditioning function applied to the inputs (linear, square root, programmable exponent, or round horizontal tank), math function for A & B, constants, low-flow cutoff, and analog output programming. Multi-point linearization is part of the linear function selection.



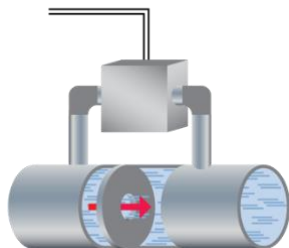
### Input Signal Conditioning (Function)

The *Function* menu is used to select the input-to-output transfer function applied to the input signal: linear, square root, programmable exponent, 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.



### Square Root Linearization (Square E)

The square root function is used to calculate flow measured with a differential pressure transmitter. The flow rate is proportional to the square root of the differential pressure. Scale the meter so that the low input signal (e.g. 4 mA) is equal to zero flow and the high input signal (e.g. 20 mA) is equal to the maximum flow.

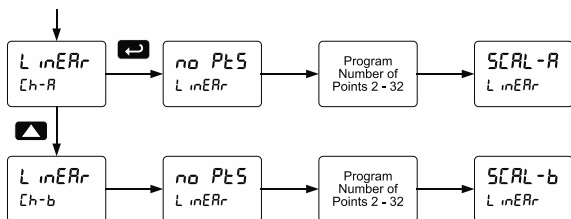


### Programmable Exponent Linearization (Power E)

The programmable exponent function is used to calculate open-channel flow measured with a level transmitter in weirs and flumes. The flow rate is proportional to the head height. Scale the meter so that the low input signal (e.g. 4 mA) is equal to zero flow and the high input signal (e.g. 20 mA) is equal to the maximum flow. This method works well for all weirs and flumes that have a simple exponent in the flow calculation formula. For weirs and flumes with complex exponents it is necessary to use a strapping table and the 32-point linearization of the meter. For more information on how the Programmable Exponent Linearization feature works, see the [PD6200](#) manual.

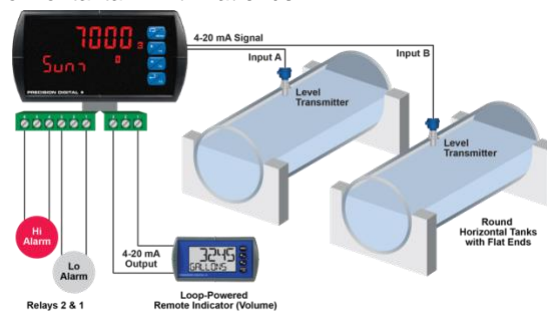
### Multi-Point Linearization (Linear E)

Meters are set up at the factory for linear function with 2-point linearization. Up to 32 linearization points can be selected for each channel under the linear function. The 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.

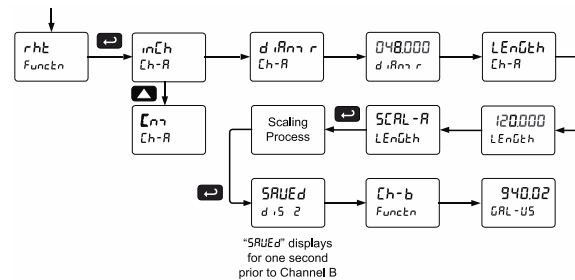


### Round Horizontal Tank Linearization (Tank E)

This function is used to calculate volume in a round horizontal tank with flat ends.



The volume is calculated based on the diameter and length of the tank. The tank's dimensions can be entered in inches or centimeters; the meter automatically calculates the volume in gallons or liters. After entering the dimensions, complete the scaling process with the display values calculated by the meter. The meter can be re-scaled to display the volume in any engineering unit without the need to re-enter the dimensions again.



*Note: After Scale is displayed continue pressing the Enter button until the meter completes the scaling of the input and display values.*

#### Changing the Volume from Gallons to Liters

In the above graphic, entering the 48" for the diameter and 120" for the length of the round horizontal tank, the meter automatically calculates that the volume of the tank is 940.02 gallons.

- Convert gallons to liters  
1 US gallon = 3.7854 L  
940.02 gal = 3558.4 L
- Go to the *Setup* menu and change the decimal point to 1 decimal.
- Go to the *Program - Scale* menu and press Enter until *d .5 2* is shown on the Upper display.
- Press Enter and change the display 2 value to 3558.4.
- The meter is now displaying the volume in liters.

*Note: The display can be scaled to display the volume in any engineering units.*

### Math Function (ᄁᄁᄁᄁ)

The *Math* menu is used to select the math function that will determine the channel C value. These math functions are a combination of input channels A and B, and will display when channel C is selected in the *Display* menu.

The following math functions are available.

| Name           | Function           | Setting |
|----------------|--------------------|---------|
| Addition       | $(A+B+P)*F$        | ᄁᄁᄁ     |
| Difference     | $(A-B+P)*F$        | ᄁᄁᄁᄁ    |
| Absolute diff. | $((Abs(A-B))+P)*F$ | ᄁᄁᄁᄁᄁ   |
| Average        | $((A+B)/2+P)*F$    | ᄁᄁᄁ     |
| Multiplication | $((A*B)+P)*F$      | ᄁᄁᄁᄁᄁ   |
| Division       | $((A/B)+P)*F$      | ᄁᄁᄁᄁᄁ   |
| Max of A or B  | $((AB-Hi)+P)*F$    | ᄁᄁᄁᄁᄁ   |
| Min of A or B  | $((AB-Lo)+P)*F$    | ᄁᄁᄁᄁᄁ   |
| Draw           | $((A/B)-1)*F$      | ᄁᄁᄁᄁᄁ   |
| Weighted avg.  | $((B-A)*F)+A$      | ᄁᄁᄁᄁᄁ   |
| Ratio          | $(A/B)*F$          | ᄁᄁᄁᄁᄁ   |
| Ratio 2        | $((B-A)/A+P)*F$    | ᄁᄁᄁᄁᄁ   |
| Concentration  | $(A/(A+B))*F$      | ᄁᄁᄁᄁᄁᄁ  |

### Math Constants (ᄁᄁᄁᄁ)

The *Math Constants* menu is used to set the constants used in channel C math. The math functions include input channel A and B, as well as the adder constant P, and factor constant F.

The *Adder* constant (P) may be set from -99.999 to 999.999.

The *Factor* constant (F) may be set from 0.001 to 999.999.

The *Math Function* (ᄁᄁᄁᄁ) chart above details the math functions that may be selected in the *Math Function* menu.

### Low-Flow Cutoff (ᄁᄁᄁᄁᄁ)

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 0.1 to 999999. The meter will display zero below the cutoff value. Programming the cutoff value to zero disables the cutoff feature.

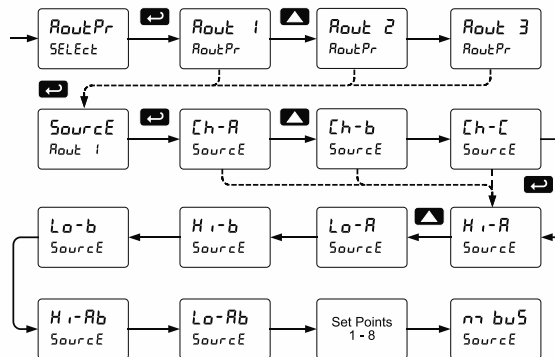
### Analog Output Programming (ᄁᄁᄁᄁᄁ)

The *Analog Output Programming* menu is used to program the behavior of the 4-20 mA output. The following parameters and functions are programmed in this menu:

1. Source: Source for generating the 4-20 mA output
2. Overrange: Analog output value with display in overrange condition
3. Underrange: Analog output value with display in underrange condition
4. Break: Analog output value when loop break is detected
5. Max: Maximum analog output value allowed regardless of input
6. Min: Minimum analog output value allowed regardless of input
7. Calibrate: Calibrate the internal 4-20 mA source reference used to scale the 4-20 mA output

#### Analog Output Source

The analog output source can be based on either of the input channels (Ch-A, Ch-B), the math channel (Ch-C), maximum stored value of either input channel (Hi-A, Hi-B), minimum stored value of either input channel (Lo-A, Lo-B), relay set points, or the Modbus input.



#### Analog Output Value for Loss of 4-20 mA Input (Loop Break)

The *AoutPr - Break* menu is used to force the analog output to go to a user-specified mA value if a break condition is detected in the 4-20 mA input loop. Selecting *Ignore* causes the mA output to go to the minimum value.

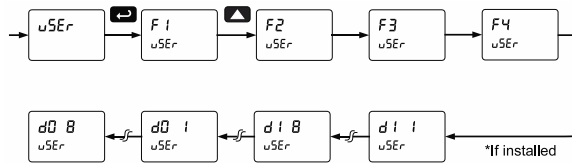
#### Analog Output Calibration

To perform the analog output calibration, it is recommended to use a milliamp meter with a resolution of at least 0.1  $\mu$ A 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.

## Programmable Function Keys User Menu (uSEr)

The User menu allows the user to assign the front panel function keys F1, F2, and F3, the digital input F4 (a digital input located on the input signal connector), and up to eight additional digital inputs to access most 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.

Up to eight digital outputs can be assigned to a number of actions and functions executed by the meter (i.e. alarms, relay acknowledgement, reset max, min, or max & min, tare, and reset tare). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.



## Function Keys & Digital I/O Available Settings

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

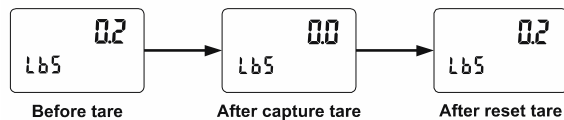
| Display   | Description  |
|-----------|--|
| r 5t H i  | Reset the stored maximum display values for all channels   |
| r 5t L o  | Reset the stored minimum display values for all channels   |
| r 5t H L  | Reset the stored maximum & minimum display values for all channels   |
| t R r E A | Capture tare and zero the display for channel A (A LED flashes – same rate as M)*  |
| t R r E b | Capture tare and zero the display for channel B (B LED flashes – same rate as M)*  |
| r 5t t r  | Reset captured tare and resume normal operation for both channels A & B  |
| r E L A Y | Directly access the relay menu   |
| S E t i   | Directly access the set point menu for relay 1 (*through 8)  |
| r L Y d   | Disable all relays until a button assigned to <i>enable relays</i> (r L Y E) is pressed                                      |
| r L Y E   | Enable all relays to function as they have been programmed   |
| d H o L d | Hold current relay states and analog output as they are until a button assigned to <i>enable relays</i> (r L Y E) is pressed |

| Display     | Description   |
|-------------|---|
| d H o L d   | Hold the current display value, relay states, and analog output momentarily while the function key or digital input is active. The process value will continue to be calculated in the background.  |
| d R b C     | Scrolls values for A, B & C when activated. Keeps the last value for 10 seconds and then it returns to its assignment. Values are displayed on display line 1 and the corresponding channel and units on display line 2.                          |
| L n 1 H i   | Display maximum channel A display value on line 1   |
| L n 1 L o   | Display minimum channel A display value on line 1   |
| L n 1 H L   | Display maximum & minimum channel A display values on line 1  |
| L n 2 H i   | Display maximum channel B display value on line 2   |
| L n 2 L o   | Display minimum Channel B display value on line 2   |
| L n 2 H L   | Display maximum & minimum channel B display values on line 2  |
| L n 3 H L   | Display maximum channel C display value on line 2   |
| L n 2 H L   | Display minimum channel C display value on line 2   |
| L n 2 H L   | Display maximum & minimum channel C display values on line 2  |
| F O n i     | Force relay 1 (*through 4) into the on state. This function is used in conjunction with a digital input expansion module to achieve interlock functionality. See <i>Setting Up the Interlock Relay (Force On) Feature</i> on page 36 for details. |
| C o n t r L | Directly access the control menu  |
| d I S A B L | Disable the selected function key or digital I/O  |
| R c H       | Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching   |
| r E S E t   | Directly access the reset menu  |
| n r E n u   | Mimic the menu button functionality (digital inputs only)   |
| r i G H t   | Mimic the right arrow/F1 button functionality (digital inputs only)   |
| u P         | Mimic the up arrow/F2 button functionality (digital inputs only)  |
| E n t E r   | Mimic the enter/F3 button functionality (digital inputs only)   |
| R L n 1 i   | Provide indication when alarm 1 (*through 8) has been triggered (digital outputs only)  |

\* If math functions are displayed, the math function indicator LED “C” will flash when either A or B channel is using a tare value (net value).

### Tare (LR E R, LR E b)

The tare function zero's out the display. In the case of scale weight, tare is used to eliminate container weight and provide net weight readings. There are two tare functions; Capture Tare for channel A and B, and Reset Tare. Display channel indicator letter flashes when a tare is used. It will flash until the tare is reset. The tare can be reset via the Reset menu, a function key, or a digital input.



Gross (without tare) and net (with tare) values can be viewed simultaneously. See *Setting the Display Parameter & Intensity (d5PLR4)* on page 29.

### Internal Calibration (ICRL)

The meter is **factory calibrated** prior to shipment for milliamps and volts with calibration equipment that is certified to NIST standards.

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

Check calibration of the meter at least every 12 months. Each input and input type must be recalibrated separately.

Notes:

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

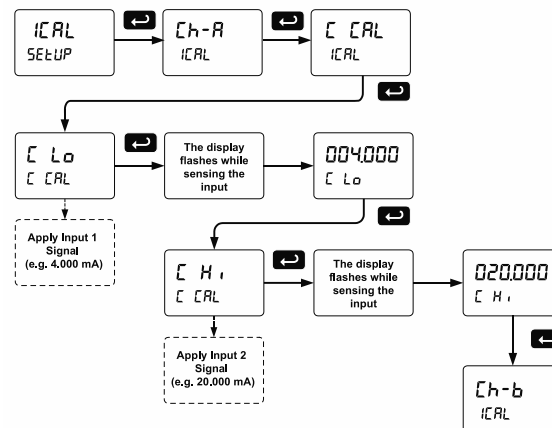
The *Internal calibration* menu is part of the *Advanced Features* menu.

1. Press and hold the Menu button for three seconds to access the advanced features of the meter.
2. Press the Up arrow button to scroll to the *Internal calibration* menu (ICRL) and press Enter.
3. Select channel A (LR) or channel B (LR-b) and press enter.
4. The meter displays either current calibration (ICRL) or voltage calibration (IVRL), according to the input setup. Press Enter to start the calibration process.

#### Example of Internal Calibration for current input:

5. The meter displays *low* input current message (LLO). Apply the low input 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, a number is displayed with the leftmost digit brighter than the rest. The bright digit is the active digit that can be changed by pressing the Up arrow button. Press the Right arrow button to move to the next digit.

7. Set the display value to correspond to the input signal being calibrated, typically 4.000 mA.
8. The display moves to the *high* input calibration (LHI). Apply the high input signal and press Enter.
9. Set the display for the high input calibration, in the same way as it was set for the low input calibration, typically 20.000 mA.



The graphic shows the calibration of the current input. The voltage input is calibrated in a similar way.

#### Tips:

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

### Error Message (Error)

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

After the error message is displayed, the meter reverts to input 2 during calibration or scaling and to input 1 during internal calibration, allowing the appropriate input signal to be applied or programmed.

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

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

### Minimum Input Span

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

| Input Range | Input 1 & Input 2 Span |
|-------------|------------------------|
| 4-20 mA     | 0.15 mA                |
| ±10 VDC     | 0.10 VDC               |

## Meter Operation





The meter is capable of accepting two input channels (A and B) of either current (0-20 mA, 4-20 mA) or voltage signals (0-5 V, 1-5 V, 0-10 V, ± 10 V) and displaying these signals in engineering units from -99999 to 999999 (e.g. a 4-20 mA signal could be displayed as -50.000 to 50.000).

A math function channel (C) is available to perform operations on channel A and B, with adder and factor constants, and display the results. Engineering units or tags may be displayed with these three channels.

The dual-line display can be customized by the user. Typically, the upper display is used to display the math channel C, while the lower display is used to alternate between displaying input channels A and B.

Additionally, the meter can be set up to display any input or math channel on the upper display and a unit or tag on the lower display. The relays and analog output can be programmed to operate based on any input or math channel.

## Front Panel Buttons Operation

| Button Symbol   | Description  |
|---|--|
|   | Press to enter or exit Programming Mode, view settings, or exit max/min readings             |
|  | Press to reset max/min readings or other parameter/function assigned through the User menu   |
|  | Press to display max/min readings or other parameter/function assigned through the User menu |
|  | Press to acknowledge relays 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. See *Programmable Function Keys User Menu (u5Er)* on page 44 for details.

The table above shows the factory default settings for F1, F2, and F3.

## F4 Operation

A digital input, F4, 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 to COM, or with an active low signal. During operation, F4 operates according to the way it has been programmed in the *Advanced Features – User* menu. See *Programmable Function Keys User Menu (u5Er)* on page 44 for details.

## Maximum/Minimum Readings

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

1. Display briefly by assigning to the F1-F3 function keys or to the digital inputs in the *User* menu.
2. Display continuously by assigning either display to max/min through the *Display* menu.

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

### To display max and min channel A reading using function key with factory defaults:

1. Press Up arrow/F2 button to display minimum reading of channel A since the last reset/power-up. The display will then display the maximum reading of channel A since the last reset/power-up.
2. Press the Up arrow/F2 button again to display the minimum reading of channel A since the last reset/power up.
3. To reset max/min press Right arrow/F1 button to access the *Reset* menu. The max & min displays are reset to actual values.
4. Press Menu to exit max/min display reading.

## Troubleshooting

The rugged design and the user-friendly interface of the meter should make it unusual for the installer or operator to refer to this section of the manual. However, 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 *Diagnostics* menu and recommendations below.

## Diagnostics Menu (d ARU)

The *Diagnostics* menu is located in the *Advanced Features* menu, to access *Diagnostics* menu see *Advanced Features Menu*, page 39.

This menu allows the user to test the functionality of all the meter LEDs, check the meter's software and version information, and erase the MeterView Pro software installation files from the meter. Press the Enter button to view the settings and the Menu button to exit at any time.

For a description of the diagnostic messages, see *Advanced Features Menu & Display Messages*, page 39.

### Testing the Display LEDs

To test all LEDs on the display:

1. Go to the *Diagnostics* menu (d ARU) and press Enter button.
2. Press Up arrow button and scroll to *LED Test* menu (LEd d t).
3. Press the Enter button to activate the LED Test. The meter will cycle through all digits, decimal points, and relay indicators to enable the operator to check that all LEDs are functioning properly.
4. Press the Enter button again to access the *Information* menu (InFd) or press the Menu button to return to Run Mode.

### Determining Software Version

To determine the software version of a meter:

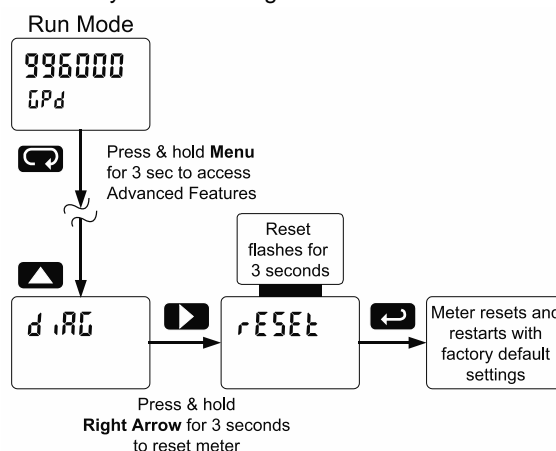
1. Go to the *Diagnostics* menu (d ARU) and press Enter button.
2. Press Up arrow button and scroll to *Information* menu (InFd).
3. Press Enter to access the software number (SFt) and version (VER) information. Write down the information as it is displayed. Continue pressing Enter until all the information is displayed.
4. The meter returns to Run Mode after displaying all the settings.

## Reset Meter to Factory Defaults

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

### Instructions to load factory defaults:

1. Enter the *Advanced Features* menu. See *Advanced Features Menu*, page 39.
2. Press Up arrow to go to *Diagnostics* menu
3. Press and hold Right arrow for three seconds, press Enter when display flashes rESEt.  
*Note: If Enter is not pressed within three seconds, the display returns to Run Mode.*
4. The meter goes through an initialization sequence (similar as on power-up), and loads the factory default settings.



## Factory Defaults & User Settings

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

| Factory Defaults & User Settings |         |                 |
|----------------------------------|---------|-----------------|
| Parameter                        | Display | Default Setting |
| Input type                       | InPuT   |                 |
| Input type, channel A            | [h-R]   | 4-20 mA         |
| Input type, channel B            | [h-b]   | 4-20 mA         |
| Unit                             | unIt    |                 |
| Unit, channel A                  | [h-R]   | mA-A            |
| Unit, channel B                  | [h-b]   | mA-b            |
| Unit, channel C                  | [h-C]   | mA-C            |
| Number of points                 | no PtS  |                 |
| Number of points, ch A           | [h-R]   | 2               |
| Number of points, ch B           | [h-b]   | 2               |
| Scaling, (channel A)             | ScAL R  |                 |
| Input 1, channel A               | InP 1   | 4.000 mA        |
| Display 1, channel A             | d 1S 1  | 4.000           |
| Input 2, channel A               | InP 2   | 20.000 mA       |
| Display 2, channel A             | d 1S 2  | 20.000          |
| Scaling (channel B)              | ScAL b  |                 |

| Factory Defaults & User Settings |                       |                 |
|----------------------------------|-----------------------|-----------------|
| Parameter                        | Display               | Default Setting |
| Input 1, channel B               | inP 1                 | 4.000 mA        |
| Display 1, channel B             | d 15 1                | 4.000           |
| Input 2, channel B               | inP 2                 | 20.000 mA       |
| Display 2, channel B             | d 15 2                | 20.000          |
| Math, channel C                  | Su r                  | Sum             |
| Adder (constant P)               | R d d E r             | 0.000           |
| Factor (constant F)              | F R c t o r           | 1               |
| Filter                           | F i l t e r           |                 |
| Filter, channel A                | [h-R                  | 70              |
| Filter, channel B                | [h-b                  | 70              |
| Bypass, channel A                | b y P R S S           | 0.2             |
| Bypass, channel B                | b y P R S S           | 0.2             |
| Round                            | r o u n d             | 1               |
| Cutoff                           | [u t o f f            |                 |
| Cutoff value, channel A          | [h-R                  | 0.0 (disabled)  |
| Cutoff value, channel B          | [h-b                  | 0.0 (disabled)  |
| Display assignment               | d s P L A Y           |                 |
| Display line 1                   | d [h-R                | Channel A       |
| Display line 2                   | d [h-b                | Channel B       |
| Display intensity                | d - i n t e n s i t y | 6               |
| Relay 1 assignment               | [h-R                  | Channel A       |
| Relay 1 action                   | R c t 1               | Automatic       |
| Relay 1 set point                | S E t 1               | 1.000           |
| Relay 1 reset point              | r S e t 1             | 0.500           |
| Relay 2 assignment               | [h-R                  | Channel A       |
| Relay 2 action                   | R c t 2               | Automatic       |
| Relay 2 set point                | S E t 2               | 2.000           |
| Relay 2 reset point              | r S e t 2             | 1.500           |
| Relay 3 assignment               | [h-R                  | Channel A       |
| Relay 3 action                   | R c t 3               | Automatic       |
| Relay 3 set point                | S E t 3               | 3.000           |
| Relay 3 reset point              | r S e t 3             | 2.500           |
| Relay 4 assignment               | [h-R                  | Channel A       |
| Relay 4 action                   | R c t 4               | Automatic       |
| Relay 4 set point                | S E t 4               | 4.000           |
| Relay 4 reset point              | r S e t 4             | 3.500           |
| Fail-safe relay 1                | F L S 1               | Off             |
| Fail-safe relay 2                | F L S 2               | Off             |
| Fail-safe relay 3                | F L S 3               | Off             |
| Fail-safe relay 4                | F L S 4               | Off             |
| On delay relay 1                 | O n 1                 | 0.0 sec         |
| Off delay relay 1                | O f f 1               | 0.0 sec         |
| On delay relay 2                 | O n 2                 | 0.0 sec         |

| Factory Defaults & User Settings |                           |                    |
|----------------------------------|---------------------------|--------------------|
| Parameter                        | Display                   | Default Setting    |
| Off delay relay 2                | O f f 2                   | 0.0 sec            |
| On delay relay 3                 | O n 3                     | 0.0 sec            |
| Off delay relay 3                | O f f 3                   | 0.0 sec            |
| On delay relay 4                 | O n 4                     | 0.0 sec            |
| Off delay relay 4                | O f f 4                   | 0.0 sec            |
| Loop break relay 1               | [u n o r E                | Ignore             |
| Loop break relay 2               | [u n o r E                | Ignore             |
| Loop break relay 3               | [u n o r E                | Ignore             |
| Loop break relay 4               | [u n o r E                | Ignore             |
| Display 1 analog out             | d 15 1                    | 4.000              |
| Output 1 value                   | O u t 1                   | 4.000 mA           |
| Display 2 analog out             | d 15 2                    | 20.000             |
| Output 2 value                   | O u t 2                   | 20.000 mA          |
| Source analog output             | S o u r c E               | Channel A          |
| Overrange output                 | O - r R n E               | 21.000 mA          |
| Underrange output                | u - r R n E               | 3.000 mA           |
| Loop break output                | b r E A H                 | 3.000 mA           |
| Maximum output                   | m a x                     | 23.000 mA          |
| Minimum output                   | m i n                     | 3.000 mA           |
| Slave ID (Address)               | S L A v e i d             | 247                |
| Baud rate                        | b a u d                   | 9600               |
| Transmit delay                   | t r a n s m i t d e l a y | 50 ms              |
| Parity                           | P a r i t y               | Even               |
| Byte-to-byte timeout             | b - b y t e t o u t       | 010 (0.1 sec)      |
| F1 function key                  | F 1                       | Reset max & min    |
| F2 function key                  | F 2                       | Upper Max & Min    |
| F3 function key                  | F 3                       | Acknowledge relays |
| F4 function (digital input)      | F 4                       | Acknowledge relays |
| Digital input 1                  | d i 1                     | Menu               |
| Digital input 2                  | d i 2                     | Right arrow        |
| Digital input 3                  | d i 3                     | Up arrow           |
| Digital input 4                  | d i 4                     | Enter              |
| Digital output 1                 | d o 1                     | Alarm 1            |
| Digital output 2                 | d o 2                     | Alarm 2            |
| Digital output 3                 | d o 3                     | Alarm 3            |
| Digital output 4                 | d o 4                     | Alarm 4            |
| Password 1                       | P R S S 1                 | 000000 (unlocked)  |
| Password 2                       | P R S S 2                 | 000000 (unlocked)  |
| Password 3                       | P R S S 3                 | 000000 (unlocked)  |



## Troubleshooting Tips

This meter is a highly sophisticated instrument with an extensive list of features and capabilities. If the front panel buttons are used to program the meter, it may be a difficult task to keep everything straight. That is why we strongly recommend the use of the free [MeterView Pro](#) software for all programming activities. A USB cable is provided with the meter for programming with MeterView Pro software.

If you have programmed the meter with the front panel buttons and it is not working as intended, try re-programming the meter using MeterView Pro software.

| Symptom   | Check/Action  |
|---|---|
| No display at all   | Check power at power connector  |
| Not able to change setup or programming, <b>LoCd</b> is displayed                     | Meter is password-protected, enter correct six-digit password to unlock or Master Password of 508655.   |
| Meter does not respond to input change  | If a <i>Low-Flow Cutoff</i> Value has been programmed, the meter will display zero below that point, regardless of the input – which can appear like the meter is not responding to an input change. Check to make sure the problem is not being caused by an undesired low-flow cutoff value.<br>To prevent the display from showing a negative value, set the low-flow cutoff to a value greater than zero. |
| Meter displays error message during calibration ( <b>Error</b> )                      | Check:<br>1. Signal connections<br>2. Input selected in <i>Setup</i> menu<br>3. Minimum input span requirements   |
| Meter displays<br>1. <b>999999</b><br>2. <b>-99999</b>                                | Check:<br>1. Input selected in <i>Setup</i> menu<br>2. Corresponding signal at Signal connector   |
| 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. Input signal conditioner selected: Linear, square root, etc.<br>2. Scaling or calibration  |
| Display does not respond to input changes, reading a fixed number                     | Check:<br>1. Display assignment, it might be displaying max, min, or set point.   |
| Display alternates between<br>1. <b>H i</b> and a number<br>2. <b>Lo</b> and a number | Press Menu to exit max/min display readings.  |
| Relay operation is reversed   | Check:<br>1. Fail-safe in <i>Setup</i> menu<br>2. Wiring of relay contacts  |
| Relay and status LED do not respond to signal   | Check:<br>1. Relay action in <i>Setup</i> menu<br>2. Set and reset points   |
| Flashing relay status LEDs  | Relays in manual control mode or relay interlock switches opened.   |
| Meter not communicating with application programs                                     | Check:<br>1. Serial adapter and cable<br>2. Serial settings<br>3. Meter address and baud rate   |
| 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 use the manual as a step by step programming guide, rather than a random approach to programming. To reset the meter to factory defaults, see [Reset Meter to Factory Defaults](#) on page 47. In addition, for best results, we recommend using the free MeterView Pro software for all programming needs.*

## Contact Precision Digital

### Technical Support

Call: (800) 610-5239 or (508) 655-7300

Fax: (508) 655-8990

Email: [support@predig.com](mailto:support@predig.com)

### Sales Support

Call: (800) 343-1001 or (508) 655-7300

Fax: (508) 655-8990

Email: [sales@predig.com](mailto:sales@predig.com)

### Place Orders

Email: [orders@predig.com](mailto:orders@predig.com)

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