

Helios PD2-6200 Analog Input Flow Rate/Totalizer

Instruction Manual



HELIOS



MeterView Pro

USB Install

- Large Display NEMA 4X, IP65 Wall Mounted Flow Rate/Totalizer
- 0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and ± 10 V Field Selectable Inputs with $\pm 0.03\%$ Accuracy
- Large Dual-Line 6-Digit Display, 1.8" (46 mm) Readable from 100 Feet (30 Meters) Away
- Isolated 24 VDC @ 200 mA Transmitter Power Supply
- 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
- Display Rate & Total at the Same Time
- Rate in Units per Second, Minute, Hour, or Day
- Total, Grand Total or Non-Resettable Grand Total
- Front Panel or Remote Total Reset
- Password Protection for Total Reset
- Total Stored in Non-Volatile Memory
- Assign Any Relay for Rate or Total
- 4-20 mA Output for Rate or Total
- Display Open Channel Flow with Programmable Exponent Feature
- 32-Point Linearization & Square Root Extraction
- Operating Temperature Range: -40 to 65°C (-40 to 149°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
- Programmable Display, Function Keys & Digital Inputs
- On-Board USB & 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

Limited Warranty

Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period under "Specifications" from the date of shipment from the factory. Precision Digital's liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit. See Warranty Information and Terms & Conditions on 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

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 buttons and the instructions in this manual to do so.

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Introduction

The Helios PD2-6200 is a multi-purpose, easy to use, large-display rate/totalizer ideal for flow rate, total, and control applications. It 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.

The meter accepts current and voltage signals (e.g. 4-20 mA, 0-10 V) from an analog output flowmeter. The rate, as measured by the flowmeter, is automatically aggregated into a cumulative total and grand total which can be displayed simultaneously with the rate. Three of the programming buttons can be set for custom operation.

A fully loaded Helios PD2-6200 meter comes with four SPDT relays, a 4 20 mA output, two 24 VDC power supplies, five digital inputs and four digital outputs, and RS485 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 PD2-6200 an excellent addition to any system.

Using the PD2-6200 Like a PD2-6000 Process Meter

The PD2-6200 is essentially a PD2-6000 process meter with flow totalization capability. The flow totalization capability can easily be de-activated for customers that would prefer their PD2-6200 behave like a PD2-6000 process meter. For instructions on how to do this, see *Setting Up the Rate/Totalizer Meter (SE&uP)* on page 27 for details.

Ordering Information

85-265 VAC Models

Model	Standard Features	Options Installed
PD2-6200-6H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6200-6H7		4 relays 4-20 mA output

12-24 VDC Models

Model	Standard Features	Options Installed
PD2-6200-7H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6200-7H7		4 relays 4-20 mA output

Accessories

Model	Description
PDA0004	Cable Gland
PDA7485-I	RS-232 to RS-485 isolated converter
PDA8485-I	USB to RS-485 isolated converter
PDAPLUG2	Plastic Conduit Plug
PDX6901	Snubber: 0.01 μF/470 Ω, 250 VAC

PDA2360 Control Stations



Model	Description
PDA2360-E	Emergency button
PDA2361-A	Ack button
PDA2361-B	Blank button
PDA2361-R	Reset button
PDA2361-T	Tare button
PDA2361-S	Stop button
PDA2361-Q	Silence button
PDA2362-AR	Ack and Reset buttons
PDA2362-BB	Two blank buttons
PDA2364-MRUE	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 Accessories



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

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

Note:

- 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.



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 15 for details.

Model	Description
PDA6260	2" Pipe Mounting Kit for PD2

Signal Splitter & Conditioner Accessories



Model	Description
PD659-1MA-1MA	Signal Isolator with One 4-20 mA Input and One 4-20 mA Output
PD659-1MA-2MA	Signal Splitter with One 4-20 mA Input and Two 4-20 mA Outputs
PD659-1V-1MA	Signal Conditioner with One 0-10 VDC Input and One 4-20 mA Output
PD659-1MA-1V	Signal Conditioner with One 4-20 mA Input and One 0-10 VDC Output

Useful Tools

PD9501 Multi-Function Calibrator



This [PD9501](#) Multi-Function Calibrator has a variety of signal measurement and output functions, including voltage, current, thermocouple, and RTD.

PD9502 Low-Cost Signal Generator



The [PD9502](#) is a low-cost, compact, simple to use 4-20 mA or 0-10 VDC signal generator. It can easily be set for 0-20 mA, 4-20 mA, 0-10 V or 2-10 V ranges. Signal adjustment is made with a one-turn knob. A 15-27 VDC wall plug is provided with the instrument. Optional USB power bank is available.

Specifications

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

General

Display	Dual-line: 1.8" (46 mm) high, red LEDs 6 digits per line (-99999 to 999999), with lead zero blanking
Display Intensity	Eight user selectable intensity levels. Default value is six.
Display Update Rate	5/second (200 ms)
LED Status Indicators	See <i>LED Status Indicators</i> on page 23 for details.
Overrange	Display flashes 999999
Underrange	Display flashes -99999
Display Assignment	Display Line 1: Rate, total, grand total, alternate (rate/total, rate/grand total, rate/units, total/units, and grand total/units), set points, max/min, and Modbus input. Display Line 2: Same as Display Line 1; plus units, tag or turned off. Additional displays are available if parameter total is off, and parameter d-SCAL is on: gross weight, gross & net weight, PV1, PV2, and PCT (refer to PD2-6000 instruction manual).
Programming Methods	Four programming buttons, digital inputs, PC and MeterView Pro software, or Modbus registers.
Noise Filter	Programmable from 2 to 199 (0 will disable filter)
Filter Bypass	Programmable from 0.1 to 99.9% of calibrated span
Recalibration	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
Max/Min Display	Max/min readings reached by the process are stored until reset by the user or until power to the meter is turned off.
Rounding	Select 1, 2, 5, 10, 20, 50, or 100 (e.g. rounding = 10, value = 123.45, display = 123.50).
Password	Three programmable passwords restrict modification of programmed settings and two prevent resetting the totals. 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. Total: Prevents resetting the total manually Gtotal: Prevents resetting the grand total manually
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.

Power Options	85-265 VAC 50/60 Hz; 90-265 VDC, 20 W max; 12-24 VDC, 12-24 VAC, 15 W max. Powered over USB for configuration only.
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 meters may share one 5 A fuse
Normal Mode Rejection	Greater than 60 dB at 50/60 Hz
Isolation	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.
Environmental	Operating temperature range: -40 to 65°C (-40 to 149°F) Storage temperature range: -40 to 85°C (-40 to 185°F) Relative humidity: 0 to 90% non-condensing <i>Note: Printed circuit boards are conformally coated.</i>
Connections	Power, signal, relays, mA out: Removable screw terminal blocks accept 12 to 22 AWG wire. RS-485: Removable screw terminal block accepts 16 to 30 AWG wire. Digital I/O: Non-removable screw terminal blocks accept 16 to 30 AWG wire.
Enclosure	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.
Mounting	Wall Mounting: Four (4) mounting holes provided for mounting meter to wall. See <i>Wall Mounting Instructions</i> on page 14 for additional details. Pipe Mounting: Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See <i>Pipe Mounting Instructions</i> on page 15 for additional details.
Tightening Torque	Power, signal, relays, mA out terminals: 5 lb-in (0.56 Nm) Digital I/O and RS-485: 2.2 lb-in (0.25 Nm)
Overall Dimensions	10.63" x 12.59" x 4.77" (270 mm x 319.7 mm x 121.2 mm) (W x H x D)
Weight	6.10 lbs (2.76 kg)
Warranty	3 years parts & labor. See Warranty Information and Terms & Conditions on www.prediq.com for complete details.

Process Input

Inputs	Field selectable: 0-20 mA, 4-20 mA ±10 V (0-5 V, 1-5 V, 0-10 V) Modbus PV (Slave)	
Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ±10%. All models selectable for 24, 10, or 5 VDC supply (Switch labeled P+/P-). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max. 5 & 10 VDC supply rated @ 50 mA max. Refer to <i>Transmitter Supply Voltage Selection (P+, P-)</i> on page 17 and <i>Figure 25. 4-20 mA Output Connections</i> on page 22. When the Light / Horn is powered by the transmitter power supply, see MOD-PD2LH Light / Horn's transmitter power supply specification in MOD-PD2LH manual for additional details. Light / Horn power not available for 5 or 10 VDC supplies.	
Accuracy	±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span	
Temperature Drift	0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient	
Input Signal Conditioning	Linear, square root, programmable exponent, or round horizontal tank volume calculation	
Multi-Point Linearization	2 to 32 points	
Programmable Exponent	User selectable from 1.0001 to 2.9999 for open channel flow	
Round Horizontal Tank	Diameter & Length: 999.999 inch or cm calculates volume in gallons or liters respectively.	
Low-Flow Cutoff	0.1 to 999,999 (0 disables cutoff function). Point below at which display always shows zero.	
Decimal Point	Up to five decimal places or none: <i>dddddd, dddddd, dddd, ddd, dd, or dddddd</i>	
Calibration Range	Input Range	Minimum Span Input 1 & Input 2
	4-20 mA	0.15 mA
	±10 V	0.10 V
	An error message will appear if the input 1 and input 2 signals are too close together.	
Input Impedance	Voltage ranges: greater than 500 kΩ Current ranges: 50 - 100 Ω (depending on internal resettable fuse impedance)	
Input Overload	Current input protected by an internal resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.	
HART Transparency	The meter does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption. The meter is not affected if a HART communicator is connected to the loop. The meter does not display secondary HART variables.	

Rate/Totalizer

Rate Display Indication	-99999 to 999999, lead zero blanking. "R" LED illuminates while displaying rate.
Total Display & Total Overflow	0 to 999,999; automatic lead zero blanking. "T" LED is illuminated while displaying total or grand total. Up to 999,999,999 with total-overflow feature. "oF" is displayed to the left of total overflow and ▲ LED is illuminated.
Total Decimal Point	Up to five decimal places or none: <i>dddddd, dddddd, dddd, ddd, dd, or dddddd</i> Total decimal point is independent of rate decimal point.
Totalizer	Calculates total based on rate and field programmable multiplier to display total in engineering units. Time base must be selected according to the time units in which the rate is displayed.
Totalizer Rollover	Totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
Total Overflow Override	Program total reset for automatic with 0.1 second delay and set point 1 for 999,999
Totalizer Presets	Four, user selectable under setup menu. Any set point can be assigned to total and may be programmed anywhere in the range of the meter for total alarm indication.
Programmable Delay On Release	0.1 and 999.9 seconds; applied to the first relay assigned to total or grand total. If the meter is programmed to reset total to zero automatically when the preset is reached, then a delay will occur before the total is reset.
Total Reset	User selectable via front panel button, F4 terminal at back of meter, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
Total Reset Password	Total and grand total passwords may be entered to prevent resetting the total or grand total from the front panel.
Non-Resettable Total	The grand total can be programmed as a non-resettable total by entering the password "050873".

⚠ CAUTION

- Once the Grand Total has been programmed as "non-resettable" the feature **CANNOT** be disabled.

Relays

Rating	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
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads. See <i>Switching Inductive Loads</i> on page 20 for details.
Relay Assignment	Relays may be assigned to rate, total, grand total, or Modbus input.
Deadband	0-100% of span, user programmable
High or Low Alarm	User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turn off).
Relay Operation	<ul style="list-style-type: none"> Automatic (non-latching) and/or manual reset Latching (requires manual acknowledge) with or without clear Pump alternation control (2-4 relays) Sampling (based on set point and time) Off (disable unused relays and enable Interlock feature) Manual on/off control mode
Relay Reset (Acknowledge)	User selectable via front panel button, F4 digital input, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
Time Delay	0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay.
Fail-Safe Operation	Programmable and independent for each relay. <i>Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.</i>
Auto Initialization	When power is applied to the meter, relays will reflect the state of the input to the meter.

USB Connection

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

Isolated 4-20 mA Transmitter Output

Output Source	Rate/process, total, grand total, max, min, set points 1-4, or manual control mode									
Scaling Range	1.000 to 23.000 mA for any display range.									
Calibration	Factory calibrated: 4.000 to 20.000 = 4-20 mA output									
Analog Out Programming	23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break									
Accuracy	$\pm 0.1\%$ FS ± 0.004 mA									
Temperature Drift	0.4 μ A/ $^{\circ}$ C max from 0 to 65 $^{\circ}$ C ambient, 0.8 μ A/ $^{\circ}$ C max from -40 to 0 $^{\circ}$ C ambient <i>Note: Analog output drift is separate from input drift.</i>									
Isolated Transmitter Power Supply	Terminals I+ & R: 24 VDC $\pm 10\%$. May be used to power the 4-20 mA output or other devices. All models rated @ 40 mA max.									
External Loop Power Supply	35 VDC maximum									
Output Loop Resistance	<table border="1"> <thead> <tr> <th>Power supply</th> <th>Minimum</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>24 VDC</td> <td>10 Ω</td> <td>700 Ω</td> </tr> <tr> <td>35 VDC (external)</td> <td>100 Ω</td> <td>1200 Ω</td> </tr> </tbody> </table>	Power supply	Minimum	Maximum	24 VDC	10 Ω	700 Ω	35 VDC (external)	100 Ω	1200 Ω
Power supply	Minimum	Maximum								
24 VDC	10 Ω	700 Ω								
35 VDC (external)	100 Ω	1200 Ω								
Additional 4-20 mA Outputs	The PD659-1MA-2MA can split the optional 4-20 mA output into two isolated 4-20 mA outputs									
0-10 VDC Output	The PD659-1MA-1V can convert the optional 4-20 mA output to a 0-10 VDC output									

RS-485 Serial Communications

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

Modbus® RTU Serial Communications

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

Note: Refer to the Helios Modbus Register Tables located at www.prediq.com for details.

Digital Input (F4)

Function	Reset total, remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values. See <i>Function Keys & Digital I/O Available Settings</i> on page 47 for a complete list of capabilities.
Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM
Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

Digital Inputs & Outputs

Function	Terminals provided for remote operation of all four programming / operation buttons (use PDA2364-MRUE control station). Other uses include acknowledge/reset relays and reset max/min values. See <i>Function Keys & Digital I/O Available Settings</i> on page 47 for a complete list of capabilities.
Channels	4 digital inputs & 4 digital outputs
Digital Input Logic High	3 to 5 VDC
Digital Input Logic Low	0 to 1.25 VDC
Digital Output Logic High	3.1 to 3.3 VDC
Digital Output Logic Low	0 to 0.4 VDC
Source Current	10 mA maximum output current
Sink Current	1.5 mA minimum input current
+5 V Terminal	To be used as pull-up for digital inputs only. Connect normally open push buttons across +5 V & DI 1-4.

WARNING

- **DO NOT** use +5 V terminal to power external devices.

MeterView Pro Software

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

Compliance Information

Safety

UL & C-UL Listed	USA & Canada UL 508 Industrial Control Equipment (USA) C22.2 No. 142 (Canadian National Standard)
UL File Number	E160849
Enclosure	UL Type 4X, NEMA 4X, IP65
Low Voltage Directive	EN 61010-1 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 14 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 *Figure 8. Transmitter Supply Voltage Selection* on page 17.

Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

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.

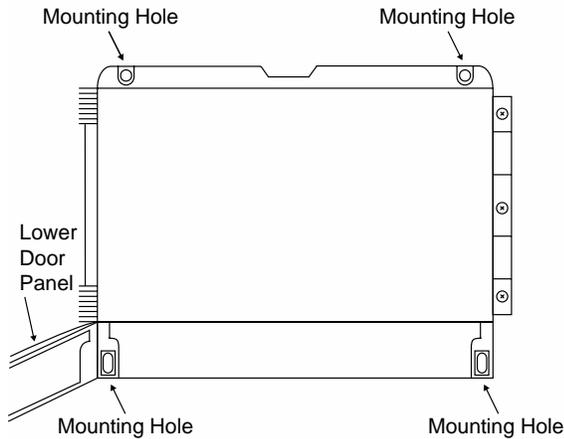


Figure 1. Meter Mounting Holes Location

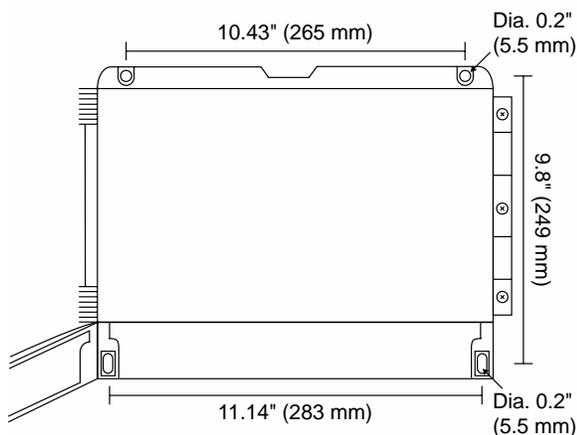


Figure 2. Meter Mounting Holes Dimensions

Mounting Dimensions

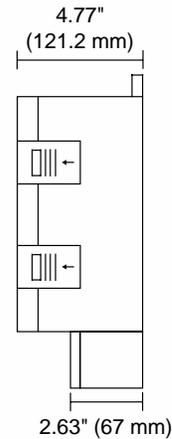


Figure 3. Meter Dimensions – Side View

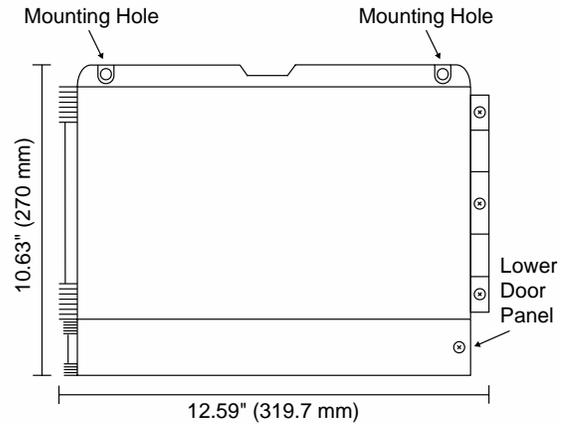


Figure 4. Meter Dimensions - Front View

Conduit Holes Location

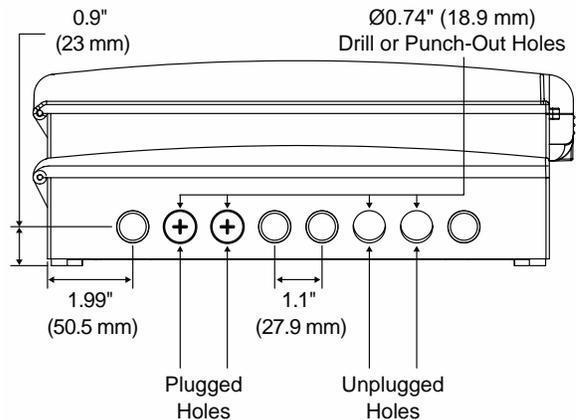


Figure 5. Conduit Holes Location – Bottom View

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).

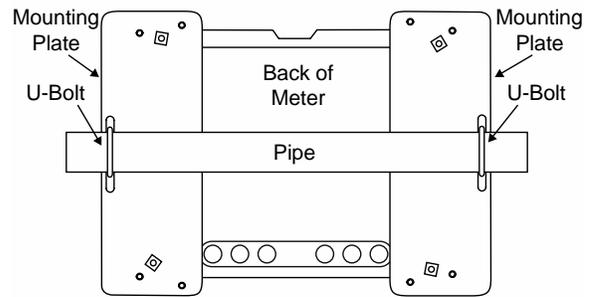
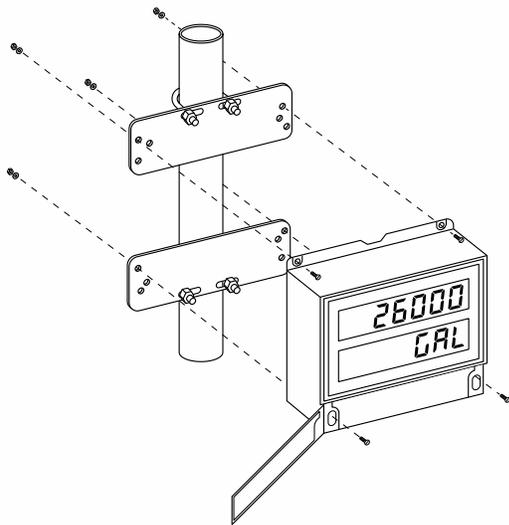
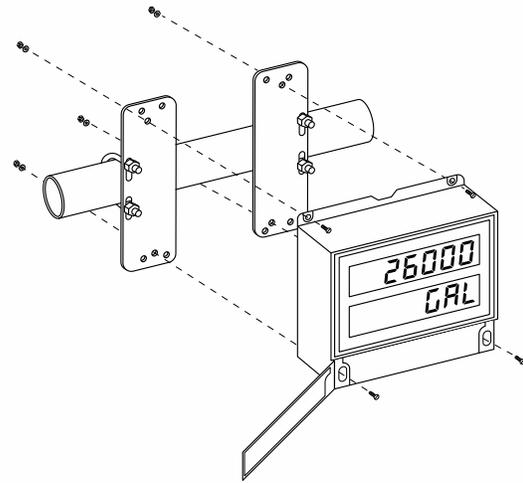


Figure 7. Horizontal Pipe Mount Assembly

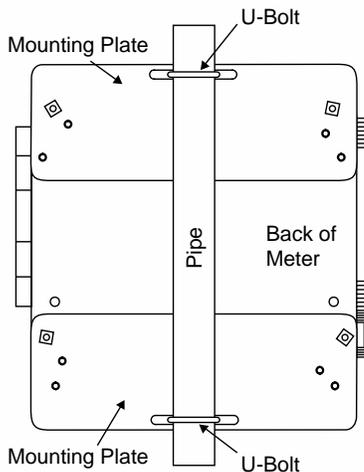


Figure 6. Vertical Pipe Mount Assembly

Transmitter Supply Voltage Selection (P+, P-)

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

If the transmitter requires 5 or 10 VDC excitation, the 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.

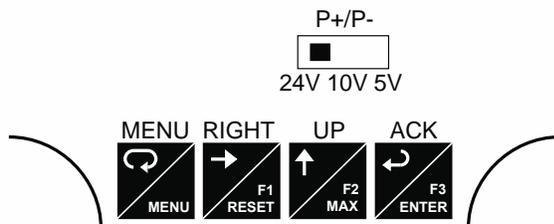


Figure 8. Transmitter Supply Voltage Selection

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.

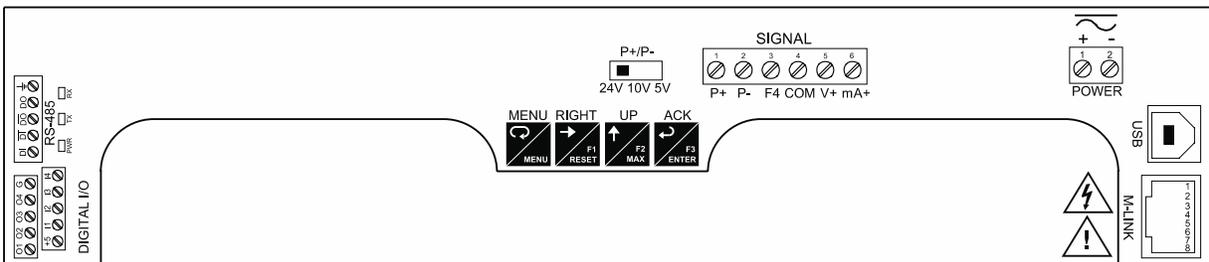


Figure 9. PD2-6200-6H0 / 7H0 Connectors Label

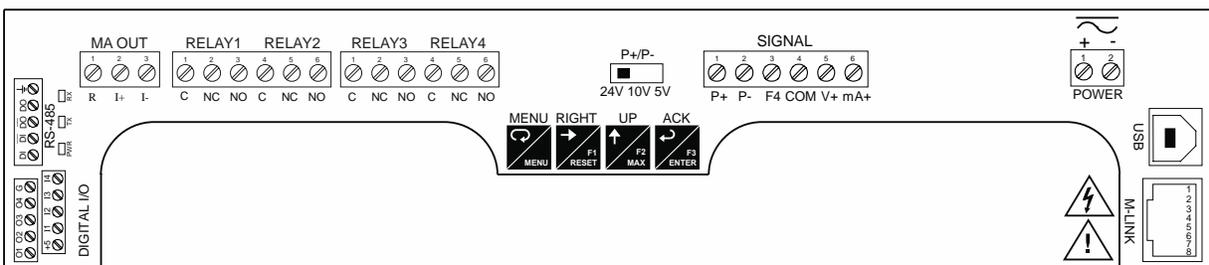


Figure 10. PD2-6200-6H7 / 7H7 Connectors Label

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.

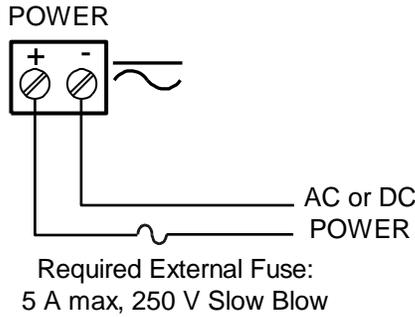


Figure 11. Power Connections

Signal Connections

Signal connections are made to a six-terminal connector labeled SIGNAL. The COM (common) terminal is the return for the 4-20 mA and the ± 10 V input signals.

Current and Voltage Connections

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

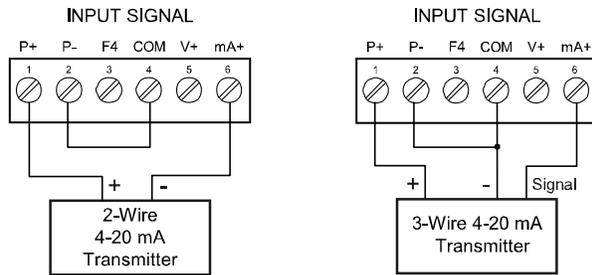


Figure 12. Transmitter Powered by Internal Supply

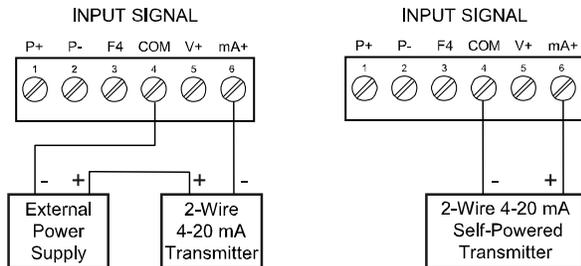


Figure 13. Transmitter Powered by External Supply or Self-Powered

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

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

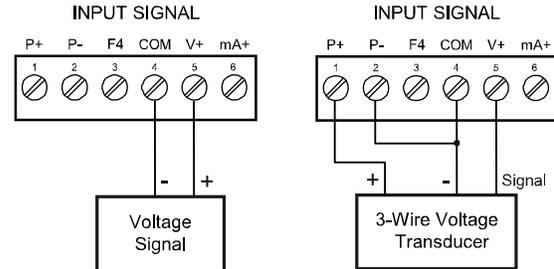


Figure 14. Voltage Input Connections

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

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.

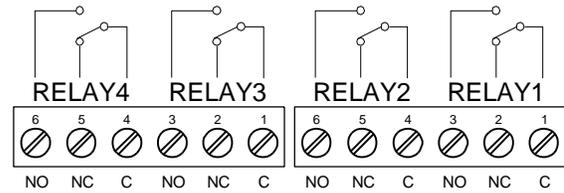


Figure 15. Relay Connections

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:

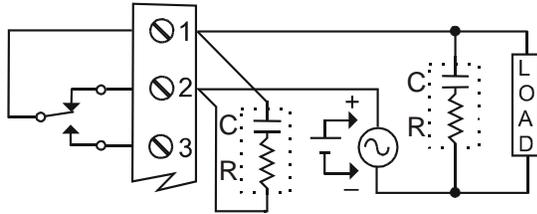


Figure 16. AC and DC Loads Protection

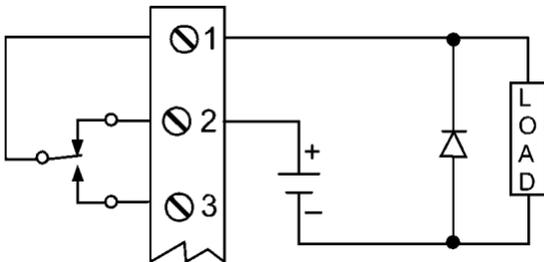
Choose R and C as follows:

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 17. 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 (5Er iRL)* on page 43 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.

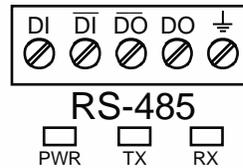


Figure 18. RS-485 Connection

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 (5Er iRL) menu is displayed and press Enter, Addr E5 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

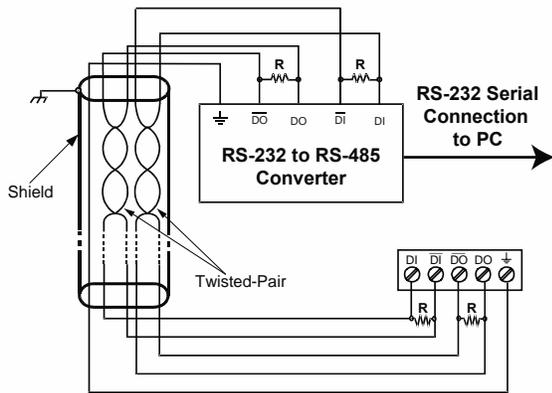


Figure 19. Five-Wire RS-485 Connections

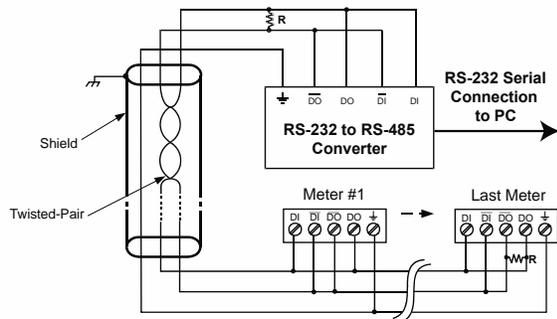


Figure 20. Three-Wire RS-485 Multi-Drop Connections

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 21 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
DO	DI
DI	DO
DI	DO

Figure 21. 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.

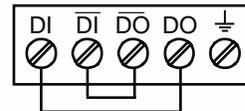


Figure 22. Three-Wire RS-485 Connection

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.

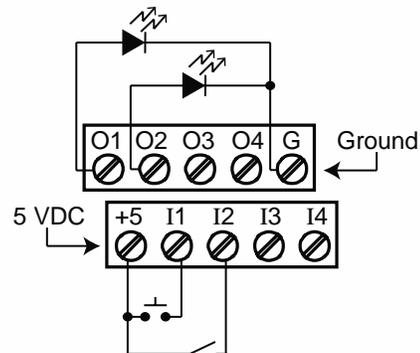


Figure 23. Digital Input and Output Connections

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 reset the total, 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.

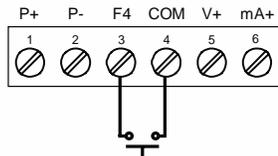


Figure 24. F4 Digital Input Connections

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.

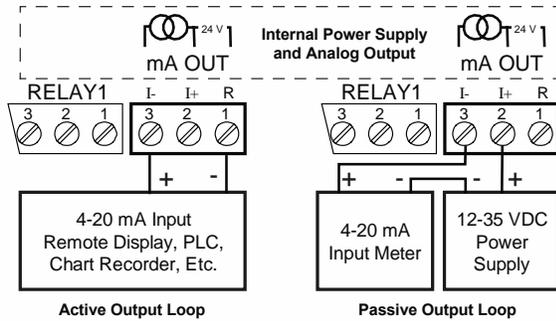


Figure 25. 4-20 mA Output Connections

Analog Output Power Supply

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

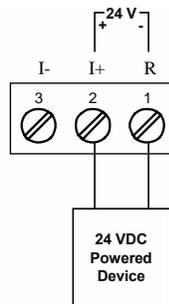


Figure 26. Analog Output Supply Powering Other Devices

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 27. Meter to PDA2364-MRUE Control Station*.

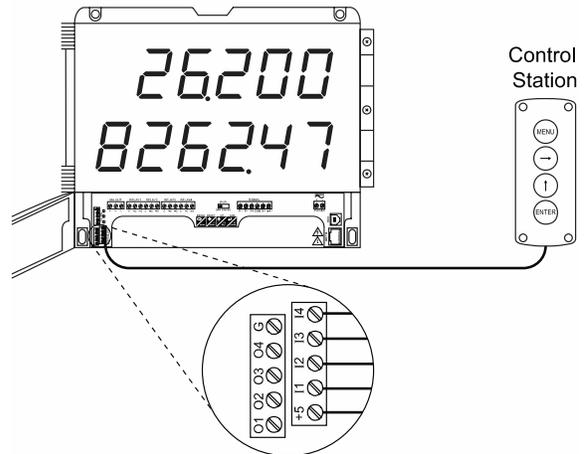


Figure 27. Meter to PDA2364-MRUE Control Station Connection

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 39.

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.

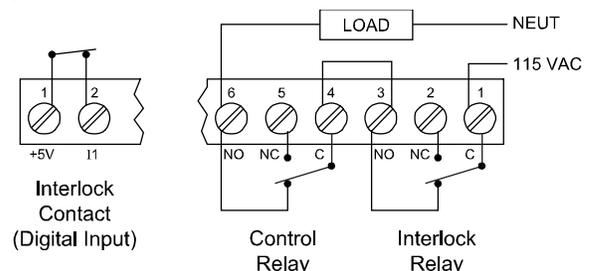


Figure 28. Interlock Connection

Setup and Programming

There is **no need to recalibrate** the meter when first received from the factory. The meter is **factory calibrated** prior to shipment for milliamps and volts with calibration equipment that is certified to NIST standards.

Overview

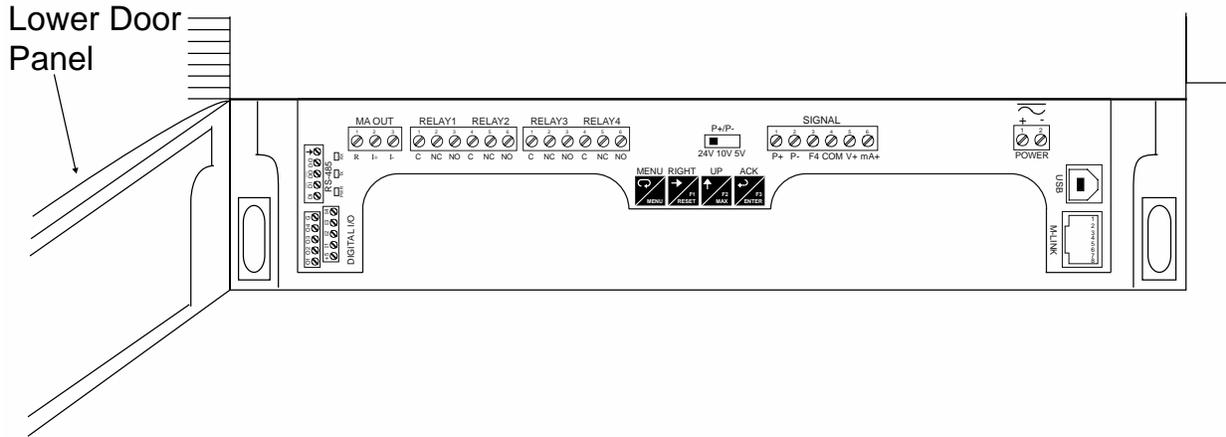
There are no jumpers to set for the meter input selection. Setup and programming is done using MeterView Pro or through the programming buttons. After power and input signal connections have been completed and verified, apply power to the meter.

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
R	Steady	Rate
T	Steady	Total
T	Flashing	Meter in Tare mode
G & T	Steady	Grand Total
▲	Steady	Total overflow. ("oF" is displayed to the left of total overflow and ▲ LED is illuminated)
M	Flashing	Analog output in manual control mode

Programming Buttons



Button	Description
	Menu
	Right Arrow/F1

Button	Description
	Up Arrow/F2
	Acknowledge (Enter)/F3

- 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.

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
ሃይቲሆፕ	Setup	Enter Setup menu
ከስፕሪት	Input	Enter Input selection menu
ጠገጸ	4-20 mA	Set meter for 4-20 mA input
ሠዕሪት	0-10 VDC	Set meter for ±10 VDC input
ኒዕቲጸሊ	Total	Enable or disable totalizer features
ደ-ሃሮሊ	Dual-scale	Enter d-SCAL menu and select Yes for dual-scale or No for single scale display
ሠከቴሃ	Units	Select the display units/tags
ገጸይ	Rate	Select the display units for rate
ኒዕቲጸሊ	Total	Select the display units for total
ከቴዕቲጸሊ	Grand Total	Select the display units for grand total
ደፎሮ ፓይ	Decimal point	Set decimal point for rate, total, grand total
ፕሮግራም	Program	Enter the Program menu
ከስሮሊ	Input Calibration	Enter the Input Calibration menu
ሃሮሊይ	Scale	Enter the Scale menu
ሮሊ	Calibrate	Enter the Calibrate menu
ከስፕ 1	Input 1	Calibrate input 1 signal or program input 1 value
ደ.ሃ 1	Display 1	Program display 1 value
ከስፕ 2	Input 2	Calibrate input 2 signal or program input 2 value (up to 32 points)
ደ.ሃ 2	Display 2	Program display 2 value (up to 32 points)
Error	Error	Error, calibration not successful, check signal or programmed value
ኒ ቴቴ	Total time base	Program total time base
ኒ ሮፍ	Total conversion factor	Program total conversion factor
ኒ ገሃይ	Total reset	Program total rest mode: auto or manual
ከቴ ቴቴ	Grand total time base	Program grand total time base

Display Functions & Messages		
Display	Parameter	Action/Setting Description
ከቴ ሮፍ	Grand total conversion factor	Program grand total conversion factor
ከቴ ገሃይ	Grand total reset	Program grand total rest mode: auto or manual
ጸሐቴ	Automatic	Press Enter to set automatic total reset
ኒ ደሊሃ	Time delay	Program time delay for total auto reset
ጠገጸ	Manual	Press Enter to reset total manually
ደሃፒሊሃ	Display	Enter the Display menu
ኒ ከፎ 1	Line 1	Press Enter to assign the Main display parameter (default: PV or rate)
ኒ ከፎ 2	Line 2	Press Enter to assign the small display parameter (default: total)
ደ-ከቴሃ	Display intensity	Set display intensity level from 1 to 8
ገይሊሃ	Relay	Enter the Relay menu
ጸሃህ ስክ	Assignment	Assign relays to rate, total, or grand total
ጸሃ ስክ 1	Assign 1	Relay 1 assignment
ኒዕቲጸሊ	Total	Assign relay to total
ከቴዕቲጸሊ	Grand total	Assign relay to grand total
ጠገ ቴህሃ	Modbus	Select to display Modbus input or to assign Modbus input as the analog output source
ገጸይ	Rate	Assign relay to rate
ገሃ 1	Relay 1	Relay 1 setup
ገሮት 1	Action 1	Set relay 1 action
ጸሐቴ	Automatic	Set relay for automatic reset
ጸ-ጠገጸ	Auto-manual	Set relay for automatic & manual reset any time
ሊጸይጸ	Latching	Set relay for latching operation (relays assigned to rate)
ኒቴ-ሮሊ	Latching-cleared	Set relay for latching operation with manual reset only after alarm condition has cleared (relays assigned to rate)
ጸሊቴገጠ	Alternate	Set relay for pump alternation control (relays assigned to rate)
ሃጸጠፒሊ	Sampling	Set relay for sampling operation

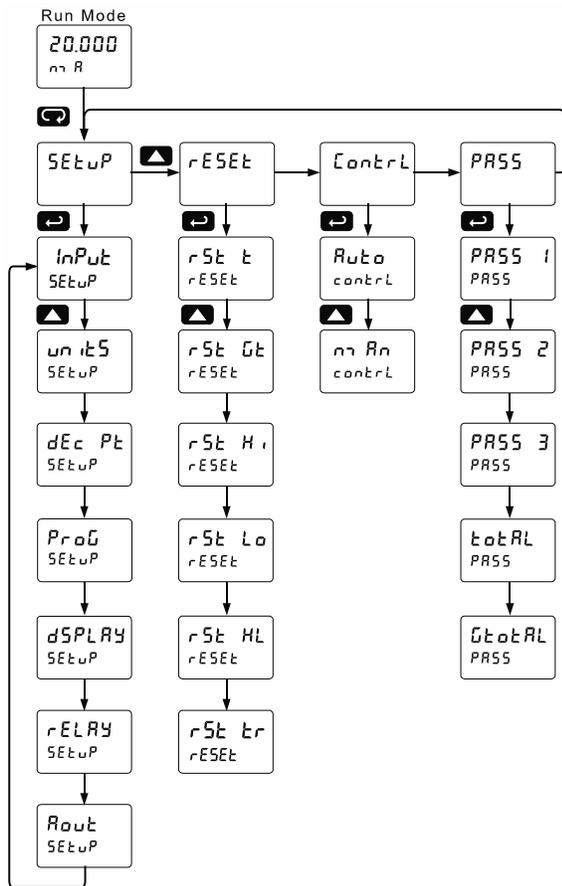
Display Functions & Messages		
Display	Parameter	Action/Setting Description
OFF	Off	Disable relay and front panel status LED (Select Off to enable Interlock feature)
SET 1	Set 1	Program set point 1
RESET 1	Reset 1	Program reset point 1
RELAY 2	Relay 2	Relays 2-4 setup
FAILSAFE	Fail-safe	Enter Fail-safe menu
FLS 1	Fail-safe 1	Set relay 1 fail-safe operation
ON	On	Enable fail-safe operation
OFF	Fail-safe off	Disable fail-safe operation
DELAY	Delay	Enter relay Time Delay menu
DLY 1	Delay 1	Enter relay 1 time delay setup
ON 1	On	Set relay 1 On time delay
OFF 1	Off	Set relay 1 Off time delay
BREAK	Loop break	Set relay condition if loop break detected (For mA input only)
IGNORE	Ignore	Ignore loop break condition (Processed as a low signal condition)
ON	On	Relay goes to alarm condition when loop break is detected
OFF	Off	Relay goes to non-alarm condition when loop break is detected
ROUT	Analog output	Enter the Analog output 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 Reset menu
RESET GT	Reset grand total	Press Enter to reset grand total
RESET HI	Reset high	Press Enter to reset max display
RESET LO	Reset low	Press Enter to reset min display
RESET HL	Reset high & low	Press Enter to reset max & min displays
RESET T	Reset total	Press Enter to reset total
RESET TR	Reset tare	Reset tare (Used when TOTAL is on only)

Display Functions & Messages		
Display	Parameter	Action/Setting Description
CONTROL	Control	Enter Control menu
RULO	Automatic	Press Enter to set relays and analog output for automatic operation
MANUAL	Manual	Press Enter to manually control relays or analog output operation
PRSS	Password	Enter the Password menu
PRSS 1	Password 1	Set or enter Password 1
PRSS 2	Password 2	Set or enter Password 2
PRSS 3	Password 3	Set or enter Password 3
TOTAL	Total password	Set or enter password for manual reset
GTOTAL	Grand total password	Set or enter password for manual reset
NONRST	Non-resettable	Non-resettable grand total set after entering "050873" for Gtotal password
UNLOC	Unlocked	Program password to lock meter
LOC	Locked	Enter password to unlock meter
999999 -999999	Flashing display	Overrange condition Underrange condition

Main Menu

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

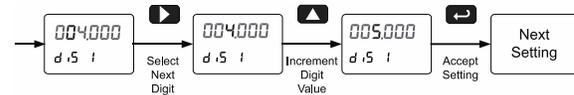
- Press Menu button to enter Programming Mode, then press the Up arrow button to scroll main menu.
- Press Menu, at any time, to exit and return to Run Mode. Changes made to settings prior to pressing Enter are not saved.
- Changes to the settings are saved to memory only after pressing Enter/F3.
- The display moves to the next menu every time a setting is accepted by pressing Enter/F3.



Setting Numeric Values

The numeric values are set using the Right and Up arrow buttons. Press Right arrow to select next digit and Up arrow to increment digit value. The digit being changed is displayed brighter than the rest.

Press and hold Up to auto-increment the display value. If negative numbers are allowed, the first digit position will include a negative symbol (-) after the 9. Press the Enter button, at any time, to accept a setting or Menu button to exit without saving changes.

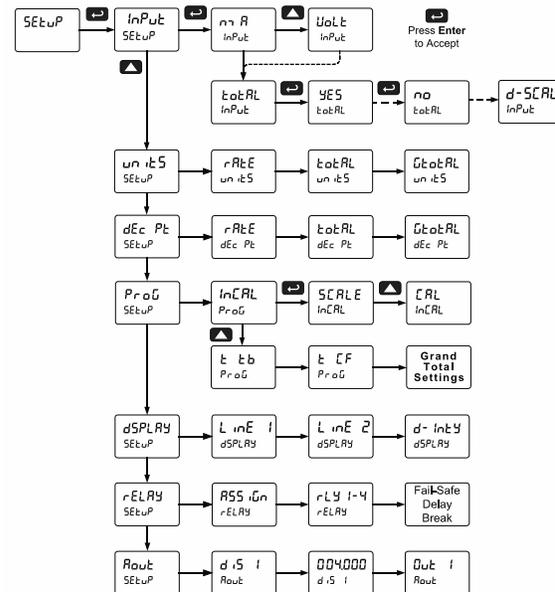


Setting Up the Rate/Totalizer Meter (SEtUP)

The *Setup* menu is used to select:

1. Input signal the meter will accept and enable totalizer features
2. Select the display units/tags
3. Select the decimal point position
4. Meter programming & input calibration
5. Display parameter and intensity
6. Relay operation
7. 4-20 mA analog output scaling

Press the Enter button to access any menu or press Up arrow button to scroll through choices. Press the Menu button to exit at any time.



Notes:

1. When *tOtAL* is set to *no*, the meter now functions as a Process Meter. Please refer to the [PD2-6000](#) manual for instructions on setting up the meter parameters.

Setting the Input Signal (Input)

Enter the *Input* menu to set up the meter to display current (mA) or voltage (VDC) inputs.
 The current input is capable of accepting any signal from 0 to 20 mA. Select current input to accept 0-20 mA or 4-20 mA signals.
 The voltage input is capable of accepting any signal from -10 to +10 VDC. Select voltage input to accept 0-5, 1-5, 0-10, or ±10 VDC signals.

Setting the Totalizer Features (Total)

To simply not display the total, select alternative display parameters in the display (Display) menu.
 Enable or disable the totalizer features by selecting "YES" or "no" after the input type has been set up. If the totalizer features are disabled, all the totalizer features and functions are hidden from the menus. Level and process meter features and functions are added to the menus.
 If disabling the *Total* parameter by selecting *no*, please refer to the [PD2-6000](#) manual for instructions on setting up the meter parameters.
Notes:
 1. *The totalizer continues working in the background.*
 2. *When selecting "no" for Total, the meter now functions as a PD2-6000 Process Meter. We strongly suggest that you download and use the [PD2-6000](#) instruction manual while in this mode of operation.*

Setting the Display Units or Custom Tags (Units)

Use this menu to enter the unit or custom tag that will be displayed if:
 1. Alternating rate, total, or grand total and units is selected in the *Units* menu, or
 2. *Units* is selected as the line 2 parameter.
 See the *Setting the Display Parameter & Intensity (Display)* flow chart on page 31 to access the display menu to show the unit or tag on line 2. The engineering units or custom legends can be set using the following 7-segment character set:

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

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

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

Setting the Decimal Point (dECPt)

The decimal point may be set with up to five decimal places or with no decimal point at all. The rate, total, and grand total decimal points are independent. The decimal point selection should be made prior to scaling, calibrating or programming the meter. Pressing the Right arrow moves the decimal point one place to the right until no decimal point is displayed then it moves to the leftmost position. Pressing the Up arrow moves the decimal point one place to the left.

Programming the Rate/Totalizer (Prog)

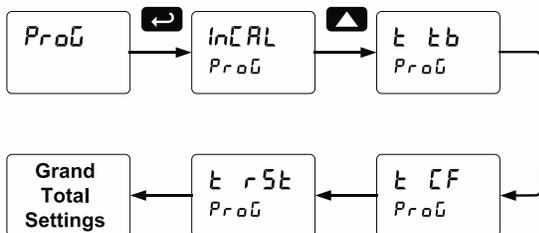
The meter may either be scaled (SCALE) without applying an input or calibrated (CAL) by applying an input. The meter comes factory calibrated to NIST standards, so for initial setup, it is recommended to use the (SCALE) function.

The Program menu contains the following menus:

1. Scale without a signal source
2. Calibrate with a calibrated signal source
3. Total time base & conversion factor
4. Grand total time base & conversion factor
5. Total reset mode for total & grand total

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

Note: The Scale and Calibrate functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in the Advanced menu prior to scaling and calibration of the meter. See Multi-Point Linearization (LINEAR) menu on page 44 for details.



Additional parameters, not needed for most applications, are programmed in the Advanced Features menu; see Advanced Features Menu on page 42.

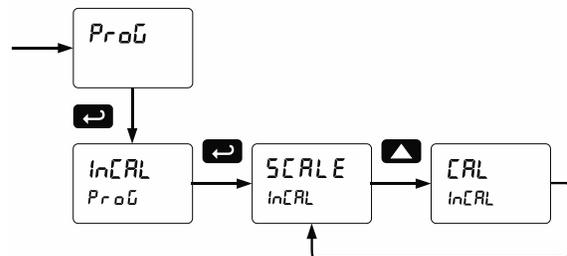
Multi-Point Calibration & Scaling

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. See Multi-Point Linearization (LINEAR) menu on page 44 for details.

Input Calibration Method (InCAL)

There are two methods of calibrating (or scaling) the display to show the correct engineering units.

- Use the Scale menu to enter the scaling without a signal source.
- Use the Calibrate menu to apply a signal from a signal source.

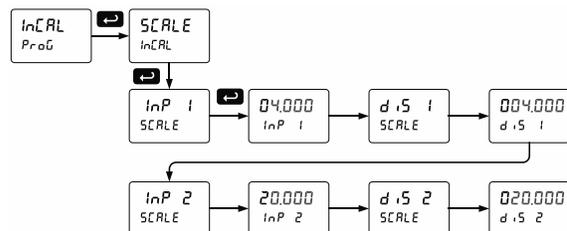


Note: The Scale and Calibrate functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in the Advanced menu prior to scaling and calibration of the meter. See Multi-Point Linearization (LINEAR) on page 44 for details.

Scaling the Meter (SCALE)

The process inputs (4-20 mA and ±10 VDC) 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.



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 the input prior to the failure 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*.

**Not relevant when scaling the meter.*

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

Minimum Input Span

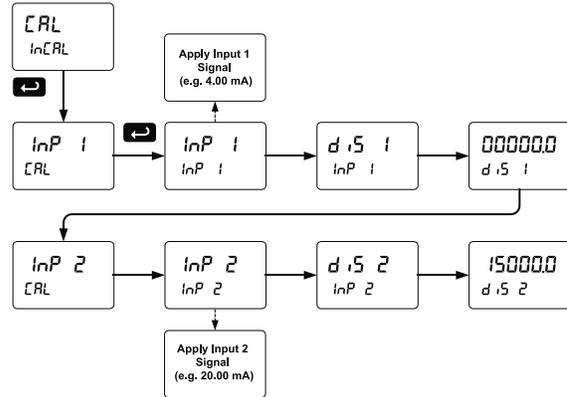
The minimum input span is the minimum difference between input 1 and input 2 signals required to complete the calibration or scaling of the meter.

Input range	Input 1 & input 2 span
4-20 mA	0.15 mA
±10 VDC	0.10 VDC

Calibrating the Meter with External Source (CAL)

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.



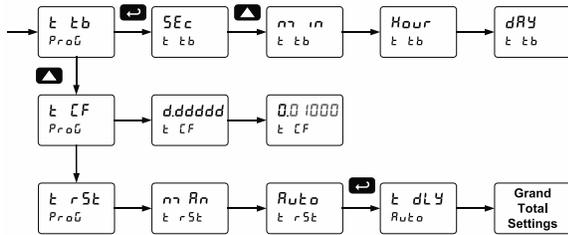
*Note: Inputs for the above example are:
Input 1: 4.00 mA; Display 1: 0.0 Gallons
Input 2: 20.00 mA; Display 2: 15000.0 Gallons*

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

Time Base, Total Conversion Factor & Total Reset

The time base, total conversion factor, and total reset menus are located in the *Program* menu.

The total and grand total have their own independent settings. This means that one can be displaying the value in gallons while the other displays in million gallons, liters, m³, etc.



Time Base

The time base is the amount of time over which the rate parameter should accrue. For example, if the rate was ten and the time base was in minutes, then the total would increase by ten every one minute.

Total & Grand Total Conversion Factor

The total & grand total conversion factor is the amount by which the rate is multiplied before it is added to the total or grand total. For Example, if the rate was ten per second and the total conversion factor was 100, the total would increase by 1000 every second. This is useful, for instance, if you want to show rate in gallons and total in thousands of gallons.

Total & Grand Total Reset

The totals can be programmed for automatic or manual reset. In the automatic reset mode, a programmable time delay is available to reset the total or grand total after the assigned preset is reached.

The totals can also be reset via the front panel button, via a switch across the F4 terminal, digital inputs, or via a Modbus command.

Non-Resettable Totalizer

The total and grand total can be password-protected to prevent unauthorized resets. The grand total can be programmed as a non-resettable total. See *Total Reset Password & Non-Resettable Total* on page 41 for details.

Setting the Display Parameter & Intensity (dSPLeRY)

Display line 1 can be programmed to display:

1. Rate value
2. Total or grand total
3. Toggle rate/total
4. Toggle rate/G-total
5. Relay set points
6. Toggle rate and units
7. Toggle total and units
8. Toggle grand total and units
9. Max, min, or max & min values
10. Modbus input

Display line 2 can be programmed to display:

1. Engineering units or custom legends for line 1
2. Rate value
3. Total or grand total
4. Toggle rate/total
5. Toggle rate/G-total
6. Relay set points
7. Toggle rate and units
8. Toggle total and units
9. Toggle grand total and units
10. Max, min, or max & min values
11. Modbus input
12. Off (no display)

Selecting engineering units or custom legends as display line 2 (d-IntY) will display the unit or tag selected for the rate, total, or grand total displayed on line 1.

For example, if line 1 is set to **Rate**, selecting **d-IntY** to display on line 2 will have the total appear on line 1, and the total unit appear on line 2.

After setting up the input and the 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 Flow Rate, Total or Grand Total

Line 1 can be programmed to display flow rate, total, or grand total, and line 2 can be programmed to display flow rate, total, grand total, engineering units, custom legends, or be turned off. Both lines can also display relay set points, or max and min values.



Flow Rate Indicator



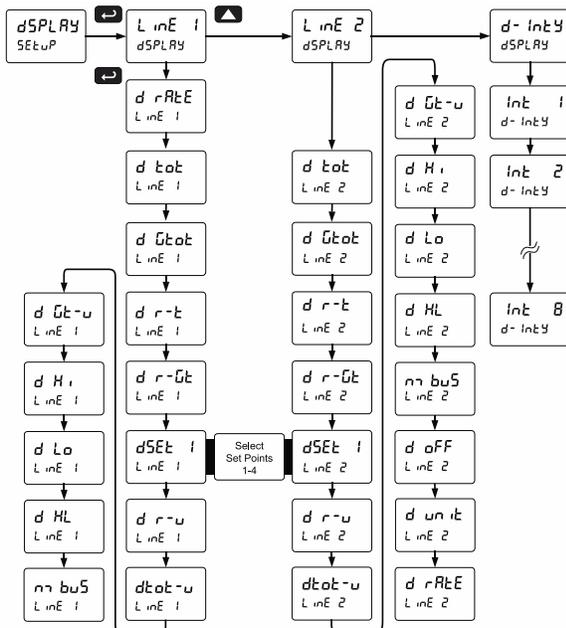
Flow Totalizer



Rate & Total

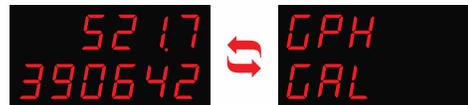


Total & Grand Total



Display Toggling Between Reading & Units

The PD2-6200 can be programmed so that line 1 and line 2 toggle between the reading and their engineering units. For instance, line 1 displays flow rate, line 2 displays total, and the display toggles to show their units.



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 setting is 6.

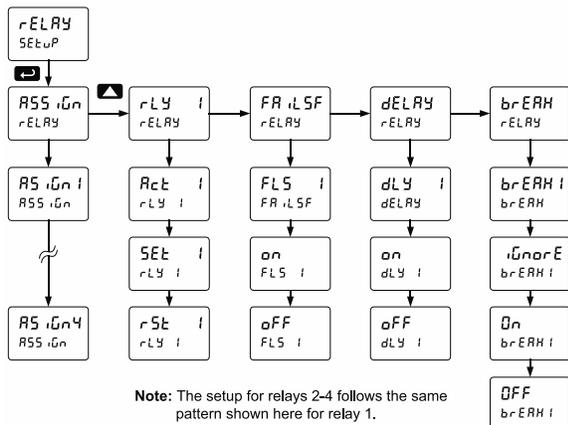
Setting the Relay Operation (rELAY)

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.

- Relay assignment
 - Rate for low and high alarm
 - Total
 - Grand total
 - Modbus input process variable
- Relay action
 - Automatic reset only (non-latching)
 - Automatic + manual reset at any time (non-latching)
 - Latching (manual reset only)
 - Latching with Clear (manual reset only after alarm condition has cleared)
 - Pump alternation control (automatic reset only)
 - Sampling (the relay is activated for a user-specified time)
 - Off (relay state controlled by Interlock feature)
- Set and reset points
- Fail-safe operation
 - On (enabled)
 - Off (disabled)
- Time delay
 - On delay (0-999.9 seconds)
 - Off delay (0-999.9 seconds)
- Relay action for loss (break) of 4-20 mA input (ignore, on, off)

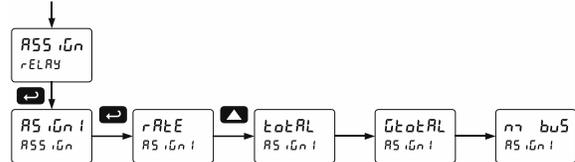


Note: The setup for relays 2-4 follows the same pattern shown here for relay 1.

Relay Assignment (ASSIGN)

The relays can be assigned to any of the following parameters:

- Rate for low or high alarm indication
- Total for alarm indication
- Grand total for alarm indication
- Modbus input process variable

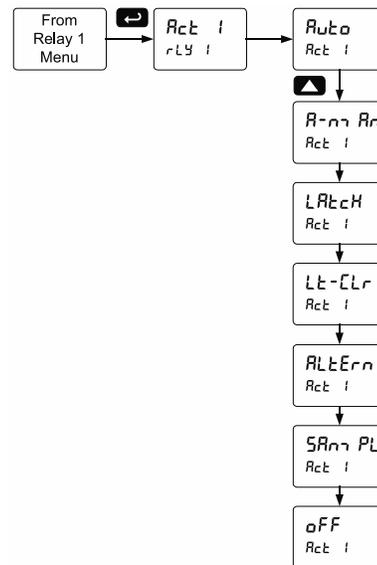


Setting the Relay Action

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

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

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

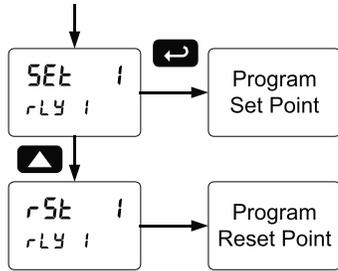


Programming Set and Reset Points

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.

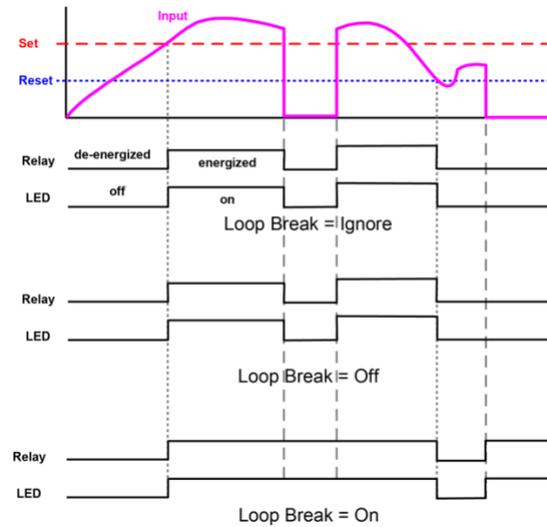
The *Off* time delay is associated with the reset point.

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

A loop break condition is triggered when the 4-20 mA input signal drops below 0.005 mA. Each relay may be programmed to go to one of the following conditions when the meter detects the loss of the input signal (i.e. < 0.005 mA):

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

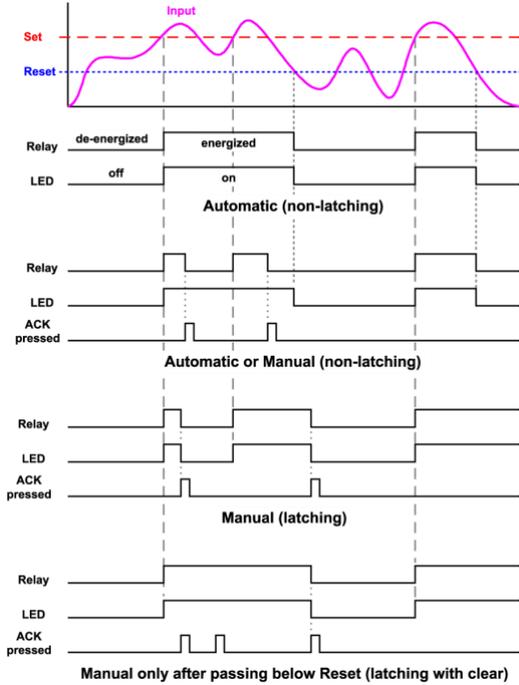
The following graph shows the loop break relay operation for a high alarm relay.



Relay and Alarm Operation Diagrams

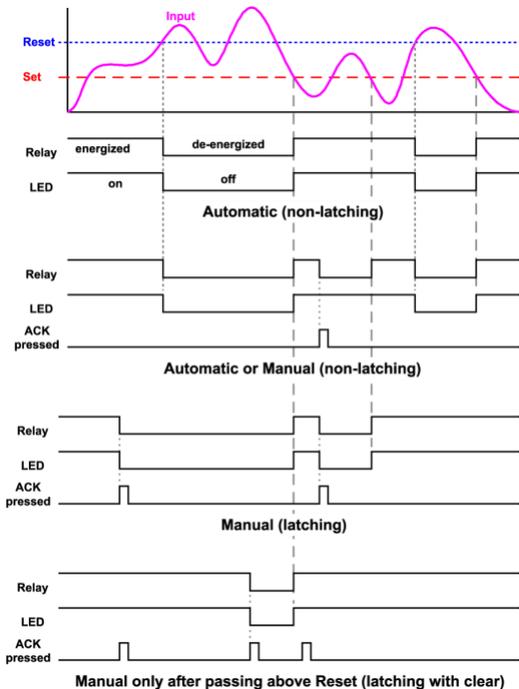
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)



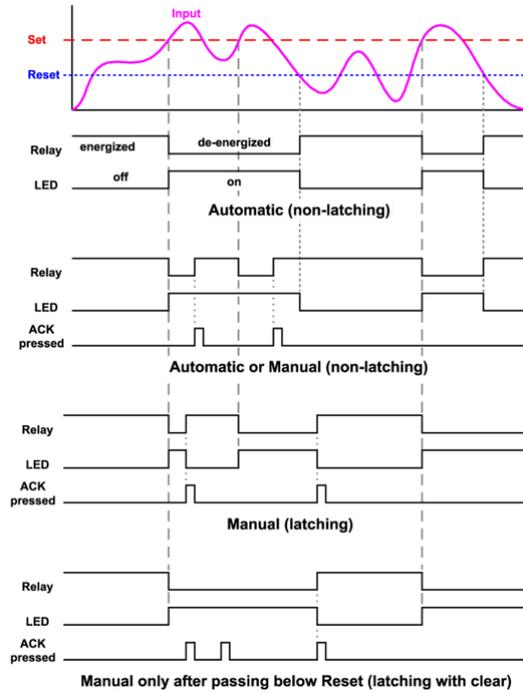
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

Low Alarm Operation (Set < Reset)



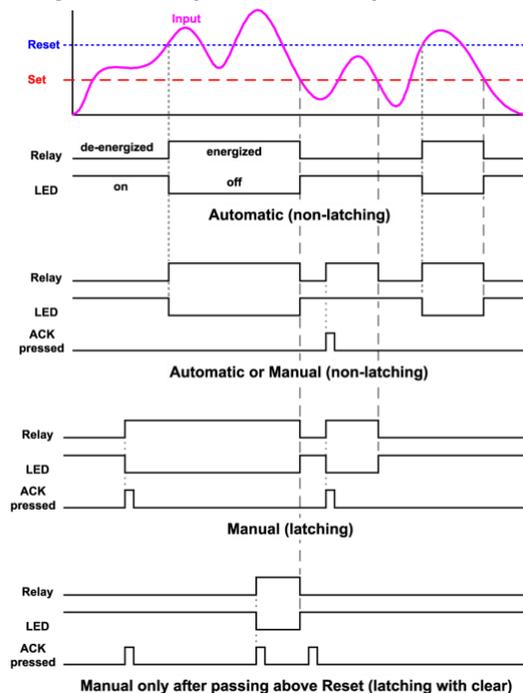
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

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.

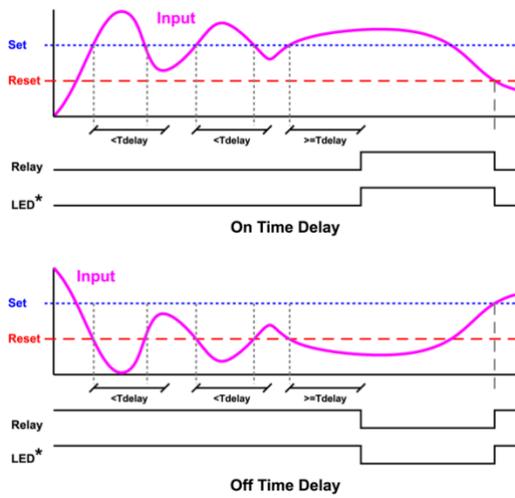
Low Alarm with Fail-Safe Operation (Set < Reset)



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

Time Delay Operation

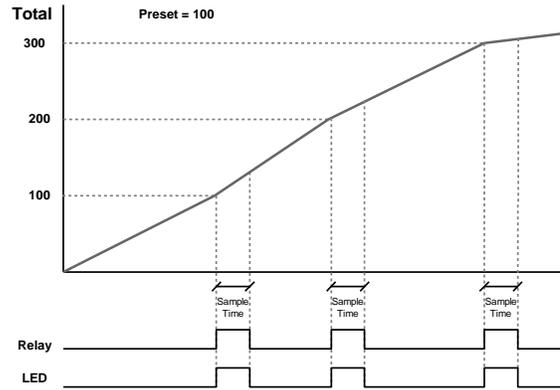
The following graphs show the operation of the time delay function.



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-nRn)" reset mode is selected, the LED follows the reset point and not the relay state when the relay is acknowledged.

Total Relay Sampling Operation



When the total reaches the preset, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the preset value is added to the total.

Relay Operation Details

Overview

The four-relays option for the meters expands its usefulness beyond simple indication to provide users with alarm and control functions. Typical applications include high and low temperature, level, pressure or flow alarms, control applications such as simple on/off pump control, pump alternation control for up to 4 pumps, and basic batch control. There are four basic ways the relays can be used:

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

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 (Ἰαὐτο-ἱκανοποίηση)

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 with Clear (Ἰαὐτο-ἱκανοποίηση)

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 (Ἰαὐτο-ἱκανοποίηση)

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

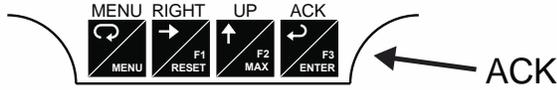


Add visible and audible ways to indicate alarm conditions on any Helios meter with the [MOD-PD2LH](#) Light / Horn / Button accessories. The light with built-in 85 dB horn, and button come mounted and wired to the Helios. Meter and accessories are ordered as separate items. See *Ordering Information*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

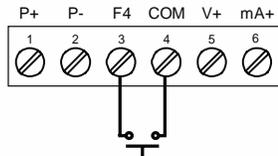
Acknowledging Relays

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

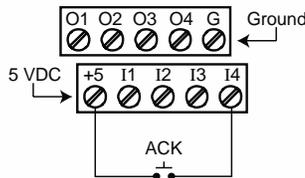
1. Via the programmable front panel function keys F1-F3 (Example: F3 assigned to ACK).



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

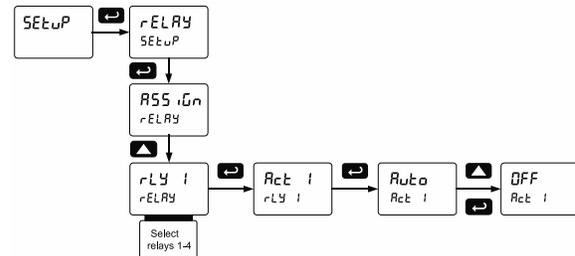
Relays may be remotely acknowledged by connecting the [PDA2361-A](#) to either the F4 terminal or a digital input as described above.



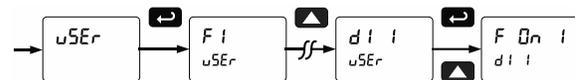
Setting Up the Interlock Relay (Force On) Feature

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

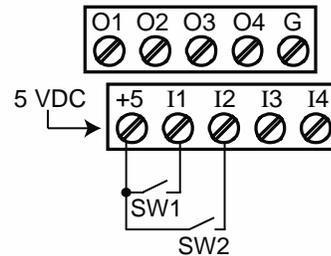
1. Access the *Setup – Relay – Action* menu and set the action to off.



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



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

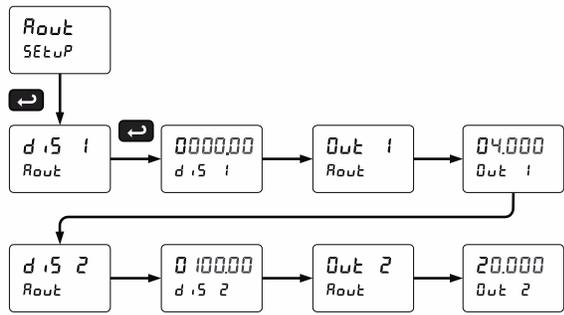
IMPORTANT

- 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 further details, see *Setting Numeric Values* on page 27, *Analog Output Value for Loss of 4-20 mA Input (Loop Break)* on page 46.

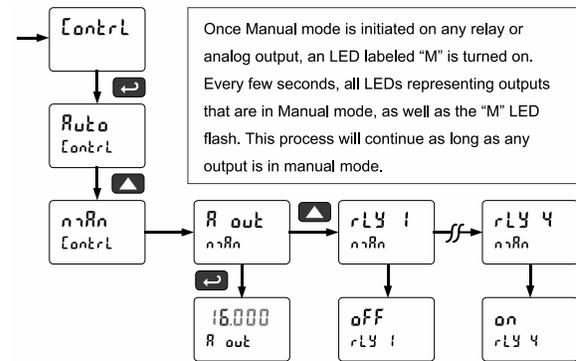


Reset Menu (rESEt)

The *Reset* menu is used to reset the totals and maximum or minimum reading (peak or valley) reached by the process; both may be reset at the same time by selecting "reset high & low" (rSEt HL). If *tARE* is set to *no*, the tare value used to zero the display may be reset by selecting "reset tare" (rSEt tr).

Manual Control Menu (Control)

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



Setting Up the Password (PR55)

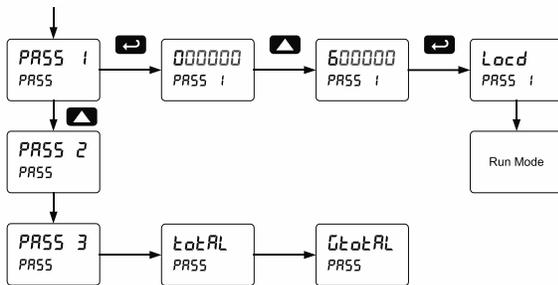
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings and to program the non-resettable totalizer.

- 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.
- Total: Prevents resetting the total manually
- Gtotal: Prevents resetting the grand total manually

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.



Total Reset Password & Non-Resettable Total

The total and the grand total can be password-protected to prevent unauthorized total resets. The grand total can be programmed as a non-resettable total by entering the password "050873".

⚠ CAUTION

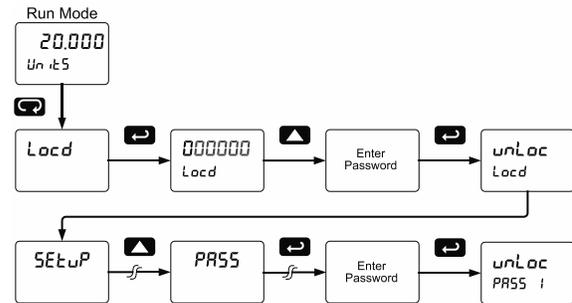
- Once the Grand Total has been programmed as "non-resettable" the feature **CANNOT** be disabled.

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 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.

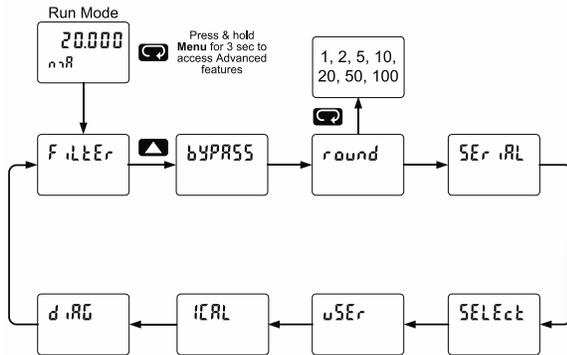
Did you forget the password?

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.

Display	Parameter	Action/Setting
F i l t e r	Filter	Set noise filter value
b y p a s s	Bypass	Set filter bypass value
r o u n d	Round	Set the rounding value for display variables
S E R I A L	Serial	Set serial communication parameters
S L A V E I D	Slave ID	Set slave ID or meter address
b a u d	Baud rate	Select baud rate
t r a n s m i t d e l a y	Transmit delay	Set transmit delay for serial communication
p a r i t y	Parity	Select parity Even, Odd, or None with 1 or 2 stop bits
t i m e b y t e	Time byte	Set byte-to-byte timeout
S E L E C T	Select	Enter the Select menu (function, cutoff, out)
F u n c t i o n	Input signal conditioning	Select linear, square root, programmable exponent, or round horizontal tank function
L i n e a r	Linear	Set meter for linear function and select number of linearization points
n u m b e r o f p o i n t s	Number of points	Set meter for 2 to 32-point linearization
S q u a r e r o o t	Square root	Set meter for square root extraction
P r o g r a m m a b l e e x p o n e n t	Programmable exponent	Set meter for programmable exponent and enter exponent value

Display	Parameter	Action/Setting
r o u n d	Round horizontal tank	Set meter for round horizontal tank volume calculation
i n c h	Dimension (cm)	Calculate volume in gallons or meters
d i a m e t e r	Diameter	Enter the tank's diameter in inches
L e n g t h	Length	Enter the tank's length in inches
C u t o f f	Cutoff	Set low-flow cutoff
C o u n t	Count	Set total and grand total count direction
T o t a l C o u n t	Total Count	Set total to count up or down
G r a n d T o t a l C o u n t	Grand Total Count	Set grand total to count up or down
C o u n t S t a r t	Count Start	Set start for total or grand total countdown
A n a l o g o u t p u t p r o g r a m m i n g	Analog output programming	Program analog output parameters
S o u r c e	Source	Select source for the 4-20 mA output
O v e r r a n g e	Overrange	Program mA output for display overrange
U n d e r r a n g e	Underrange	Program mA output for display underrange
L o o p B r e a k	Loop Break	Set relay condition if loop break detected
F o r c e	Force	Force analog output value for loop break
I g n o r e	Ignore	Ignore loop break condition
M a x i m u m	Maximum	Program maximum mA output allowed
M i n i m u m	Minimum	Program minimum mA output allowed
C a l i b r a t e	Calibrate	Calibrate 4-20 mA output (internal reference source used for scaling the output)
4 m A o u t p u t	4 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
20 m A o u t p u t	20 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
U s e r I / O	User I/O	Assign function keys and digital I/O
F 1	F1 function key	Assign F1 function key
F 2	F2 function key	Assign F2 function key
F 3	F3 function key	Assign F3 function key
F 4	F4 function	Assign F4 function (digital input)
D i g i t a l i n p u t 1	Digital input 1	Assign digital input 1-4
D i g i t a l o u t p u t 1	Digital output 1	Assign digital output 1-4
I n t e r n a l s o u r c e c a l i b r a t i o n	Internal source calibration	Enter internal source calibration (used for scaling the meter without a signal source)

Advanced Features Menu & Display Messages		
Display	Parameter	Action/Setting
[ERL	Current calibration	Calibrating 4-20 mA current input (internal reference source used for scaling the input)
[L o	Current low	Calibrate low current input (e.g. 4 mA)
[H i	Current high	Calibrate high current input (e.g. 20 mA)
U ERL	Voltage calibration	Calibrating voltage input
U L o	Voltage low	Calibrate low voltage input (e.g. 0 V)
U H i	Voltage high	Calibrate high voltage input (e.g. 10 V)
d rR	Diagnostics	Display parameter settings
L E d t	LED test	Test all LEDs (press menu to exit test)
Inf o	Information	Display software number and version
E r R S E	Erase	Erase MeterView Pro software stored in meter's memory

Noise Filter (F L E E r)

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 (b Y P A S S)

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 (r o u n d)

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 (S E r , R L)

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

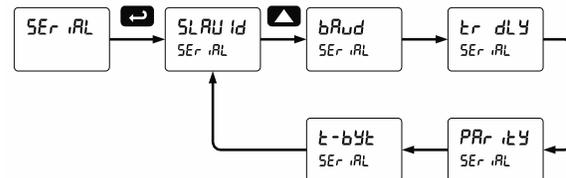
The meter may be connected to a PC for initial configuration via the on-board USB connection. For ongoing digital communications with a computer or other data terminal equipment, use the RS-485 connection with the appropriate serial converter; see *Ordering Information* on page 6 for details.

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:

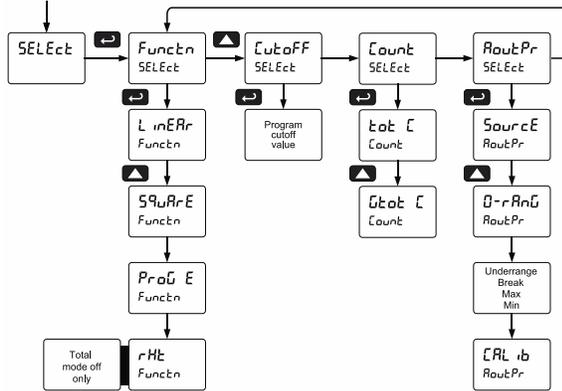
1. More detailed instructions are provided with each optional serial communications adapter.
2. Refer to the Helios Modbus Register Tables located at www.predig.com for details.



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

Select Menu (SELEct)

The *Select* menu is used to select the input signal conditioner applied to the input (linear, square root, programmable exponent, or round horizontal tank), low-flow cutoff, and analog output programming. The multi-point linearization is part of the linear function selection.



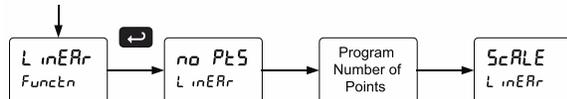
Input Signal Conditioning (Functn)

The *Function* menu is used to select the input signal conditioner applied to the input: linear, square root, programmable exponent, or round horizontal tank volume calculation. 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 (LINER)

Meters are set up at the factory for linear function with 2-point linearization. Up to 32 linearization points can be selected under the linear function. The multi-point linearization can be used to linearize the display for non-linear signals such as those from level transmitters used to measure volume in odd-shaped tanks or to convert level to flow using weirs and flumes with complex exponent.



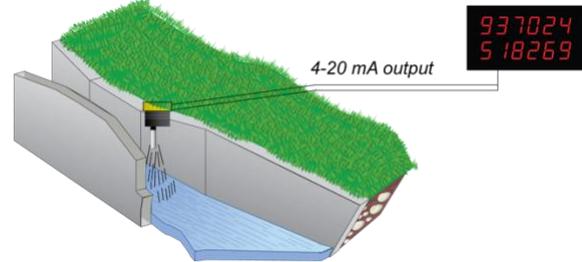
Square Root Linearization (SQUR-E)

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

Programmable Exponent Linearization (PROG E)

The programmable exponent can be used to linearize the signal from level transmitters in open-channel flow applications using weirs and flumes.

Application: Open Channel Flow



The PD2-6200, in combination with an ultrasonic level transmitter, makes for an economical way to measure and display open channel flow rate and total in most weirs and flumes. A guide such as the ISCO Open Channel Flow Measurement Handbook can provide the user with all the information needed: the exponent used in the flow equation for the desired flow units and the flow rate for any given head height. For example, to display the open channel flow rate from a 3" Parshall flume, the ISCO handbook advises the exponent is 1.547 and at the maximum head height of 3.0 feet, the flow rate is 3.508 MGD.

3" Parshall Flume Discharge Table with Head in Feet

Formula: CFS = 0.9920 H^{1.547}
 GPM = 445.2 H^{1.547}
 MGD = 0.6411 H^{1.547}

Where: H = head in feet

Head (Feet)	CFS	GPM	MGD
3.00	5.428	2436	3.508

ISCO Open Channel Flow Measurement Handbook, 3rd edition

With this information the PD2-6200 should be programmed in the following fashion. This setup assumes the level transmitter is programmed to output 20 mA at the maximum head height of 1.10 feet; but any mA value at a head height with a known flow rate may be used.

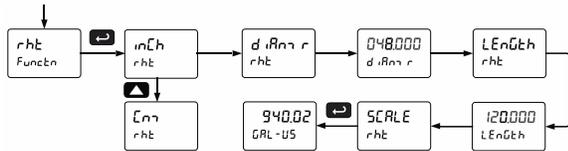
Function	Desire	Programming
Open Channel Flow	3" Parshall flume	Set Programmable Exponent to 1.547
Flow Rate	Millions of Gallons per Day (MGD)	Set 4 mA = 0 20 mA = 3.508 Time base = Day
Total	Millions of Gallons	Set Totalizer Conversion Factor = 1 (password protect "total" to avoid accidental reset)
Non-Resettable Grand Total	Program meter so grand total can never be reset	Set non-resettable grand total password
Display	Display Flow Rate, Total, and Grand Total	Set upper display for Grand Total and lower display to toggle between rate and total.

Round Horizontal Tank Linearization (rHt)

This function automatically calculates the volume in a round horizontal tank with flat ends. This function is only used when **Unit RL** is set to **no**.

Set the display for the desired decimal point and engineering units before entering the round horizontal tank function. Select units, inches or cm for the tank dimension. Enter the diameter and the length in inches and the results are given in US gallons. Enter the diameter and length in cm and the results are calculated automatically in liters.

The meter can be scaled to display the volume in any engineering unit.



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

Changing the Volume from Gallons to Liters

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

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

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

Another way to display the volume in liters is to enter the dimensions in cm. The meter automatically calculates the volume in liters.

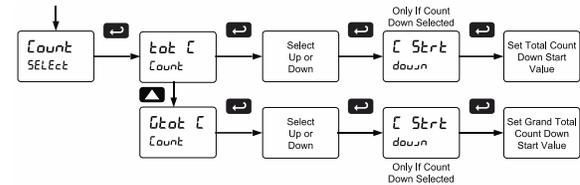
Low-Flow Cutoff (LutOFF)

The low-flow cutoff feature allows the meter to be programmed so that the often-unsteady output from a differential pressure transmitter, at low flow rates, always displays zero on the meter.

The cutoff value may be programmed from 0.1 to 999999. The meter will display zero below the cutoff value. Programming the cutoff value to zero disables the cutoff feature. The cutoff can be disabled to display negative values.

Totalizer Count Up/Down (Count)

The totalizer count up/down menu may be used to program the total and grand total to either count up from 0 when reset or count down from a programmed value when reset. Total and grand total may have their countdown numbers programmed individually from 0 to 999999.



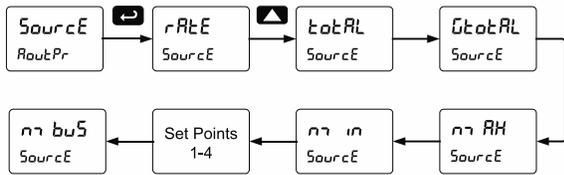
Analog Output Programming (RoutPr)

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. Break: Analog output value when loop break is detected
5. Max: Maximum analog output value allowed regardless of input
6. Min: Minimum analog output value allowed regardless of input
7. Calibrate: Calibrate the internal 4-20 mA source reference used to scale the 4-20 mA output

Analog Output Source

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



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

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

Analog Output Calibration

To perform the analog output calibration, it's recommended to use a milliamp meter with a resolution of at least 0.1 μ 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.

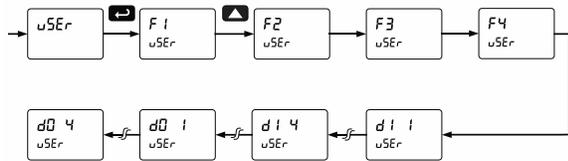
Analog Output Calibration Procedure

1. Wire the PD2-6200 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 25. 4-20 mA Output Connections* on page 22 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 (RatePr)/Calibration (Total Bi) menu and press **Enter**.
4. The display will show 4 mA. The PD2-6200 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 mA. The PD2-6200 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 (uSEr)

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.

Display	Description
rELRY	Directly access the relay menu
SEt 1	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
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 1 Hi	Display maximum display value on line 1
Ln 1 Lo	Display minimum display value on line 1
Ln 1 HL	Display maximum & minimum display values on line 1
Ln 2 Hi	Display maximum display value on line 2
Ln 2 Lo	Display minimum display value on line 2
Ln 2 HL	Display maximum & minimum display values on line 2
Ln 2 Gt	Display the grand total on line 2

Display	Description
F On 1	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 39 for details.
EnterL	Directly access the control menu
d,SRbL	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
rSE t	Reset the total
rSE Gt	Reset the grand total
rSE Hi	Reset the stored maximum display value
rSE Lo	Reset the stored minimum display value
rSE HL	Reset the stored maximum & minimum display values
nEnu	Mimic the menu button functionality (digital inputs only)
r,GRt	Mimic the right arrow/F1 button functionality (digital inputs only)
uP	Mimic the up arrow/F2 button functionality (digital inputs only)
EnEr	Mimic the enter/F3 button functionality (digital inputs only)
RLn 1	Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)

Internal Source Calibration (ICRL)

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

The use of calibrated signal sources is necessary to calibrate the internal source of the meter. The meter's internal source is what allows the user to scale the meter without applying a signal. Check calibration of the meter at least every 12 months. Each input must be recalibrated separately.

Notes:

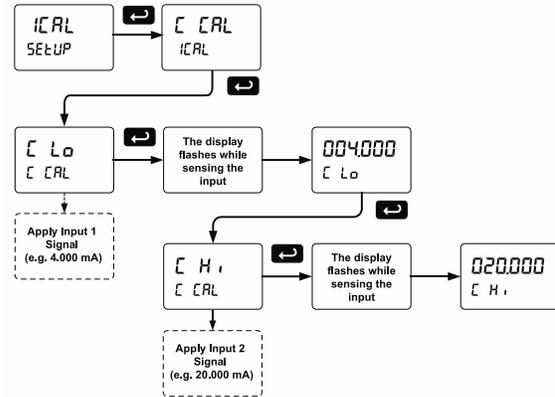
1. If meter is in operation and it is intended to accept only one input type (e.g. 4-20 mA), recalibration of other input is not necessary.
2. Allow the meter to warm up for at least 15 minutes before performing the internal source calibration procedure.

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 either current calibration (ICRL) or voltage calibration (IVRL), according to the input setup. Press Enter to start the calibration process.

Example of Internal Calibration for current input:

4. The meter displays *low* input current message (LLO). Apply the low input signal and press Enter. The display flashes for a moment while the meter is accepting the low input signal.
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 4.000 mA.
7. The display moves to the *high* input calibration (LHI). 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 20.000 mA.



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

Tips:

- Low and high input signals can be any valid values within the range of the meter.
- Observe minimum input span requirements between input 1 and input 2.
- Low input should be less than high input signal. However, the low display can be higher than the high display (i.e. 4-20 mA = 100.0 to 0.0).

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 the input prior to the failure during calibration or scaling and to input 1 during internal calibration, allowing the appropriate input signal to be applied or programmed.

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

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

*Not relevant when scaling the meter.

Minimum Input Span

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

Input range	Input 1 & input 2 span
4-20 mA	0.15 mA
±10 VDC	0.10 VDC

Meter Operation

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

The dual-line display can be customized by the user to operate in such a way as to satisfy a specific application. Typically, the main display is used for the process variable; while the second display is used for engineering units, custom legend, total, grand total, or set point indication.

The meter can be set up to display the analog input on the main display and the Modbus input on the second display. The relays and analog output can be programmed to operate from the Modbus PV input.

Button Operation

Button Symbol	Description
	Press to enter or exit Programming Mode, view settings, or exit max/min readings
	Press to reset max/min readings or other parameter/function assigned through the <i>User</i> menu
	Press to display max/min readings or other parameter/function assigned through the <i>User</i> menu
	Press to acknowledge relays or other parameters/function assigned through the <i>User</i> menu

Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. See *Programmable Function Keys User Menu (u5Er)* on page 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 momentarily:

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

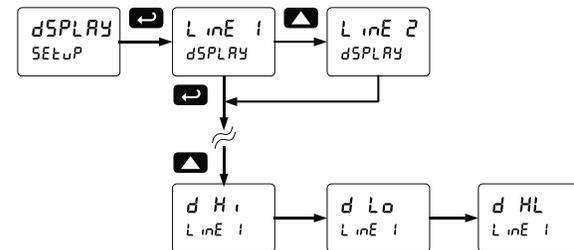
Any of the F1-F3 function keys (buttons) and the digital inputs can be programmed to reset the max & min readings. The meters are set at the factory to display the max reading by pressing the Up arrow/F2 button and to use the Right arrow/F1 button to access the *Reset* menu.

To display max reading using function key with factory defaults:

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

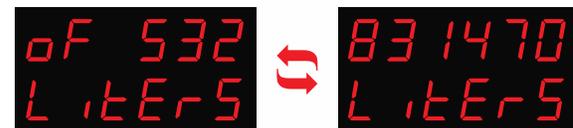
To display max/min readings continuously:

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



Totalizer Overflow Displays Total to 9 Digits

These flow rate/totalizers can display up to nine digits of total flow with the total overflow feature.



In the diagrams above, the flow totalizer is displaying 532,831,470 by toggling between a display of “oF 532” and “83 1470”. Notice the T with arrow ▲ symbol is lit up indicating the display is in overflow mode.

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 recommendations below.

Diagnostics Menu (d ,Rd)

The *Diagnostics* menu is located in the *Advanced Features* menu, to access *Diagnostics* menu see *Advanced Features Menu* on page 41.

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 42.

Testing the Display LEDs

To test all LEDs on the display:

1. Go to the *Diagnostics* menu (d ,Rd) 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 (,nFd) or press the Menu button to return to Run Mode.

Determining Software Version

To determine the software version of a meter:

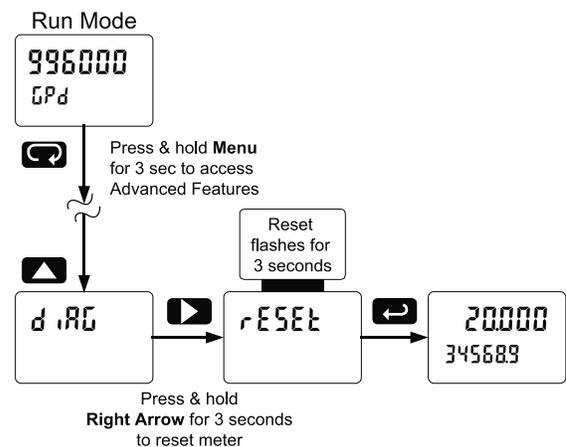
1. Go to the *Diagnostics* menu (d ,Rd) and press Enter button.
2. Press Up arrow button and scroll to *Information* menu (,nFd).
3. Press Enter to access the software number (5Ft) and version (jEr) information. Write down the information as it is displayed. Continue pressing Enter until all the information 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 41.
2. Press Up arrow to go to *Diagnostics* (d ,Rd) 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 parameters.

Parameter	Display	Default Setting
Input type	InPut	4-20 mA
Total	toLR	Yes
Units	units	Rate / total / gr. total mA / mA / mA
Filter	Filter	70
Bypass	bypass	0.2
Function	Function	Linear
Number of points	nopts	2
Programming	Prog	Scale
Input 1	InP 1	4.000 mA
Display 1	d,5 1	4.000
Input 2	InP 2	20.000 mA
Display 2	d,5 2	20.000
Decimal point	dddd	3 places
Cutoff value	cutoff	0.0 (disabled)
Display line 1	line 1	Rate/Process
Display line 2	line 2	Total value
Display intensity	d-int	6
Total time base	tb	Second
Total conversion factor	CF	1.000
Total reset	rst	Manual
Grand total time base	gtb	Second
Grand total conversion factor	gtCF	1.000
Grand total reset	grst	Manual
Total count up/down	toE	Up
Grand tot count	gtotE	Up
Relay 1 assignment	RS1	Total
Relay 2 assignment	RS2	Total
Relay 3 assignment	RS3	Rate
Relay 4 assignment	RS4	Rate

Parameter	Display	Default Setting
Relay 1 action	RC1	Automatic
Relay 1 set point	SE1	1.000
Relay 1 reset point	r5t 1	0.000
Relay 2 action	RC2	Automatic
Relay 2 set point	SE2	2.000
Relay 2 reset point	r5t 2	0.000
Relay 3 action	RC3	Automatic
Relay 3 set point	SE3	3.000
Relay 3 reset point	r5t 3	2.500
Relay 4 action	RC4	Automatic
Relay 4 set point	SE4	4.000
Relay 4 reset point	r5t 4	3.500
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
Display 1 analog out	d,5 1	4.000
Output 1 value	out 1	4.000 mA
Display 2 analog out	d,5 2	20.000
Output 2 value	out 2	20.000 mA
Source analog output	Source	Rate/process
Overrange output	ORR	21.000 mA
Underrange output	URR	3.000 mA
Loop break output	brRH	1.000 mA
Maximum output	max	23.000 mA
Minimum output	min	1.000 mA
F1 function key	F1	Reset max & min
Password 1	PR55 1	000000 (unlocked)
Password 2	PR55 2	000000 (unlocked)
Password 3	PR55 3	000000 (unlocked)
Total password	toLR	000000 (unlocked)
Grand total password	gtotLR	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, L o c k is displayed	Meter is password-protected, enter correct six-digit password to unlock or Master Password of 508655.
Meter does not respond to input change	If a <i>Low-Flow Cutoff Value</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-flow cutoff value. 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 (E r r o r)	Check: 1. Signal connections 2. Input selected in <i>Setup</i> menu 3. Minimum input span requirements
Meter displays 1. 999999 2. -999999	Check: 1. Input selected in <i>Setup</i> menu 2. Corresponding signal at Signal connector
Display is unstable	Check: 1. Input signal stability and value 2. Display scaling vs. input signal 3. Filter and bypass values (increase)
Display response is too slow	Check filter and bypass values
Display reading is not accurate	Check: 1. Input signal conditioner selected: Linear, square root, etc. 2. Scaling or calibration
Display does not respond to input changes, reading a fixed number	Check: Display assignment, it might be displaying max, min, or set point.
Display alternates between 1. H i and a number 2. L o and a number	Press Menu to exit max/min display readings.
Relay operation is reversed	Check: 1. Fail-safe in <i>Setup</i> menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in <i>Setup</i> menu 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: 1. Serial adapter and cable 2. Serial settings 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

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