

# Helios PD2-6100 Strain Gauge, Load Cell, and mV Meter

## Instruction Manual



**HELIOS**



**MeterView Pro**

USB Install

- Large Display NEMA 4X, IP65 Wall Mounted Meter
- 15, 30, 150, 300 mV unipolar;  $\pm 15$ ,  $\pm 25$ ,  $\pm 150$ ,  $\pm 250$  mV bipolar Inputs
- Large Dual-Line 6-Digit Display, 1.8" (46 mm) Digits Readable up to 100 Feet (30 Meters) Away
- Selectable 5 or 10 VDC Sensor Excitation @ 350 mA Max
- 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Option
- Free PC-Based, On-Board, MeterView Pro USB Programming Software
- SunBright Display Standard Feature; Great for Outdoor Applications
- Operating Temperature Range:  $-40$  to  $65^{\circ}\text{C}$  ( $-40$  to  $149^{\circ}\text{F}$ )
- Conformal Coated PCBs for Dust and Humidity Protection
- 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
- Supports up to twelve (12) 350  $\Omega$  Load Cells
- Capture or Programmable Tare Feature
- Auto-Zero Feature Eliminates Zero Drift
- Ratiometric Operation
- Programmable Display, Function Keys & Digital Inputs
- On-Board RS-485 Serial Communications
- Modbus RTU Communication Protocol Standard
- 5 Digital Inputs & 4 Digital Outputs Standard
- Password Protection
- Light / Horn & Button Accessory
- Control Station Accessory for Remote Operation
- 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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Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period under "Specifications" from the date of shipment from the factory. Precision Digital's liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit. See Warranty Information and Terms & Conditions on [www.prediq.com](http://www.prediq.com) for complete details.

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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 Helios 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 Helios 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 programming panel buttons and the instructions in this manual to do so.

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## Introduction

The Helios PD2-6100 is a multi-purpose, easy to use, large-display digital strain gauge & load cell meter ideal for weighing and force measurement applications. With a max current of 350 mA at 10 V, it can support up to twelve (12) 350  $\Omega$  load cells (minimum load resistance of 28  $\Omega$ ), making it ideal for multipoint weight measurement applications. It also features large 1.8 inch superluminous LED digits, which can be read from up to 100 feet away. It is housed in a water-resistant, field mountable, NEMA 4X/IP65 rated enclosure for convenient indoor and outdoor installation.

The programming buttons are located behind the lower panel door and are not generally accessible during operation. For that reason, we recommend the use of the PDA2364-MRUE remote control station which has four buttons to mimic the buttons behind the panel. An additional control station, model PDA2361-T, is available to remotely tare the meter.

The meter accepts mV input signals up to 300 mV. Three of the programming buttons can be custom-programmed for a specific operation. The mV input can be scaled to display the process in two different scales; for example, pounds on the upper display and gallons on the lower display.

A fully loaded Helios PD2-6100 meter comes with four SPDT relays, a 4 20 mA output, one 10 VDC sensor excitation, one 24 VDC power supply, five digital inputs and four digital outputs, and onboard RS-485 serial communications.

The four relays can be used for alarm indication or process control applications. The 4-20 mA isolated output, Modbus RTU serial communications, and digital I/O features make the Helios an excellent addition to any system.

## Ordering Information

### 85-265 VAC Models

| Model        | Standard Features   | Options Installed          |
|--------------|---|----------------------------|
| PD2-6100-6H0 | 5 Digital Inputs,<br>4 Digital Outputs,<br>RS-485<br>Communications | No options                 |
| PD2-6100-6H7 |   | 4 relays<br>4-20 mA output |

### 12-24 VDC Models

| Model        | Standard Features   | Options Installed          |
|--------------|---|----------------------------|
| PD2-6100-7H0 | 5 Digital Inputs,<br>4 Digital Outputs,<br>RS-485<br>Communications | No options                 |
| PD2-6100-7H7 |   | 4 relays<br>4-20 mA output |

### Accessories

| Model                     | Description                                  |
|---------------------------|--|
| <a href="#">PDA0004</a>   | Cable Gland                                  |
| <a href="#">PDA7485-I</a> | RS-232 to RS-485 isolated converter          |
| <a href="#">PDA8485-I</a> | USB to RS-485 isolated converter             |
| <a href="#">PDAPLUG2</a>  | Plastic Conduit Plug                         |
| <a href="#">PDX6901</a>   | Snubber: 0.01 $\mu$ F/470 $\Omega$ , 250 VAC |

### 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 can be connected directly to the Helios meter's on-board digital inputs. See *Remote Operation of Meter* on page 22 for details.

## Light / Horn &amp; Button Accessories



Helios Meter Shown with MOD-PD2LHRB1 Red Light / Horn and Button. Meter Sold Separately.

| Model                             | Description  |
|-----------------------------------|--|
| <a href="#">MOD-PD2LHRB1</a>      | Red Light / Horn and Button Mounted and Wired to Helios <sup>(1)</sup>   |
| <a href="#">MOD-PD2LHGB1</a>      | Green Light / Horn and Button Mounted and Wired to Helios <sup>(1)</sup>   |
| <a href="#">MOD-PD2LHYB1</a>      | Yellow Light / Horn and Button Mounted and Wired to Helios <sup>(1)</sup>  |
| <a href="#">MOD-PD2LHBB1</a>      | Blue Light / Horn and Button Mounted and Wired to Helios <sup>(1)</sup>  |
| <a href="#">MOD-PD2LHWB1</a>      | White Light / Horn and Button Mounted and Wired to Helios <sup>(1)</sup>   |
| <a href="#">MOD-PD2LH5CB1</a>     | Light / Horn with User Choice of Red, Green, Yellow, Blue or White Light, Button, Mounted and Wired to Helios <sup>(1)</sup> |
| <a href="#">MOD-PD2LH3CB1-RYG</a> | Light / Horn with Red, Yellow, Green Light Layers, Button, Mounted and Wired to Helios <sup>(1)</sup>                        |

Note:

1. Specify MOD-PD2LH model as a separate item on the order for the Helios to order the Light / Horn & Button accessory installed and wired. Meter is sold separately.
2. An external 24 VDC power supply ([PDA1024-01](#)) is required to power the Light / Horn.



9 labels are provided for the button.

## Pipe Mounting Kit



Helios Meter Shown mounted to pipe using PDA6260 pipe mounting kit. See *Pipe Mounting Instructions* on page 13 for details.

| Model                   | Description                  |
|-------------------------|------------------------------|
| <a href="#">PDA6260</a> | 2" Pipe Mounting Kit for PD2 |

## Signal Splitter &amp; 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 |



## Specifications

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

### General

|                              |   |
|------------------------------|---|
| <b>Display</b>               | Dual-line: 1.8" (46 mm) high, red LEDs<br>6 digits per line (-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>LED Status Indicators</i> on page 23 for details.  |
| <b>Overrange</b>             | Display flashes 999999  |
| <b>Underrange</b>            | Display flashes -99999  |
| <b>Display Assignment</b>    | Display Line 1:<br>PV1, PV2, PCT, max & min, set points, PV & units, net & gross weight, Modbus input, millivolts.<br>Display line 2:<br>Same as Display Line 1; plus units, tag or turned off.   |
| <b>Units</b>                 | Predefined: lb, kg, ounce, gram, ton, metric ton (tonne); and custom units.   |
| <b>Programming Methods</b>   | Four programming 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>                  | There are three modes of tare operation: Capture Tare, Programmable Tare, and Off. See <i>Tare Functionality (t Rr E)</i> on page 41 for details.   |
| <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-to-power line<br>500 V input-to-output<br>(powered by external 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<br><i>Note: Printed circuit boards are conformally coated.</i>  |
| <b>Connections</b>           | Power, signal, relays, mA out: Removable screw terminal blocks accept 12 to 22 AWG wire.<br>RS-485: Removable screw terminal block accepts 16 to 30 AWG wire.<br>Digital I/O: Non-removable screw terminal blocks accept 16 to 30 AWG wire.   |
| <b>Enclosure</b>             | UL Type 4X, IP65 rated. Polycarbonate & glass blended plastic case, color: gray. Includes four PG11 through-hole conduit openings, with two factory installed PG11, IP68, black nylon threaded hole plugs with backing nuts.  |
| <b>Mounting</b>              | Wall Mounting:<br>Four (4) mounting holes provided for mounting meter to wall. See <i>Wall Mounting Instructions</i> on page 12 for additional details.<br>Pipe Mounting:<br>Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See <i>Pipe Mounting Instructions</i> on page 13 for additional details. |
| <b>Tightening Torque</b>     | Power, signal, relays, mA out terminals:<br>5 lb-in (0.56 Nm)<br>Digital I/O and RS-485:<br>2.2 lb-in (0.25 Nm)   |
| <b>Overall Dimensions</b>    | 10.63" x 12.59" x 4.77"<br>(270 mm x 319.7 mm x 121.2 mm)<br>(W x H x D)  |
| <b>Weight</b>                | 6.10 lbs (2.76 kg)  |
| <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.  |



## Strain Gauge Input

|                                     |   |
|-------------------------------------|---|
| <b>Inputs</b>                       | Field selectable: 0-15 mV, 0-30 mV, 0-150 mV, 0-300 mV, $\pm 15$ mV, $\pm 25$ mV, $\pm 150$ mV, $\pm 250$ mV, or Modbus PV (Slave)  |
| <b>Isolated Sensor Power Supply</b> | Terminals EX+ & EX-: 10 VDC or 5 VDC $\pm 10\%$ , rated @ 350 mA max.<br><i>Note: Do not use 24 VDC to power strain gauge bridge.</i>   |
| <b>Accuracy</b>                     | $\pm 0.03\%$ of calibrated span $\pm 1$ count   |
| <b>Minimum Load Resistance</b>      | 14 $\Omega$ @ 5 V<br>28 $\Omega$ @ 10 V   |
| <b>Maximum Excitation Current</b>   | 350 mA @ 5 V or 10 V  |
| <b>Temperature Drift</b>            | 0.002% of calibrated span/ $^{\circ}\text{C}$ max from 0 to 65 $^{\circ}\text{C}$ ambient, 0.005% of calibrated span/ $^{\circ}\text{C}$ max from -30 to 0 $^{\circ}\text{C}$ ambient |
| <b>Functions</b>                    | Linear with multi-point linearization   |
| <b>Multi-Point Linearization</b>    | 2 to 32 points for PV or PV1<br>2 to 8 points for PV2 (Dual-scale feature)  |
| <b>Low Cutoff</b>                   | 0.1 to 999,999 (0 disables cutoff function).<br>Point below at which display always shows zero.   |
| <b>Decimal Point</b>                | Up to five decimal places or none:<br>dddddd, dddddd, dddd, ddd, dd, or dddddd  |
| <b>Calibration Range</b>            | Input Range      Minimum Span<br>Input 1 & Input 2  |
|                                     | 15 mV      0.2 mV   |
|                                     | 25 mV, 30 mV      0.4 mV  |
|                                     | 150 mV      2.0 mV  |
|                                     | 250 mV, 300 mV      4.0 mV  |
|                                     | An Error message will appear if the input 1 and input 2 signals are too close together.   |
| <b>Input Impedance</b>              | Strain Gauge Bridge: Greater than 10 M $\Omega$<br>mV Source: 200 k $\Omega$  |

## Relays

|                                  |  |
|----------------------------------|--|
| <b>Rating</b>                    | 4 SPDT (Form C) internal and rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP ( $\approx 50$ 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 19 for details.  |
| <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.<br>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 to 4 relays)</li> <li>Sampling (based on 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 digital input, 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.   |

## USB Connection

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

## Isolated 4-20 mA Transmitter Output

|  |   |              |               |
|--|---|--------------|---------------|
| <b>Output Source</b>                     | Process variable (PV), max, min, set points 1-4, 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>0.00 to 100.00 = 4-20 mA output  |              |               |
| <b>Analog Output Programming</b>         | 1.000 mA minimum and 23.000 mA maximum for all parameters: overrange, underrange, max, min, and break   |              |               |
| <b>Accuracy</b>                          | $\pm 0.1\%$ of span $\pm 0.004$ mA  |              |               |
| <b>Temperature Drift</b>                 | 0.4 $\mu\text{A}/^\circ\text{C}$ max from 0 to $65^\circ\text{C}$ ambient,<br>0.8 $\mu\text{A}/^\circ\text{C}$ max from $-40$ to $0^\circ\text{C}$ ambient<br><i>Note: Analog output drift is separate from input drift.</i>  |              |               |
| <b>Isolated Transmitter Power Supply</b> | Terminals I+ & R: 24 VDC $\pm 10\%$ isolated from the input at $>500$ V. May be used to power the 4-20 mA output or other devices (except load cell/strain gauge). Refer to <i>Connectors Labeling</i> on page 16 and <i>Figure 29. 4-20 mA Output Connections</i> on page 21.<br>All models rated @ 40 mA max. |              |               |
| <b>External Loop Power Supply</b>        | 35 VDC maximum  |              |               |
| <b>Output Loop Resistance</b>            | Power supply  | Minimum      | Maximum       |
|  | 24 VDC  | 10 $\Omega$  | 700 $\Omega$  |
|  | 35 VDC (external)   | 100 $\Omega$ | 1200 $\Omega$ |
| <b>Additional 4-20 mA Outputs</b>        | The <a href="#">PD659-1MA-2MA</a> can split the optional 4-20 mA output into two isolated 4-20 mA outputs   |              |               |
| <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   |              |               |

## RS-485 Serial Communications

|                          |  |
|--------------------------|--|
| <b>Compatibility</b>     | EIA-485  |
| <b>Connectors</b>        | Removable screw terminal connector                           |
| <b>Max Distance</b>      | 3,937' (1,200 m) max   |
| <b>Status Indication</b> | Separate LEDs for Power (P), Transmit (TX), and Receive (RX) |

## 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 Helios Modbus Register Tables located at [www.prediq.com](http://www.prediq.com) for details.*

## Digital Input (F4)

|                     |   |
|---------------------|---|
| <b>Function</b>     | Operate tare function, 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 47 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  |

## 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)<br>(Standard USB A to USB Type B)<br>RS-485 to USB converter<br>(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><b>DO NOT</b> apply AC or DC power to the meter while the USB port is in use.                     |

## Compliance Information

### Safety

|                              |   |
|------------------------------|---|
| <b>UL &amp; C-UL Listed</b>  | USA & Canada<br>UL 508 Industrial Control Equipment (USA)<br>C22.2 No. 142 (Canadian National Standard) |
| <b>UL File Number</b>        | E160849   |
| <b>Enclosure</b>             | UL Type 4X, NEMA 4X, IP65   |
| <b>Low Voltage Directive</b> | EN 61010-1<br>Safety requirements for measurement, control, and laboratory use                          |

## 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 open the clear plastic front cover in order to complete the installation, wiring, and setup of the meter. All programming is done using [MeterView Pro](#) software or through the buttons and switches located under the lower door panel and are accessible by removing the single securing screw. Wires should be run through the knockout holes located on the bottom of the meter, see *Figure 5. Conduit Holes Location – Bottom View* on page 12 for details.

There are a total of four pre-drilled conduit entry holes located at the bottom of the meter. If the need to drill additional holes arises, make sure you will have the clearance necessary for conduit mounting hardware.

Do not disconnect the RJ45 connector found on the right side of the meter wiring board. Doing so will disable the on-board digital I/O, RS-485 serial communications, and M-Link functionality.

Instructions are provided for changing the transmitter power supply to output 5 or 10 VDC instead of 24 VDC, see *Sensor Excitation Voltage Selection (EX+, EX-)* on page 15.

## 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.

## Wall Mounting Instructions

The meter can be mounted to any wall using the four provided mounting holes. Note that the bottom mounting holes are located underneath the lower door panel. To mount the meter to a wall, follow these instructions

- Prepare a section of wall approximately 11" x 13" (280 mm x 330 mm) for meter mounting by marking with a pencil the mounting holes (shown in *Figure 1*) on the wall.
- Select the appropriate mounting screws for the mounting surface to be used. The mounting holes diameter is shown on *Figure 2*.  
*Note: Mounting screws are not included.*
- Using a drill bit slightly smaller than the girth of the mounting screws, pre-drill holes at the mounting locations previously marked.
- Insert mounting screws into the four mounting holes and screw them into the pre-drilled holes.  
**DO NOT** overtighten the mounting screws as it is possible that the enclosure could crack and become damaged.

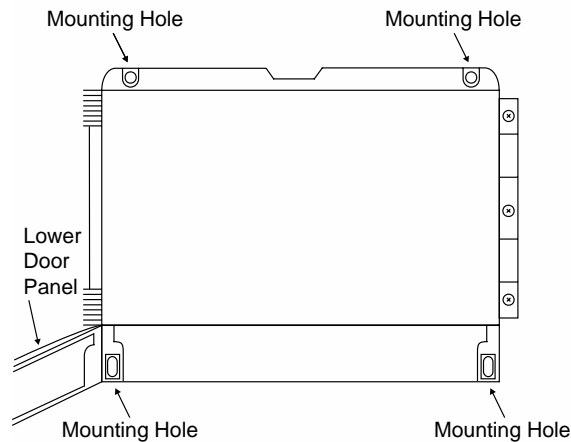


Figure 1. Meter Mounting Holes Location

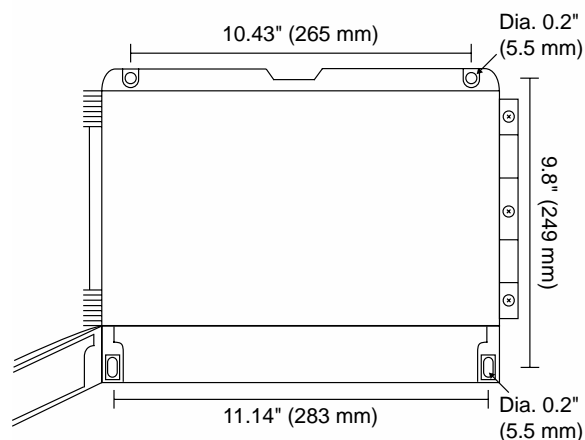


Figure 2. Meter Mounting Holes Dimensions

## Mounting Dimensions

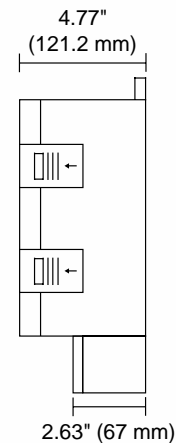


Figure 3. Meter Dimensions – Side View

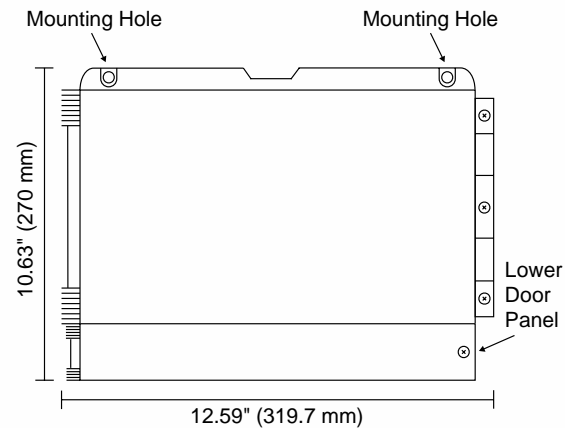


Figure 4. Meter Dimensions - Front View

## Conduit Holes Location

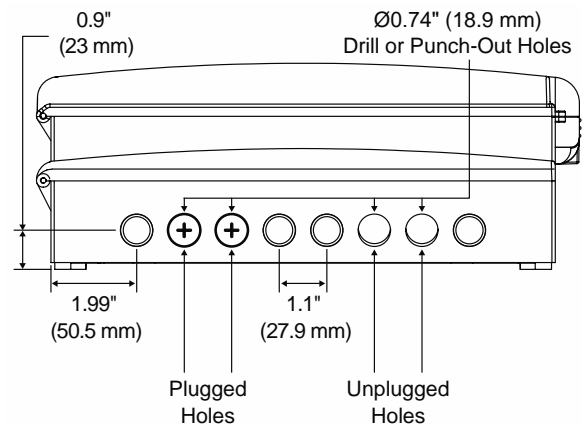


Figure 5. Conduit Holes Location – Bottom View

## Pipe Mounting Instructions

The meter can also be mounted to a pipe using the optional pipe mounting kit ([PDA6260](#)). This kit includes two mounting plates, two U-bolts, and the necessary nuts and bolts. To mount the meter to a pipe using the pipe mounting kit accessory, follow these instructions.

- Secure the mounting plates to the top and bottom (for vertical pipes) or left and right (for horizontal pipes) of the reverse side of the meter enclosure using the provided fasteners.
- DO NOT** overtighten the fasteners as it could cause damage to the enclosure.
- Using the provided nuts and U-bolts, secure the mounting plates to the pipe applying enough torque such that the meter cannot be moved up or down (or side to side).

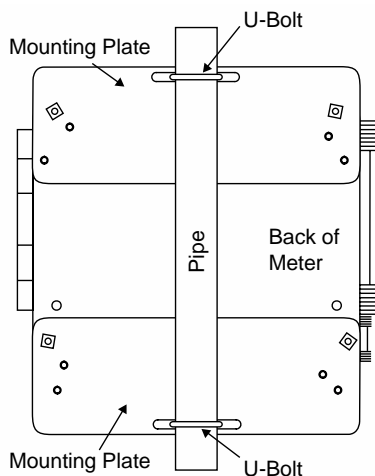
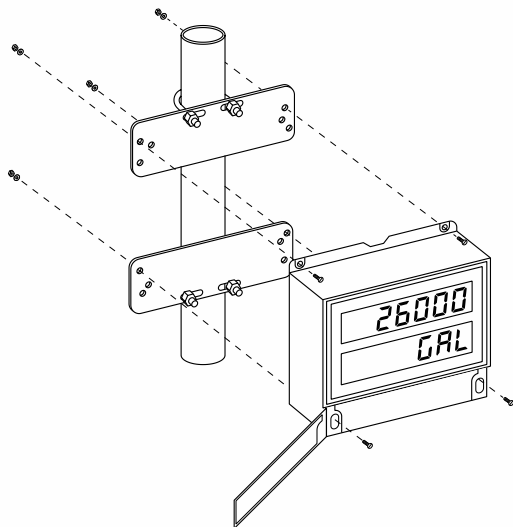


Figure 6. Vertical Pipe Mount Assembly

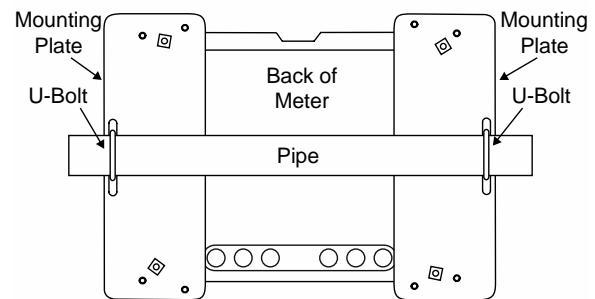
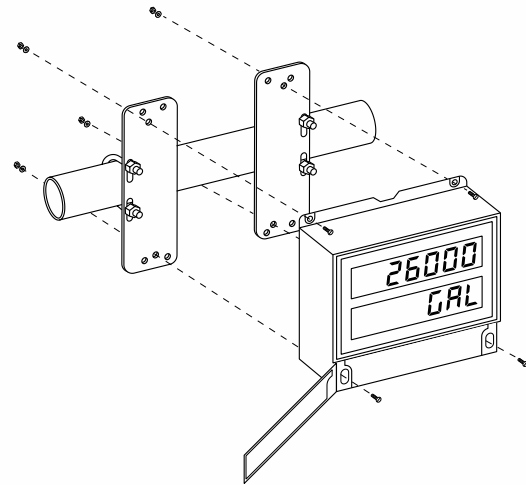


Figure 7. Horizontal Pipe Mount Assembly

## 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 programming buttons.

## MeterView Pro Software

The easiest and quickest way to program your Helios 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 Helios 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.

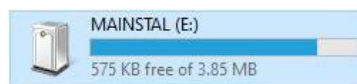
### ⚠ WARNINGS

- 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.

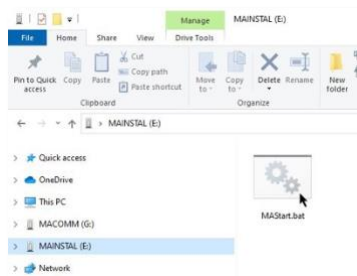
2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."



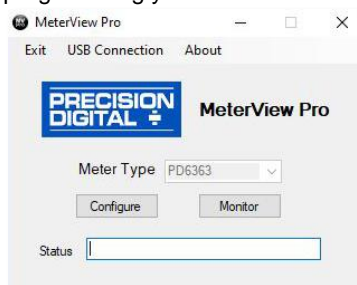
If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."



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  $\overline{\text{E}}$  during the process and you will receive an on-screen notification once the process is complete.



## Sensor Excitation Voltage Selection (EX+, EX-)

All meters, including models equipped with the 12-24 VDC power option, are shipped from the factory configured to provide 10 VDC excitation for the sensor.

If the sensor requires 5 VDC excitation, the switch labeled P+/P- must be configured accordingly.

To access the voltage selection switch:

1. Turn off the power to the meter.
2. Unscrew and open the lower door panel.
3. Locate the P+/P- switch located in the center of the connections board (see diagram below).
4. Flip this switch into the appropriate position for the required transmitter excitation.

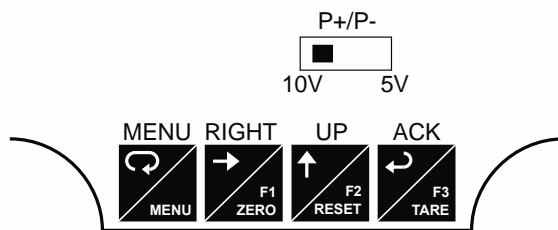


Figure 8. Sensor Excitation Voltage Selection

## Connections

All connections are made to screw terminal connectors located under the lower door panel. Remove the single securing screw in order to access the wiring terminals.

### 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 inside of the lower door panel, shows the location of all connectors available with the ordered configuration.

### WARNINGS

- **DO NOT** connect any equipment to the RJ45 M-LINK connector. Otherwise damage will occur to the equipment and the meter.
- **DO NOT** disconnect the RJ45 connector located to the left of the power terminal block. Doing so will disable the on-board digital I/O, and the RS-485 serial communications.

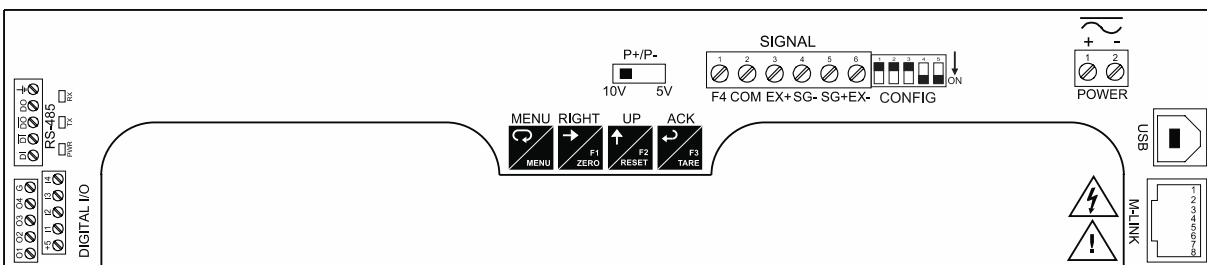


Figure 9. PD2-6100-6H0 / 7H0 Connectors Label

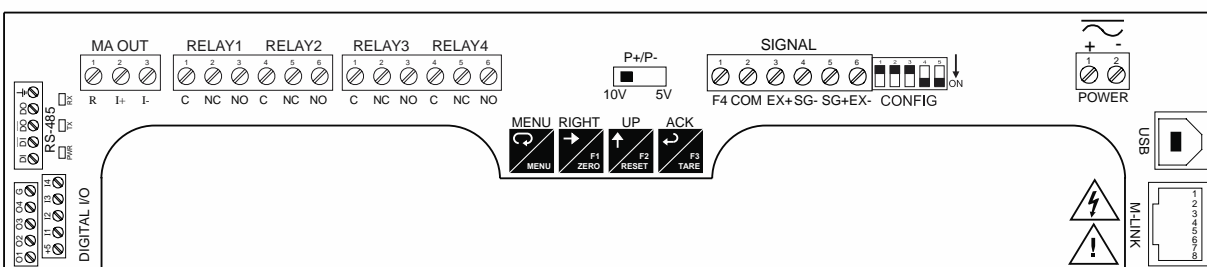
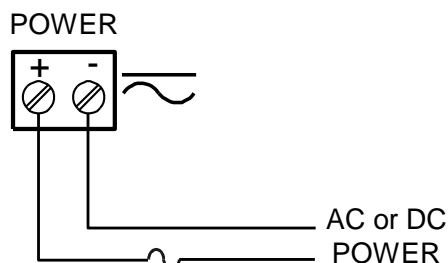


Figure 10. PD2-6100-6H7 / 7H7 Connectors Label

## 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 11. Power Connections

## Signal Connections

Signal connections are made to a six-terminal connector labeled SIGNAL. The EX+ and EX- terminals are used to sense the sensor excitation voltage for ratiometric operation, when the sensor is powered externally (switch 1 is off).

## Switch Configuration

Setup and programming is performed both through the programming buttons and switch settings shown below. The switch configuration must correspond to the *Setup and Programming* starting on page 23 (same range, type, etc.).

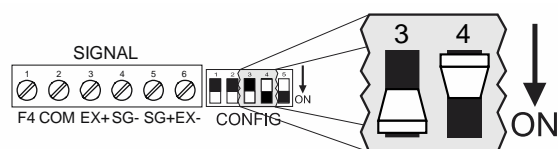


Figure 12. Strain Gauge Configuration Switch

## Excitation (Switch 1)

The excitation switch designates whether the meter will use its internal power supply or an external power supply.

|     |            |                            |  |
|-----|------------|----------------------------|--|
| OFF | Excitation | <u>External</u> Excitation | When switch is turned OFF, an external power supply is used. |
| ON  | Excitation | <u>Internal</u> Excitation | When switch is turned ON, the Helios's power supply is used. |

## Range (Switch 2)

The range switch adjusts the gain of the internal circuitry. Narrower ranges require more amplification.

|     |       |                             |   |
|-----|-------|-----------------------------|---|
| OFF | Range | <u>Lower</u> internal gain  | Turn this switch OFF for the following input ranges: 150, 300, $\pm 150$ , or $\pm 250$ mV. |
| ON  | Range | <u>Higher</u> internal gain | Turn this switch ON for the following input ranges: 15, 30, $\pm 15$ , or $\pm 25$ mV.      |

## Polarity (Switch 3)

The polarity switch selects whether the range is unipolar and starts at zero (i.e. 0 to 30 mV) or bipolar and starts at a negative value, or below zero (i.e. -15 to +15 mV).

|     |          |  |   |
|-----|----------|--|---|
| OFF | Polarity | Range <u>starts</u> below zero (bipolar) | Turn this switch OFF for the following input ranges: $\pm 15$ , $\pm 25$ , $\pm 150$ , or $\pm 250$ mV. |
| ON  | Polarity | Range <u>starts</u> at zero (unipolar)   | Turn this switch ON for the following input ranges: 15, 30, 150, or 300.                                |

## Source (Switch 4)

The source switch tells the Helios whether the input is a strain gauge bridge (i.e. *Figure 15. Multiple Strain Gauges Connected Through Junction Box*, page 18), or it is a signal from a 2 or 4 wire transducer, or mV source (i.e. *Figure 16. mV Transducer Input Connections*, page 18)

|     |        |                               |  |
|-----|--------|-------------------------------|--|
| OFF | Source | Source is strain gauge bridge | Turn this switch OFF if the source is a strain gauge bridge  |
| ON  | Source | Source is mV input transducer | Turn this switch ON if the connected source is a transducer* |

\*Ratio should be set to NO in Setup Input Menu

### Shunt Resistor (Switch 5)

The PD2-6100 provides a means of simulating strain in a strain gauge bridge circuit via a 60.4K $\Omega$  shunt resistor included in the meter. This will simulate an approximate 70% full-scale load in the case of a 350 $\Omega$  strain bridge.

|     |       |  |  |
|-----|-------|--|--|
| OFF | Shunt | Shunt resistor is <u>disconnected</u> from the input bridge. | Turn this switch OFF to remove the shunt resistor      |
| ON  | Shunt | Shunt resistor is <u>connected</u> to the input bridge.      | Turn switch ON when you want to simulate a strain load |

### Strain Gauge Connections

The following figures show examples of strain gauge connections.

There is a 5-position DIP switch (CONFIG) to set up the input ranges and sensor excitation.

*Note: Refer to Switch Configuration on page 17 for proper configuration switch positioning.*

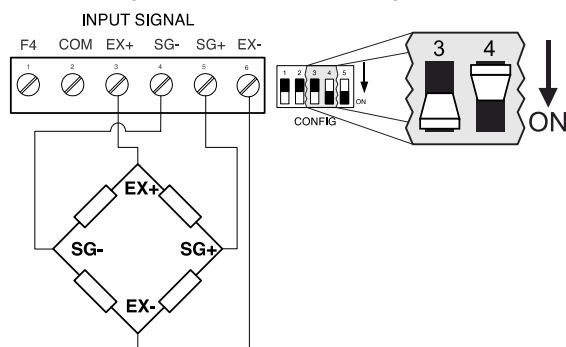


Figure 13. Strain Gauge Powered by Internal Supply

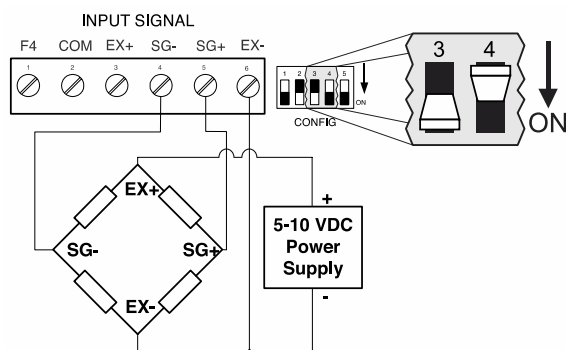


Figure 14. Strain Gauge Powered by External Supply

When connecting multiple strain gauges to the meter, each must be wired in parallel. This is typically done with the use of a junction box.

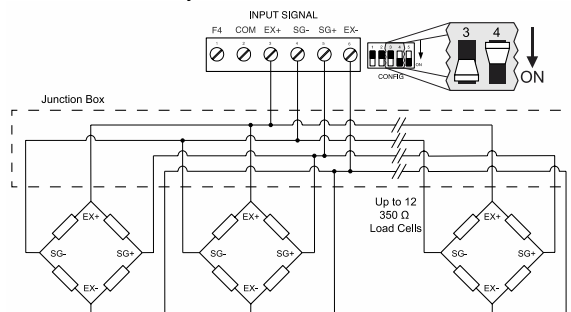


Figure 15. Multiple Strain Gauges Connected Through Junction Box

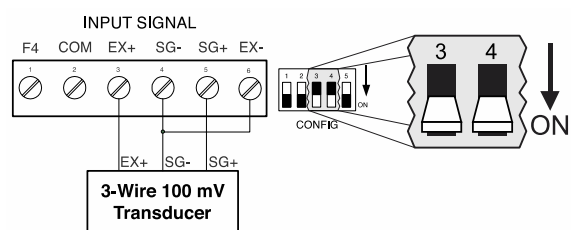


Figure 16. mV Transducer Input Connections

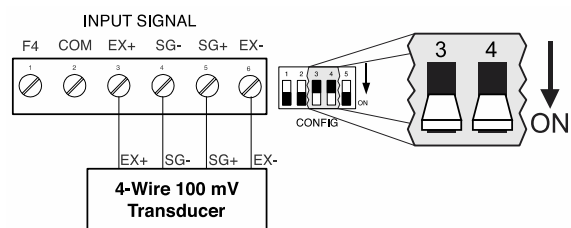


Figure 17. Four-wire mV Transducer Connections

#### Notes

1. Two-wire mV signals: Connect positive to SG+ and negative to SG-.
2. Three-wire transducer: Connect EX- to SG-.

## Shunt Calibration

The PD2-6100 is equipped with a means of simulating strain in a strain gauge bridge circuit, via a shunt resistor included inside the meter. This technique is performed by enabling the “shunt resistor” switch (switch 5), which in turn shunts one leg of a connected strain bridge with a predetermined resistive load (60.4k). This technique can be used as a means of verifying instrumentation by simulating a physical input. With no load connected, the enabling of the shunt resistor (switch 5) will simulate approximately a 70% F.S. load in the case of a 350Ω Strain Bridge.

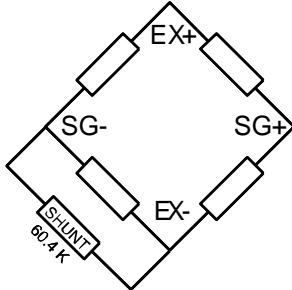


Figure 18. Shunt Resistor

## 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.

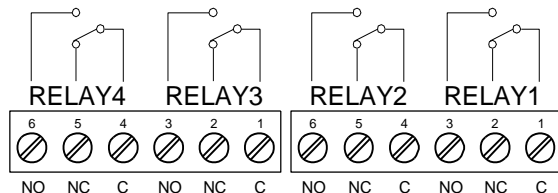


Figure 19. Relay Connections

## 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:

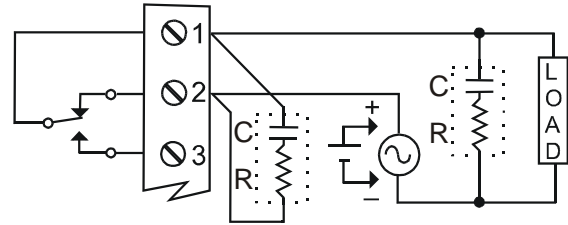


Figure 20. AC and DC Loads Protection

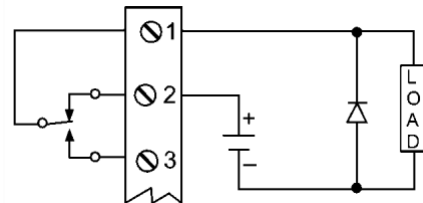
Choose R and C as follows:

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 21. 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.*

## RS-485 Connections

The RS-485 connections are made to a five terminal connector used for Modbus® RTU serial communications. The RS-485 terminals include Transmit Data (DO) and (/DO), Receive Data (DI) and (/DI), and Signal Ground. See *Modbus RTU Serial Communications (Serial)* on page 44 for more information.

There are three diagnostic LEDs: Power (PWR) Transmit Data (TX), and Receive Data (RX) to show when the meter is transmitting and receiving data from other devices.

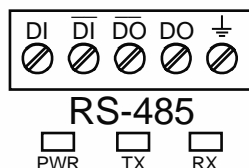


Figure 22. RS-485 Connection

## RS-485 Multi-Drop Connection

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) can be programmed between 1 and 247. The transmit delay can be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop bits.

### To change the meter address:

1. Press and hold the Menu button for three seconds to access Advanced Features menu of the meter.
2. Press Up arrow until Serial (Serial) menu is displayed and press Enter, Address is displayed.
3. Press Enter to change meter address using Right and Up arrow buttons. Press Enter to accept.
4. Press Menu button to exit and return to Run Mode.

## RS-485 Serial Converters

To convert the RS-485 to RS-232, use the PDA7485-I converter. To convert the RS-485 to USB, use the PDA8485-I converter. See *Ordering Information* on page 6 for additional information.

## RS-485 Connection Examples

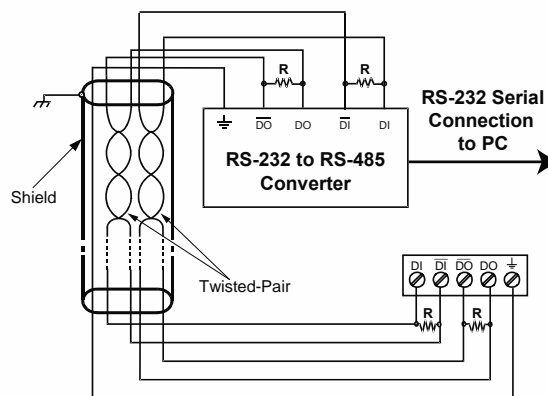


Figure 23. Five-Wire RS-485 Connections

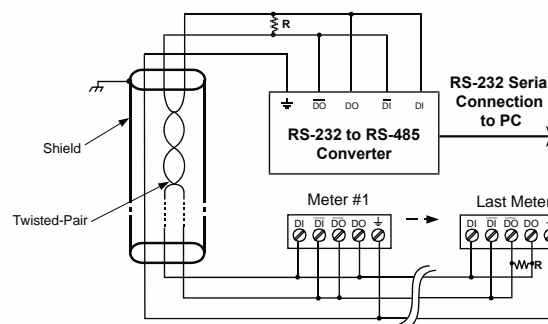


Figure 24. Three-Wire RS-485 Multi-Drop Connections

### Notes:

1. Termination resistors are optional, and values depend on the cable length and characteristic impedance. Consult the cable manufacturer for recommendations.
2. Refer to RS-232 to RS-485 Converter documentation for further details.
3. Use shielded cable, twisted-pair plus ground. Connect ground shield only at one location



### RS-485 Converter Connections

Figure 25 below details the wiring connections from the RS-485 connector to an RS-485 serial converter (such as the PDA7485-I or PDA8485-I) for a five-wire network.



| RS-485 Connector to RS-485 Serial Converter Connections                           |   |
|---|---|
| RS-485 Connector  | RS-485 to USB or RS-232 Converter   |
|  |  |
| DO  | DI  |
| DI  | DO  |
| DI  | DO  |
| DI  | DO  |

Figure 25. Connections for RS-485 Connector to Serial Converter

### Three-Wire Connection

In order to wire the five pins for use as a three-wire half-duplex RS-485 connection, it is necessary to create a jumper connection between DI to DO and /DI to /DO- as shown below.

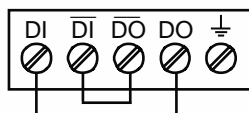


Figure 26. Three-Wire RS-485 Connection

### Digital I/O Connections

Digital inputs and outputs are provided in order to expand the functionality of the meter. Digital input connections are made via a push button or switch to the appropriate digital input terminal and the +5 VDC terminal. Digital output connections are made by wiring from the appropriate digital output terminal to the ground terminal.

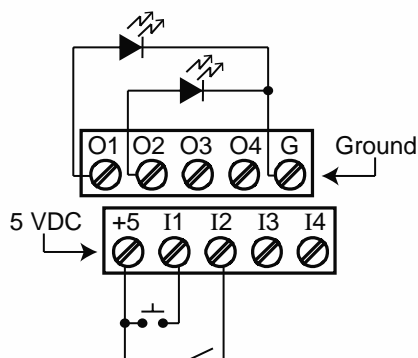


Figure 27. Digital Input and Output Connections

### 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 to operate the tare function, 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 47 for a complete list of capabilities.

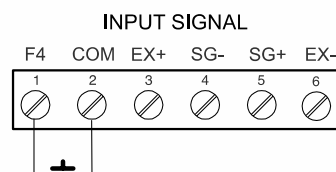


Figure 28. F4 Digital Input Connections

### 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.

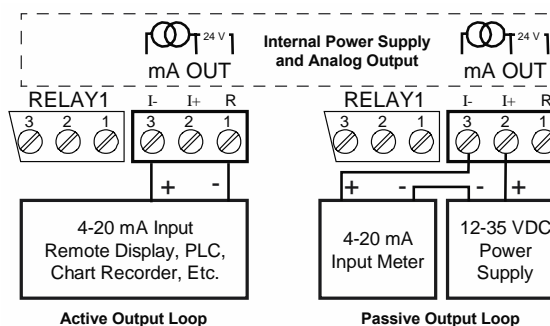


Figure 29. 4-20 mA Output Connections

### Analog Output Power Supply

If the analog output is not using the 24 VDC supply to power the output loop, it can be used for other things. The I+ Terminal is the +24 V and the R terminal is the return.

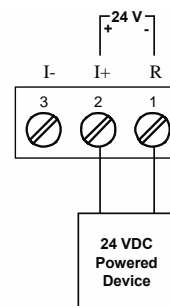
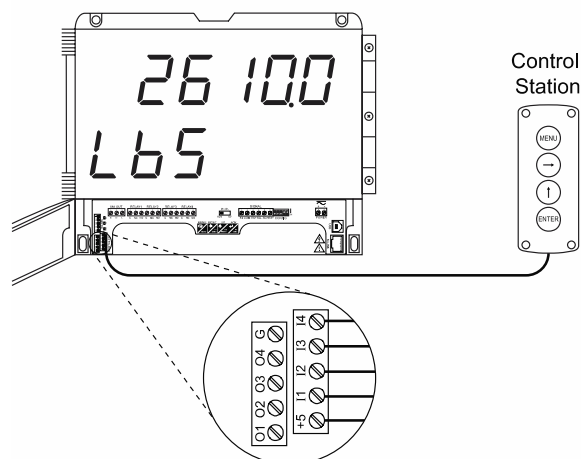


Figure 30. Analog Output Supply Powering Other Devices

### Remote Operation of Meter

The meter can be operated via the programming buttons or a PDA2364-MRUE remote control station using the digital inputs and outputs connections as illustrated in *Figure 31. Meter to PDA2364-MRUE Control Station Connection*.



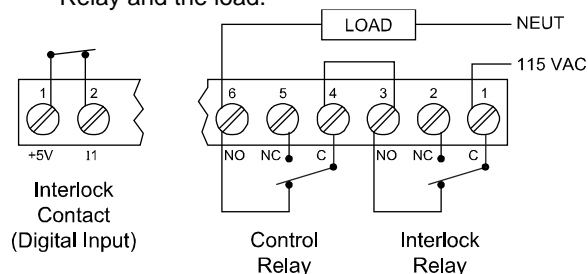
**Figure 31. Meter to PDA2364-MRUE Control Station Connection**

### 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 40.

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 32. Interlock Connections**

## Setup and Programming

There is **no need to recalibrate** the meter when first received from the factory, if used to read millivolts.

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

If the meter is used with a strain gauge or load cell, it is recommended to perform a live calibration with the sensor connected.

### Overview

There is a 5-position DIP switch to set the meter input selection. See *Switch Configuration* on page 17 to setup the switch.

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

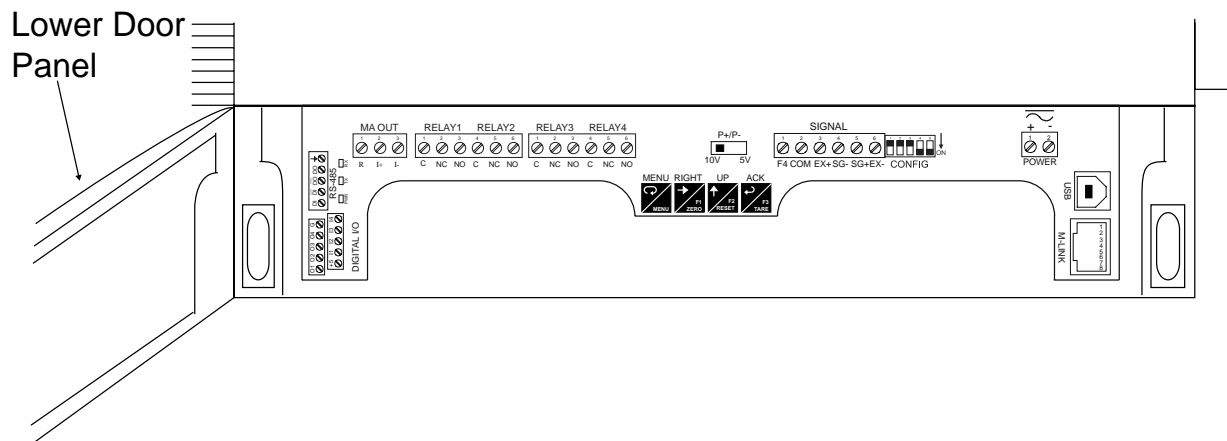
After power and input signal connections have been completed and verified, apply power to the meter.

### LED Status Indicators



| LED     | State    | Indication  |
|---------|----------|---|
| 1-4     | 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) |
| 1-4     | Flashing | Relay interlock switch open   |
| 1-4 & M | Flashing | Relay in manual control mode  |
| T       | Flashing | Meter in Tare mode  |
| M       | Flashing | Analog output in manual control mode  |
| G       | Steady   | Gross value being displayed   |

## Programming Buttons



| Button | Description                        |
|--------|------------------------------------|
|        | Menu                               |
|        | Right Arrow/F1<br>ZERO THE DISPLAY |

| Button | Description                    |
|--------|--------------------------------|
|        | Up Arrow/F2<br>RESET TARE      |
|        | Acknowledge (Enter)/F3<br>TARE |

- 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.



### Remote Buttons

The meter can be operated via a remote control station (PDA2364-MRUE) using the digital input connections. The PDA2364-MRUE mimics the Helios's four programming buttons: Menu, Right Arrow, Up Arrow, and Enter.

See *Remote Operation of Meter* on page 22 for details.



### Remote Tare

The Tare feature on the meter may be operated remotely using the PDA2361-T control station.

See *Ordering Information* on page 6 for details.

## Display Functions & Messages

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

| Display Functions & Messages |               |   |
|------------------------------|---------------|---|
| Display                      | Parameter     | Action/Setting Description  |
| SEtUP                        | Setup         | Enter Setup menu  |
| INPUt                        | Input         | Enter Input selection menu  |
| POLAR                        | Polar         | Enter unipolar or bipolar selection menu  |
| uni                          | Unipolar      | Press Enter to select operation with positive signals only (e.g. 0-30 mV)           |
| bi                           | Bipolar       | Press Enter to select operation with positive & negative signals (e.g. $\pm 15$ mV) |
| RANGE                        | Range         | Enter range selection menu  |
| 15 mV                        | 15 mV         | Set meter for 15 mV input (uni/bi)  |
| 25 mV                        | 25 mV         | Set meter for $\pm 25$ mV input (bi)  |
| 30 mV                        | 30 mV         | Set meter for 30 mV input (uni)   |
| 150 mV                       | 150 mV        | Set meter for 150 mV input (uni/bi)   |
| 250 mV                       | 250 mV        | Set meter for $\pm 250$ mV input (bi)   |
| 300 mV                       | 300 mV        | Set meter for 300 mV input (uni)  |
| RAtioMETRIC                  | Ratiometric   | Press Enter to select ratiometric operation to compensate for excitation changes.   |
| DUAL                         | Dual-Scale    | Press Enter to select dual-scale display (Select Yes or No)                         |
| UNITS                        | Units         | Select the display units/tags   |
| DEC Pt                       | Decimal point | Set decimal point   |
| PV 1                         | PV1           | PV1 decimal point (dual-scale)  |
| PV 2                         | PV2           | PV2 decimal point (dual-scale)  |
| PRoG                         | Program       | Enter the Program menu  |
| SCALE                        | Scale         | Enter the Scale menu  |
| SCALE 1                      | Scale 1       | Enter the Scale menu for PV1  |
| SCALE 2                      | Scale 2       | Enter the Scale menu for PV2  |

| Display Functions & Messages |                   |   |
|------------------------------|-------------------|---|
| Display                      | Parameter         | Action/Setting Description  |
| CAL                          | Calibrate         | Enter the Calibration menu  |
| 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            | Press Enter to assign the upper display parameter (default: PV)                           |
| LINE 2                       | Line 2            | Press Enter to assign the lower display parameter (default: engineering units)            |
| DIS INT                      | Display intensity | Set display intensity level from 1 to 8   |
| RELAY                        | Relay             | Enter the Relay menu  |
| REL 1                        | Relay 1           | Relay 1 setup   |
| ACT 1                        | Action 1          | Set relay 1 action  |
| RESET                        | Automatic         | Set relay for automatic reset   |
| REMAN                        | Auto-manual       | Set relay for automatic & manual reset any time   |
| LATCH                        | Latching          | Set relay for latching operation  |
| LATCH-C                      | Latching-cleared  | Set relay for latching operation with manual reset only after alarm condition has cleared |
| RELTERN                      | Alternate         | Set relay for alternation control   |
| SAMPL                        | Sampling          | Set relay for sampling operation  |
| OFF                          | Off               | Disable relay and front panel status LED (Select Off to enable Interlock feature)         |
| SET 1                        | Set 1             | Program set point 1   |
| RESET 1                      | Reset 1           | Program reset point 1   |
| REL 2                        | Relay 2           | Relays 2-4 setup.   |
| FAILSAFE                     | Fail-safe         | Enter Fail-safe menu  |
| FLS 1                        | Fail-safe 1       | Set relay 1 fail-safe operation   |
| ON                           | On                | Enable fail-safe operation  |

| Display Functions & Messages |                  |   |
|------------------------------|------------------|---|
| Display                      | Parameter        | Action/Setting Description  |
| FLS 2                        | Fail-safe 2      | Set relays 2-4 fail-safe operation                                |
| dELAY                        | Delay            | Enter relay <i>Time Delay</i> 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 2-4 time delay setup                                 |
| ROUT                         | Analog output    | Enter the <i>Analog output</i> scaling menu                       |
| DIS 1                        | Display 1        | Program display 1 value   |
| OUT 1                        | Output 1         | Program output 1 value (e.g. 4.000 mA)                            |
| DIS 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 <i>Reset</i> menu                       |
| RES H                        | Reset high       | Press Enter to reset max display                                  |
| RES L                        | Reset low        | Press Enter to reset min display                                  |
| RES HL                       | Reset high & low | Press Enter to reset max & min displays                           |
| RES T                        | Reset tare       | Press Enter to reset tare   |
| TARE                         | Tare             | Enter <i>Tare</i> menu  |
| CAPTURE                      | Capture          | Press Enter to set meter to capture tare using the Tare button    |
| PROG T                       | Programmable     | Press Enter to set meter to programmable tare and enter a value   |
| OFF                          | Off              | Press Enter to disable the tare function                          |
| CONTROL                      | Control          | Enter <i>Manual Control</i> menu                                  |
| AUTO                         | Automatic        | Press Enter to set meter for automatic operation                  |
| MAN                          | Manual           | Press Enter to manually control relays or analog output operation |
| PASS                         | Password         | Enter the <i>Password</i> menu                                    |
| PASS 1                       | Password 1       | Set or enter Password 1   |
| PASS 2                       | Password 2       | Set or enter Password 2   |
| PASS 3                       | Password 3       | Set or enter Password 3   |

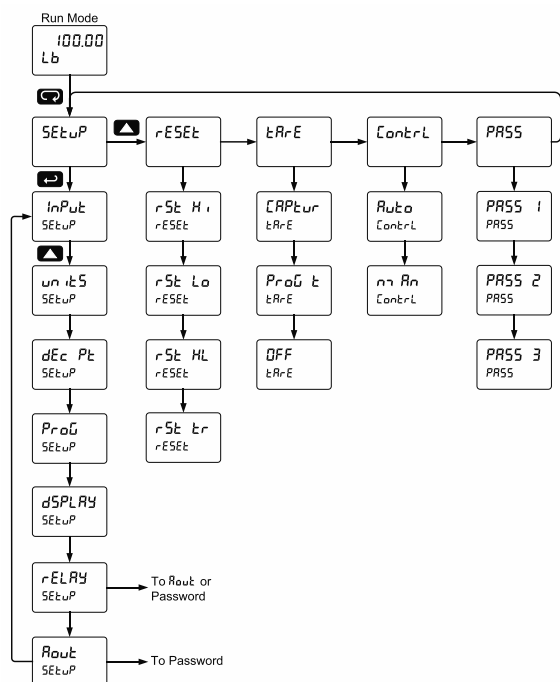
| Display Functions & Messages |           |                                |
|------------------------------|-----------|--------------------------------|
| Display                      | Parameter | Action/Setting Description     |
| UNLOC                        | Unlocked  | Program password to lock meter |
| LOCK                         | Locked    | Enter password to unlock meter |
| 999999<br>-999999            | Flashing  | Over/under range condition     |
| FRUL                         | Flashing  | Input exceeds range settings   |



## Main Menu

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

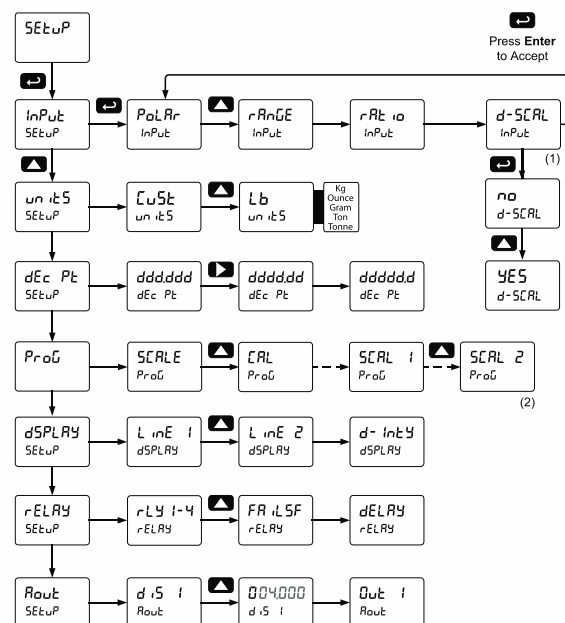
- Press Menu button to enter Programming Mode then press the Up arrow button to scroll main menu.
- Press Menu, at any time, to exit and return to Run Mode. Changes made to settings prior to pressing Enter are not saved.
- Changes to the settings are saved to memory only after pressing Enter.
- The display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



## Setting Up the Meter (SEtUP)

The *Setup* menu is used to select:

- Unipolar (e.g. 0-30 mV) or bipolar (e.g.  $\pm 25$  mV) polarity, input range, ratiometric operation, and dual-scale feature
- Engineering units
- Decimal point position
- Program scaling or live calibration
- Display parameter and intensity
- Relay operation
- 4-20 mA analog output scaling



### Notes:

- Use the *d-SEtRL* selection to activate the dual-scale level feature - PV1 & PV2. Set *d-SEtRL* to *no* if both displays are to be used for anything other than PV1 & PV2.
- SCAL 1* & *SCAL 2* are displayed if *d-SEtRL* is selected under the Setup Input menu. They correspond to the PV2 & PV2 scales.

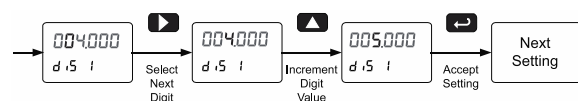
## Setting Numeric Values

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 arrow to auto-increment the display value.

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



### Dual-Scale (d-5[RL)

The mV input can be displayed in two different scales, by enabling the dual-scale feature in the *Setup-Input* menu. See *Dual-Scale (d-5[RL])* on page 28.

After selecting “Yes” or “No” for *ratio*, *d-5[R]* is displayed. Selecting “Yes” enables the dual-scale feature, allowing scaling of the same input in two different scales (for PV1 & PV2) or displaying the percentage of PV1.

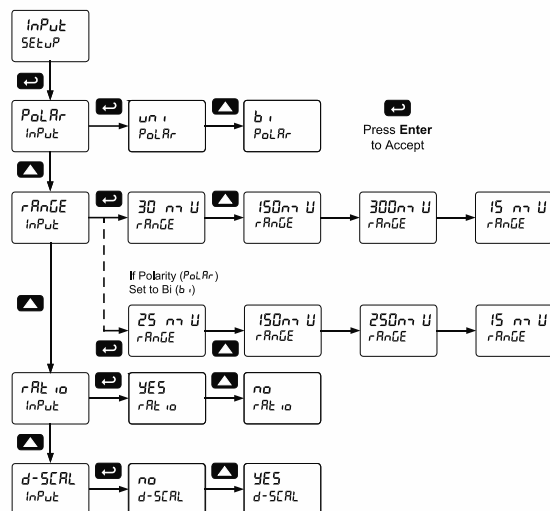
Enter the pre-defined engineering unit or custom unit. The pre-defined units have automatic conversion factors. This unit will be displayed if  $d_{unit}$  is selected as the lower display parameter. See *Setting the Display Parameter & Intensity (dSPLY)* flow chart on page 32 to access the display menu to show the unit on the lower display.

**Pre-defined engineering units:** lb, kg, ounce, gram, ton (short), tonne (metric ton). The meter converts the reading according to the unit selected (e.g. 100.00 lb = 45.36 kg = 45359.2 g = 1600 oz).

**Unit Conversions:** After scaling values in the *Scale* menu have been entered during setup, automatic unit conversions are done when switching from any standard unit to any other standard unit during future changes of the *Units* menu.

Once a standard unit has been selected in the units menu, the user must then set their scaling values for that unit (under the setup menu) in order for that unit's conversion factor to take effect. Otherwise, the meter will allow the user to freely switch between standard unit selections, without applying a conversion factor.

Note that if the dual-scale feature is selected in the *Setup* menu, both PV1 and PV2 will be converted from the original standard unit to the new standard unit. A scaled PV not scaled for the selected units must be reprogrammed. *Example:* If PV 1 is scaled for pounds, and PV 2 scaled for gallons; if the unit selection is changed from lb to ounce, PV 2 will need to re-scaled manually back to gallons.



*Note: PV1 and PV2 may use different standard units as starting points, however the user must select the unit and complete scaling for both PV1 and PV2 individually. For example, set PV1 equal to "Lbs" and complete the scaling for PV1 only. PV1 is now reading in Lbs. Then, change the units for PV2 to be "Kg" and complete the scaling for PV2.*

This menu is used to select the input range. The selections listed are determined by the *Polarity* setting.  
Unipolar mode: 0-15 mV, 0-30 mV, 0-150 mV, 0-300 mV

**NOTE: Refer to Switch Configuration on page 17 for proper configuration switch positioning.**

Ratiometric operation corrects the measured strain gauge signal for up to  $\pm 5\%$  variation of either the internal or external excitation power supply. In order to use the ratiometric operation, the ratiometric operation menu must be set to yes (YES).

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

Enter the display unit or custom tag that will be displayed if units are selected in the Units menu, or if Units is selected as the lower display parameter. See *Setting the Display Parameter & Intensity (Display)* flow chart on page 32 to access the display menu to show the unit or tag on the lower display. The engineering units or custom legends can be set using the following 7-segment character set:

| Display | Character | Display | Character |
|---------|-----------|---------|-----------|
| 0       | 0         | K       | K         |
| 1       | 1         | L       | L         |
| 2       | 2         | m       | m         |
| 3       | 3         | n       | n         |
| 4       | 4         | O       | O         |
| 5       | 5         | o       | o         |
| 6       | 6         | P       | P         |
| 7       | 7         | q       | q         |
| 8       | 8         | r       | r         |
| 9       | 9         | S       | S         |
| A       | A         | t       | t         |
| b       | b         | u       | u         |
| C       | C         | v       | v         |
| c       | c         | w       | w         |
| d       | d         | X       | X         |
| E       | E         | Y       | Y         |
| F       | F         | Z       | Z         |
| G       | G         | -       | -         |
| g       | g         | /       | /         |
| H       | H         | [       | ]         |
| h       | h         | ]       | [         |
| i       | i         | =       | =         |
| l       | l         | °       | Degree(<) |
| J       | J         |         | 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.

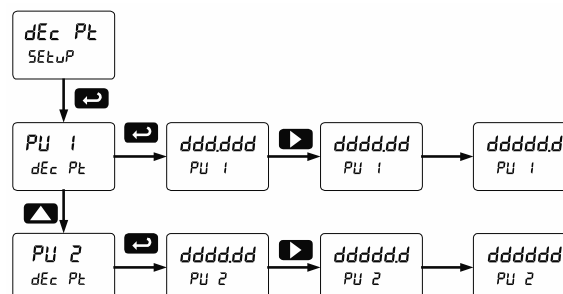
## Setting the Decimal Point (dEc Pt)

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.

Pressing the Up arrow moves the decimal point to the left.

If the dual-scale feature is selected, the decimal point selections for PV1 & PV2 are enabled.



## Programming the Meter (Prog)

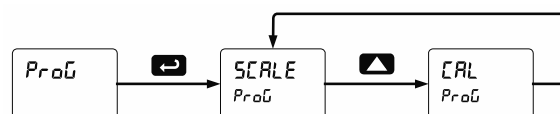
The meter may either be scaled (SCALE) without applying an input or calibrated (CAL) by applying an input. The meter comes factory calibrated to NIST standards to read in millivolts, so for initial setup, it is recommended to use the (SCALE) function.

For strain gauge and load cell applications it is **recommended to calibrate** the meter using the sensor as the input and with ratiometric operation enabled to compensate for small variation in the excitation voltage.

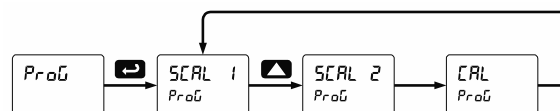
The PD2-6100 is a single input meter with dual-scale capability. If the dual-scale feature is selected in the Setup menu, the Scale 1 and Scale 2 menus are enabled for PV1 & PV2 respectively.

The process inputs may be calibrated or scaled to any display value within the range of the meter.

### Program Menu for Single Scale Process



### Program Menu for Dual-Scale Applications



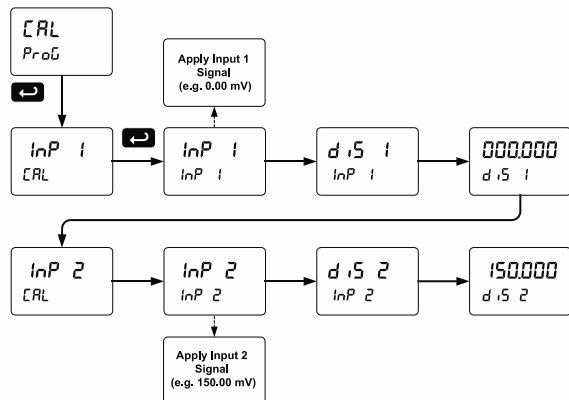
Additional parameters, not needed for most applications, are programmed in the *Advanced Features* menu. See *Advanced Features Menu* on page 43.

## Calibrating the Meter with Strain Gauge/Load Cell (CRL)

To scale the meter without a signal source, refer to *Scaling the Meter (SCALE)* on page 30.

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.



Note: Inputs for the above example are:  
 Input 1: 0.00 mV; Display 1: 0.000 mV  
 Input 2: 150.00 mV; Display 2: 150.000 mV

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

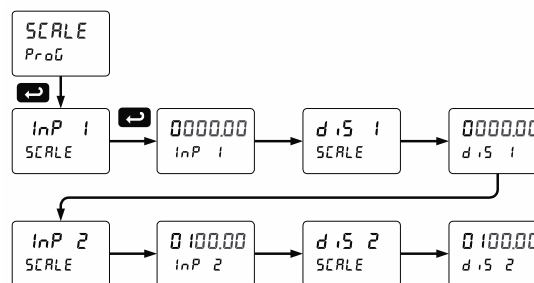
## Multi-Point Calibration & Scaling

The meter is set up at the factory for 2-point linear calibration. The number of points for multi-point calibration/scaling is set up in the *Advanced Features* menu. Up to 32 linearization points may be selected for PV1 and up to 8 linearization points may be selected for PV2. See *Multi-Point Linearization (LINEAR)* on page 45 for details.

## Scaling the Meter (SCALE)

The strain gauge input (e.g. 0-100 mV) can be scaled to display the process variable in engineering units.

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



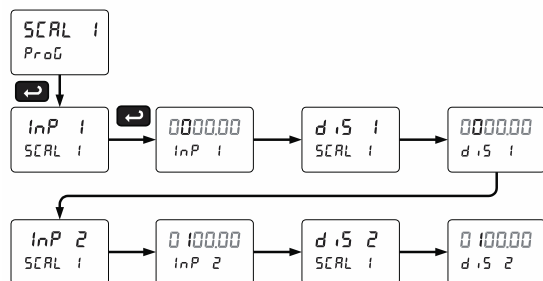
For instructions on how to program numeric values see *Setting Numeric Values* on page 27.

### Dual-Scale Application

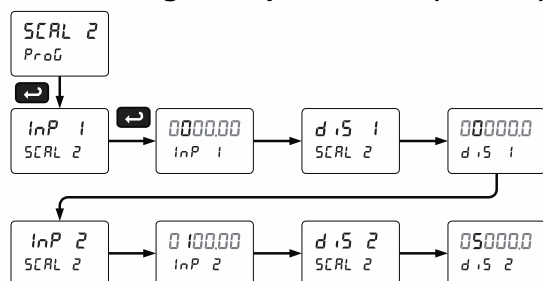
The mV input can be displayed in two different scales, by enabling the dual-scale feature in the *Setup Input* menu. See *Dual-Scale (d-5[RL])* on page 28.

To enable the dual-scale feature you must select it in the Input selection menu. See *Setting the Input Signal (InPut)* on page 28 for details.

#### Scaling the Input for PV1 (5[RL 1])



#### Scaling the Input for PV2 (5[RL 2])



### 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 |
|----------------|------------------------|
| 15 mV          | 0.2 mV                 |
| 25 mV, 30 mV   | 0.4 mV                 |
| 150 mV         | 2.0 mV                 |
| 250 mV, 300 mV | 4.0 mV                 |

## Setting the Display Parameter & Intensity (dSPLY)

Display line 1 (LINE 1) can be programmed to display:

1. Process value 1 (PV1)
2. Process value 2 (PV2)\*
3. Percent of PV1 (PCT)\*
4. Relay set points
5. Toggle process value & units
6. Max & min values
7. Gross value
8. Toggle net & gross values
9. Input millivolts
10. Modbus input

Display line 2 (LINE 2) can be programmed to display:

1. Engineering units or custom legends
2. Process value 1 (PV1)
3. Process value 2 (PV2)\*
4. Percent of PV1 (PCT)\*
5. Relay set points
6. Toggle process value & units
7. Max & min values
8. Gross value
9. Toggle net & gross values
10. Input millivolts
11. Modbus input
12. Off (no display)

\*These menu items will only appear if Dual-Scale feature is turned on.

After setting up the input and display, press the Menu button to exit programming and skip the rest of the setup menu. Press the Menu button again and the Up arrow to reach the Program menu and complete the scaling or calibration of the meter.

## Display Intensity (d-INTY)

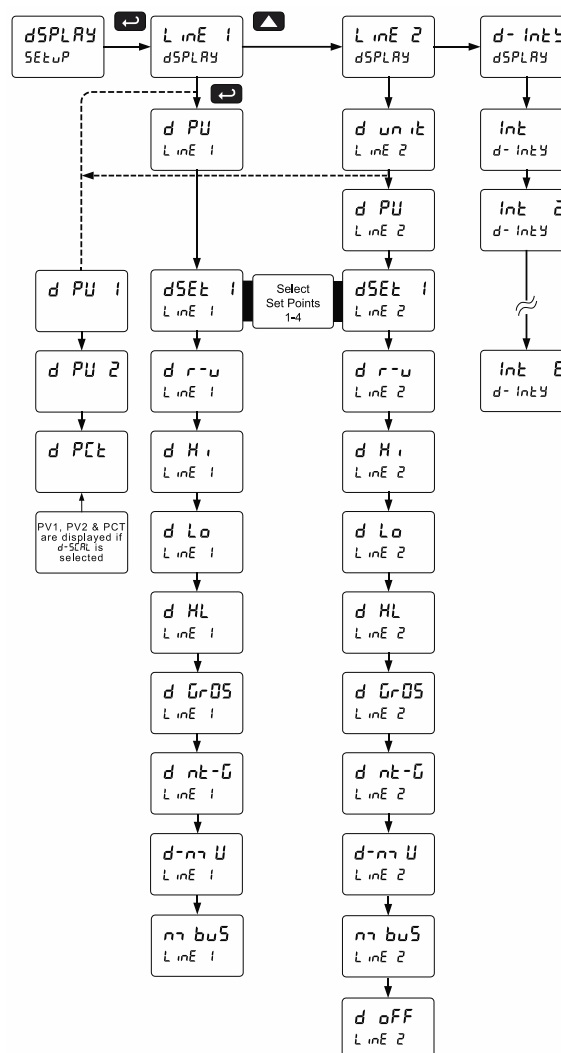
The meter has eight display intensity levels to give the best performance under various lighting conditions. Select intensity 8 for outdoor applications. The default intensity is 6.

## Display Toggling Between Reading & Units with Tag

The PD2-6100 can be programmed so that line 1 toggles between the reading and units and line 2 displays a tag. For instance, line 1 toggles between 9500 and Lbs and line 2 displays Tank 1.



## Display Parameter Menu

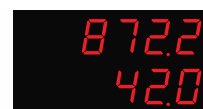


## Dual-Scale Display Feature

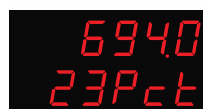
The dual-scale feature is of particular value in weighing applications where a second scaled display can represent the measured input in a different form (i.e. pounds & height). Both displays are independently scaled and are based on the millivolt input signal.



Lbs & mV



Lbs & Height



Lbs & Percent



Lbs & Tons



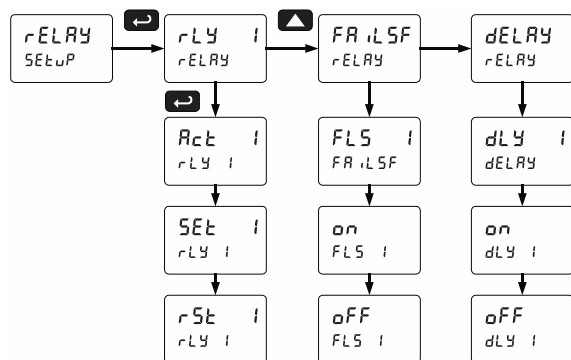
## Setting the Relay Operation (rELAY)

This menu is used to set up the 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.

1. Relay action
  - a. Automatic reset only (non-latching)
  - b. Automatic + manual reset at any time (non-latching)
  - c. Latching (manual reset only)
  - d. Latching with Clear (manual reset only after alarm condition has cleared)
  - e. Pump alternation control (automatic reset only)
  - f. Sampling (the relay is activated for a user-specified time)
  - g. Off (relay state controlled by Interlock feature)
2. Set point
3. Reset point
4. Fail-safe operation
  - a. On (enabled)
  - b. Off (disabled)
5. Time delay
  - a. On delay (0-999.9 seconds)
  - b. Off delay (0-999.9 seconds)



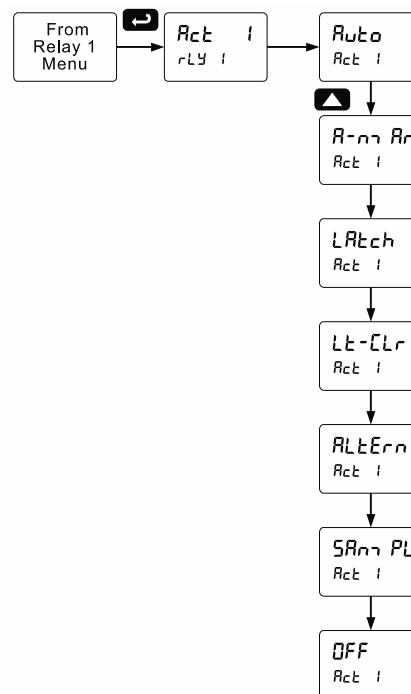
Note: The setup of relays 2-4 follows the same pattern shown here for relay 1.

## 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:

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

The following graphic shows relay 1 action setup; relay 2-4 are set up in a similar fashion.

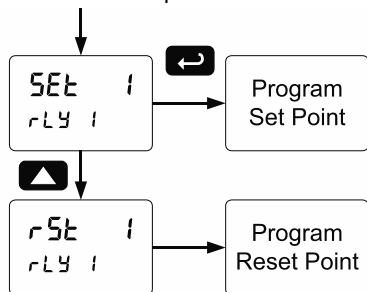


## Programming Set and Reset Points

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.

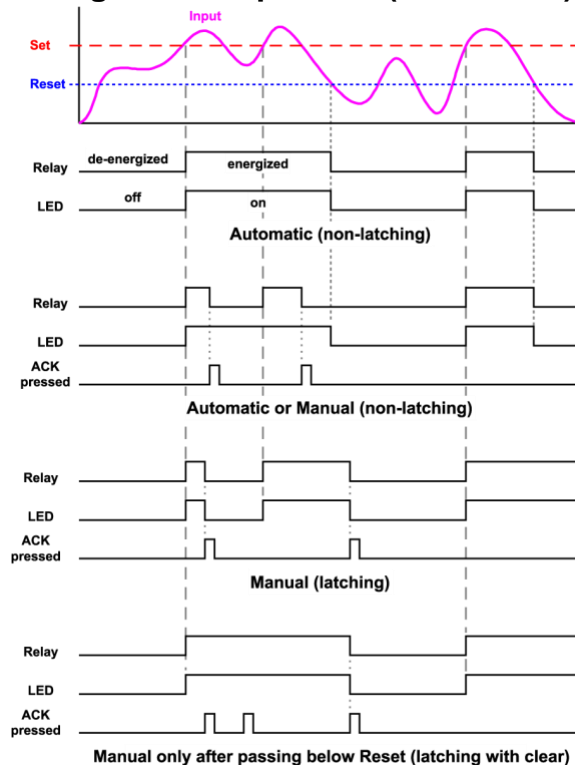
The *On* time delay is associated with the set point.

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

## Relay and Alarm Operation Diagrams

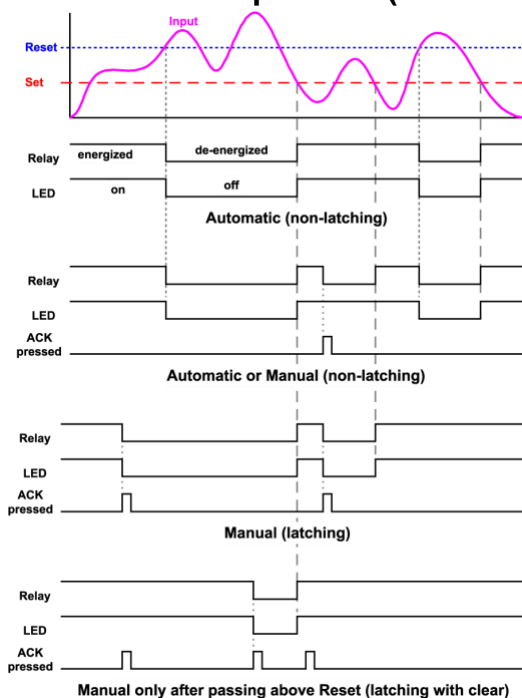
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

### High Alarm Operation (Set > Reset)



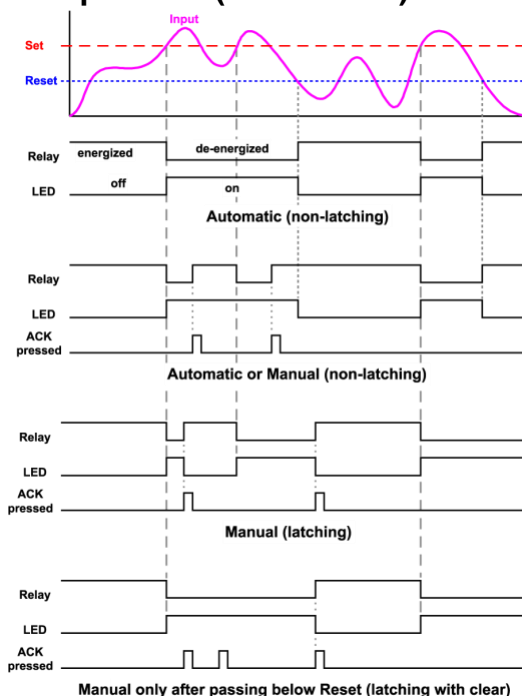
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

### Low Alarm Operation (Set < Reset)



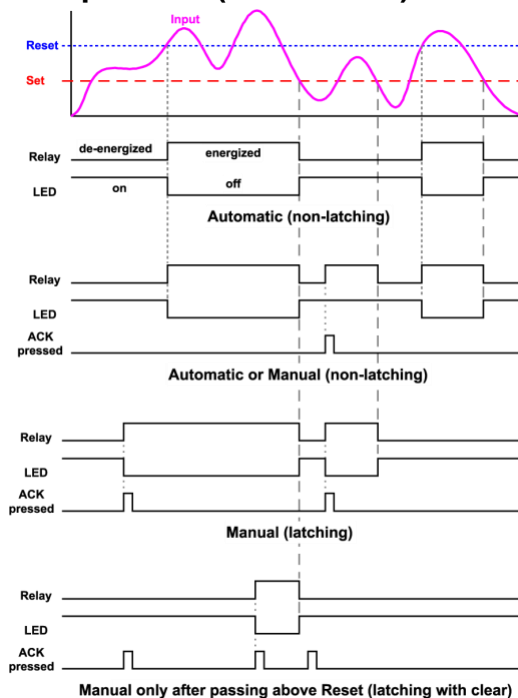
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point and then go below it.

### 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.

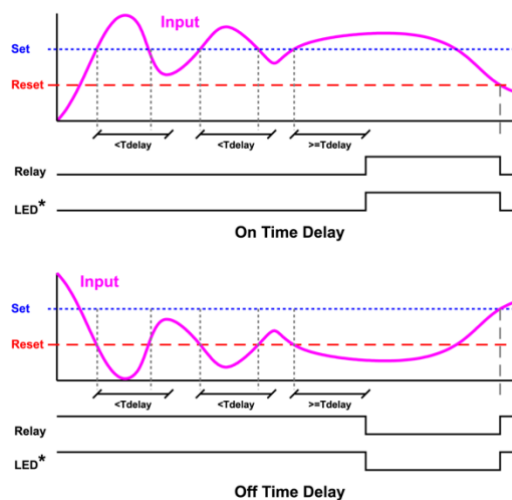
### Low Alarm with Fail-Safe Operation (Set < Reset)



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

### Time Delay Operation

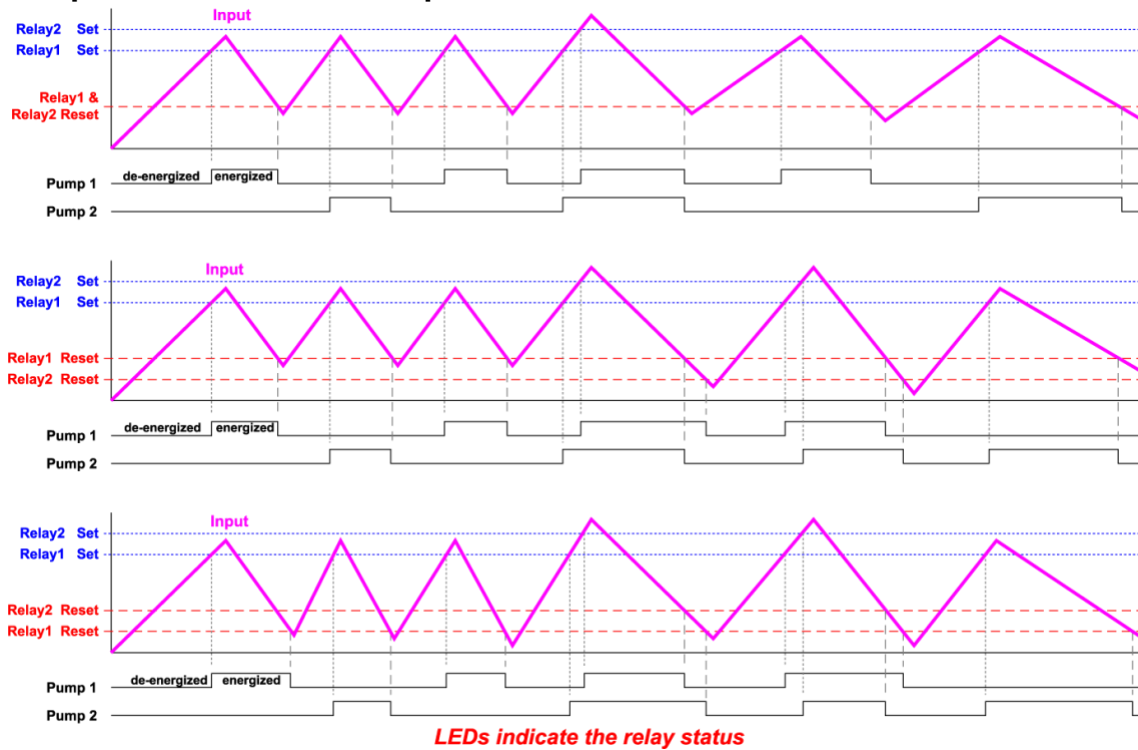
The following graphs show the operation of the time delay function.



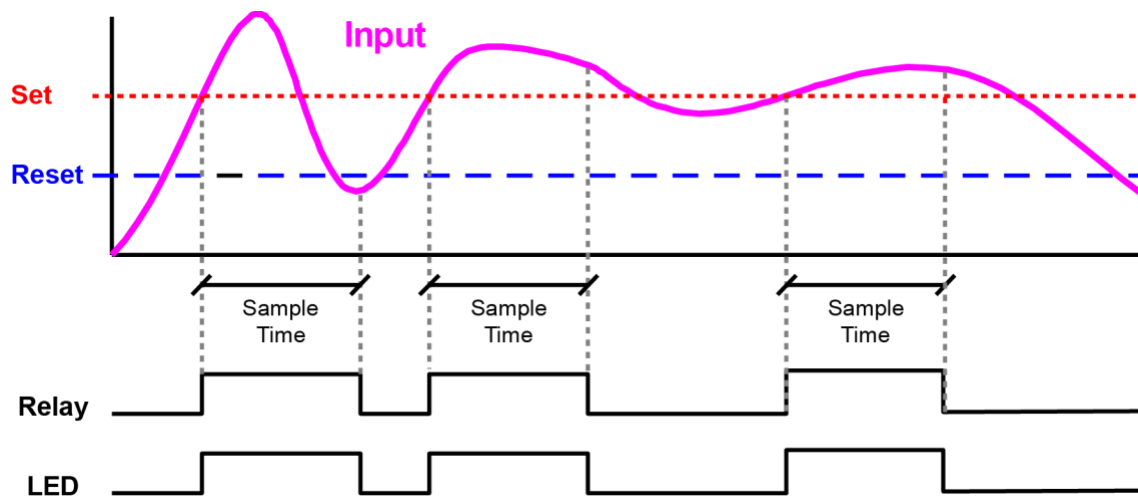
When the signal crosses the set point, the On time delay timer starts and the relay trips when the time delay has elapsed. If the signal drops below the set point (high alarm) before the time delay has elapsed, the On time delay timer resets and the relay does not change state. The same principle applies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

Note: If "Automatic or Manual (R -  $\neg R_N$ )" 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 four-relays option for the meter expands its usefulness beyond simple indication to provide users with alarm and control functions. Typical applications include high and low force, level, or pressure alarms, control applications such as simple on/off control, and relay alternation control for up to 4 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. Alternation Control for up to 4 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  |
|-----|---------|
| 1   | Alarm 1 |
| 2   | Alarm 2 |
| 3   | Alarm 3 |
| 4   | Alarm 4 |

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 respond 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 reflect 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 (ᐃᐅᐅ)

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 (ᐃᐅᐅᐅᐅ)

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 (ᐃᐅᐅᐅᐅ)

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 (ᐃᐅᐅᐅᐅᐅ)

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   |

### Light / Horn / Button Accessories

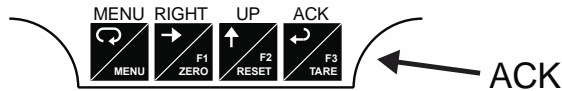


Add visible and audible ways to indicate alarm conditions on any Helios meter with the [MOD-PD2LH](#) Light / Horn / Button accessories. The light with built-in 85 dB horn, and button come mounted and wired to the Helios. An external 24 VDC power supply ([PDA1024-01](#)) is required to power the Light / Horn. Meter and accessories are ordered as separate items. See *Ordering Information* on page 6.

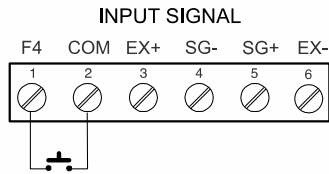
## Acknowledging Relays

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

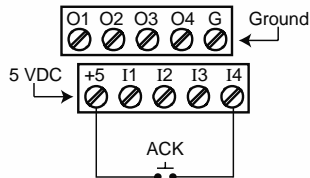
1. Via the programmable front panel function keys F1-F3 (Example: F3 assigned to ACK).  
*Note: If F3 is assigned to ACK, then it cannot be used for Tare.*



2. Remotely via a normally open push button wired to the F4 terminal.



3. Remotely via a normally open push button wired to one of the digital inputs and the +5 V terminal on the digital I/O connections.



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

## Acknowledging Relays with Remote Control Station

Relays may be remotely acknowledged by connecting the [PDA2361-A](#) to either the F4 terminal or a digital input as described above.



## Pump Alternation Control Applications (RL&Ern)

For pump control applications where two or more similar pumps are used to control the level of a tank, 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 4 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 4 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.

## Application #2: Pump Alternation Using Relays 3 & 4

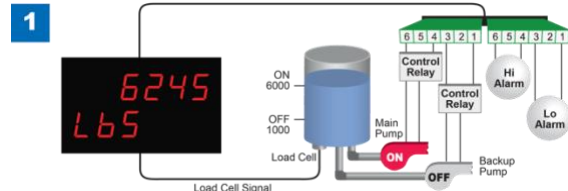
1. Relays 1 and 2 are set up for low and high alarm indication.
2. Relays 3 and 4 are set up for pump alternation.

| Set and Reset Point Programming |           |             |                      |
|---------------------------------|-----------|-------------|----------------------|
| Relay                           | Set Point | Reset Point | Function             |
| 1                               | 495       | 750         | Controls low alarm   |
| 2                               | 7500      | 6900        | Controls high alarm  |
| 3                               | 7000      | 900         | Controls backup pump |
| 4                               | 6000      | 1000        | Controls main pump   |

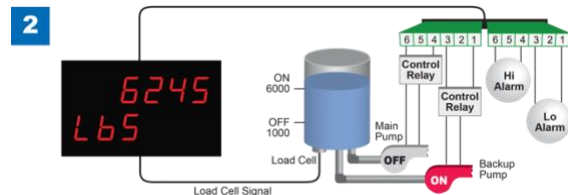
The following graphics provide a visual representation of a typical pump alternation application with high and low alarm monitoring:



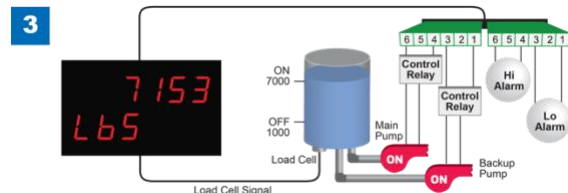
- Relay #4 turns the main pump on at 6000 pounds and turns it off at 1000 pounds.



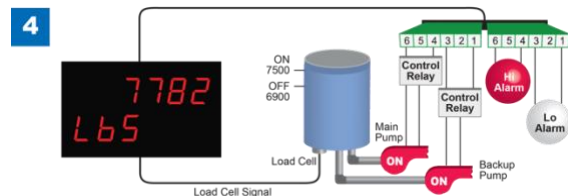
- With the Pump Alternation feature activated, the next time the level reaches 6000 pounds, relay #3 transfers and starts the backup pump.



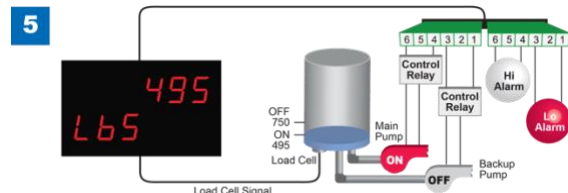
- If the backup pump is not able to keep up, and the level reaches 7000 pounds, relay #4 transfers and starts the main pump as well.



- Relay #2 trips the High Level Alarm at 7500 pounds and resets at 6900 pounds.



- Relay #1 trips the Low Level Alarm at 495 pounds and resets at 750 pounds.

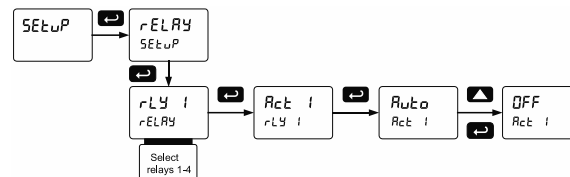


Use the PDA-LH Light / Horn Accessory to Indicate High and Low Alarm Conditions.

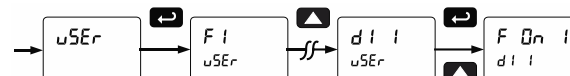
## Setting Up the Interlock Relay (Force On) Feature

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

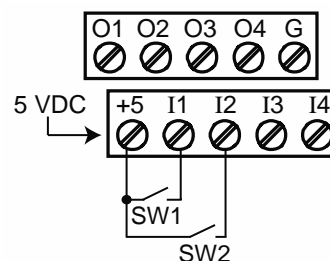
- Access the *Setup – Relay – Action* menu and set the action to off.



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



- 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 activate the relay.*

### ! IMPORTANT

- If the digital inputs are assigned to the *Interlock Function*, then they cannot be used to program the meter remotely.



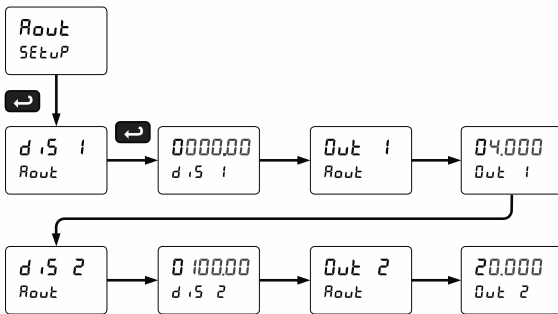
## Scaling the 4-20 mA Analog Output (Rout)

The 4-20 mA analog output can be scaled to provide a 4-20 mA signal for any display range selected.

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

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

For instructions on how to program numeric values see *Setting Numeric Values* on page 27.



## Reset Menu (rESEt)

The *Reset* menu is used to reset the tare (r5t 5r) and the maximum or minimum readings (peak or valley) reached by the process; max & min may be reset at the same time by selecting "reset high & low" (r5t HL).

*Note: Resetting the tare resets the max & min readings.*

## Tare Menu (tRrE)

The *Tare* menu is used to select the tare mode. There are three modes of operation: *Capture Tare*, *Programmable Tare*, and *Off*.

**Capture Tare:** Pressing the Tare key zeroes the display and the "T" indicator flashes indicating that tare is applied to the reading (e.g. Net weight).

**Programmable Tare:** Program a known value to be subtracted from the display value to obtain the net value. Pressing Reset tare clears the tare value to zero. Programmable Tare will not tare negative PVs. Use Capture Tare for negative PVs.

**Off:** Tare function is disabled and pressing Tare key has no effect.

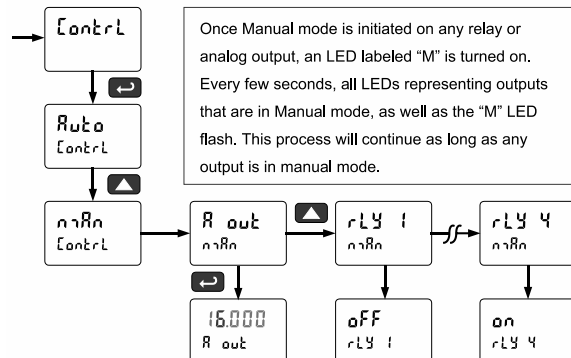
## Tare Functionality (tRrE)

The tare function zeroes out the display. In the case of scale weight, tare is used to eliminate container weight and provide net weight readings.



## 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 (PR55)

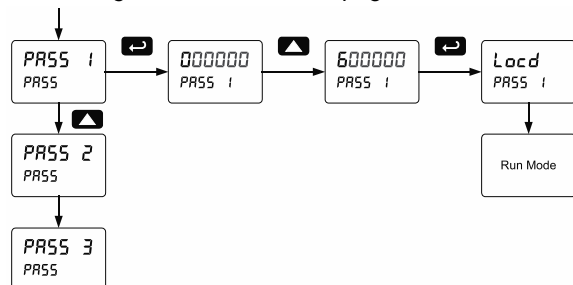
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings.

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* on page 27.

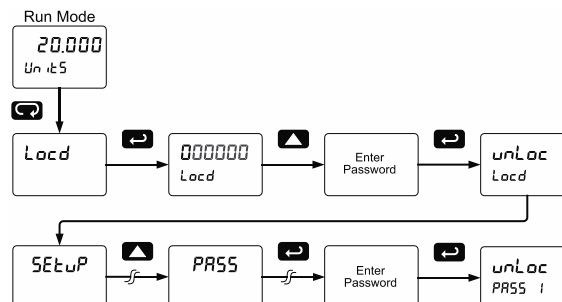


### Making Changes to a Password Protected Meter

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.

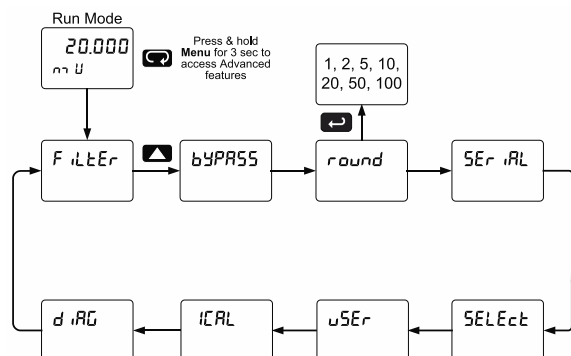
### Did you forget the password?

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 ILT Er                                  | Filter                    | Set noise filter value  |
| bYPASS                                    | Bypass                    | Set filter bypass value   |
| round                                     | Rounding                  | Select rounding value   |
| SEr iAL                                   | Serial                    | Set serial communication parameters   |
| SLAVE id                                  | Slave ID                  | Set slave ID or meter address   |
| bAUD                                      | Baud rate                 | Select baud rate  |
| t r 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)                                     |
| Functi                                    | Input signal conditioning | Linear, select number of points   |
| L iNEAr                                   | Linear                    | Set meter for linear function and select number of linearization points           |
| PV 1                                      | PV1                       | Select PV1 number of linearization points   |
| PV 2                                      | PV2                       | Select PV2 number of linearization points   |
| no Pts                                    | Number of points          | Set PV1 for 2 to 32-point linearization<br>Set PV2 for 2 to 8-point linearization |

| Advanced Features Menu & Display Messages |                             |  |
|---|-----------------------------|--|
| Display                                   | Parameter                   | Action/Setting   |
| SCALE                                     | Scale                       | Scaling parameter  |
| SCALE 1                                   | Scale 1                     | Scaling parameter 1  |
| SCALE 2                                   | Scale 2                     | Scaling parameter 2  |
| Cutoff                                    | Cutoff                      | Set low-value cutoff   |
| Auto 0                                    | Auto Zero                   | Enter the Auto Zero function (on/off)  |
| Analog Pr                                 | Analog output programming   | Program analog output parameters   |
| Source                                    | Source                      | Select source for the 4-20 mA output   |
| OverrNG                                   | Overrange                   | Program mA output for display overrange  |
| UnderrNG                                  | Underrange                  | Program mA output for display underrange   |
| Maximum                                   | Maximum                     | Program maximum mA output allowed  |
| Minimum                                   | Minimum                     | Program minimum mA output allowed  |
| Calib 4                                   | 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)   |
| di 1                                      | Digital input 1             | Assign digital input 1 – 4   |
| do 1                                      | Digital output 1            | Assign digital output 1 – 4  |
| iCAL                                      | Internal source calibration | Enter internal source calibration (used for scaling the meter without a signal source) |
| 15 mV                                     | 15 mV calibration           | Calibrate 15 mV input range (internal reference source used for scaling the input)     |
| 20 mV                                     | 20 mV calibration           | Calibrate 30 mV input range (internal reference source used for scaling the input)     |
| 100 mV                                    | 100 mV calibration          | Calibrate 150 mV input range (internal reference source used for scaling the input)    |

## Advanced Features Menu &amp; Display Messages

| Display  | Parameter          | Action/Setting  |
|----------|--------------------|---|
| 200mV    | 200 mV calibration | Calibrate 300 mV input range (internal reference source used for scaling the input) |
| 5t r oFF | Strain offset      | Calibrate the offset of the input circuit   |
| mV Lo    | mV low             | Calibrate low mV input (e.g. 0 mV)  |
| mV Hi    | mV high            | Calibrate high mV input (e.g. 100 mV)   |
| d iAG    | Diagnostics        | Display test and information  |
| LED t    | LED test           | Test all LEDs   |
| Info     | Information        | Display software number and version   |
| ErASE    | Erase              | Erase MeterView Pro software stored in meter's memory                               |

## Noise Filter (F iLEEr)

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 (SEr iRL)

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

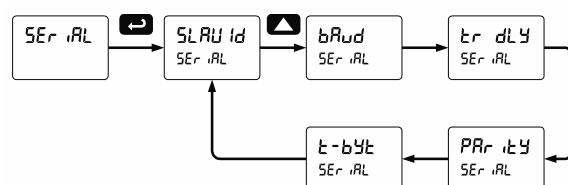
The meter may be connected to a PC for initial configuration via the onboard USB connection. For ongoing digital communications with a computer or other data terminal equipment, use the RS-485 connection with the appropriate serial converter; see *Ordering Information* on page 6 for details.

## CAUTION

- DO NOT** connect any equipment to the RJ45 M-LINK connector. Otherwise damage will occur to the equipment and the meter.
- DO NOT** disconnect the RJ45 connector located to the left of the power terminal block. Doing so will disable the on-board digital I/O, and the RS-485 serial communications.

## Notes:

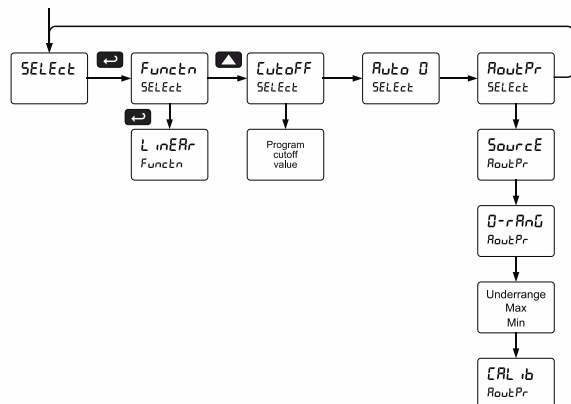
- More detailed instructions are provided with each optional serial communications adapter.
- Refer to the *Helios Modbus Register Tables* located at [www.prediq.com](http://www.prediq.com) for details.



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 conditioner applied to the input (linear), low-value cutoff, Auto-zero, and analog output programming. The multi-point linearization is part of the linear function selection.



## Input Signal Conditioning (Functn)

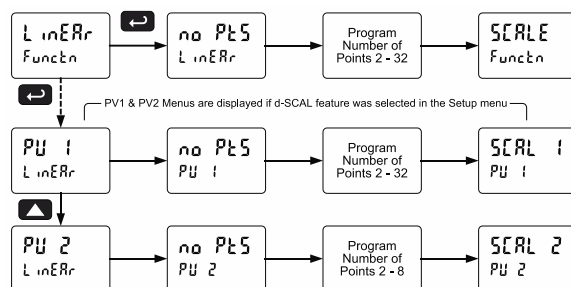
The *Function* menu is used to select the input signal conditioner applied to the input: linear. The multi-point linearization is part of the linear function selection.

Meters are set up at the factory for linear function with 2-point linearization. The linear function provides a display that is linear with respect to the input signal.

## Multi-Point Linearization (L inERr)

Meters are set up at the factory for linear function with 2-point linearization. Up to 32 linearization points can be selected for PV under the linear function. The multi-point linearization can be used to linearize the display for non-linear signals.

If the dual-scale Level feature has been selected, the menus for PV1 & PV2 are enabled. PV2 can be programmed with up to 8 linearization points.



## Auto-Zero (Auto 0)

Auto-zero corrects for drift that can occur over time that causes the input signal to slowly change. The meter will continue to read zero despite slow and small changes to the input signal. The auto-zero value represents the percent of full scale drift that the meter will correct.

Under normal circumstances, when the signal increases quickly, by an amount greater than the auto-zero percent of full scale, the value will not be adjusted. Slow signal changes that occur over time at increments less than the auto-zero value, will not register on the meter (example: dust on a load cell or sensor drift over time).

## Auto-Zero Example

|           |               |
|-----------|---------------|
| Scale     | 0.00 – 100.00 |
| Auto-Zero | 0.06          |

Changes less than 0.06 within 1 second are zeroed out. If the change is 0.10, then it is registered as a real signal change and the Auto-Zero function is bypassed.

## Low-Value Cutoff (Cutoff)

The low-value cutoff feature allows the meter to be programmed so that below a certain value, the meter always displays zero.

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. The cutoff can be disabled to display negative values.

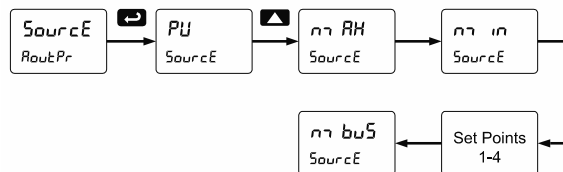
## Analog Output Programming (RoutePr)

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 (e.g. PV)
2. Overrange: Analog output value with display in overrange condition
3. Underrange: Analog output value with display in underrange condition
4. Max: Maximum analog output value allowed regardless of input
5. Min: Minimum analog output value allowed regardless of input
6. Calibrate: Calibrate the internal 4-20 mA source reference used to scale the 4-20 mA output

## Analog Output Source

The source for generating the 4-20 mA output may be assigned to the process variable, maximum or minimum value reached by the process, one of the set points, or the Modbus PV input.



## 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.

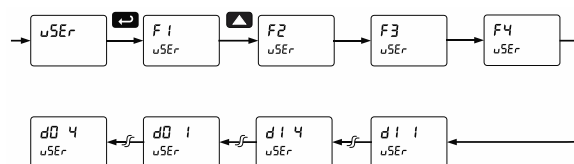
## Analog Output Calibration Procedure

1. Wire the PD2-6100 4-20 mA output to a current loop that includes a power supply (internal or external 12 to 24 VDC), and the mA input on the digital meter. See *Figure 29. 4-20 mA Output Connections* on page 21 for details.
2. Turn on all devices. Allow for a 15 to 30 minute warm-up.
3. Go to the Advanced Features menu, and navigate to the Analog Output Programming (RoutePr)/Calibration (Cal) menu and press **Enter**.
4. The display will show 4.000. The PD2-6100 mA output should now be close to 4 mA. Press **Enter** and the display will show 04.000. Enter the actual value read by the digital mA meter and press **Enter**.
5. The display will show 20.000. The PD2-6100 mA output should now be close to 20 mA. Press **Enter** and the display will show 20.000. Enter the actual value read by the digital mA meter and press **Enter**.
6. The meter will now calculate the calibration factors and store them.
7. Press **Menu** to exit and return to Run mode.

## Programmable Function Keys User Menu (μSEr)

The *User* menu allows the user to assign the front programming buttons function keys F1, F2, and F3, the digital input F4 (located on the input signal connector), and four digital inputs (located on the digital I/O connector) 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.

The four 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.

| Function Keys & Digital I/O Available Settings |  |
|--|--|
| Display  | Description  |
| rSt H i  | Reset the stored maximum display value   |
| rSt Lo   | Reset the stored minimum display value   |
| rSt HL   | Reset the stored maximum & minimum display values  |
| tRrE   | Capture tare and zero the display  |
| rSt tr   | Reset captured tare and resume normal operation  |
| rELRY  | Directly access the relay menu   |
| SEt I*   | Directly access the set point menu for relay 1 (*through 4)  |
| rLY d  | Disable all relays until a button assigned to <i>enable relays</i> (rLY E) is pressed  |
| rLY E  | Enable all relays to function as they have been programmed   |
| H HoLd   | Hold current relay states and analog output as they are until a button assigned to <i>enable relays</i> (rLY E) is pressed   |
| d HoLd   | 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. |
| Ln i H i                                       | Display minimum display value on line 1  |

| Function Keys & Digital I/O Available Settings |   |
|--|---|
| Display  | Description   |
| Ln i Lo  | Display minimum display value on line 1   |
| Ln i HL  | Display maximum & minimum display values on line 1  |
| Ln2 nW   | Display the mV input on line 2  |
| Ln2 H i  | Display maximum display value on line 2   |
| Ln2 Lo   | Display minimum display value on line 2   |
| Ln2 HL   | Display maximum & minimum display values on line 2  |
| ZEr o  | Zero the display (this is different from <i>capture tare</i> because it cannot be reset)  |
| F On I*  | Force relay 1 (*through 4) into the on state. This function is used in conjunction with a digital input to achieve interlock functionality. See <i>Setting Up the Interlock Relay (Force On) Feature</i> on page 40 for details about interlock relays. |
| EnterL   | Directly access the <i>Manual Control</i> menu  |
| d rStbL  | Disable the selected function key or digital I/O  |
| RcH  | Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching   |
| rESEt  | Directly access the reset menu  |
| nREnU  | Mimic the menu button functionality (digital inputs only)   |
| r rHt  | Mimic the right arrow/F1 button functionality (digital inputs only)   |
| uP   | Mimic the up arrow/F2 button functionality (digital inputs only)  |
| EnEEr  | Mimic the enter/F3 button functionality (digital inputs only)   |
| RLn r I*                                       | Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)  |



## Internal Source Calibration (ICRL)

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

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

The internal source allows the user to scale the meter without applying a signal.

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

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

### Notes:

1. **mV input:** If meter is in operation and it is intended to accept only one input range (e.g. 0-30 mV), recalibration of other ranges is not necessary.
2. **Strain gauge:** If the meter is intended to accept a strain gauge bridge input, it is recommended to use the CAL function with ratiometric compensation turned on.
3. Allow the meter to warm up for at least 15 minutes before performing the internal source calibration procedure.

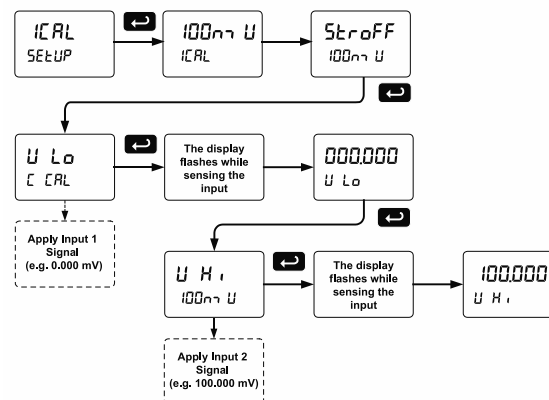
The *Internal calibration* menu is part of the *Advanced Features* menu.

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. The meter displays the first input range (15 mV), press the Up arrow to select any other range (e.g. 250 mV). Press Enter to start the calibration process.

### Example of Internal Calibration for 100 mV input range:

4. The meter displays the message "5LoFF" (strain offset), short the SG+, SG- terminals and press Enter. The *low* input message is displayed (U Lo). Apply the low input signal (e.g. 0.00 mV) and press Enter. The display flashes for a moment while the meter is accepting the low input signal.
5. After the display stops flashing, a number is displayed with the leftmost digit brighter than the rest. The bright digit is the active digit that can be changed by pressing the Up arrow button. Press the Right arrow button to move to the next digit.
6. Set the display value to correspond to the input signal being calibrated; typically 0.00 mV.
7. The display moves to the *high* input calibration (U Hi). Apply the high input signal and press Enter.
8. Set the display for the high input calibration, in the same way as it was set for the low input calibration, typically 100.00 mV.

The following graphic shows the calibration of the 100 mV input range. The other ranges are 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:

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

### Minimum Input Span

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

| Input Range    | Input 1 & Input 2 Span |
|----------------|------------------------|
| 15 mV          | 0.2 mV                 |
| 25 mV, 30 mV   | 0.4 mV                 |
| 150 mV         | 2.0 mV                 |
| 250 mV, 300 mV | 4.0 mV                 |

## Meter Operation

The meter is capable of accepting any signal from -250 to 250 mV in bipolar mode, or 0 to 300 mV in unipolar mode, and displaying these signals in engineering units from -99999 to 999999 (e.g. a 0-100 mV signal could be displayed as 0 to 50000). The dual-line display can be customized by the user to operate in such a way as to satisfy a specific application. Typically, display line 1 is used for the process variable; while line 2 is used for engineering units, custom legend, or set point indication.

The input signal can be scaled to display the process in two different scales; for example, line 1 could indicate weight in pounds and line 2 could indicate percent of maximum weight capacity. The meter can also be set up to display the mV input on line 1 and the Modbus input on line 2. The relays and analog output can be programmed to operate from the Modbus PV input if the Modbus input has been assigned to display line 1.

During operation, the meter can be either tared or zeroed. The tare feature is useful for momentarily zeroing out of the display, in the case where there is additional weight than what is intended to be measured (e.g. a bucket on the scale is being filled with material). The meter will display a T to indicate that the display has been tared and taring is resettable via the reset tare operation. The zero feature is useful for permanent zeroing of the meter, in the case where there has been drift in the strain gauge output over time. The zero feature will zero out the display without indication or the ability to reset.

## Button Operation

| Button Symbol | Description  |
|---------------|--|
|               | Press to enter or exit <i>Programming Mode</i> .   |
|               | Press to zero the meter or other parameter/ function assigned through the <i>User menu</i> .         |
|               | Press to reset tare or other parameter/function assigned through the <i>User menu</i> .              |
|               | Press to tare the display value or other parameters/function assigned through the <i>User menu</i> . |

## 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 47 for details.

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

## Digital Inputs Operation

Five (5) digital inputs, F4, DI-1 to DI-4, come standard on the meter. These digital inputs are programmed identically to function keys F1, F2, and F3. The inputs are triggered with a contact closure to +5 in the case of digital inputs 1-4 or with an active high signal, see *Digital I/O Connections* on page 21 for details. The F4 is triggered with a contact closure to COM or with an active low signal. During operation, digital inputs operate according to the way they are programmed in the *Advanced Features – User menu*. See *Programmable Function Keys User Menu (u5Er)* on page 47 for details.

## Maximum/Minimum Readings

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

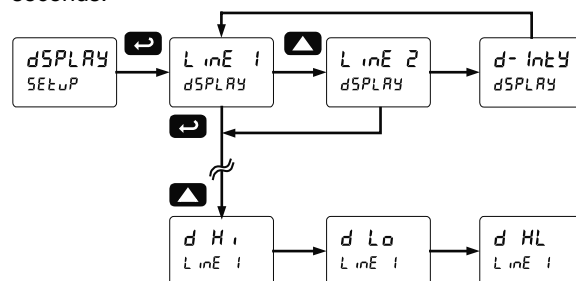
1. Display briefly by assigning to the F1-F3 function keys or to the digital inputs in the *User menu*. Any of the F1-F3 function keys (buttons) and the digital inputs can be programmed to reset the max & min readings.
2. Display continuously by assigning either display to max/min through the *Display menu*.

### To display max reading using function key:

1. Press user assigned function key/digital input to display maximum reading since the last reset/power-up.
2. To reset max/min, press the Menu button, then the Up arrow/F2 button until the Reset (r 55t) menu is displayed.
3. Press the Up arrow/F2 button to select reset high (r 5t H i), reset low (r 5t L o), or reset high and low (r 5t H L) is displayed and then press the Enter/F3 button. The max and/or min displays are reset to actual values.
4. Press Menu to exit max/min display reading.

### To display max/min readings continuously:

Assign either display to Max (d H i), Min (d L o), or toggle between Max and Min (d H L) every 10 seconds.



## Troubleshooting

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

### Diagnostics Menu (d ,RG)

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

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* on page 43.

### Testing the Display LEDs

To test all LEDs on the display:

1. Go to the *Diagnostics* menu (d ,RG) and press Enter button.
2. Press Up arrow button and scroll to *LED Test* menu (LED 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 ( ,nFa) or press the Menu button to return to Run Mode.

### Determining Software Version

To determine the software version of a meter:

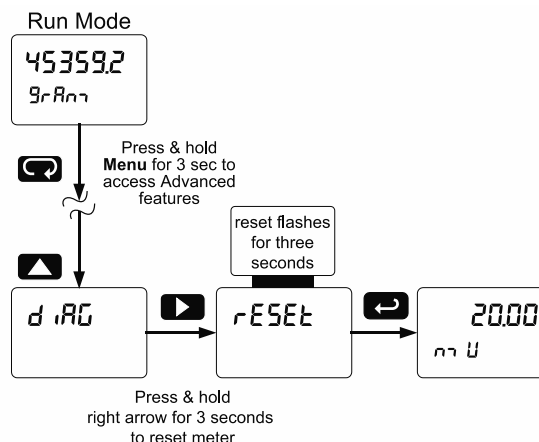
1. Go to the *Diagnostics* menu (d ,RG) and press Enter button.
2. Press Up arrow button and scroll to *Information* menu ( ,nFa).
3. Press Enter to access the software number (5Ft) and version (UR) information. Write down the information as it is displayed. Continue pressing Enter until all the information 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* on page 43.
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 the *Diagnostics* menu.
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.

| Parameter           | Display  | Default Setting      |
|---------------------|----------|----------------------|
| Input type          | POLAR    | Polar = Uni          |
| Input Range         | RANGE    | Range = 30mV         |
| Ratiometric         | RATIO    | Ratio = Yes          |
| Dual-scale          | d-SLR    | No (Single scale)    |
| Filter              | FILTER   | 70                   |
| Bypass              | bypass   | 0.2                  |
| Rounding            | round    | 1                    |
| Function            | Function | Linear               |
| Number of points    | noPTS    | 2                    |
| Programming         | PROG     | Scale                |
| Input 1             | INP 1    | 0.00 mV              |
| Display 1           | d15 1    | 0.00                 |
| Input 2             | INP 2    | 100.00 mV            |
| Display 2           | d15 2    | 100.00               |
| Decimal point       | dddddd   | 3 places             |
| Cutoff value        | CUTOFF   | 0.0 (disabled)       |
| Auto-zero           | AUTO 0   | 0.05% of Full Scale  |
| Display assignment  | dSPLR    |                      |
| Line 1              | LINE 1   | PV: Process variable |
| Line 2              | LINE 2   | Eng units: mV        |
| Display intensity   | d-INTY   | 6                    |
| Relay 1 action      | REL 1    | Automatic            |
| Relay 1 set point   | SET 1    | 10.00                |
| Relay 1 reset point | rSE 1    | 5.00                 |
| Relay 2 action      | REL 2    | Automatic            |
| Relay 2 set point   | SET 2    | 20.00                |
| Relay 2 reset point | rSE 2    | 15.00                |
| Relay 3 action      | REL 3    | Automatic            |
| Relay 3 set point   | SET 3    | 30.00                |
| Relay 3 reset point | rSE 3    | 25.00                |
| Relay 4 action      | REL 4    | Automatic            |
| Relay 4 set point   | SET 4    | 40.00                |
| Relay 4 reset point | rSE 4    | 35.00                |
| Fail-safe relay 1   | FLS 1    | Off                  |
| Fail-safe relay 2   | FLS 2    | Off                  |
| Fail-safe relay 3   | FLS 3    | Off                  |
| Fail-safe relay 4   | FLS 4    | Off                  |

| Parameter            | Display  | Default Setting    |
|----------------------|----------|--------------------|
| On delay relay 1     | ON 1     | 0.0 sec            |
| Off delay relay 1    | OFF 1    | 0.0 sec            |
| On delay relay 2     | ON 2     | 0.0 sec            |
| Off delay relay 2    | OFF 2    | 0.0 sec            |
| On delay relay 3     | ON 3     | 0.0 sec            |
| Off delay relay 3    | OFF 3    | 0.0 sec            |
| On delay relay 4     | ON 4     | 0.0 sec            |
| Off delay relay 4    | OFF 4    | 0.0 sec            |
| Display 1 analog out | d15 1    | 0.00               |
| Output 1 value       | OUT 1    | 4.000 mA           |
| Display 2 analog out | d15 2    | 100.00             |
| Output 2 value       | OUT 2    | 20.000 mA          |
| Source analog output | SOURCE   | Process Variable   |
| Overrange output     | ORANGE   | 21.000 mA          |
| Underrange output    | UNDER    | 3.000 mA           |
| Maximum output       | MAX      | 23.000 mA          |
| Minimum output       | MIN      | 1.000 mA           |
| Slave ID (Address)   | SLAVE ID | 247                |
| Baud rate            | BAUD     | 9600               |
| Transmit delay       | TR DELY  | 10 ms              |
| Parity               | PARITY   | Even               |
| Byte-to-byte timeout | BTBYT    | 010 (0.1 sec)      |
| F1 function key      | F1       | Zero               |
| F2 function key      | F2       | Reset Tare         |
| F3 function key      | F3       | Tare               |
| F4 Function          | F4       | Acknowledge relays |
| Digital input 1      | d1 1     | Menu               |
| Digital input 2      | d1 2     | Right arrow/F1     |
| Digital input 3      | d1 3     | Up arrow/F2        |
| Digital input 4      | d1 4     | Enter/F3           |
| Digital output 1     | d0 1     | Alarm 1            |
| Digital output 2     | d0 2     | Alarm 2            |
| Digital output 3     | d0 3     | Alarm 3            |
| Digital output 4     | d0 4     | Alarm 4            |
| Password 1           | PR55 1   | 000000 (unlocked)  |
| Password 2           | PR55 2   | 000000 (unlocked)  |
| Password 3           | PR55 3   | 000000 (unlocked)  |

## Troubleshooting Tips

This meter is a highly sophisticated instrument with an extensive list of features and capabilities. If the programming 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 programming 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>Lock</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-Value Cutoff</i> 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-value cutoff setting.<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>-999999</b><br>3. <b>FRUL</b>          | Check:<br>1. Input selected in <i>Setup</i> menu<br>2. Signal at Signal connector<br>3. Input exceeds range selected  |
| 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)<br>4. Increase Rounding value  |
| 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</b> and a number<br>2. <b>L</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 50. 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

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

### Place Orders

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