Helios PD2-6363 Dual Pulse Input Rate/Totalizer
Instruction Manual

HELIOS

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MeterView Pro
USB Install

- Large Display NEMA 4X, IP65 Wall Mounted Flow Rate/Totalizer
- Dual Pulse, Open Collector, NPN, PNP, TTL, Switch Contact, Sine Wave (Coil), Square Wave Inputs
- Large Dual-Line 6-Digit Display, 1.8" (46 mm) Readable from 100 Feet (30 Meters) Away
- Isolated 5, 10 or 24 VDC Flowmeter 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
- Rate, Total, and Grand Total for Each Input Channel
- Gate Function for Display of Slow Pulse Rates
- K-Factor, Internal Scaling, or External Calibration
- 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 Input
- 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

PRECISION DIGITAL

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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.predig.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.predig.com/meterviewpro**

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

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

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

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Introduction

The Helios PD2-6363 is a multi-purpose, easy to use, large-display dual pulse input rate/totalizer ideal for flow rate, total, and flow control applications. It features large 1.8 inch superluminous LED digits, which can be read in direct sunlight from up to 100 feet (30 meters) 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 two pulse (e.g. ±40 mV to ±8 V), square wave (0-5 V, 0-12 V, or 0-24 V), open collector, NPN, PNP, TTL or switch contact signals from a pulse output flowmeter. The rates, as measured by the flowmeters, are automatically aggregated into cumulative totals and grand totals which can be displayed with the rates.

Various math functions may be applied to the rate, total, or grand totals of the two channels, including addition, difference, absolute difference, average, weighted average, multiplication, division, minimum, maximum, draw, ratio, and concentration. This is in addition to the input signal conditioning functions (linear, square root, programmable exponent, or round horizontal tank calculations).

The displays, relays, and the analog output may be assigned to the rate, total, or grand total of input channels A or B, or math result channel C. Three of the programming buttons can be set for custom operation.

A fully loaded Helios PD2-6363 rate/totalizer comes with four SPDT relays, a 4-20 mA output, two 24 VDC power supplies, five digital inputs and four digital outputs, and RS-485 serial communications. The four relays can be used for alarm indication or process control applications. The 4-20 mA isolated output, Modbus RTU serial communications, and digital I/O features make the Helios an excellent addition to any system.

Ordering Information

85-265 VAC Models

Model	Standard Features	Options Installed
PD2-6363-6H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6363-6H7		4 relays 4-20 mA output

12-24 VDC Models

Model	Standard Features	Options Installed
PD2-6363-7H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6363-7H7		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:

1. Specify MOD-PD2LH model as a separate item on the order for the Helios to order the Light / Horn & Button accessory installed and wired. Meter is sold separately.

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 *14* 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
PD659-1MA-1V	Signal Conditioner with One 4-20 mA Input and One 0-10 VDC Output

Specifications

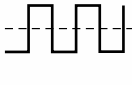*Except where noted all specifications apply to operation at +25°C.*

General

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	Rate: 10 per second; up to 1 per 100 seconds (and is a function of Low Gate setting); Total: 10 per second (fixed)
LED Status Indicators	See *LED Status Indicators* on page *23* for details.
Overrange	Display flashes 999999
Display Assignment	Display lines 1 & 2 may be assigned to show: • One or more rate channels: Channel A (Ch-A), B (Ch-B), or C (Ch-C) • Toggle between rate channels: Ch-A & Ch-B, Ch-A & Ch-C, Ch-B & Ch-C, and Ch-A, Ch-B, & Ch-C • Total or grand total: Ch-A or Ch-B • Rate and total or grand total: Ch-A, Ch-B • Relay set points • Max/min values: Ch-A, Ch-B, or Ch-C • Toggle between any rate channel & units • Total and units: Ch-A or Ch-B • Toggle between totals: Ch-A & Ch-B; Ch-A, Ch-B, and sum of Ch-A and Ch-B • Modbus input Line 2 may also be set to show engineering units or be off, with no display.
Programming Methods	Four programming buttons, digital inputs, PC and MeterView Pro software, or Modbus registers.
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

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
	Storage temperature range:
	    -40 to 85°C
	Relative humidity:
	    0 to 90% non-condensing
	Note: Printed circuit boards are conformally coated.

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 *Wall Mounting Instructions* on page 13 for additional details. Pipe Mounting: Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See *Pipe Mounting Instructions* on page *14* 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.predig.com for complete details.

Dual Pulse Inputs

Two Inputs	Field selectable: Pulse or square wave 0-5 V, 0-12 V, or 0-24 V @ 30 kHz; TTL; open collector 4.7 kΩ pull-up to 5 V @ 30 kHz; NPN or PNP transistor, switch contact 4.7 kΩ pull-up to 5 V @ 40 Hz; Modbus PV (Slave)
Isolated Flowmeter 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 *Flowmeter Supply Voltage Selection (P+, P-)* on page *16*. When the Light / Horn is powered by the flowmeter 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.
Channels	Channel A, Channel B, Channel C (Math channel)
Programmable Constants	Constant P (Adder): -99.999 to 999.999, default: 0.000 Constant F (Factor): 0.001 to 999.999, default: 1.000

Math Functions	Name	Function	Setting
	Addition	(A+B+P)*F	Sum
	Difference	(A-B+P)*F	dif
	Absolute diff.	((Abs(A-B))+P)*F	difAbS
	Average	(((A+B)/2)+P)*F	AuG
	Multiplication	((A*B)+P)*F	multi
	Division	((A/B)+P)*F	diuidE
	Max of A or B	((AB-Hi)+P)*F	Hi-Ab
	Min of A or B	((AB-Lo)+P)*F	Lo-Ab
	Draw	((A/B)-1)*F	drAu
	Weighted avg.	((B-A)*F)+A	uu Au
	Ratio	(A/B)*F	rAtio
	Ratio 2	((B-A)/A)+P)*F	rAtio2
	Concentration	(A/(A+B))*F	ConcEn
	Total Addition	(tA+tB+P)*F	Sum t
	G. Tot. Addition	(GtA+GtB+P)*F	SumGt
	Total Difference	(tA-tB+P)*F	dif Gt
	G. Tot. Difference	(GtA-GtB+P)*F	dif Gt
	Total Ratio	(tA/tB)*F	trAtio
	Total Ratio 2	((tB-tA)/tA)*F	t-rAt2
	Total Percent	(tA/(tA+tB))*100	t PCt

*Note: The F constant can be any value from 0.001 to 999.999. If the value is less than 1, it will have the same effect as a divider. For example, the average could also be derived by using (A+B)*F, where F = 0.500.*

Low Voltage Mag Pickup	Sensitivity: 40 mVp-p to 8Vp-p
Minimum Input Frequency	0.001 Hz Minimum frequency is dependent on high gate setting.

Maximum Input Frequency	30,000 Hz (10,000 for low voltage mag pickup)
Input Impedance	Pulse input: Greater than 300 kΩ @ 1 kHz. Open collector/switch input: 4.7 kΩ pull-up to 5 V.

Input Threshold	Low	High	
	1.6 V	3.3 V	3.3 V 1.6 V 0 V

Sequence of Operations for Input Programming	1. Select Input for A and B 2. Set up the rate, total, and grand total engineering units for channels A & B, and units for math channel C 3. Set up rate, total, and grand total decimal points for channels A & B, and decimal point for math channel C 4. Program channel A & B rate parameters 5. Program channel A & B total and reset parameters 6. Set up display lines 1 & 2 and display intensity 7. Select the transfer function for A & B (e.g. Linear) 8. Select Math function for Channel C 9. Program constants for Factor (F) and Adder (P). 10. Program cutoff values for A and B
Accuracy	±0.03% of calibrated span ±1 count
Temperature Drift	Rate display is not affected by changes in temperature.
Multi-Point Linearization	2 to 32 points for channel A and B
Low-Flow Cutoff	0.1 to 999,999 (0 disables cutoff function). Point below at which the display always shows zero.
Decimal Point	Up to five decimal places or none: *dddddd*, *ddddd*, *dddd*, *ddd*, *dd*, or *dddddd*
Calibration	May be calibrated using K-factor, scaling without a signal source, or by applying an external calibration signal.
K-Factor	Field programmable K-factor converts input pulses to rate in engineering units. May be programmed from 0.00001 to 999,999 pulses/unit.
Calibration Range	Input 1 signal may be set anywhere in the range of the meter; input 2 signal may be set anywhere above or below input 1 setting. Minimum input span between any two inputs is 1.0 Hz for calibration and 0.1 Hz for scaling. An error message will appear if the input span is too small.
Filter	Programmable contact de-bounce filter: 40 to 999 Hz maximum input frequency allowed with low speed filter.
Time Base	Second, minute, hour, or day
Gate	Low gate: 0.1-99.9 seconds High gate: 2.0-999.9 seconds

Dual Rate/Totalizer

Rate Display Indication	-99999 to 999999, lead zero blanking.
Total Display & Total Overflow	0 to 999,999; automatic lead zero blanking. Up to 999,999,999 with total-overflow feature. "o̅F̅" is displayed to the left of total overflow and ▲ LED is illuminated.
Total Decimal Points	Up to five decimal places or none: dddddd, ddddd, dddd, ddd, dd, or dddddd Total decimal point is independent of rate decimal point. Channel A and B decimal points programmed independently.
Dual Totalizer	Calculates total for channels A and B 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. Channel A and B totalizer parameters programmed independently.
Totalizer Rollover	Totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
Total Overflow Override	Program total A or B total reset for automatic with 0.1 second delay and set point 1 for 999,999
Totalizer Alarm Presets	Up to eight, user selectable under setup menu. Any set point can be assigned to channel A or B total or grand total (or C) and may be programmed anywhere in the range of the meter for total alarm indication.
Total & Grand Total Reset	Via front panel button, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications. Channel A and B total and grand total reset parameters programmed independently.
Total Reset Password	Total and grand total passwords may be entered to prevent resetting the totals or grand totals from the front panel.
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.
Non-Resettable Total	The grand totals can be programmed as non-resettable totals by entering the password "050873". Both channels are set to non-resettable when this password is entered.

⚠️ **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 (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads; see *Switching Inductive Loads* on page *19*.
Relay Assignment	Relays may be assigned to channel A or B rate, total, or grand total; channel C; or Modbus control.
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	• 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, or through serial communications. 1. Automatic reset only (non-latching), when the input passes the reset point. 2. Automatic + manual reset at any time (non-latching) 3. Manual reset only, at any time (latching) 4. Manual reset only after alarm condition has cleared (L) *Note: Front panel button, F4 terminal at back of meter or digital input may be assigned to acknowledge relays programmed for manual reset.*
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. *Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.*
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. **DO NOT** apply AC or DC power to the meter while the USB port is in use.

Isolated 4-20 mA Transmitter Output

Output Source	Input channels A or B, rate, total, or grand total; channel C; max or min for channel A or B; highest or lowest max or min of A and B; set points 1-4; Modbus input; 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	± 0.1% of span ± 0.004 mA
Temperature Drift	0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient *Note: Analog output drift is separate from input drift.*
Isolated Transmitter Power Supply	Terminals I+ & R: 24 VDC ± 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	Power supply	Minimum	Maximum
	24 VDC	10 Ω	700 Ω
	35 VDC (external)	100 Ω	1200 Ω

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.predig.com for details.

Digital Input (F4)

Function	Remote operation of front-panel buttons, acknowledge/reset relays, reset totals, reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *53* 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 *Function Keys & Digital I/O Available Settings* on page *53* 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.predig.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 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 *13* 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 flowmeter power supply to output 5 or 10 VDC instead of 24 VDC. See *Figure 8. Flowmeter Supply Voltage Selection* on page *16*.

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.
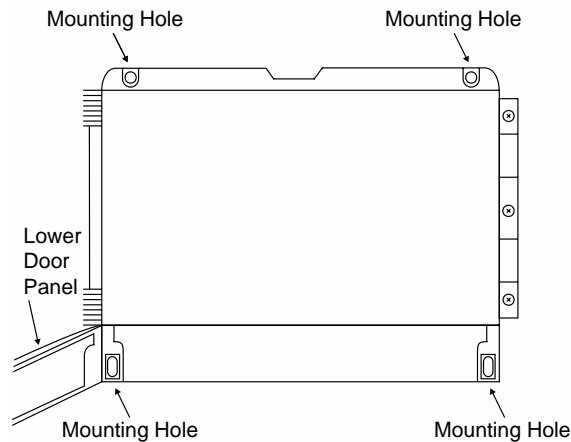

Figure 1. Meter Mounting Holes Location
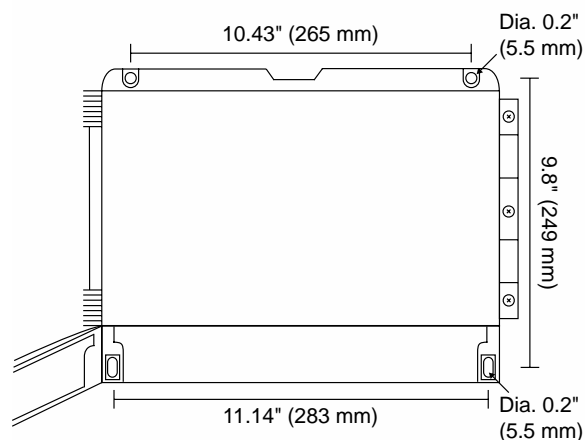

Figure 2. Meter Mounting Holes Dimensions
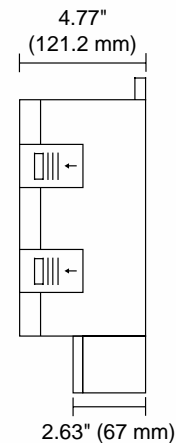
Mounting Dimensions

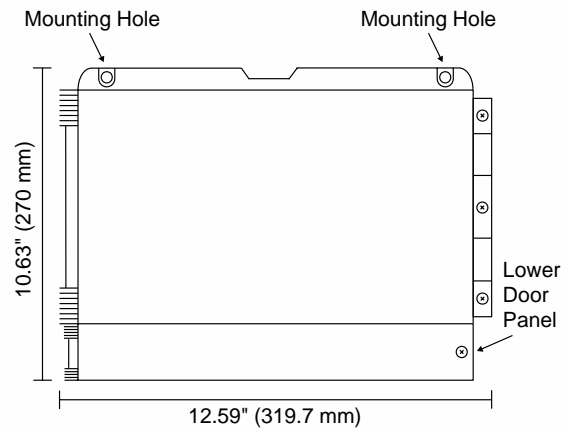**Figure 3. Meter Dimensions – Side View**

Figure 4. Meter Dimensions - Front View
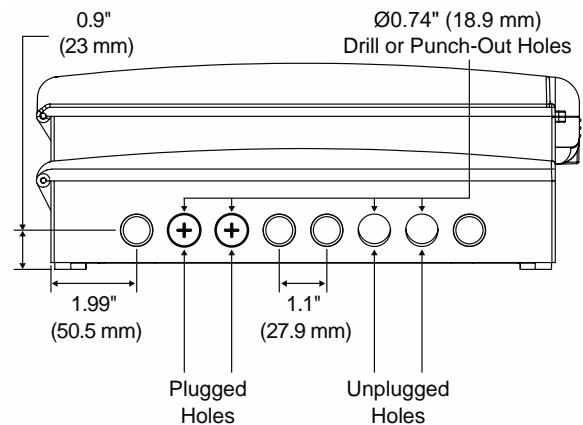
Conduit Holes Location

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).
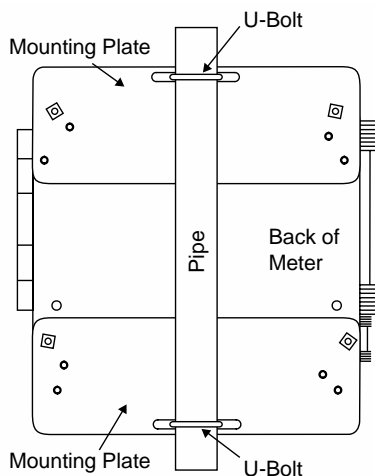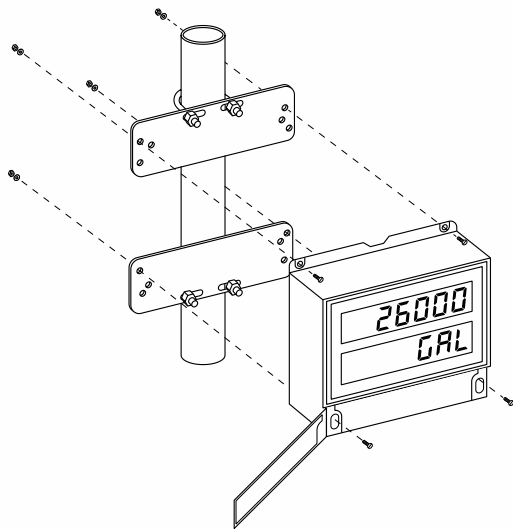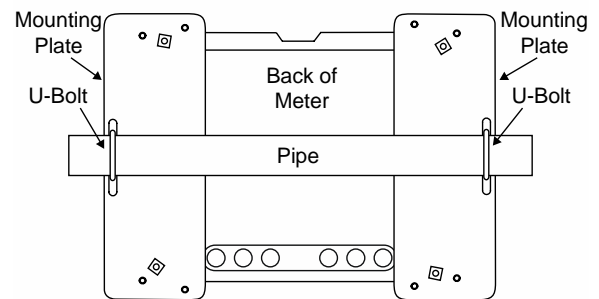
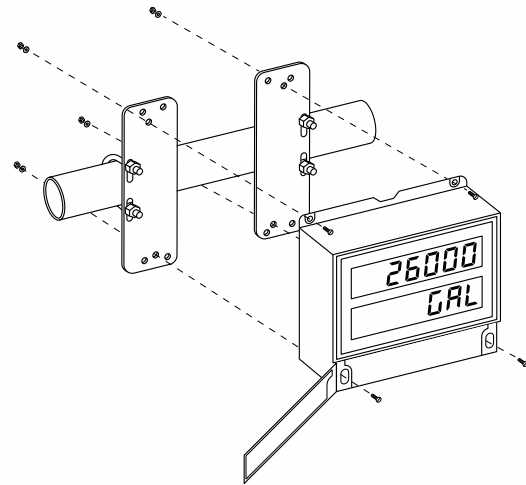**Figure 7. Horizontal Pipe Mount Assembly**

Figure 6. Vertical Pipe Mount Assembly

Installation Overview

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

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

MeterView Pro Software

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

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

> **Watch Meterview Pro Software Video at**
> **www.predig.com/meterviewpro**

MeterView Pro Installation

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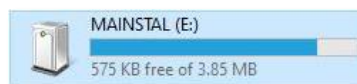
⚠ **WARNINGS**

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

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

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

3. Double-click on the file named "MAStart." The program will open a few windows and install two programs on your computer. Simply follow the on-screen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."
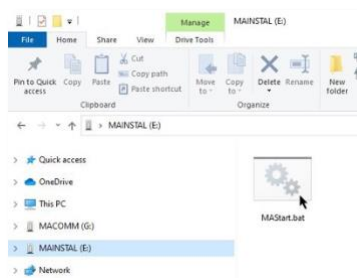
4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your meter.
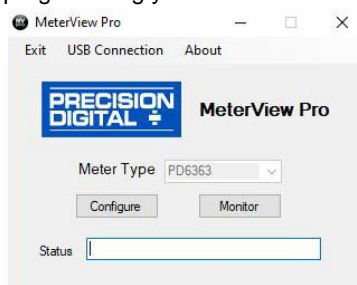
> **Note:** If you decide to update your MeterView Pro software, once the installation has completed, you will be asked if you want to update the setup files located on the meter itself. This way, you will always have the most current version on the meter for future installs.

⚠ **WARNING**

- **DO NOT** unplug the meter while the new installation files are being written to it. The meter will display ʊ◡ʋ ⊓ᴸᴱ during the process and you will receive an on-screen notification once the process is complete.

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Flowmeter 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 flowmeter or sensor.

If the flowmeter 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 flowmeter excitation.
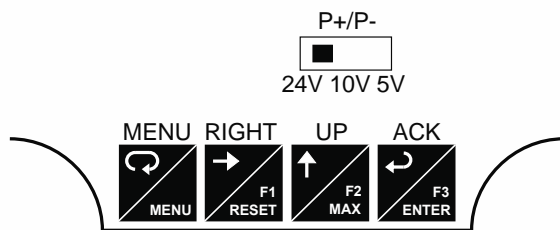
Figure 8. Flowmeter Supply Voltage Selection

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.
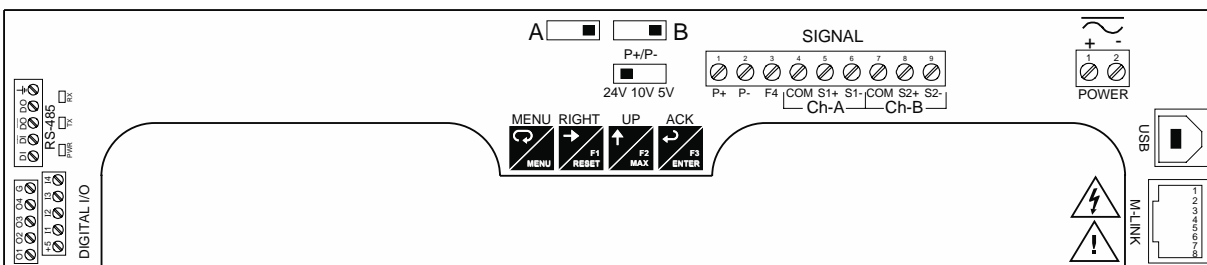
Figure 9. PD2-6363-6H0 / 7H0 Connectors Label
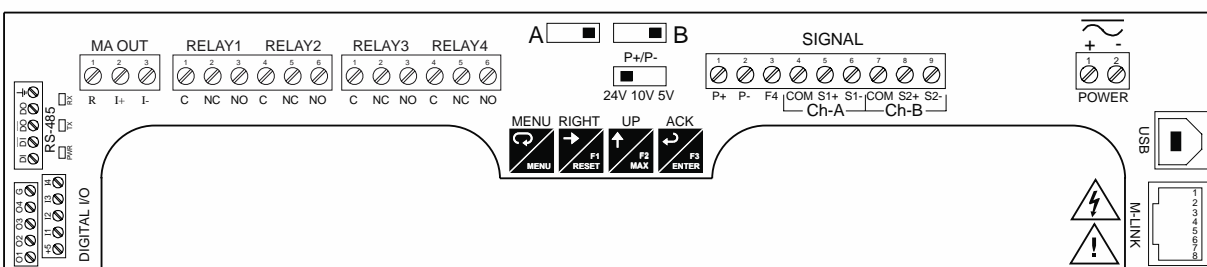
Figure 10. PD2-6363-6H7 / 7H7 Connectors Label

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.
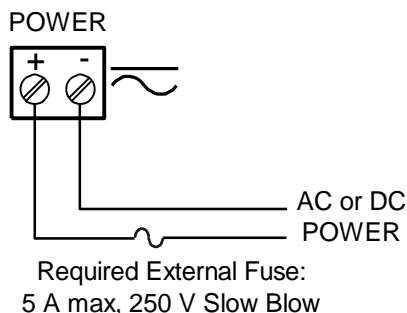
Figure 11. Power Connections

Signal Connections

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

The following figures show examples of signal connections.

Setup and programming is performed through the programming buttons or MeterView Pro software.
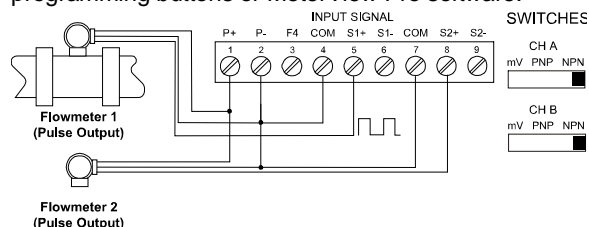
Figure 12. Flowmeters Powered by Internal Power Supply
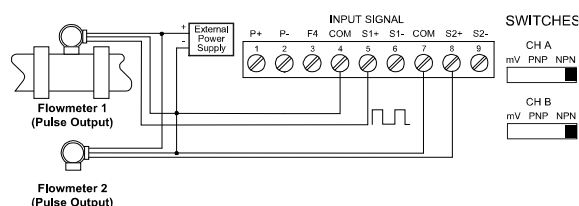
Figure 13. Flowmeters Powered by External Supply
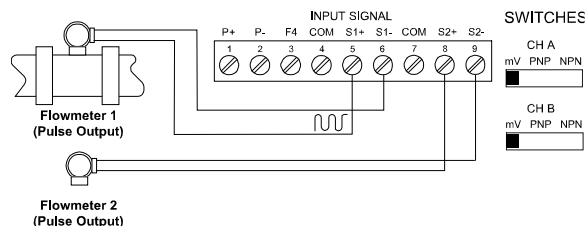
Figure 14. Self-Powered Magnetic Pickup Coil Flowmeter
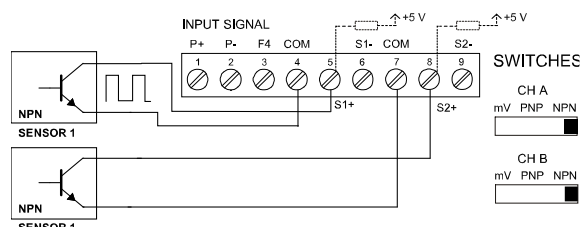
Figure 15. NPN open Collector Input
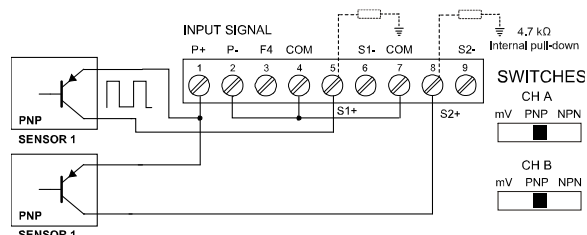
Figure 16. PNP Sensor Powered by Internal Supply
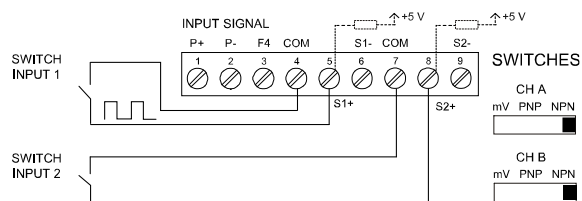
Figure 17. Switch Input Connections

Configure Input Type and Level Switches

Channel A and B each have an internal input type configuration switch. These switches must be set to the correct input type and level. Each switch can be set for mV, PNP, or NPN. For details on what input type to select, see *Signal Connections* starting on page *18*.

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.
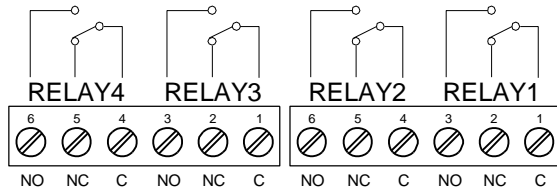
Figure 18. Relay Connections

Switching Inductive Loads

The use of suppressors (snubbers) is strongly recommended when switching inductive loads to prevent disrupting the microprocessor's operation. The suppressors 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:
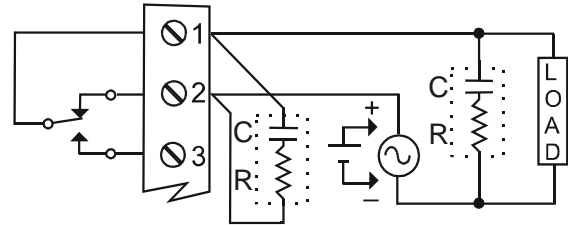
Figure 19. AC and DC Loads Protection

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.*
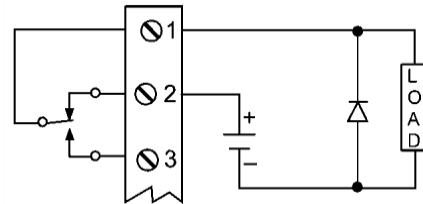
Figure 20. Low Voltage DC Loads Protection

RC Networks 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 *49* 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.
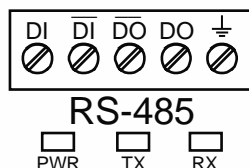
Figure 21. RS-485 Connection

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, RddrE5 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
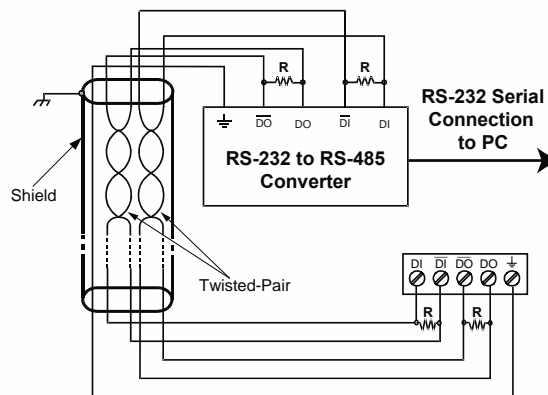
Figure 22. Five-Wire RS-485 Connections
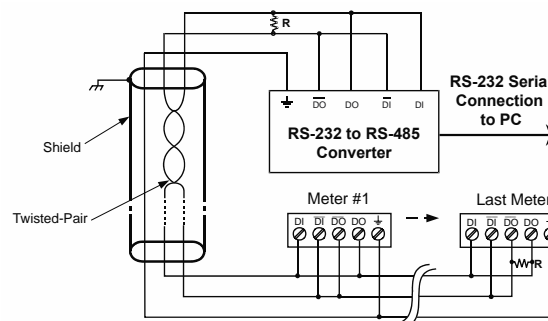
Figure 23. Three-Wire RS-485 Multi-Drop Connections

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 24 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
⏚	⏚
$\overline{DO}$	$\overline{DI}$
DO	DI
$\overline{DI}$	$\overline{DO}$
DI	DO

Figure 24. 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.
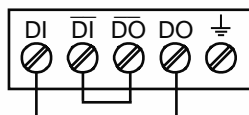
Figure 25. Three-Wire RS-485 Connection

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.
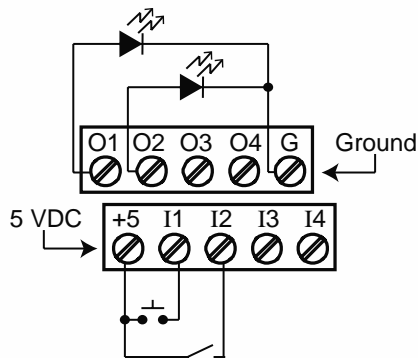
Figure 26. Digital Input and Output Connections

F4 Digital Input Connections

A digital input, F4, is standard on the meter. This digital input connected with a normally open closure across F4 and COM, or with an active low signal applied to F4. It can be used for remote operation of front-panel buttons, to acknowledge/reset relays, reset totals, or to reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *53* for a complete list of capabilities.
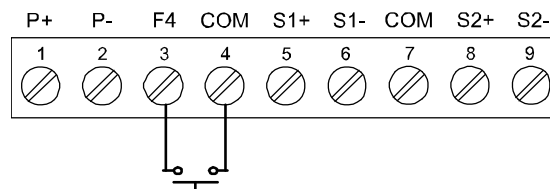
Figure 27. F4 Digital Input Connections

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.
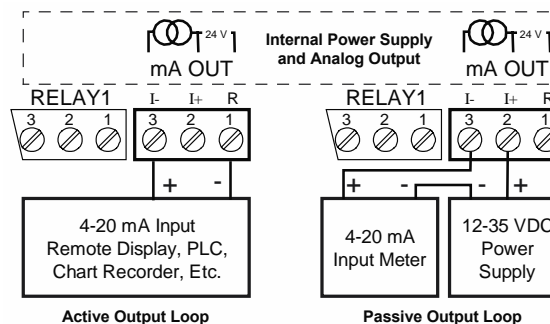
Figure 28. 4-20 mA Output Connections

Analog Output Transmitter 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.
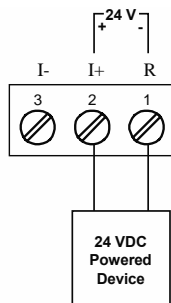
Figure 29. Analog Output Supply Powering Other Devices

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 30. Meter to PDA2364-MRUE Control Station Connection*.
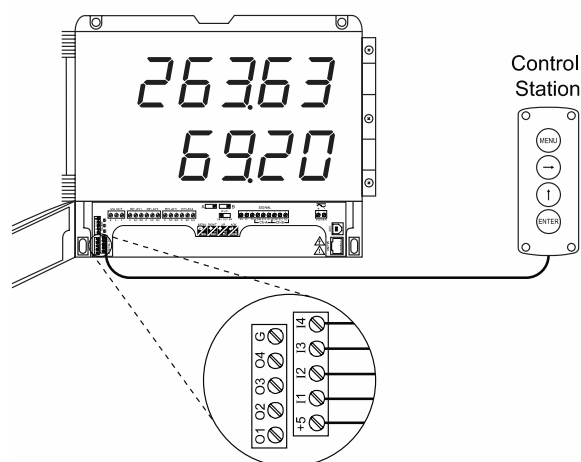
Figure 30. Meter to PDA2364-MRUE Control Station Connection

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 *44*.

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.
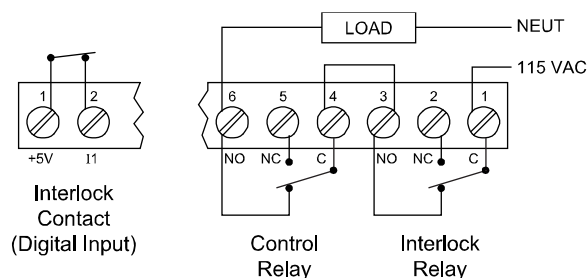
Figure 31. Interlock Connections

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Setup and Programming

> The meter may either be scaled (5CRLE) without applying an input, calibrated (CRL) by applying an input, or you may use the K-Factor menu to match the rate/totalizer with a flowmeter's k-factor (pulse/unit of measure).
>
> The meter comes factory calibrated to NIST standards, so for initial setup, it is recommended to use the K-Factor method or (5CRLE) function.

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
A	Steady	Channel A displayed
B	Steady	Channel B displayed
C	Steady	Channel C displayed

Programming Buttons

Lower Door Panel
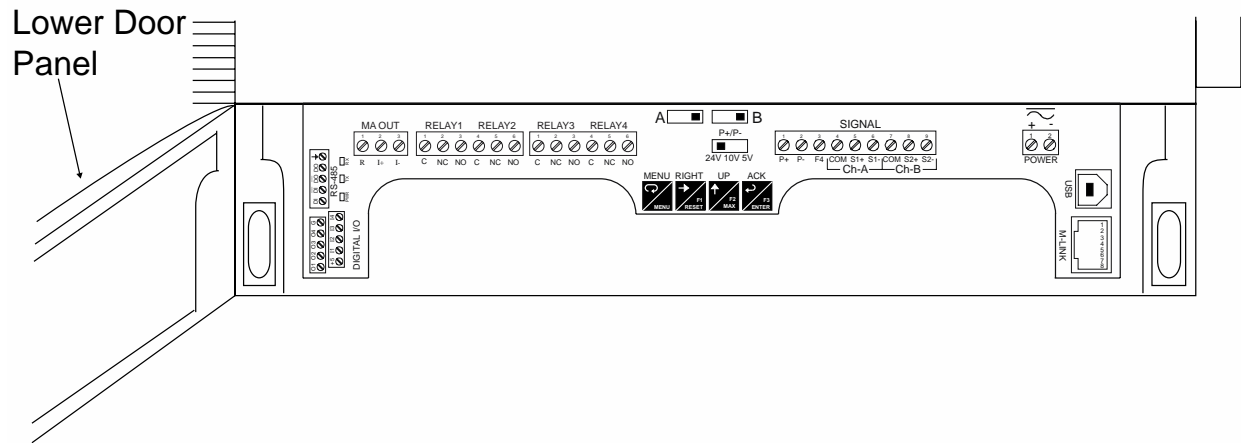
Button	Description		Button	Description
MENU	**Menu**		UP	**Up Arrow/F2**
RIGHT	**Right Arrow/F1**		ACK	**Acknowledge (Enter)/F3**

- 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
5EtuP	Setup	Enter *Setup* menu
InPut	Input	Enter *Input* selection menu
Ch-A*	Input	Set input operation for channel A (*or B)
totAL	Total	Enable/disable totalizer functions
YES	Yes	Enable totalizer functions
no	No	Disable totalizer functions
modE	Mode	Select dual-input operation mode
duAL	Dual	Set independent dual input mode
ud Ab	Up/Down AB	Set channel A total add/subtract based on the state of channel B
ud A1	Up/Down AI	Set channel A total add/subtract based on the state of a digital input
ud b1	Up/Down BI	Set channel B total add/subtract based on the state of a digital input
ud b1	Up/Down ABI	Set channel A & B total add/subtract based on the state of a digital input for each
9uAd 1	Quadrature 1	Set type 1 quadrature operation
9uAd 2	Quadrature 2	Set type 2 quadrature operation
9uAd 4	Quadrature 4	Set type 4 quadrature operation
unitS	Unit	Select the display units/tags
Ch-A*	Rate unit	Set rate unit or tag for channel A (*or B)
Ch-C	Math unit	Set unit or tag for math channel C
tot-A*	Total unit	Set total unit or tag for channel A (*or B)
Gtot-A*	Grand total unit	Set grand total unit or tag for channel A (*or B)
dEc Pt	Decimal point	Set decimal point
Ch-A*	Decimal point	Set decimal point for channel A (*or B or C)
rAtE*	Rate	Set rate decimal point (*channel A and B only)

Display Functions & Messages

Display	Parameter	Action/Setting Description
totAL*	Total	Set total decimal point (*channel A and B only)
GtotAL*	Grand total	Set grand total decimal point (*channel A and B only)
ProG	Program	Enter the *Program* menu
InCAL	Input calibration	Enter the *Input Calibration* menu
Ch-A	Channel A	Enter channel A input setup
FAct-A	K-factor A	Enter channel A k-factor
5CAL-A	Scale A	Enter the *Scale* menu for channel A
CAL-A	Calibrate A	Enter the *Calibration* menu for channel A
InP 1	Input 1	Calibrate input 1 signal or program input 1 value
diS 1	Display 1	Program display 1 value
InP 2	Input 2	Calibrate input 2 signal or program input 2 value (up to 32 points)
diS 2	Display 2	Program display 2 value (up to 32 points)
Error	Error	Error, calibration or scaling not successful, check signal or programmed value
Ch-b	Channel B	Enter channel B input setup
FAct-b	K-factor B	Enter channel B k-factor
5CAL-b	Scale B	Enter the *Scale* menu for channel B
CAL-b	Calibrate B	Enter the *Calibration* menu for channel B
t5EtuP	Total setup	Enter the *Total Setup* menu
Ch-A*	Channel A	Setup the total for channel A (*or B)
tbASE	Time base	Program total time base
t CF	Total conversion factor	Program total conversion factor
Gt CF	Grand total conversion factor	Program grand total conversion factor
trESEt	Total reset	Program total reset mode: auto or manual
Ch-A*	Channel A	Set total reset modes for channel A (*or B)
t r5t	Total reset	Program total reset mode: auto or manual
Gt r5t	Grand total reset	Program grand total reset mode: auto or manual

Display Functions & Messages

Display	Parameter	Action/Setting Description
t dLY	*Time delay*	Program automatic reset time delay
dSPLAY	*Display*	Enter the *Display* menu
L inE 1	*Display Line 2*	Assign the upper display parameter
L inE 2	*Display Line 2*	Assign the lower display parameter
d Ch-A	*Display Ch-A*	Assign display to channel A
d Ch-b	*Display Ch-B*	Assign display to channel B
d Ch-C	*Display Ch-C*	Assign display to channel C (math)
d Ab	*Display AB*	Alternate display of channels A & B
d AC	*Display AC*	Alternate display of channels A & C
d bC	*Display BC*	Alternate display of channels B & C
d AbC	*Display ABC*	Alternate display of channels A, B, & C
d t-A	*Display total A*	Assign display to channel A total
d t-b	*Display total B*	Assign display to channel B total
d Gt-A	*Display grand total A*	Assign display to channel A grand total
d Gt-b	*Display grand total B*	Assign display to channel B grand total
d rt-A	*Display rate and total A*	Alternate display of channel A rate and total
d rt-b	*Display rate and total B*	Alternate display of channel B rate and total
drGt-A	*Display rate and grand total A*	Alternate display of channel A rate and grand total
drGt-b	*Display rate and grand total B*	Alternate display of channel B rate and grand total
dSEt 1*	*Display Set 1*	Displays relay 1 (*through 4) set point.
d Hi-A	*Display high A*	Display high value of channel A
d Lo-A	*Display low A*	Display low value of channel A
d HL-A	*Display high/low A*	Alternate between high/low value of channel A
d Hi-b	*Display high B*	Display high value of channel B

Display Functions & Messages

Display	Parameter	Action/Setting Description
d Lo-b	*Display low B*	Display low value of channel B
d HL-b	*Display high/low B*	Alternate between high/low value of channel B
d Hi-C	*Display high C*	Display high value of channel C
d Lo-C	*Display low C*	Display low value of channel C
d HL-C	*Display high/low C*	Alternate between high/low value of channel C
d A-u	*Display A and units/tags*	Alternate display of channel A and the unit/tag
d b-u	*Display B and units/tags*	Alternate display of channel B and the unit/tag
d C-u	*Display C and units/tags*	Alternate display of channel C and the unit/tag
d tA-u	*Display total A and total A units*	Alternate display of channel A total and total units
d tb-u	*Display total B and total B units*	Alternate display of channel B total and total units
d tAb	*Display total A and B*	Alternate display of channel A total and channel B total
d tAbC	*Display total A, B, and sum of A and B*	Alternate display of channel A total, channel B total, and sum of totals as channel C
n buS	*Display Modbus*	Display Modbus input register
d oFF	*Display off*	Display blank line 2
d un t	*Display unit*	Display line 1 channel units
d- intY	*Display intensity*	Set display intensity level from 1 to 8
rELAY	*Relay*	Enter the *Relay* menu
ASS iGn	*Assignment*	Assign relays to channels or Modbus
AS iGn 1*	*Assign 1*	Relay 1 (*through 4) assignment
Ch-A*	*Channel A*	Assign relay to channel A (*or B or C)
rAtE*	*Rate*	Assign relay to rate (*channel A and B only)
totAL*	*Total*	Assign relay to total (*channel A and B only)
GtotAL*	*Grand total*	Assign relay to grand total (*channel A and B only)

Display Functions & Messages

Display	Parameter	Action/Setting Description
n̄ bu5	*Modbus*	Assign relay to Modbus register
rLY 1*	*Relay 1*	Relay 1 (*through 4) setup
Rct 1	*Action 1*	Set relay 1 action
Ruto	*Automatic*	Set relay for automatic reset
5Et 1	*Set 1*	Enter relay 1 set point
r5t 1	*Reset 1*	Enter relay 1 reset point
R-n̄Rn	*Auto-manual*	Set relay for auto or manual reset any time
LRtCH	*Latching*	Set relay for latching operation
Lt-CLr	*Latching-cleared*	Set relay for latching operation with manual reset only after alarm condition has cleared
RLtErn	*Alternate*	Set relay for pump alternation control
5Rn̄PL	*Sample*	Set relay for sample time trigger control
OFF	*Off*	Turn relay off
FR ɪLSF	*Fail-safe*	Enter *Fail-safe* menu
FL5 1*	*Fail-safe 1*	Set relay 1 (*through 4) fail-safe operation
on	*On*	Enable fail-safe operation
oFF	*Off*	Disable fail-safe operation
dELRY	*Delay*	Enter relay *Time Delay* menu
dLY 1*	*Delay 1*	Enter relay 1 (*through 4) time delay setup
On 1	*On 1*	Set relay 1 On time delay
OFF 1	*Off 1*	Set relay 1 Off time delay
Rout	*Analog output*	Enter the *Analog output* scaling menu
Rout 1	*Aout Channel*	Analog Output source channel
d ɪ5 1	*Display 1*	Program display 1 value
Out 1	*Output 1*	Program output 1 value (e.g. 4.000 mA)
d ɪ5 2	*Display 2*	Program display 2 value
Out 2	*Output 2*	Program output 2 value (e.g. 20.000 mA)
rE5Et	*Reset*	Press Enter to access the *Reset* menu
r5t Hɪ	*Reset high*	Press Enter to reset max display
r5t Lo	*Reset low*	Press Enter to reset min display
r5t HL	*Reset high & low*	Press Enter to reset max & min displays

Display Functions & Messages

Display	Parameter	Action/Setting Description
tot R	*Reset total A*	Press Enter to reset channel A total
tot b	*Reset total B*	Press Enter to reset channel B total
Gtot R	*Reset grand total A*	Press Enter to reset channel A grand total
Gtot b	*Reset grand total B*	Press Enter to reset channel B grand total
tot Rb	*Reset totals A and B*	Press Enter to reset channels A and B totals
Gt Rb	*Reset grand totals A and B*	Press Enter to reset channels A and B grand totals
ContrL	*Control*	Enter *Manual Control* menu
Ruto	*Automatic*	Press Enter to set meter for automatic operation
n̄Rn	*Manual*	Press Enter to manually control relays or analog output operation
PR55	*Password*	Enter the *Password* menu
PR55 1	*Password 1*	Set or enter Password 1
unLoc	*Unlocked*	Program password to lock meter
Locd	*Locked*	Enter password to unlock meter
PR55 2	*Password 2*	Set or enter Password 2
PR55 3	*Password 3*	Set or enter Password 3
totRL	*Total reset password*	Set or enter a total reset password
GtotRL	*Grand total password*	Set or enter a grand total reset password
999999	*Flashing*	Overrange condition

Main Menu

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

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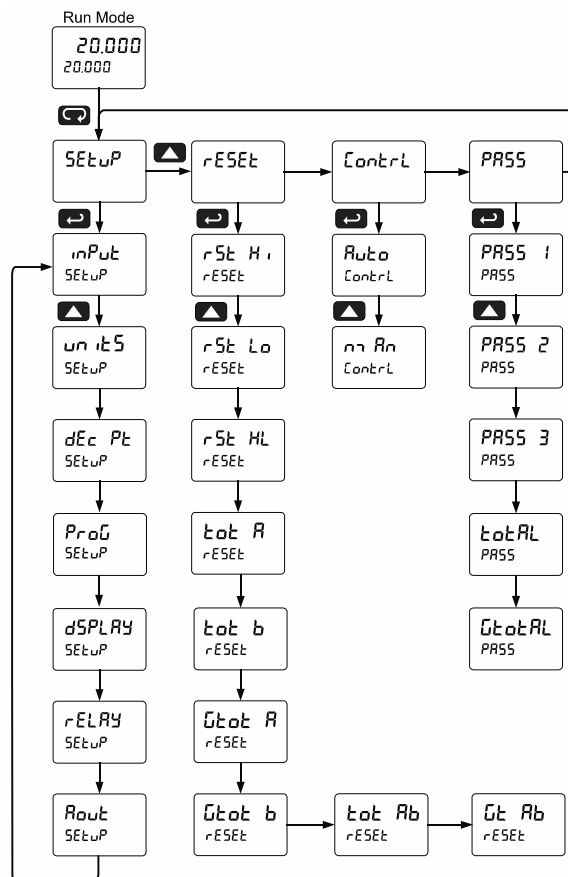
Setting Numeric Values

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

Press and hold Up to auto-increment the display value. If negative numbers are allowed, the first digit position will include a negative symbol (-) after the 9.

Press the Enter button, at any time, to accept a setting or Menu button to exit without saving changes.
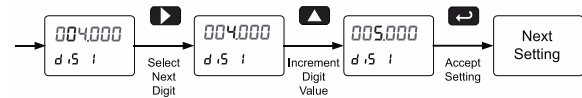
Setting Up the Meter (5EtuP)

The *Setup* menu is used to select:

1. Total enable/disable and channel A and B input modes
2. Units for A & B rate, total & grand total, and C
3. Decimal positions for A & B rate, total, and grand total, and C
4. Program the K-factor (or scale or calibrate) & total functions
5. Display parameters and intensity
6. Relay assignments and operation
7. 4-20 mA analog output scaling

Press the Menu button to exit at any time.
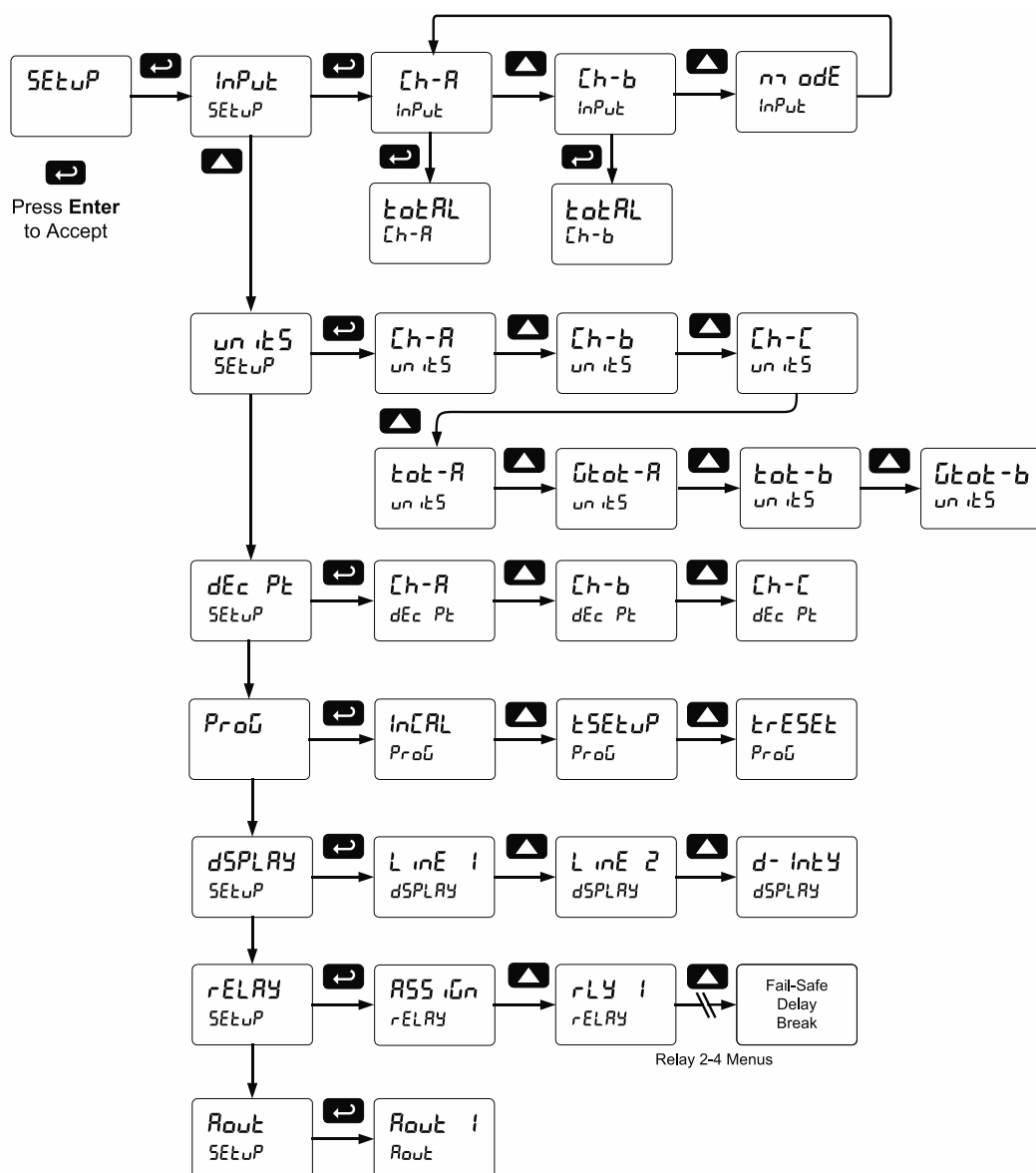
Setting the Input Signal (InPut)

There is a switch, located to the right of the input connector, which must be configured according to the input level and type. The switch labeled P+/P- located in the center of the connections board is used to select the excitation voltage (24 V [*Default setting*], 10 V or 5 V) which is supplied to the P+ and P- wiring terminals.

Enter the Input menu to enable or disable the totalizer features.
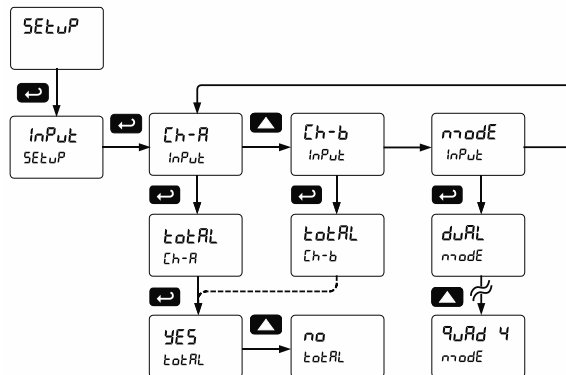
Setting the Totalizer Features (totAL)

To simply not display the total, select alternative display parameters in the display (dSPLAY) 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, most totalizer features and functions are hidden from the menus.

Note: The totalizer continues working in the background.

Setting the Dual-Input Mode (modE)

The *Mode* menu is used to set the functions of the dual input and total. The inputs may be configured for independent one-directional total operation, bi-directional total count with the use of another input or a digital input, or for quadrature input modes.

Independent Dual Totalizers (dUAL)

Total A and B are one-directional and independent, only counting up *or* down depending on *Count* settings.

Ch-A Totalizer Add/Subtract by Ch-B Input (ud Ab)
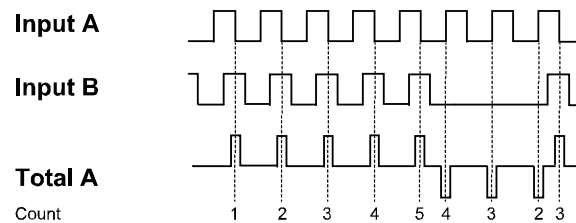
Figure 32. Dual Input Mode (ud Ab)

Total of channel A will add or subtract as determined by the state of input channel B. Channel A total will add at each falling edge if input B is high, and subtract at each rising edge if input B is low.

Ch-A Totalizer Add/Subtract by Digital Input (ud A1)
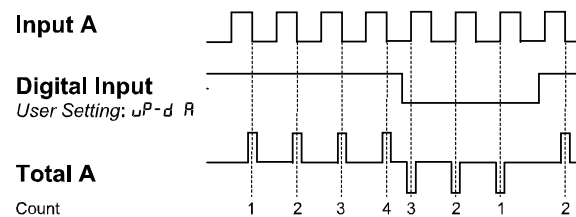
Figure 33. Dual Input Mode (ud A1)

Total of channel A will add or subtract as determined by the state of a digital input. Channel A total will add at each falling edge if an assigned digital input is high, and subtract at each rising edge if an assigned digital input is low.

Ch-B Totalizer Add/Subtract by Digital Input (ud b1)

Total of channel B will add or subtract as determined by the state of a digital input. Channel B total will add at each falling edge if an assigned digital input is high, and subtract at each rising edge if an assigned digital input is low.

Ch-A & Ch-B Totalizer Add/Subtract by Digital Input (ud Ab)

Totals of channel A and B will add or subtract as determined by the state of a digital input assigned to each channel. This mode combines the features of ud A1 and ud b1.

This setting requires the use of the on-board digital inputs. The F4 digital input will only support one channel.

Quadrature Input Type 1 (QuAd 1)
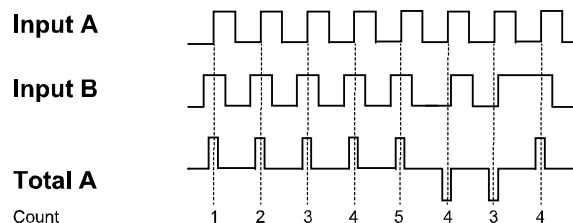
Figure 35. Dual Input Mode (QuAd 1)

Quadrature modes are used to accept inputs that are ±90 degrees out of phase, from quadrature output devices. Total of channel A will add or subtract as determined by the state of input channel B. Channel A total will add at each rising edge if channel B is high, and subtract at each rising edge if channel B is low.

Quadrature Input Type 2 (QuAd 2)
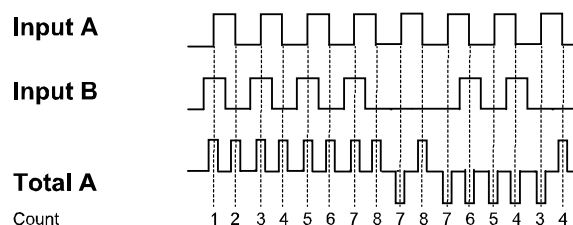
Figure 36. Dual Input Mode (QuAd 2)

Quadrature modes are used to accept inputs that are ±90 degrees out of phase, from quadrature output devices. Total of channel A will add or subtract as determined by the state of input channel B. Channel A total will add at each rising edge if channel B is high, and at each falling edge if channel B is low. Channel A total will subtract at each rising edge if channel B is low, and at each falling edge if channel B is high.

Quadrature Input Type 4 (QuAd 4)
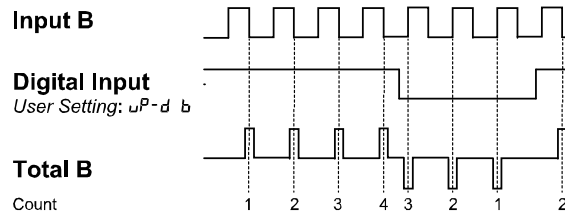
Figure 34. Dual Input Mode (ud b1)
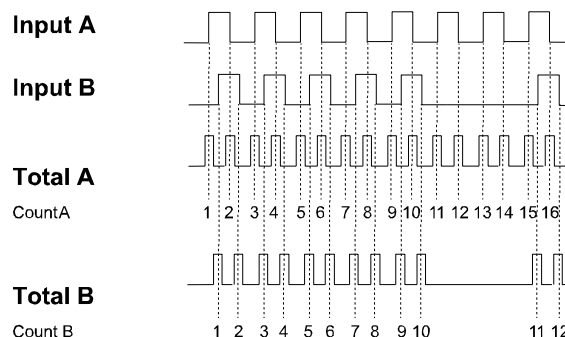
Figure 37. Dual Input Mode (QuAd 4)

Quadrature modes are used to accept inputs that are ±90 degrees out of phase, from quadrature output devices. Totals of channel A and B will add at each rising and falling edge of that channel.

Setting the Rate, Total, & Grand Total Units/Tags (un it5)

Enter the channel A and B rate, total, grand total, and math channel C units (or custom tags) that will be displayed if alternating units is selected in the un it5 menu, or d un it is selected as the lower display parameter.

See the *Setting the Display Parameters & Intensity* (d5PLAY) flow chart on page *36* for details on accessing the *Units* menu and parameters. Ch-A and Ch-b set the rate units, tot-A and tot-b the total units, and Gtot-A and Gtot-b the grand total units. Ch-C sets the units for the math channel C.

See the *Setting the Display Parameters & Intensity* (d5PLAY) flow chart on page *36* to access the display menu to show the unit or tag on the lower display.

The engineering units or custom legends can be set using the following 7-segment character set:

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

Notes:

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

Setting the Decimal Point (dEc Pt)

The decimal point for any channel, rate, total, or grand total, may be set with up to five decimal places or with no decimal point at all.

Pressing the Right arrow moves the decimal point one place to the right until no decimal point is displayed, and then it moves to the leftmost position. Pressing the Up arrow moves the decimal point one place to the left.

There are seven decimal points to set up for three channels: Ch-A rate, total, and grand total; Ch-B rate, total, and grand total; and Ch-C.

After the decimal points are set up, the meter moves to the *Program* menu.
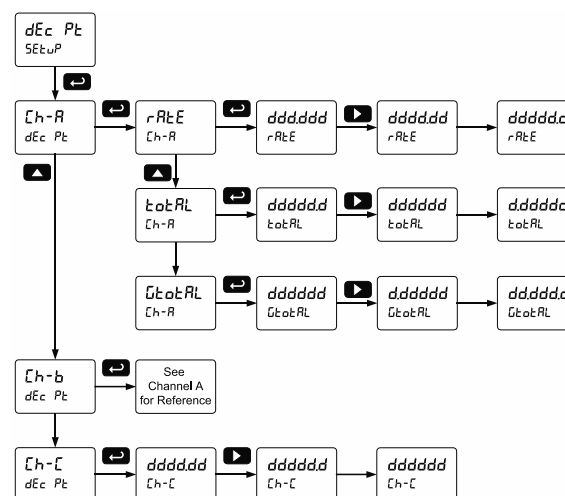
Programming the Rate/Totalizer (ProG)

The meter may either be scaled (SCALE) without applying an input, calibrated (CAL) by applying an input, or you may use the K-Factor menu to match the rate/totalizer with a flowmeter's k-factor (pulse/unit of measure). 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 for each channel A and B:

1. K-Factor calibration
2. Scale without a signal source
3. Calibrate with a calibrated signal source
4. Total time base & conversion factor
5. Grand total time base & conversion factor
6. Reset modes for total & grand total

The pulse inputs may be calibrated or scaled to any display value within the range of the meter.
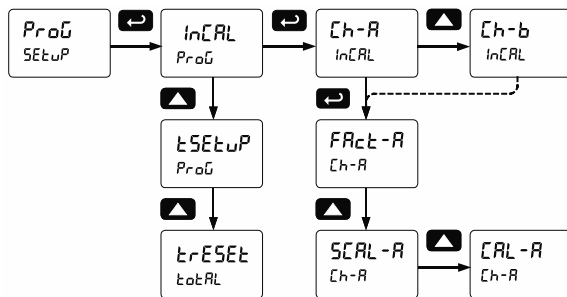
Additional parameters, not needed for most applications, are found in the *Advanced Features* menu; see *Advanced Features Menu*, page 47.

Input Calibration Method (InCAL)

There are three methods of calibrating (or scaling) the display for each input channel to show the correct engineering units.

- Use the *Factor* menu to enter the k-factor of a flowmeter in units/pulse
- Use the *Scale* menu to enter the scaling without a signal source.
- Use the *Calibrate* menu to apply a signal from a signal source.

⚠ IMPORTANT

- The Scale, Calibrate, and K-Factor functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time.

Multi-Point Calibration & Scaling

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 under the *Multi-Point Linearization* (LinEAr) menu selection prior to scaling and calibration of the meter, see page *50* for details.

K-Factor Calibration (FAct-A, FAct-b)

The meter may be calibrated using the *K-Factor* function. Most flowmeter manufacturers provide this information with the device. Enter the *K-Factor* (FAct-A, FAct-b) menu and select the decimal point with highest resolution possible and program the k-factor value (*i.e.* pulses/gal). The meter will automatically calculate the flow rate using the k-factor and the time base selected.
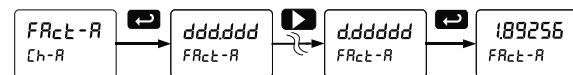
Scaling the Meter without a Signal Source (SCAL-A, SCAL-b)

The inputs can be scaled to display the process variables in engineering units.

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

From the InCAL menu, select channel A or B, followed by SCAL-A or SCAL-b, and then set the input signal value and display value for each of the scaling points (default is two). Enter the input signal values in pulses/second (Hz), and the corresponding display values in appropriate engineering units.

Channel B is scaled similarly to Channel A, shown below.

Scaling the Meter for Channel A (5CAL-A)

"5AVEd" displays for one second prior to Channel B
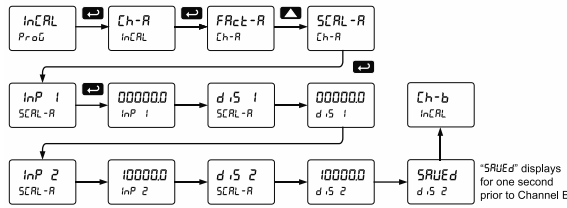
> For instructions on how to program numeric values see *Setting Numeric Values*, page *28*.

Note: The display values (d i5 l and d i5 2) need to be in units of measure per second. For example, if the rate at 1000 Hz is 13.20 gal/min, this must be converted to gal/sec. In this scenario, the numbers input into the 5CALE menu would be as follows:

InP l: 0.0
d i5 l: 0.00
InP 2: 1000.0
d i5 2: 0.22

Set the time base set to minutes (see *Total & Grand Total Setup* (t5EtuP) on page *35*) and the meter will display 13.20 gal/min at 1000 Hz

Error Message (Error)

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

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

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

1. Input signal is not connected to the proper terminals or it is connected backwards.
2. Minimum input span requirements not maintained.
3. Input 1 signal inadvertently applied to calibrate input 2.

Minimum Input Span

The minimum allowed input span is 1.0 Hz, which is the minimum difference between input 1 and input 2 signals required to complete the calibration using an external signal source, or 0.1 Hz for scaling the meter without a signal source.

Calibrating the Meter with External Source (CAL-A, CAL-b)

> To scale the meter without a signal source, refer to *Scaling the Meter without a Signal Source* (5CAL-A, 5CAL-b), page *33*.

The meter can be calibrated to display the process variables 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.

> There is no need to warm up the meter before performing calibration of the inputs.

Channel B is calibrated similarly to Channel A, shown below.

Calibrating the Meter for Channel A (CAL-A)
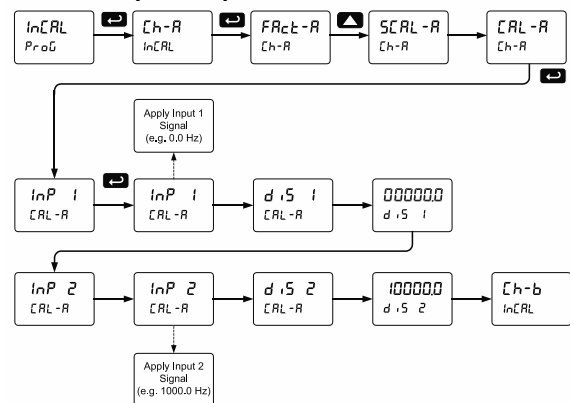
Note: The display values (d i5 l and d i5 2) need to be in units of measure per second.

Note: Inputs for the above example are:
Input 1: 0.0 Hz; Display 1: 0.0 gallons/min
Input 2: 1000.0 Hz; Display 2: 6000.0 gallons/min

Total & Grand Total Setup (tSEtuP)

The time base and total and grand total conversion factors for input channels A and B are located in the *Totalizer Setup* menu.

The time base is determined by the rate programming. Enter the time unit of the programmed rate scale. *For example: A rate display scaled in engineering units of gallons per minute would use a time base of minutes.*

Total & grand total conversion factors for channel A and B are programmed independently. This means that one total or grand total can be displaying the value in gallons while another displays in million gallons, liters, m^3, etc.
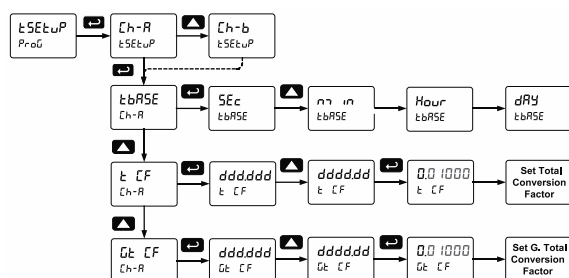
Total & Grand Total Reset (trESEt)

Total reset menus are located in the *Program* menu. The totals can be programmed for manual or automatic 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.

35
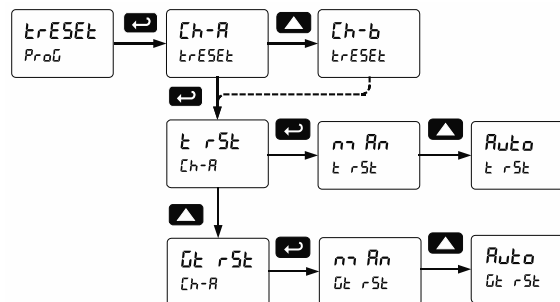
Setting the Display Parameters & Intensity (dSPLAY)

Display line 1 (L inE 1) can be programmed to display:

1. Ch-A rate (d Ch-A)
2. Ch-B rate (d Ch-b)
3. Ch-C math channel (d Ch-C)
4. Toggle Ch-A & Ch-B rate (d Ab)
5. Toggle Ch-A rate and Ch-C (d AC)
6. Toggle Ch-B rate and Ch-C (d bC)
7. Toggle Ch-A & Ch-B rate, and Ch-C (d AbC)
8. Ch-A total (d t-A)
9. Ch-B total (d t-b)
10. Ch-A grand total (d Gt-A)
11. Ch-B grand total (d Gt-b)
12. Toggle Ch-A rate and total (d rt-A)
13. Toggle Ch-B rate and total (d rt-b)
14. Toggle Ch-A rate and grand total (drGt-A)
15. Toggle Ch-B rate and grand total (drGt-b)
16. Relay set points (1-4) (dSEt 1 to dSEt 4)
17. Max, min, and max & min values for Ch-A, Ch-B, or Ch-C (d Hi-A to d HL-C)
18. Toggle Ch-A rate & units (d A-u)
19. Toggle Ch-B rate & units (d b-u)
20. Toggle Ch-C & units (d C-u)
21. Toggle Ch-A total & units (d tA-u)
22. Toggle Ch-B total & units (d tb-u)
23. Toggle Ch-A total and Ch-B total (d tAb)
24. Toggle Ch-A total, Ch-B total, and the sum of total A + total B (d tAbC)*
25. Modbus input (ni buS)

Note: The (C = sum of total A + total B) displayed with the selection (d tAbC) is different than the math channel C calculated under the Math menu functions. Example: (C = Rate Ch-A + Rate Ch-B).

Display line 2 (L inE 2) can be programmed to display:

1. All options for display line 1
2. Off, with no display (d oFF)
3. Engineering units for any single channel, total, or grand total

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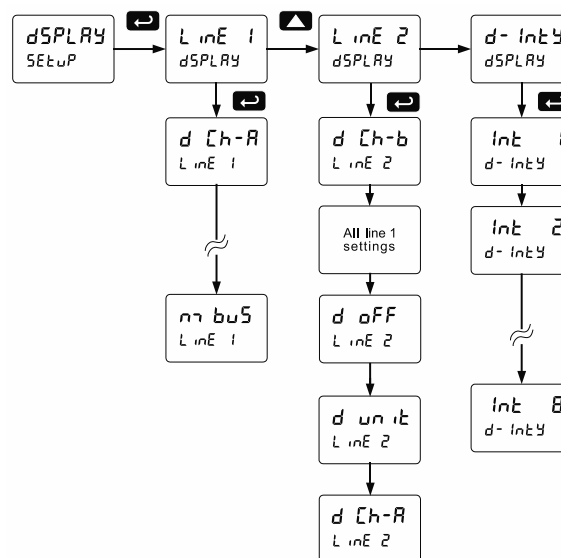
After setting up the input and display, press the Menu button to exit programming and skip the rest of the setup menu.

Customizable Displays

The displays can be set up to read input channels (A or B), rate, total, or grand total, math function channel C, toggle between A & B, B & C, A & C, A & B & C, toggle between channels A, B, or C & units, the max/min of any of the channels, including the math channel (C), set points, or the Modbus input. This allows the display to be setup to display whatever variables are most valuable to the application. Here are just a few examples.

**Line 1 displays Math Function (C)
Line 2 toggles between Totals A & B**

**Math Function
& Tag**

**Input Channels
A & B Total**
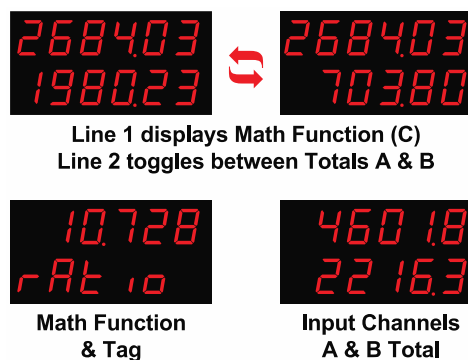
Display Intensity (d-IntY)

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

Setting the Relay Operation (rELAY)

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

⚠ **CAUTION**

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

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

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

Setting the Relay Assignment (ASSiGn)

Relays may be assigned to Channel A (rate, total, or grand total), Channel B (rate, total, or grand total), Channel C (Math channel), or Modbus input.
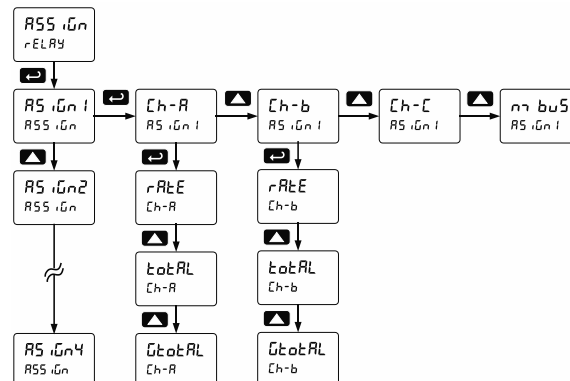
Setting the Relay Action (Act)

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

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

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

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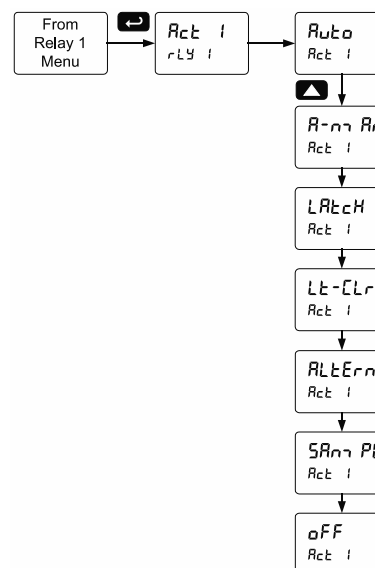
Programming Set and Reset Points

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

Note: Changes are not saved until the reset point has been accepted.
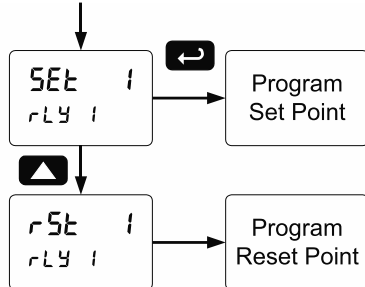
Setting Fail-Safe Operation

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

Programming Time Delay

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

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

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

Relay and Alarm Operation Diagrams

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

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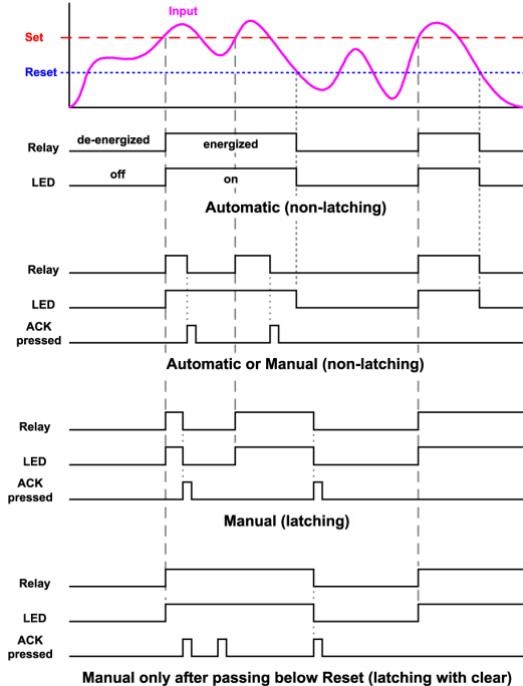
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

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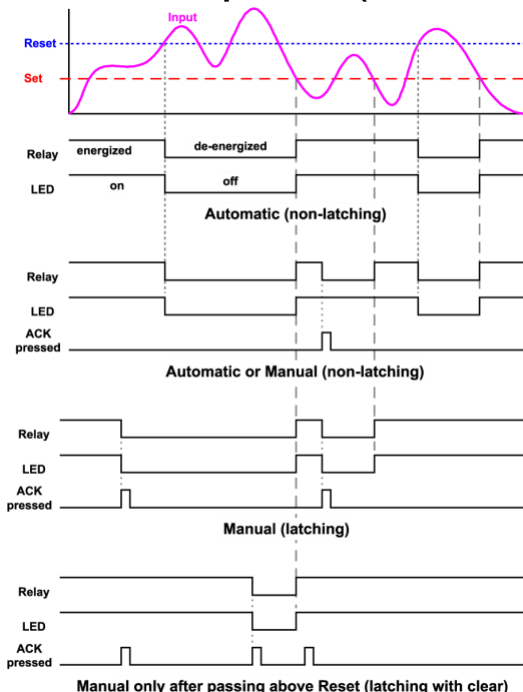
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

High Alarm with Fail-Safe Operation (Set > Reset)
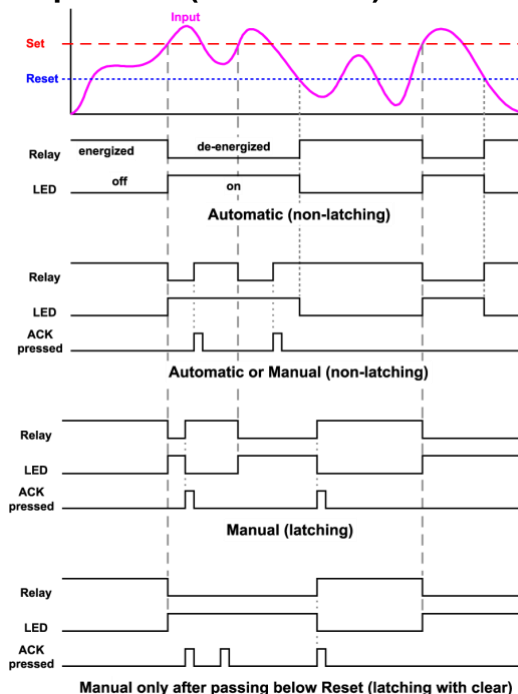
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Low Alarm with Fail-Safe Operation (Set < Reset)
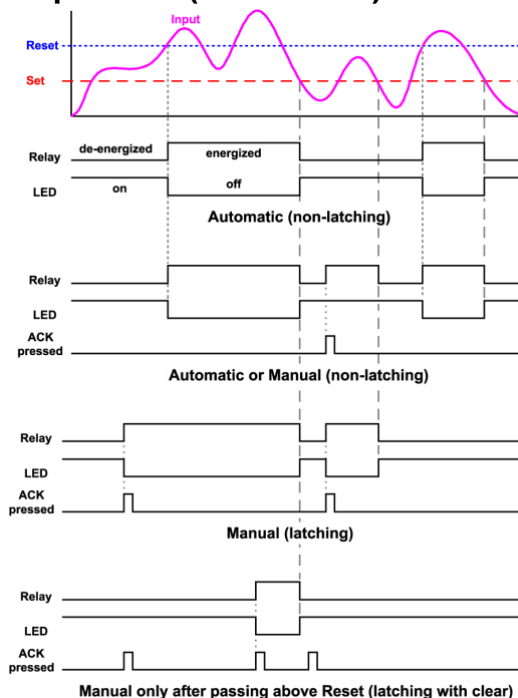
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

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Time Delay Operation

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

On Time Delay
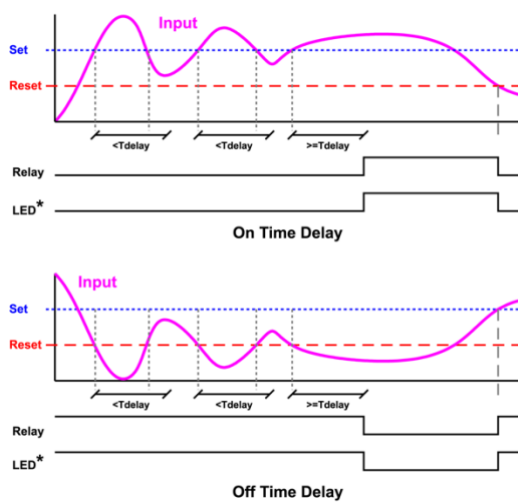
Off Time Delay

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

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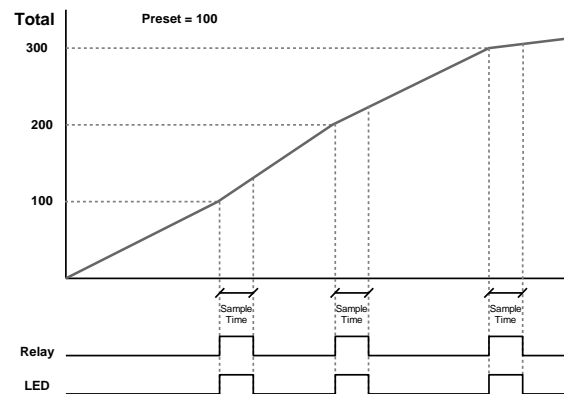
When the total reaches the preset, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the preset value is added to the total.

Pump Alternation Control Operation

LEDs indicate the relay status
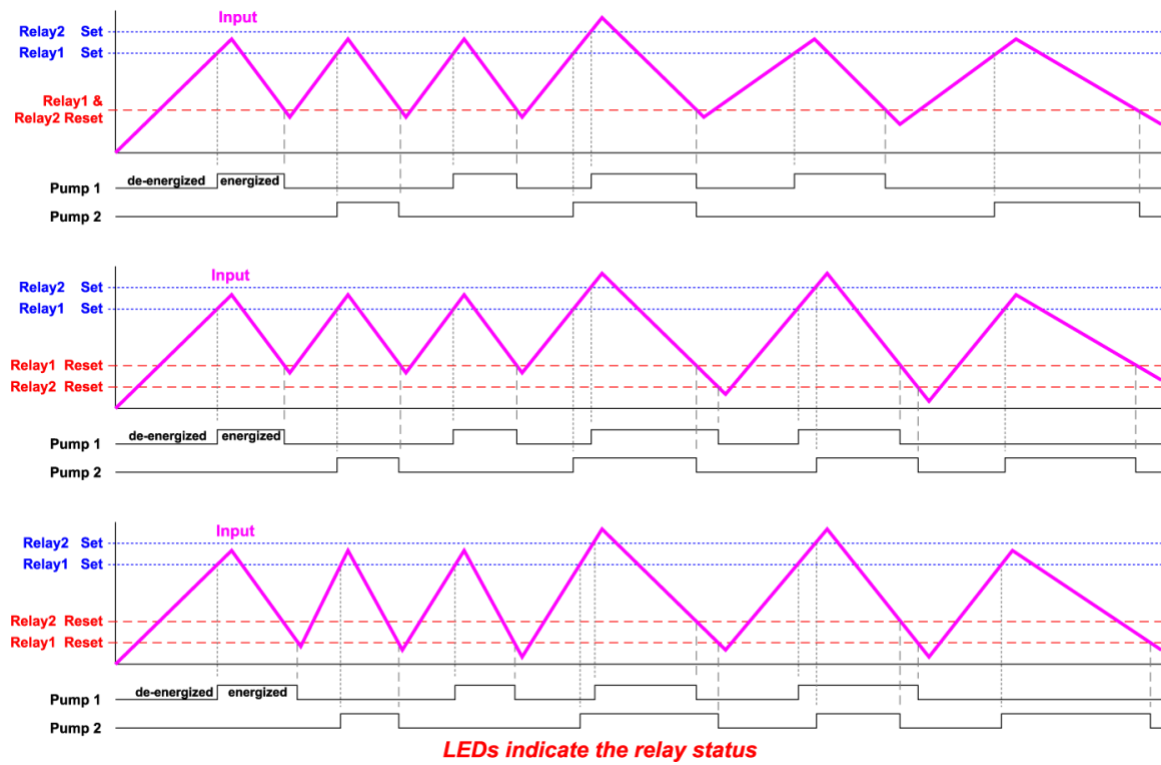
Relay Operation Details
Overview

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, and pump alternation control for up to 4 pumps. There are four basic ways the relays can be used:

1. High and Low Alarms with Latching or Non-Latching Relays
2. Simple On/Off Control with 100% Adjustable Deadband
3. Sampling (Based on Time)
4. 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 responds differently for latching and non-latching relays.

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

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

Latching and Non-Latching Relay Operation

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

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

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

⚠ **WARNING**

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

Non-Latching Relay (Auto)

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 (A-niAn)

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 (LAtcH)

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

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

Latching Relay with Clear (Lt-CLr)

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).
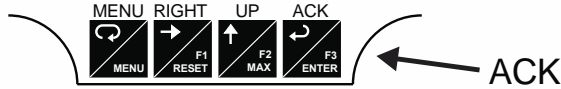
2. Remotely via a normally open push button wired to the F4 terminal.
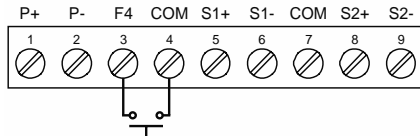
3. Remotely via a normally open push button wired to one of the digital inputs and the +5 V terminal on the digital I/O connections.
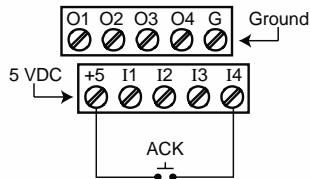
When the ACK button or the assigned digital input is closed, all relays programmed for manual reset are acknowledged.

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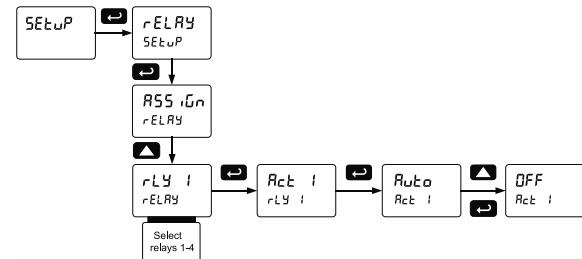
2. In the Advanced features – *User* menu program any of the digital inputs to *Force On* any of the internal relays (1-4).

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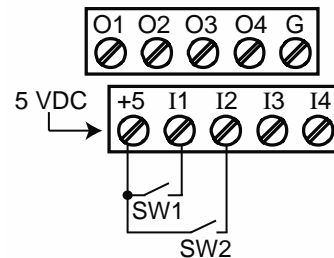
Interlock Relay Operation Example

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 trip 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 (Aout)

The 4-20 mA analog output can be scaled to provide a 4-20 mA signal for any display range selected. To select the channel and source assignments the analog output are assigned to, see *Analog Output Source* on page *52*.

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 outputs based on display values.
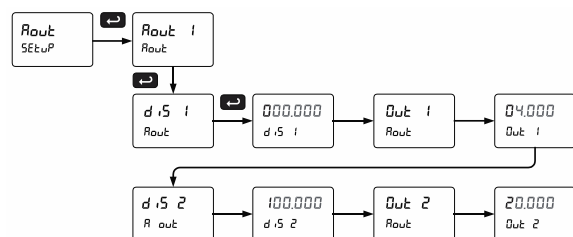
For further details, see *Setting Numeric Values* on page *28*.

Reset Menu (rESEt)

The *Reset* menu is used to reset the maximum (peak) value of Ch-A and Ch-B rate (rSt Hi), minimum (valley) reading of Ch-A and Ch-B rate (rSt Lo), both high and low value of Ch-A and Ch-B rate (rSt HL), Ch-A total (tot A) or Ch-B total (tot b), Ch-A grand total (Gtot A) or Ch-B grand total (Gtot b), both Ch-A and Ch-B totals (tot Ab), or both Ch-A and Ch-B grand totals (Gt Ab).

Manual Control Menu (Contrl)

The *Manual Control* menu is used to control the 4-20 mA analog output (Aout 1 only) 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.

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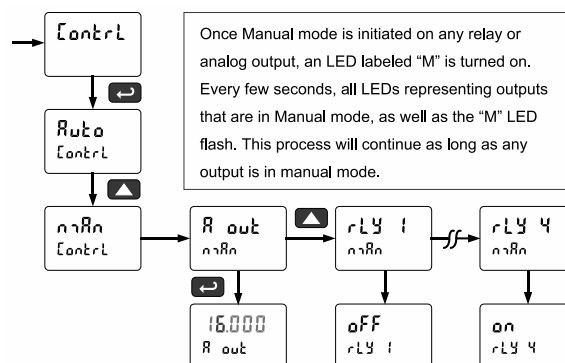
Setting Up the Password (PASS)

The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings, to restrict the ability to reset the totals and grand totals, 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 Functions

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

For instructions on how to program numeric values see *Setting Numeric Values* on page *28*.
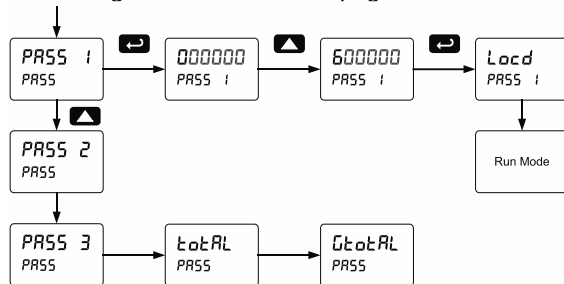
Total Reset Password & Non-Resettable Total

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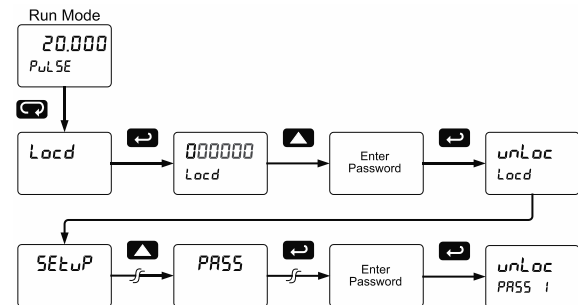
If the correct six-digit password is entered, the meter displays the message unLoc (unlocked) and the protection is disabled until a new password is programmed.

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.

Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
GAtE	Gate	Enter Gate function menu
Lo G	Low gate	Program Low gate value
Hi G	High gate	Program High gate value
FiLtEr	Filter	Enter the Filter menu
Ch-A	Channel A	Set filter speed for channel A
Ch-b	Channel B	Set filter speed for channel B
Lo SPd	Low speed	Set the contact de-bounce filter value
Hi SPd	High speed	Select high speed filter
round	Round	Set the rounding value for the display
SEriAL	Serial	Set serial communication parameters
SLAV id	Slave ID	Set slave ID or meter address
bAud	Baud rate	Select baud rate
tr dLY	Transmit delay	Set serial communication transmit delay
PArity	Parity	Select parity Even, Odd, or None with 1 or 2 stop bits
t-bYt	Time byte	Set byte-to-byte timeout
SELEct	Select	Enter the Select menu (function, math, constant, cutoff, count, Aout programming)
Functn	Input signal conditioning	Select linear function parameters
Ch-A	Channel A	Select menu for channel A
Ch-b	Channel B	Select menu for channel B
LinEAr	Linear	Set meter for linear function and select number of linearization points
no PtS	Number of points	Set the number of linearization points (default: 2)
nAth	Math	Select the channel C math function

Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
Sunn	Sum	C = (A+B+P)*F
diF	Difference	C = (A-B+P)*F
diFAbS	Abs difference	C = ((Absolute value of (A-B))+P)*F
AvG	Average	C = (((A+B)/2)+P)*F
nuLti	Multiplication	C = ((A*B)+P)*F
diVidE	Divide	C = ((A/B)+P)*F
Hi-Ab	Max of A or B	C = ((High value of channel A or B)+P)*F
Lo-Ab	Min of A or B	C = ((Low value of channel A or B)+P)*F
drAw	Draw	C = ((A/B)-1)*F
wj AvG	Weighted avg.	C = ((B-A)*F)+A
rAtio	Ratio	C = (A/B)*F
rAtio2	Ratio 2	C = ((B-A)/A)+P)*F
ConcEn	Concentration	C = (A/(A+B))*F
Sunn t	Sum total	C = (tA+tB+P)*F
SunGt	Sum grand total	C = (GtA+GtB+P)*F
diF t	Diff. of total	C = (tA-tB+P)*F
diF Gt	Difference of grand total	C = (GtA-GtB+P)*F
trAtio	Total ratio	C = (tA/tB)*F
t-rAt2	Total ratio 2	C = ((tB-tA)/tA)*F
t Pct	Total percent	C = (tA/(tA+tB))*100
ConSt	Constant	Enter math equation constants
AddEr	Adder	Addition constant used in channel C math calculations (P)
FActor	Factor	Multiplication constant used in channel C math calculations (F)
CutoFF	Cutoff	Set low-flow cutoff
Ch-A	Channel A	Set low-flow cutoff for Channel A
Ch-b	Channel B	Set low-flow cutoff for Channel B
Count	Count	Set total count direction
Ch-A	Channel A	Set total count direction for Channel A
Ch-b	Channel B	Set total count direction for Channel B
tot C	Total count	Set direction of total count
Gtot C	G. total count	Set direction of grand total count
uP	Count up	Count up
down	Count down	Count down
C Strt	Count start	Enter count down start value
AoutPr	Analog output programming	Program analog output parameters
Aout 1	Analog output 1	Program analog output
SourcE	Source	Select source for the 4-20 mA output
CAL ib	Calibrate	Calibrate 4-20 mA output

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Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
4 mR	4 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
20 mR	20 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
0-rAnG	Overrange	Program mA output for display overrange
u-rAnG	Underrange	Program mA output for display underrange
mAX	Maximum	Program maximum mA output allowed
mi in	Minimum	Program minimum mA output allowed
USEr	User I/O	Assign function keys and digital I/O
F1*	F1* function key	Assign F1 function key (*F1/F2/F3)
F4	F4 digital input	Assign F4 function (digital input)
di 1	Digital input 1	Assign digital input 1 – 4
dO 1	Digital output 1	Assign digital output 1 – 4
d iRG	Diagnostics	Display parameter settings
LEd t	LED test	Test all LEDs
InFo	Information	Display software number and version
ErASE	Erase	Erase MeterView Pro software stored in meter's memory

Gate Function (GAtE)

The gate function (GAtE) is the first option in the Advanced Features menu. There are two settings for the GAtE, low gate (Lo G) and high gate (Hi G). Channel A and B use the same gate settings.

The gate function is used for displaying slow pulse rates. Using the programmable gate, the meter is able to display pulse rates as slow as 1 pulse every 999.9 seconds (0.001 Hz). The gate function can also be used to obtain a steady display reading with a fluctuating input signal.

Low Gate (Lo G)

For most applications, low gate setting should be left at 1.0 second. Increase low gate setting to obtain a steadier rate display. The rate display will update in accordance with the low gate setting, for example if low gate is set at 10.0, the display will update every 10 seconds; changes in rate between updates will not be reflected until next display update.

High Gate (Hi G)

Set the high gate value to correspond to the highest expected pulse period (lowest pulse rate). For instance if the meter must display a rate when there is 1 pulse coming into the meter every 10 seconds, set the high gate to 11.0 seconds. When the signal is removed from the meter, the display will show the last reading for 11 seconds; then it will read zero.

Gate Settings

Slow Pulse Rate		
Low Gate* (sec)	High Gate (sec)	Min Freq** (Hz)
1.0	2.0	0.5000
1.0	10.0	0.1000
1.0	20.0	0.0500
1.0	100.0	0.0100
1.0	200.0	0.0050
1.0	400.0	0.0025
1.0	800.0	0.0012
1.0	999.9	0.0010

*The low gate setting corresponds to the display update rate and is used to stabilize the display reading with a fluctuating signal.

**The minimum frequency is dependent on high gate setting.

Contact De-Bounce Filter (F iLtEr)

The filter function (F iLtEr) is the second option in the Advanced Features menu. The filter function (F iLtEr) can be used for applications where the meter is set up to count pulses generated by switch contacts. The filter value can be set anywhere between 2 and 50, the higher the value, the greater the filtering. Channel A and B have independent settings.

There are two settings, H i SPd (high speed) and Lo SPd (low speed). After pressing **ENTER** to select Lo SPd, enter the desired filter setting based on the table below so that there are no extra counts when a contact closure is completed. Selecting H i SPd does not require a programmable filter value.

Filter Settings

Contact De-Bounce Filter		
Filter Setting	Speed Setting	Max Freq (Hz)
2	Lo SPd	999
4	Lo SPd	499
8	Lo SPd	249
16	Lo SPd	124
32	Lo SPd	62
40	Lo SPd	50
50	Lo SPd	40
N/A	Hi SPd	30,000

Rounding Feature (round)

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

Rounding causes the display to round to the nearest value according to the rounding selected. This setting affects the last two digits, regardless of decimal point position.

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

Modbus RTU Serial Communications (SEr iAL)

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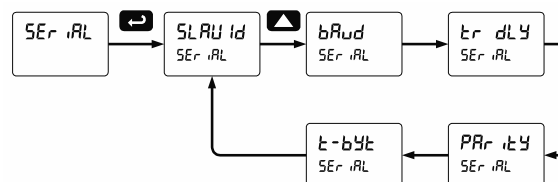
When using more than one meter in a multi-drop mode, each meter must be provided with its own unique address. The meter address (Slave ID) may be programmed between 1 and 247. The transmit delay may be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop bits.

Select Menu (SELEct)

The *Select* menu is used to select the input signal conditioner applied to the inputs, math function for A & B, constants, low-flow cutoff, total count direction (up or down from a preset amount), and analog output programming. Multi-point linearization is part of the linear function selection.
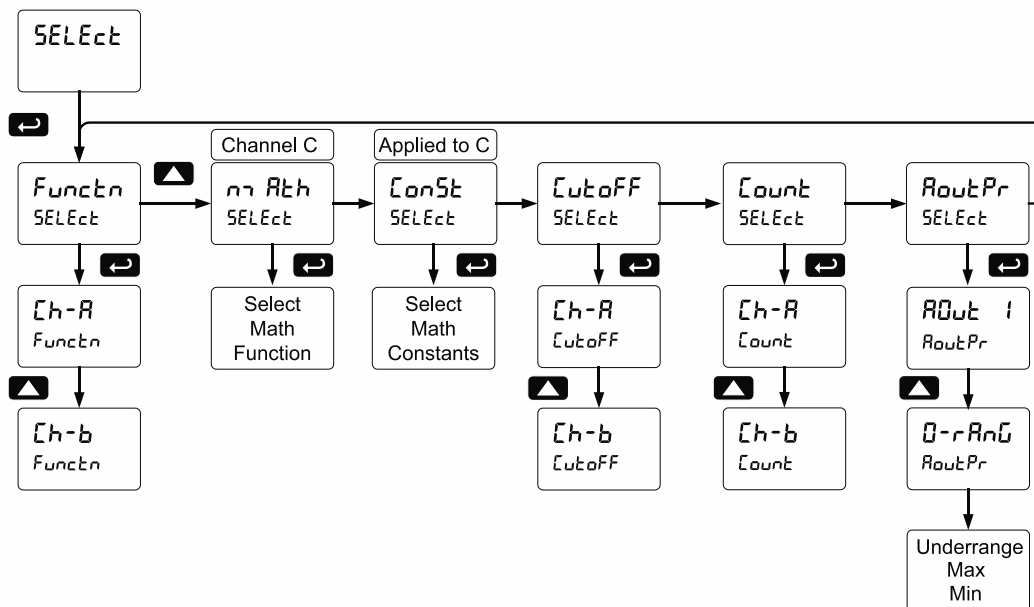
Input Signal Conditioning (Functn)

The *Function* menu is used to condition the linear input signal. Multi-point linearization is part of the linear function selection. Each input channel input signal conditioner is programmed independently.
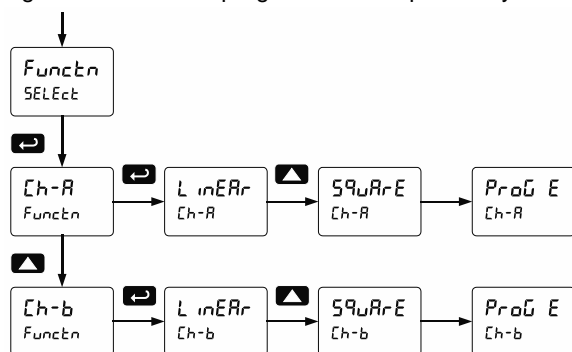
Multi-Point Linearization (L inEAr)

Meters are set up at the factory for linear function with 2-point linearization. Up to 32 linearization points can be selected for each channel under the linear function. The multi-point linearization can be used to linearize the display for non-linear signals such as those from level transmitters used to measure volume in odd-shaped tanks or to convert level to flow using weirs and flumes with complex exponent.
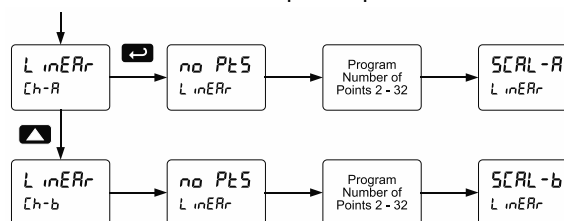
Note: After Scale is displayed continue pressing the Enter button until the meter completes the scaling of the input and display values.

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Math Function (ᴄ∩ᴀᴛʜ)

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

A and B refer to the rate of channel A and B. tA and tB refer to the totals of channel A and B. GtA and GtB refer to the grand totals of channel A and B. The following math functions are available.

Function	Display	Description
Sum∩	Sum	$C = (A+B+P)*F$
d ıF	Difference	$C = (A-B+P)*F$
d ıFAb5	Absolute difference	$C = ((\text{Absolute value of } (A-B))+P)*F$
AUG	Average	$C = (((A+B)/2)+P)*F$
∩ᴜʟᴛ ı	Multiplication	$C = ((A*B)+P)*F$
d ıU ıdE	Divide	$C = ((A/B)+P)*F$
H ı-Ab	Max of A or B	$C = ((\text{High value of channel A or B})+P)*F$
Lo-Ab	Min of A or B	$C = ((\text{Low value of channel A or B})+P)*F$
drAᴜ	Draw	$C = ((A/B)-1)*F$
ᴜ ı AᴜG	Weighted avg.	$C = ((B-A)*F)+A$
rAt ıo	Ratio	$C = (A/B)*F$
rAt ıo2	Ratio 2	$C = ((B-A)/A)+P*F$
ConcEn	Concentration	$C = (A/(A+B))*F$
Sum∩ t	Sum total	$C = (tA+tB+P)*F$
Sum∩Gt	Sum grand total	$C = (GtA+GtB+P)*F$
d ıF t	Difference of total	$C = (tA-tB+P)*F$
d ıF Gt	Diff. of grand total	$C = (GtA-GtB+P)*F$
trAt ıo	Total ratio	$C = (tA/tB)*F$
t-rAt2	Total ratio 2	$C = ((tB-tA)/tA)*F$
t Pct	Total percent	$C = (tA/(tA+tB))*100$

Math Constants (Con5t)

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

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

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

The chart on page 51 details the math functions that may be selected in the *Math Function* menu.
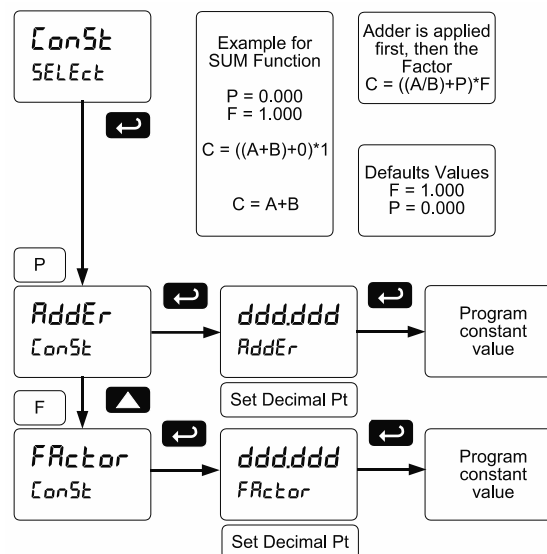
Low-Flow Cutoff (CutoFF)

The low-flow cutoff feature allows the meter to be programmed so that the often-unsteady output from a differential pressure transmitter, at low flow rates, always displays zero on the meter. The low-flow cutoff for each channel is programmed independently. The cutoff can be disabled to display negative values.

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.
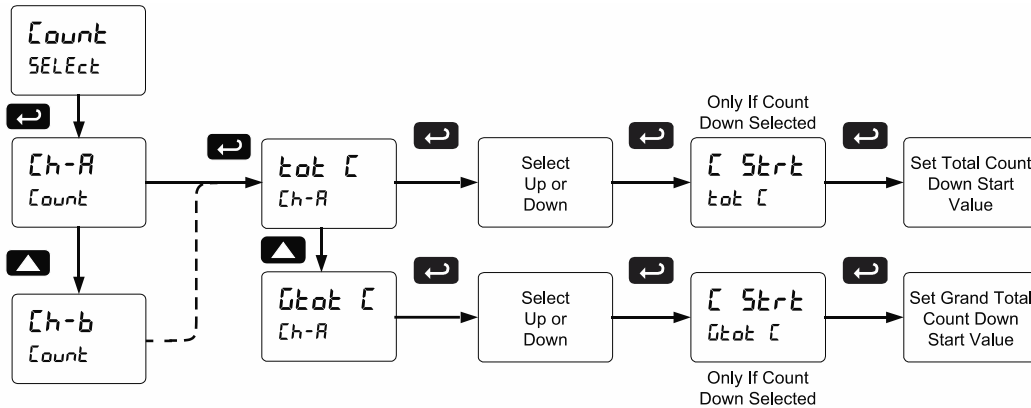
Analog Output Programming (RoutPr)

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

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

Analog Output Source

The analog output source can be based on either of the input channel rate, total, or grand totals (Ch-A, Ch-B), the math channel (Ch-C), maximum stored value of either input channel (Hi-A, Hi-B), minimum stored value of either input channel (Lo-A, Lo-B), maximum or minimum of A and B (Hi-AB, Lo-AB), relay set points, or the Modbus input.
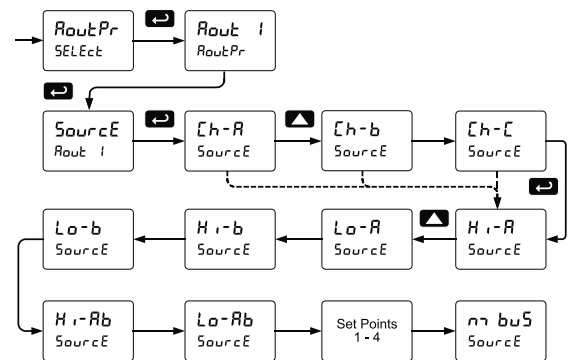
To base an analog output on the rate, total, or grand total of channels A or B, select the channel in the *Analog Output Source* menu. Then select the rate, total, or grand total as the source reference for the output, and program the output scale.
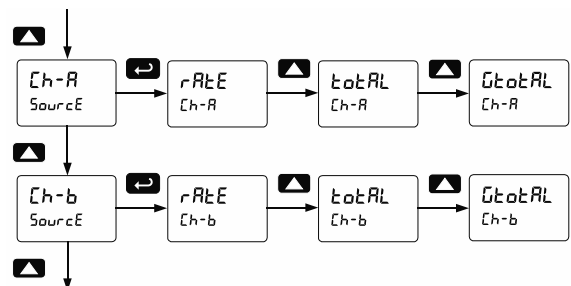
Programmable Function Keys User Menu (uSEr)

The *User* menu allows the user to assign the front panel function keys F1, F2, and F3, the digital input F4 (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 totals, 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 totals, reset max, min, or max & min, tare, and reset tare). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.

Function Keys & Digital I/O Available Settings

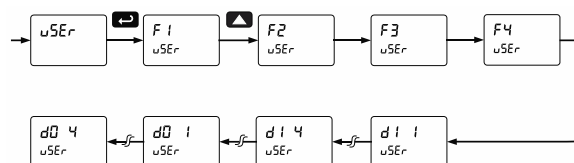Refer to the following table for descriptions of each available function key or digital I/O setting.

Function Keys & Digital I/O Available Settings	
Display	**Description**
rSt Xi	Reset the stored maximum display values for all channels
rSt Lo	Reset the stored minimum display values for all channels
rSt XL	Reset the stored maximum & minimum display values for all channels
rELAY	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 *enable relays* (rLY E) is pressed
rLY E	Enable all relays to function as they have been programmed
O Hold	Hold current relay states and analog output as they are until a button assigned to *enable relays* (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.

Function Keys & Digital I/O Available Settings	
Display	**Description**
d AbC	Scrolls values for A, B & C when activated. Keeps the last value for 10 seconds and then it returns to its assignment. Values are displayed on display line 1 and the corresponding channel and units on display line 2.
d tot	Scrolls through totals for channels A, B, and C (which is the sum of A and B). Values are displayed on display line 1.
d Gtot	Scrolls through grand totals for channels A, B, and C (which is the sum of A and B). Values are displayed on display line 1.
Ln1 Xi	Display maximum channel A display value on line 1
Ln1 Lo	Display minimum channel A display value on line 1
Ln1 XL	Display maximum & minimum channel A display values on line 1
Ln2 Xi	Display maximum channel B display value on line 2
Ln2 Lo	Display minimum Channel B display value on line 2
Ln2 XL	Display maximum & minimum channel B display values on line 2
Ln2 XC	Display minimum channel C display value on line 2
Ln2 XC	Display maximum & minimum channel C display values on line 2
L itXLC	Display maximum channel C display value on line 2
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 *Setting Up the Interlock Relay (Force On)* Feature on page *44* for details about interlock relays.
Contrl	Directly access the manual control menu
d iSAbL	Disable the selected function key or digital I/O
uP-d A	Total count mode direction control for channel A
uP-d b	Total count mode direction control for channel B
AcX	Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching
rESEt	Directly access the reset menu
rSt t	Reset totals for all channels
rSt Gt	Reset grand totals for all channels
rSt tA	Reset total for channel A
rSt GA	Reset grand total for channel A
rSt tb	Reset total for channel B
rSt Gb	Reset grand total for channel B

Function Keys & Digital I/O Available Settings	
Display	**Description**
ⁿ¹Eⁿᵤ	Mimic the menu button functionality (digital inputs only)
r¹Ḡᴴᵼ	Mimic the right arrow/F1 button functionality (digital inputs only)
ᵤP	Mimic the up arrow/F2 button functionality (digital inputs only)
EⁿᵼEr	Mimic the enter/F3 button functionality (digital inputs only)
RLⁿ¹ ¹	Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)

Meter Operation

The meter accepts two input channels (A and B) of either pulses (e.g. ±40 mV to ± 8V), square wave (0-5 V, 0-12 V, or 0-24 V), open collector NPN, PNP, TTL, or switch contact signals and displays these signals in engineering units from -99999 to 999999. (*e.g.* a 0-1000 Hz signal could be displayed as -50.000 to 50.000).

Digital inputs and quadrature inputs can be accepted for bi-directional flow on channel A and B. Quadrature inputs can also be accepted, using channels A and B to calculate a single bi-directional flow.

A totalizer can be programmed to count the scaled engineering units, interpreting it as count per second, minute, hour, or day. The scaled rate and total for each channel can be displayed on the top or bottom displays.

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

The dual-line display can be customized by the user. Typically, display line 1 is used to display the math channel C, while line 2 is used to alternate between displaying input channels A and B rate or total.

Additionally, the meter can be set up to display any input or math channel on display line 1 and a unit or tag on line 2. The relays and analog output can be programmed to operate based on any input rate or total, or the math function channel.

Button Operation

Button Symbol	Description
MENU / MENU	Press to enter or exit Programming Mode, view settings, or exit max/min readings
RIGHT / F1 RESET	Press to reset max/min readings or other parameter/function assigned through the *User* menu
UP / F2 MAX	Press to display max/min readings or other parameter/function assigned through the *User* menu
ACK / F3 ENTER	Press to acknowledge relays or other parameters/function assigned through the *User* menu

Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. *See Programmable Function Keys User Menu* (u5Er) on page *53* 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 *53* for details.

Maximum/Minimum Readings

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

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

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

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

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

Troubleshooting

The rugged design and the user-friendly interface of the meter should make it unusual for the installer or operator to refer to this section of the manual. However, due to the many features and functions of the meter, it's possible that the setup of the meter does not agree with what an operator expects to see.

If the meter is not working as expected, refer to the *Diagnostics* menu and recommendations below.

Diagnostics Menu (d iAG)

The *Diagnostics* menu is located in the *Advanced Features* menu. To access the *Diagnostics* menu see *Advanced Features Menu*, page *47*.

For a description of the diagnostic messages, *see Advanced Features Menu &* Display Messages, page *47.*

Testing the Display LEDs

To test all LEDs on the display:
1. Go to the *Diagnostics* menu (d iAG) 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 (info) 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 iAG) and press Enter button.
2. Press Up arrow button and scroll to Information menu (info).
3. Press Enter to access the software number (SFt) and version (UEr) information. Write down the information as it is displayed. Continue pressing Enter until all the information is displayed.
4. The meter returns to Run Mode after displaying all the settings.

Reset Meter to Factory Defaults

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

Instructions to load factory defaults:
1. Enter the *Advanced Features* menu. See *Advanced Features Menu*, page 47.
2. Press Up arrow to go to *Diagnostics* menu
3. Press and hold Right arrow for three seconds, press
   Enter when display flashes rESEt.
   Note: If Enter is not pressed within three seconds, the display returns to Run Mode.
4. The meter goes through an initialization sequence (similar as on power-up), and loads the factory default settings.
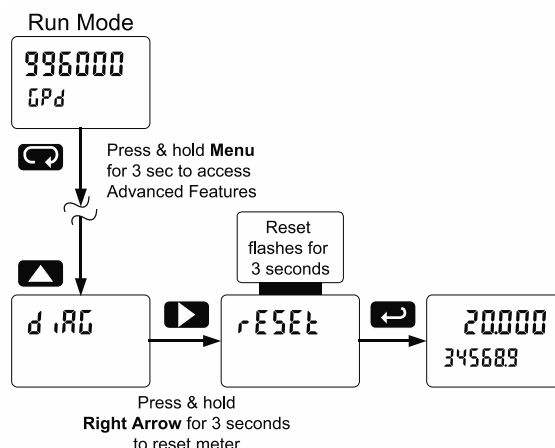
Factory Defaults & User Settings

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

Factory Defaults & User Settings		
Parameter	**Display**	**Default Setting**
Input type	InPut	
Total, channel A	Ch-A	Yes
Total, channel B	Ch-b	Yes
Units	unitS	
Rate unit, channel A	Ch-A	HZ-A
Rate unit, channel B	Ch-b	HZ-b
Unit, channel C	Ch-C	HZ-C
Total unit, channel A	tot-A	tot-A
Grand total unit, ch-A	Gtot-A	Gtot-A
Total unit, channel B	tot-b	tot-b
Grand total unit, ch-B	Gtot-b	Gtot-B
Decimal Point	dEc Pt	
Rate, channel A	rAtE	1
Total, channel A	totAL	1
Grand total, channel A	GtotAL	0
Rate, channel B	rAtE	1
Total, channel B	totAL	1
Grand total, channel B	GtotAL	0
Channel C	Ch-C	1
Input Calibration	InCAL	
Number of points	no PtS	
Number of points, ch-A	Ch-A	2
Number of points, ch-B	Ch-b	2
K-Factor, channel A	FAct-A	1.000
K-Factor, channel B	FAct-b	1.000
Total setup	tSEtuP	
Time base, channel A	tbASE	Sec
Total conversion factor, Ch-A	t CF	1.000
Grand total conversion factor, Ch-A	Gt CF	1.000
Time base, channel B	tbASE	Sec
Total conversion factor, Ch-B	t CF	1.000
Grand total conversion factor, Ch-B	Gt CF	1.000
Total reset	trESEt	
Total reset, channel A	t rSt	Manual
Grand total reset, Ch-A	Gt rSt	Manual
Total reset, channel B	t rSt	Manual
Grand total reset, Ch-B	Gt rSt	Manual
Display assignment	dSPLAY	

Factory Defaults & User Settings		
Parameter	**Display**	**Default Setting**
Display line 1	d Ch-A	Channel A
Display line 2	d Ch-b	Channel B
Display intensity	d-IntY	6
Relay	rELAY	
Relay 1 assignment	Ch-A	Channel A total
Relay 1 action	Act 1	Automatic
Relay 1 set point	SEt 1	100.0
Relay 2 assignment	Ch-A	Channel A total
Relay 2 action	Act 2	Automatic
Relay 2 set point	SEt 2	200.0
Relay 3 assignment	Ch-A	Channel A rate
Relay 3 action	Act 3	Automatic
Relay 3 set point	SEt 3	300.0
Relay 3 reset point	rSt 3	250.0
Relay 4 assignment	Ch-A	Channel A rate
Relay 4 action	Act 4	Automatic
Relay 4 set point	SEt 4	400.0
Relay 4 reset point	rSt 4	350.0
Fail-safe relay 1 to 4	FLS 1	Off
On delay relay 1 to 4	On 1	0.0 sec
Off delay relay 1 to 4	OFF 1	0.0 sec
Analog output	Aout	
Display 1 analog out	diS 1	0.0
Output 1 value	Out 1	4.000 mA
Display 2 analog out	diS 2	1000.0
Output 2 value	Out 2	20.000 mA
Source analog output	SourcE	Channel A
Overrange output	O-rAnG	21.000 mA
Underrange output	u-rAnG	3.000 mA
Maximum output	mAX	23.000 mA
Minimum output	min	3.000 mA
Filter	FiLtEr	
Filter, channel A	Ch-A	High speed
Filter, channel B	Ch-b	High speed
Round	round	1
Cutoff	CutoFF	
Cutoff value, channel A	Ch-A	0.0 (disabled)
Cutoff value, channel B	Ch-b	0.0 (disabled)
Serial	SEriAL	
Slave ID (Address)	SLAu Id	247
Baud rate	bAud	9600
Transmit delay	tr dLY	50 ms
Parity	PArItY	Even
Byte-to-byte timeout	t-bYt	010 (0.1 sec)

Factory Defaults & User Settings

Parameter	Display	Default Setting
Math	ᴺᵐᴬᵗʰ	
Math, channel C	Sᵘᵐ	Sum
Adder (constant P)	AddEr	0.000
Factor (constant F)	FActor	1
User	uSEr	
F1 function key	F1	Reset max & min
F2 function key	F2	Line 1 Max & Min
F3 function key	F3	Acknowledge relays
F4 function (digital input)	F4	Acknowledge relays
Digital input 1	di 1	Menu
Digital input 2	di 2	Right arrow
Digital input 3	di 3	Up arrow
Digital input 4	di 4	Enter
Digital output 1	do 1	Alarm 1
Digital output 2	do 2	Alarm 2
Digital output 3	do 3	Alarm 3
Digital output 4	do 4	Alarm 4
Password	PASS	
Password 1	PASS 1	000000 (unlocked)
Password 2	PASS 2	000000 (unlocked)
Password 3	PASS 3	000000 (unlocked)
Total	totAL	000000 (unlocked)
Grand total	GtotAL	000000 (unlocked)

Troubleshooting Tips

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

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

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, Locd is displayed	Meter is password-protected, enter correct six-digit password to unlock
Controller does not respond to input change	Check: 1. The input signal type and make sure it corresponds with the position of the input switch. 2. The input signal voltage level 3. If a *Low-Flow Cutoff* has been programmed, the controller will display zero below that point, regardless of the input.
Controller displays error message during calibration (Error)	Check: 1. Signal connections 2. Input switch position 3. Minimum input span requirements
Controller displays 999999 -99999	Check: 1. The input signal frequency 2. K-Factor value or scaling, time base, and decimal point
Display is unstable	Check: 1. Input signal stability and value 2. Display scaling vs. input signal 3. Increase the gate settings to average more pulses
Display reading is not accurate	Check: 1. K-Factor value provided by the flowmeter manufacturer 2. Time base selected 3. Scaling or calibration
Display response is too slow	Check: Filter and gate values
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 4. Hi and a number 5. Lo and a number	Press Menu to exit max/min display readings.
Relay operation is reversed	Check: 1. Fail-safe in *Setup* menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in *Setup* 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 56. In addition, for best results, we recommend using the free MeterView Pro software for all programming needs.

Contact Precision Digital

Technical Support

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

Fax: (508) 655-8990

Email: support@predig.com

Sales Support

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

Fax: (508) 655-8990

Email: sales@predig.com

Place Orders

Email: orders@predig.com

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