

# Helios PD2-6310 Pulse Input Batch Controller

## Instruction Manual



**HELIOS**



**MeterView Pro**

USB Install

- Large Display NEMA 4X, IP65 Wall Mounted Batch Controller
- Pulse, Open Collector, NPN, PNP, TTL, Switch Contact, Sine Wave (Coil), Square Wave Inputs
- Large Dual-Line 6-Digit Display, 1.8" (46 mm) Digits Readable up to 100 Feet (30 Meters) Away
- Isolated 5, 10 or 24 VDC Flowmeter Power Supply
- 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Options
- Free PC-Based, On-Board, MeterView Pro USB Programming Software
- SunBright Display Standard Feature; Great for Outdoor Applications
- K-Factor, Internal Scaling, or External Calibration
- Gate Function for Rate Display of Slow Pulse Rates
- Start / Pause / Stop, Change Batch Remote Capabilities
- Display Batch Total, Rate, Grand Total, Count or Preset
- Single or Multi-Stage Batch Control (Up to 8 Relays)
- Automatic Overtime Correction
- Automatic or Manual Batch Control
- Low or High Flow Alarms while Batching
- 9 Digit Grand Total with Overflow Feature
- Count Up or Down, Independent for Batch & Grand Total
- 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

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**CAUTION**

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

**WARNINGS**

- Risk of electric shock or personal injury.
- This product is not recommended for life support applications or applications where malfunctioning could result in personal injury or property loss. Anyone using this product for such applications does so at his/her own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.

**WARNING**

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

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## FREE MeterView Pro Programming Software



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

The easiest and quickest way to program your Helios batch controller is to use the FREE MeterView Pro programming software. This software is loaded into the controller and connects and installs directly to your PC with a USB cable. We recommend that the first thing you do after taking the controller 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 controller while your PC is connected to the controller 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 controller programmed as they like without even looking in the manual.

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

In addition to programming, the software may be used to perform many useful tasks:

- Start, Pause, Stop the batch
- Change preset & pre-close settings
- Reset total & grand total
- Test the relays functionality
- Monitor the batch process
- Datalogging using your PC
- Generate & save program files for later use

Once your controller 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 controller is installed, you can use the programming buttons and the instructions in this manual to do so.

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## Introduction

The Helios PD2-6310 is a multi-purpose, easy to use, large-display pulse input batch controller ideal for simplifying independent batch control operations where local control is preferred to expensive plant operation systems. It features large 1.8 inch superluminous LED digits, which can be read in sunlight from up to 100 feet away. It is housed in a water-resistant, field mountable NEMA 4X/IP65 rated enclosure for convenient indoor and outdoor installation.

The batch operation 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-MSBS remote control station which has four buttons to mimic the buttons behind the panel.

The controller comes programmed for easy start, pause, stop, and batch size (preset) changes. Display line two can be programmed to display rate, grand total, batch count, or preset by cycling the Stop (F3) button. Digital inputs come standard.

Single and multi-stage batching is possible with up to four on-board relays. Each batch control relay may have a unique preclose amount when used for multi-stage batching. Manual start batching is default, but automatic batching with a restart after a programmed time delay from the completion of the last batch is also possible.

Overrun correction adjusts the closing of the batch control relays to adjust for inaccuracies from batch to batch. This increases accuracy over time as systems wear out. The overrun correction feature is capable of compensating for inaccuracies of up to 10% of the programmed preset value.

The controller accepts pulse (e.g.  $\pm 40$  mV to  $\pm 8$  V), square wave (0-5 V, 0-12 V, or 0-24 V), open collector, NPN, PNP, TTL or switch contact signals. Three of the programming buttons can be set for custom operation.

A fully loaded PD2-6310 batch controller 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, making it an excellent addition to any system.

## Ordering Information

### 85-265 VAC Models

Model	Standard Features	Options Installed
PD2-6310-6H2	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	2 relays
PD2-6310-6H7		4 relays 4-20 mA output

### 12-24 VDC Models

Model	Standard Features	Options Installed
PD2-6310-7H2	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	2 relays
PD2-6310-7H7		4 relays 4-20 mA output

### Accessories

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

### PDA2364 Control Station



Model	Description
<a href="#">PDA2364-MSBS</a>	Menu, Start, Batch, and Stop Buttons

Note: Control stations can be connected directly to the Helios controller's on-board digital inputs. See *Remote Operation of Controller* on page 21 for details.

## Light / Horn Accessories



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

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

Note:

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



9 labels are provided for the button.

## Pipe Mounting Kit



Helios Controller Shown mounted to pipe using PDA6260 pipe mounting kit. See *Pipe Mounting Instructions* on page 14 for details.

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

## Signal Splitter &amp; Conditioner Accessories



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



## Specifications

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

### General

<b>Display</b>	Dual-line: 1.8" (46 mm) high, red LEDs 6 digits per line (-99999 to 999999), with lead zero blanking
<b>Display Intensity</b>	Eight user selectable intensity levels. Default is six.
<b>Display Update Rate</b>	5/second (200 ms)
<b>LED Status Indicators</b>	See <i>LED Status Indicators</i> on page 22 for details.
<b>Overrange</b>	Display flashes 999999
<b>Underrange</b>	Display flashes -99999
<b>Default Display Assignment</b>	Line 1 displays batch total. Line 2 displays batch preset, and can be switched to show grand total, or batch count with the STOP key.
<b>Custom Display Assignment</b>	Display lines 1 and 2 may be assigned to rate, total, grand total, batch count, preset, set points, units (lower display only), alternating R & T, R & GT, preset & rate, max & min, or a Modbus display register. Any rate/total/grand total display may be programmed to alternate with a custom unit or tag.
<b>Alternating Display</b>	Displays alternate every 10 seconds when display is selected, or the batch is paused.
<b>Programming Methods</b>	Four programming buttons, digital inputs, PC and MeterView Pro software, or Modbus registers.
<b>Recalibration</b>	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
<b>Max/Min Display</b>	Max/min readings reached by the process are stored until reset by the user or until power to the controller is cycled.
<b>Rounding</b>	Select 1, 2, 5, 10, 20, 50, or 100 (e.g. rounding = 10, value = 123.45, display = 123.50).
<b>Password</b>	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 Password: Prevents resetting the total manually Gtotal Password: Prevents resetting the grand total manually
<b>Non-Volatile Memory</b>	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
<b>Power Options</b>	85-265 VAC 50/60 Hz; 90-265 VDC, 20 W max; 12-24 VDC, 12-24 VAC, 15 W max. Powered over USB for configuration only.

<b>Fuse</b>	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 controllers may share one 5 A fuse
<b>Normal Mode Rejection</b>	Greater than 60 dB at 50/60 Hz
<b>Isolation</b>	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
<b>Overvoltage Category</b>	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.
<b>Environmental</b>	Operating temperature range: -40 to 65°C (-40 to 149°F) Storage temperature range: -40 to 85°C (-40 to 185°F) Relative humidity: 0 to 90% non-condensing <i>Note: Printed circuit boards are conformally coated.</i>
<b>Connections</b>	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.
<b>Enclosure</b>	UL Type 4X, IP65 rated. Polycarbonate & glass blended plastic case, color: gray. Includes four PG11 through-hole conduit openings, with two factory installed PG11, IP68, black nylon threaded hole plugs with backing nuts.
<b>Mounting</b>	Wall Mounting: Four (4) mounting holes provided for mounting controller to wall. See <i>Wall Mounting Instructions</i> on page 13 for additional details. Pipe Mounting: Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See <i>Pipe Mounting Instructions</i> on page 14 for additional details.
<b>Tightening Torque</b>	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)
<b>Overall Dimensions</b>	10.63" x 12.59" x 4.77" (270 mm x 319.7 mm x 121.2 mm) (W x H x D)
<b>Weight</b>	6.10 lbs (2.76 kg)
<b>Warranty</b>	3 years parts & labor. See Warranty Information and Terms & Conditions on <a href="http://www.predig.com">www.predig.com</a> for complete details.



## Batch Controller Rate/Totalizer Display

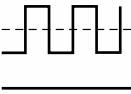
<b>Rate Display Indication</b>	-99999 to 999999, lead zero blanking. "R" LED illuminates while displaying rate.
<b>Batch Total &amp; Grand Total Display</b>	0 to 999,999; automatic lead zero blanking. "T" LED is illuminated while displaying batch total. "GT" LEDs are illuminated while displaying grand total. Up to 999,999 for batch total/preset. Up to 999,999,999 with grand total-overflow feature. "oF" is displayed to the left of grand total overflow and ▲ LED is illuminated.
<b>Batch Total Decimal Point</b>	Up to five decimal places or none: dddddd, dddddd, dddd, ddd, dd, or dddddd. Total decimal point is independent of rate decimal point.
<b>Totalizer</b>	Calculates total based on rate and field programmable multiplier to display total in engineering units. Time base must be selected according to the time units in which the rate is displayed.
<b>Time Base</b>	Second, minute, hour, or day
<b>Batch Control Mode</b>	Automatic or manual batch control
<b>Manual Batch</b>	The operator must press the START button every time a new batch is started. Press STOP to pause the batch and either press START to resume or STOP to stop the incomplete batch.
<b>Automatic Batch</b>	Once the START button is pressed, the batches will run automatically until the STOP button is pressed twice. The time delay between batches is entered during the setup.
<b>Batch Time Delay</b>	Programmable up to 999.9 seconds. This is the time delay between batches for automatic batch control. Allow sufficient time to put in place an empty container.
<b>Batch Preset</b>	The F2 key is assigned to the preset. The preset value is the total volume to be batched in each cycle.
<b>Batch Pre-Close</b>	The pre-close value is equal to the volume amount before reaching the preset value (batch size).
<b>Single or Multi-Stage</b>	Single Stage: Only relay 1 is used. Multi-Stage: Two or more relays are used to control the batch with more precision; this is done using multiple presets or using the pre-close feature.
<b>Multiple Presets</b>	Each relay de-energizes at its own preset value.
<b>Remote Operation</b>	Start / Stop / Batch Size buttons may be operated remotely using the <a href="#">PDA2364-MSBS</a> control station
<b>Start</b>	The F1 key is assigned to START batch. Press START to start a new batch in manual mode or a set of batches in automatic mode.
<b>Pause / Stop</b>	The F3 key is assigned to PAUSE / STOP. Press F3 once to pause and press it again to stop the batch process.

<b>Automatic Overrun Correction</b>	Adjusts the closing of the batch control relays to compensate for inaccuracies from batch to batch. The overrun correction feature is capable of compensating for inaccuracies of up to 1% of the programmed preset value. To achieve an accurate batch, the flow rate must be slowed down, such that the total most-right digit increments at a rate of less than 10 counts/second. The use of a dual-stage batch control is recommended.
<b>Count Up or Count Down</b>	Batch total and grand total can set to count up or count down, independently.
<b>Start / Stop Batch</b>	The F4 digital input is assigned to start & stop the batch, it is located on the input signal connector. An external push-button can be connected between terminal F4 and COM. Press the button once to start the batch and press it again to stop the batch.
<b>High or Low Flow Alarm</b>	The user may program any alarm for high or low trip point. The alarm detection is active only while the batch is running. Unused alarm LEDs and relays may be disabled (turned off).
<b>Grand Totalizer Rollover</b>	Grand totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
<b>Grand Total Overflow</b>	The grand total can display up to 999,999,999 using the overflow feature. After the value exceeds 999,999 a 3-digit value with the prefix "oF" toggles every 10 seconds. The overflow feature can be disabled by setting a grand total alarm that automatically resets the grand total when 999,999 is reached.
<b>Grand Total Alarms</b>	Up to three, user selectable under setup menu. Any set point can be assigned to grand total and may be programmed anywhere in the range of the controller for grand total alarm indication. Relay 1 should always be assigned to batch.
<b>Programmable Delay on Release</b>	0.1 and 999.9 seconds; applied to the first relay assigned to total or grand total. If the controller is programmed to reset total to zero automatically when the preset is reached, then a delay will occur before the total is reset.
<b>Grand Total Reset</b>	Via front panel button, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
<b>Grand Total Reset Password</b>	Grand total passwords may be entered to prevent resetting the grand total from the front panel.
<b>Non-Resetable Grand Total</b>	The grand total can be programmed as a non-resetable total by entering the password "050873".

### CAUTION

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

## Pulse Input

<b>Inputs</b>	Field selectable: Pulse or square wave 0-5 V, 0-12 V, or 0-24 V @ 30 kHz; TTL; open collector 4.7 k $\Omega$ pull-up to 5 V @ 30 kHz; NPN or PNP transistor, switch contact 4.7 k $\Omega$ pull-up to 5 V @ 40 Hz; Modbus PV (Slave)		
<b>Isolated Flowmeter Power Supply</b>	Terminals P+ & P-: 24 VDC $\pm$ 10%. All models selectable for 24, 10, or 5 VDC supply (Switch labeled P+/P-). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max. 5 & 10 VDC supply rated @ 50 mA max. Refer to <i>Figure 8. Flowmeter Supply Voltage Selection</i> on page 16 for details. 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.		
<b>Low Voltage Mag Pickup (Isolated)</b>	Sensitivity: 40 mVp-p to 8 Vp-p		
<b>Minimum Input Frequency</b>	0.001 Hz Minimum frequency is dependent on high gate setting.		
<b>Maximum Input Frequency</b>	30,000 Hz (10,000 for low voltage mag pickup)		
<b>Input Impedance</b>	Pulse input: Greater than 300 k $\Omega$ @ 1 kHz. Open collector/switch input: 4.7 k $\Omega$ pull-up to 5 V.		
<b>Input Threshold</b>	Low 1.6 V	High 3.3 V	3.3 V 1.6 V 0 V 
<b>Accuracy</b>	$\pm$ 0.03% of calibrated span $\pm$ 1 count		
<b>Temperature Drift</b>	Rate display is not affected by changes in temperature.		
<b>Multi-Point Linearization</b>	2 to 32 points		
<b>Low-Flow Cutoff</b>	0.1 to 999,999 (0 disables cutoff function). Point below at which display always shows zero.		
<b>Decimal Point</b>	Up to five decimal places or none: dddddd, dddddd, dddd, ddd, dd, or dddddd		
<b>Calibration</b>	May be calibrated using K-factor, internal calibration, or by applying an external calibration signal.		
<b>K-Factor</b>	Field programmable K-factor converts input pulses to rate in engineering units. May be programmed from 0.00001 to 999,999 pulses/unit.		
<b>Calibration Range</b>	Input 1 signal may be set anywhere in the range of the controller; input 2 signal may be set anywhere above or below input 1 setting. Minimum input span between any two inputs is 10 Hz. An error message will appear if the input 1 and input 2 signals are too close together.		
<b>Filter</b>	Programmable contact de-bounce filter: 40 to 999 Hz maximum input frequency allowed with low speed filter.		
<b>Gate</b>	Low gate: 0.1-99.9 seconds High gate: 2.0-999.9 seconds		

## Relays

<b>Rating</b>	2 or 4 SPDT (Form C) internal rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP ( $\approx$ 50 W) @ 125/250 VAC for inductive loads
<b>Noise Suppression</b>	Noise suppression is recommended for each relay contact switching inductive loads; see <i>Switching Inductive Loads</i> on page 19 for details.
<b>Relay Assignment</b>	Relays may be assigned to batch control total, sampling, rate, or grand total alarms.
<b>Pre-Close</b>	0-100% of batch size, individually user programmable for each additional batch control relay beyond the first.
<b>Alarm Deadband</b>	0-100% of span, user programmable
<b>High or Low Flow Alarm</b>	User may program any alarm for high or low trip point. The alarm detection is active only while the batch is running. Unused alarm LEDs and relays may be disabled (turn off).
<b>Relay Operation</b>	<ul style="list-style-type: none"> <li>Manual or automatic batch control</li> <li>Automatic (non-latching)<sup>1</sup> and/or manual alarm reset (acknowledge)</li> <li>Latching (requires manual acknowledge) with or without clear</li> <li>Pump alternation control (N/A to batch)</li> <li>Sampling (based on set point and time)</li> <li>Off (disable unused relays and enable Interlock feature)</li> <li>Manual on/off control mode</li> </ul>
<b>Relay Reset (Acknowledge)</b>	User selectable via programming buttons, F4 digital input, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
<b>Alarm Time Delay</b>	0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay.
<b>Fail-Safe Operation</b>	Programmable and independent for each relay. <i>Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.</i>
<b>Alarm Auto Initialization</b>	When power is applied to the controller, relays will reflect the state of the input to the controller. <sup>1</sup>

1. Alarms are active only when the batch is running.

## USB Connection

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

## Isolated 4-20 mA Transmitter Output

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

## RS-485 Serial Communications

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

## Modbus® RTU Serial Communications

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

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

## Digital Input (F4)

<b>Function</b>	Start/Stop batch, remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values. See <i>Function Keys &amp; Digital I/O Available Settings</i> on page 54 for a complete list of capabilities.
<b>Contacts</b>	3.3 VDC on contact. Connect normally open contacts across F4 to COM
<b>Logic Levels</b>	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

## Digital Inputs & Outputs

<b>Function</b>	Terminals provided for remote operation of all four programming / operation buttons (use <a href="#">PDA2364-MSBS</a> control station). Other uses include acknowledge/reset relays and reset max/min values. See <i>Function Keys &amp; Digital I/O Available Settings</i> on page 54 for a complete list of capabilities.		
<b>Channels</b>	4 digital inputs & 4 digital outputs		
<b>Digital Input Logic High</b>	3 to 5 VDC		
<b>Digital Input Logic Low</b>	0 to 1.25 VDC		
<b>Digital Output Logic High</b>	3.1 to 3.3 VDC		
<b>Digital Output Logic Low</b>	0 to 0.4 VDC		
<b>Source Current</b>	10 mA maximum output current		
<b>Sink Current</b>	1.5 mA minimum input current		
<b>+5 V Terminal</b>	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

<b>Availability</b>	Download directly from controller or from <a href="http://www.prediq.com/download_software">www.prediq.com/download_software</a>
<b>System Requirements</b>	Microsoft® Windows® XP/Vista/7/8/10
<b>Communications</b>	USB 2.0 (for programming only) (Standard USB A to USB Type B) RS-485 to USB converter (programming, monitoring, batch control, and data logging)
<b>Configuration</b>	Configure controllers one at a time
<b>Power</b>	USB port provides power to the controller for configuration only. <b>DO NOT</b> apply AC or DC power to the controller while the USB port is in use.
<b>Batch Control</b>	Use MeterView Pro to control the batch, change the preset, reset totals, and test the relays.
<b>Data Logging</b>	Use MeterView Pro for data logging of the batch process.

## Compliance Information

### Safety

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

## Safety Information

### ⚠ CAUTION

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

### ⚠ 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 controller. 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 controller 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 controller from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

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

## Wall Mounting Instructions

The controller 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 controller to a wall, follow these instructions

- Prepare a section of wall approximately 11" x 13" (280 mm x 330 mm) for controller 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.

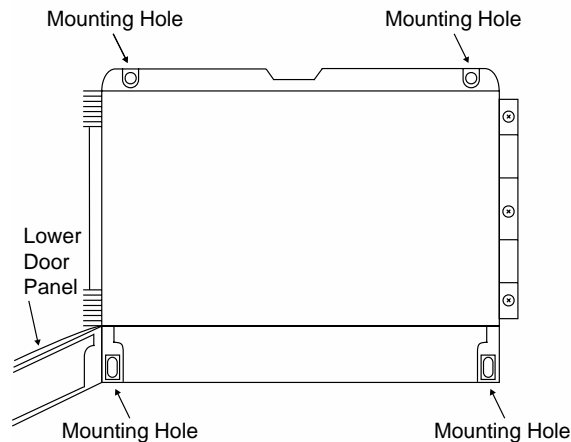


Figure 1. Controller Mounting Holes Location

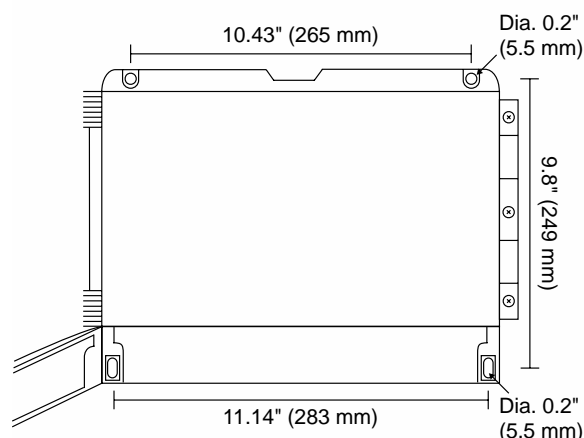


Figure 2. Controller Mounting Holes Dimensions

## Mounting Dimensions

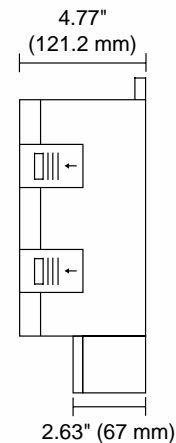


Figure 3. Controller Dimensions – Side View

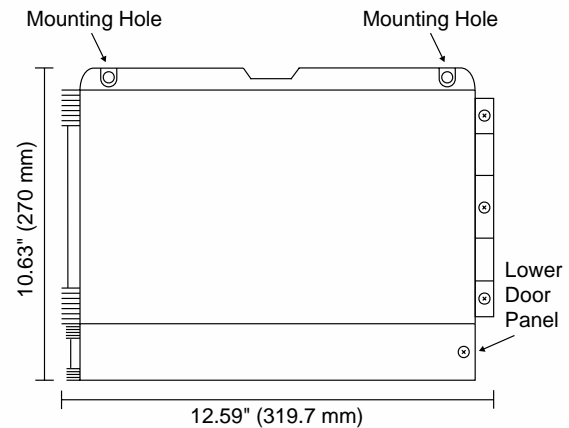


Figure 4. Controller Dimensions - Front View

## Conduit Holes Location

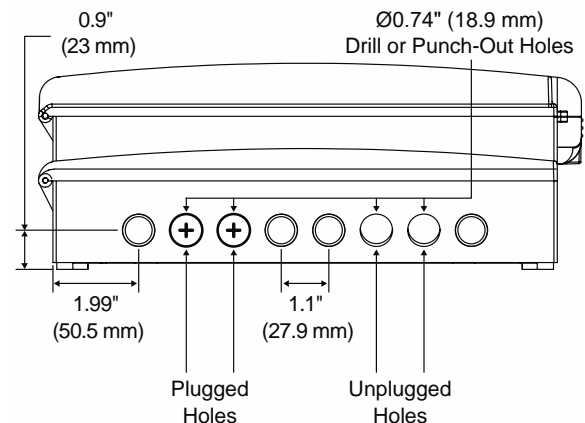


Figure 5. Conduit Holes Location – Bottom View

## Pipe Mounting Instructions

The controller 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 controller 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 controller 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 controller cannot be moved up or down (or side to side).

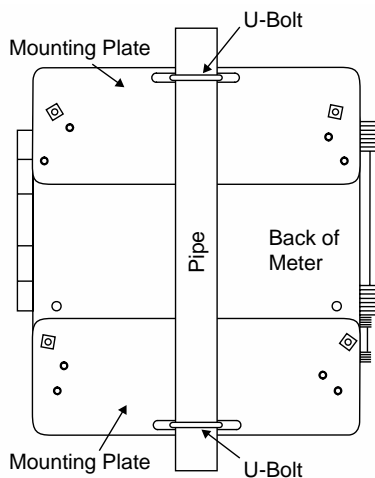
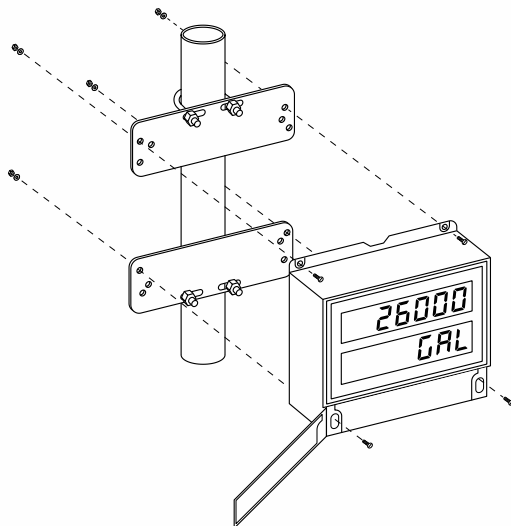


Figure 6. Vertical Pipe Mount Assembly

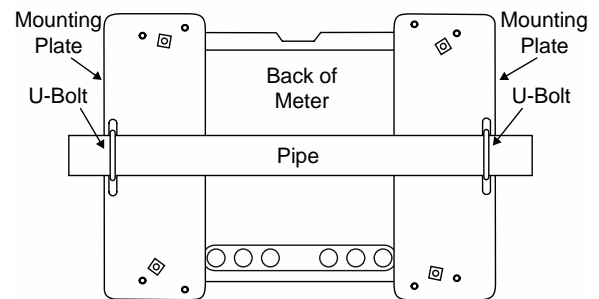
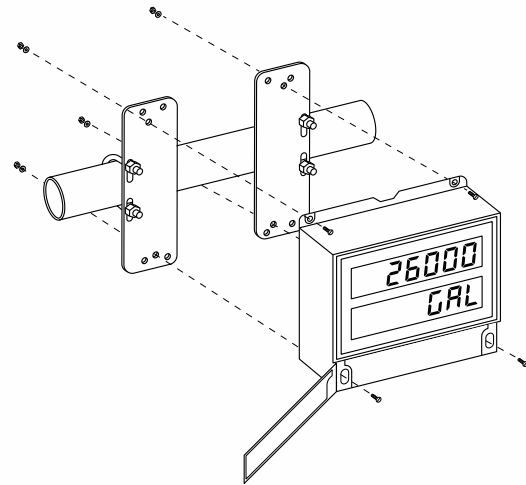


Figure 7. Horizontal Pipe Mount Assembly



## Installation Overview

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

1. **DO NOT** apply AC or DC power to the controller.
2. Connect the controller 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 controller for your application.
6. Disconnect the USB cable from the controller.
7. Apply power and signal and check operation of the controller.
8. Install the controller and put into service.
9. Make any programming adjustments using the programming buttons.

## MeterView Pro Software

The easiest and quickest way to program your Helios controller is to use the FREE MeterView Pro programming software. This software is loaded into the controller 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 controller 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 controller while your PC is connected to the controller 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 controller programmed as they like without even looking in the manual.

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

## MeterView Pro Installation

1. Connect one end of the provided USB cable to the controller and the other end to the computer. The computer will automatically install the driver software it needs to talk to the controller. 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.

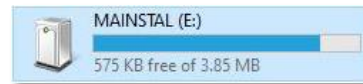
### ⚠ WARNINGS

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

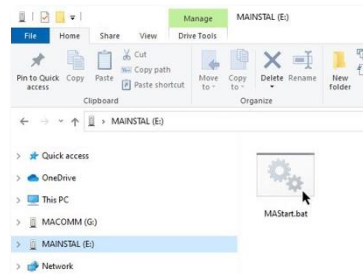
2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."



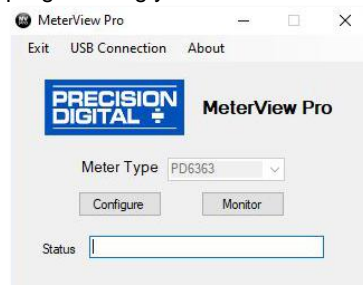
If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."



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 controller.



**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 controller itself. This way, you will always have the most current version on the controller for future installs.

### ⚠ WARNING

- **DO NOT** unplug the controller while the new installation files are being written to it. The controller will display 0000 during the process and you will receive an on-screen notification once the process is complete.

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

All controllers, 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 controller.
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.

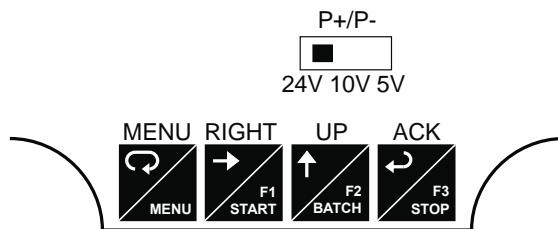


Figure 8. Flowmeter Supply Voltage Selection

## 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 controller 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 controller.
- 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.

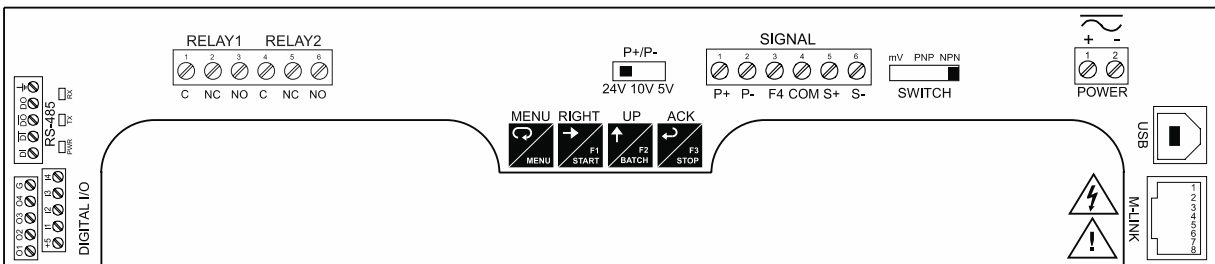


Figure 9. PD2-6310-6H2 / 7H2 Connectors Label

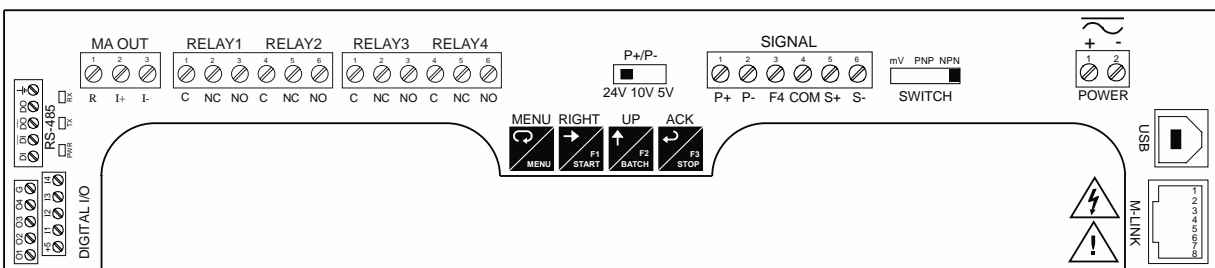


Figure 10. PD2-6310-6H7 / 7H7 Connectors Label

## Power Connections

Power connections are made to a two-terminal connector labeled POWER. The controller 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.

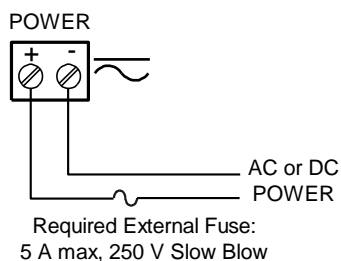


Figure 11. Power Connections

## Pulse Signal Connections

Signal connections are made to a six-terminal connector labeled SIGNAL. The COM (common) terminal is the return for the input signals.

The following figures show examples of signal connections. Setup and programming is performed through the programming buttons or MeterView Pro software.

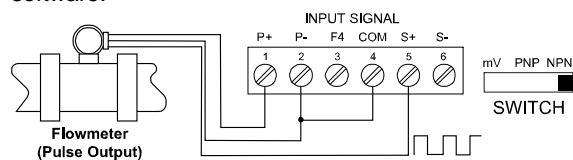


Figure 12. Flowmeter Powered by Internal Power Supply

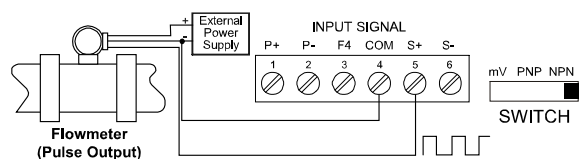


Figure 13. Flowmeter Powered by External Supply

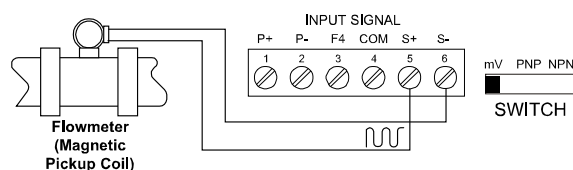


Figure 14. Self-Powered Magnetic Pickup Coil Flowmeter

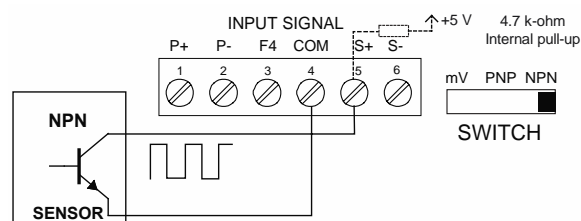


Figure 15. NPN open Collector Input

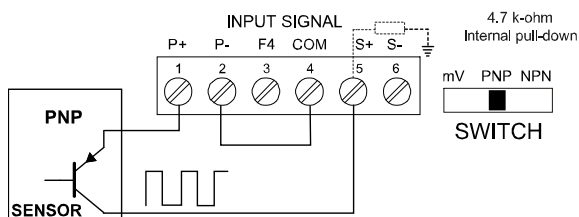


Figure 16. PNP Sensor Powered by Internal Supply

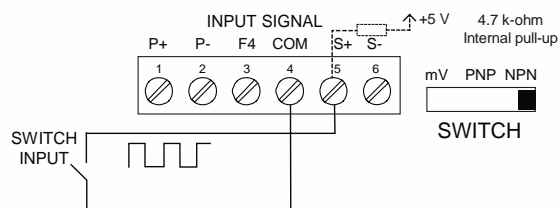


Figure 17. Switch Input Connections

## 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.

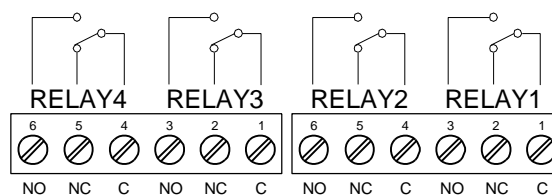


Figure 18. Relay Connections

## 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:

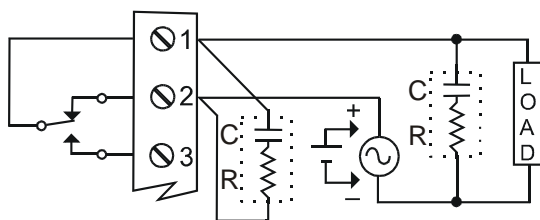


Figure 19. AC and DC Loads Protection

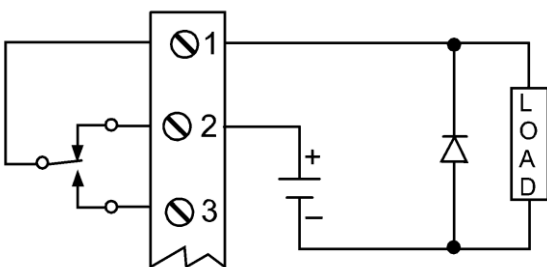
Choose R and C as follows:

R: 0.5 to 1  $\Omega$  for each volt across the contacts

C: 0.5 to 1  $\mu\text{F}$  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 controller's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.



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

Figure 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 (SERIAL)* on page 51 for more information.

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

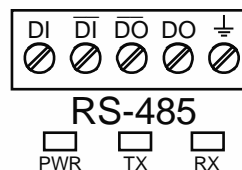


Figure 21. RS-485 Connection

## RS-485 Multi-Drop Connection

When using more than one controller in a multi-drop mode, each controller must be provided with its own unique address. The controller 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 controller address:

1. Press and hold the Menu button for three seconds to access Advanced Features menu of the controller.
2. Press Up arrow until Serial (SERIAL) menu is displayed and press Enter, Address is displayed.
3. Press Enter to change controller 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

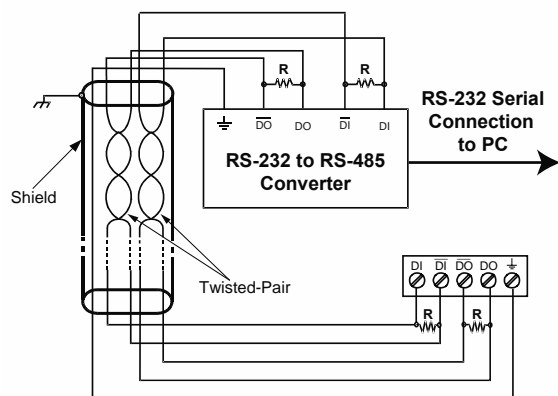


Figure 22. Five-Wire RS-485 Connections

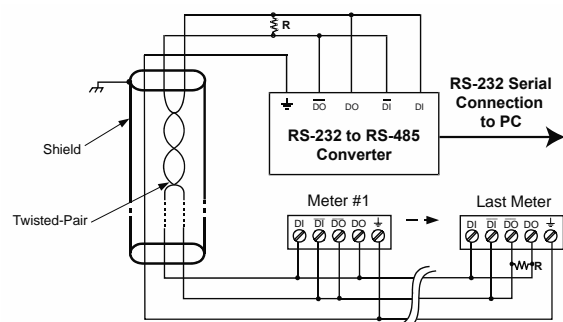


Figure 23. Three-Wire RS-485 Multi-Drop Connections

#### 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
$\frac{+}{-}$	$\frac{+}{-}$
DO	DI
DI	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.

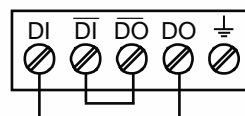


Figure 25. Three-Wire RS-485 Connection

### Digital I/O Connections

Digital inputs and outputs are provided in order to expand the functionality of the controller. 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.

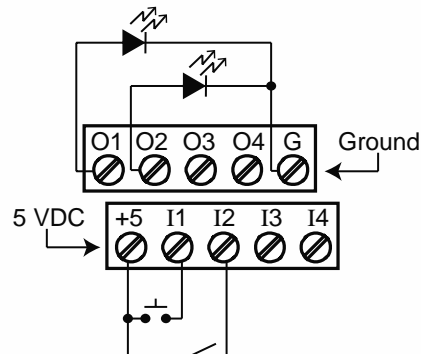


Figure 26. Digital Input and Output Connections



## F4 Digital Input Connections

A digital input, F4, is standard on the controller. This digital input should be connected with a normally open contact across F4 and COM, or with an active low signal applied to F4. It can be used to start/stop the batch, reset the total, acknowledge/reset relays, or to reset max/min values. See *Function Keys & Digital I/O Available Settings* on page 54 for a complete list of capabilities.

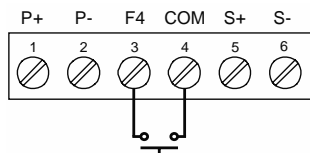


Figure 27. F4 Digital Input Connections

## 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.

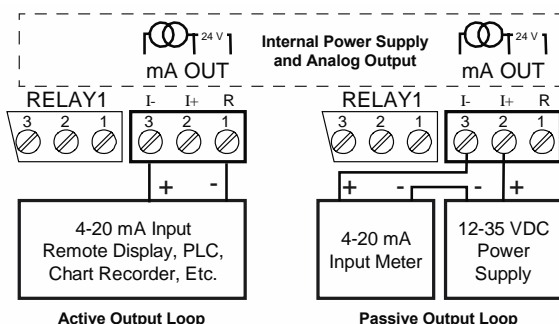


Figure 28. 4-20 mA Output Connections

## 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.

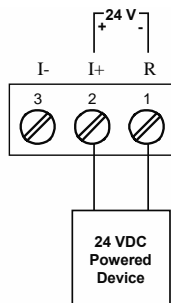


Figure 29. Analog Output Supply Powering Other Devices

## Remote Operation of Controller

The controller can be operated via the programming buttons or a PDA2364-MSBS remote control station using the digital inputs and outputs connections as illustrated in *Figure 30. Controller to PDA2364-MSBS Control Station Connection*.

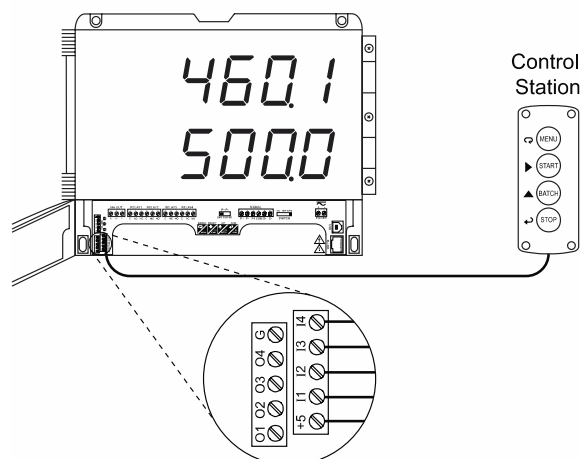


Figure 30. Controller to PDA2364-MSBS Control Station Connection

## Interlock Relay Feature

As the name implies, the interlock relay feature reassigns one, or more, alarm/control relays for use as interlock relay(s). Interlock contact(s) are wired to digital input(s) and activate the interlock relay. This feature is enabled by configuring the relay, and the corresponding digital input(s), see *Setting Up the Interlock Relay (Force On) Feature* on page 40.

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

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

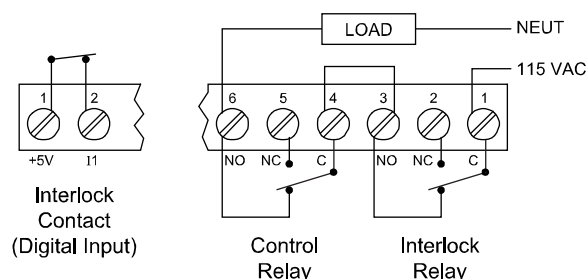


Figure 31. Interlock Connection

## Setup and Programming

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 K-Factor method or (SCALE) function.

## Overview

There is one 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\*, 10 V or 5 V) which is supplied to the P+ and P- wiring terminals.

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.

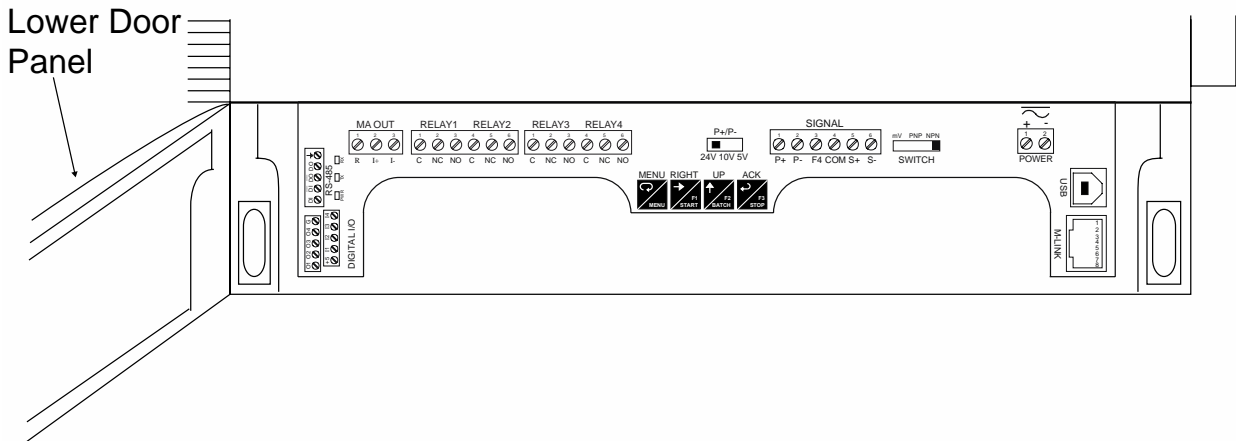
\*Default setting.

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

Programming Buttons



Button	Description	Button	Description
	Menu		BATCH Up Arrow/F2
	START Right Arrow/F1		STOP 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 controller.



Remote Buttons

The controller can be operated via a remote control station (PDA2364-MSBS) using the digital input connections. The PDA2364-MSBS has four buttons that represent Menu, Start (Right Arrow), Batch (Up Arrow), and Stop (Enter).

See *Remote Operation of Controller* on page 21 for details.

## Display Functions and Messages

The controller 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 and Messages		
Display	Parameter	Action/Setting Description
ሂደቲዎ	<i>Setup</i>	Enter <i>Setup</i> menu
ከፑቲ	<i>Input</i>	Enter <i>Input</i> selection menu
ቴቶሪ	<i>Total</i>	Enable or disable totalizer features
ህኒቲ	<i>Units</i>	Select the display units/tags
ፖሪት	<i>Rate</i>	Select the display units for rate
ቴቶሪ	<i>Total</i>	Select the display units for total
ግሪንቴቶሪ	<i>Grand Total</i>	Select the display units for grand total
ዲሲ ፖይንት	<i>Decimal point</i>	Set decimal point for rate, total, grand total
ፕሮግራም	<i>Program</i>	Enter the <i>Program</i> menu
ከፒኬሪ	<i>Input Calibration</i>	Enter the <i>Input Calibration</i> menu
ፑላር ቪዩ	<i>K-factor Scaling</i>	Programs unit to convert input pulse to rate in engineering units
ሲፎል	<i>Scale</i>	Enter the <i>Scale</i> menu
ኬሊብሬት	<i>Calibrate</i>	Enter the <i>Calibrate</i> menu
ከፑ 1	<i>Input 1</i>	Calibrate input 1 signal or program input 1 value
ዲ ሲ 1	<i>Display 1</i>	Program display 1 value
ከፑ 2	<i>Input 2</i>	Calibrate input 2 signal or program input 2 value (up to 32 points)
ዲ ሲ 2	<i>Display 2</i>	Program display 2 value (up to 32 points)
ፔሪዎር	<i>Error</i>	Error, calibration not successful, check signal or programmed value
ቴ ቴቲ	<i>Total time base</i>	Enter totalizer time base for seconds, minutes, hours or day.
ቴ ፒ	<i>Total conversion factor</i>	Enter the conversion factor decimal point and the conversion factor.
ኦቶሞቲክ	<i>Batch mode</i>	Automatic or manual batch control
ቴ ዲላይ	<i>Time delay</i>	Set time delay for automatic batch restart
ግሪን ቴቲ	<i>Grand total time base</i>	Program grand total time base

Display Functions and Messages		
Display	Parameter	Action/Setting Description
ግሪን ፒ	<i>Grand total conversion factor</i>	Program grand total conversion factor
ግሪን ፕሪት	<i>Grand total reset</i>	Program grand total reset mode: auto or manual
ዲስፕላይ	<i>Display</i>	Enter the <i>Display</i> menu
ፒ ከፒ 1	<i>Display Line 1</i>	Press Enter to assign the Upper display parameter (default: PV or rate)
ፒ ከፒ 2	<i>Display Line 2</i>	Press Enter to assign the Lower display parameter (default: total)
ዲስኬት	<i>Display intensity</i>	Set display intensity level from 1 to 8
ፖሪት	<i>Relay</i>	Enter the <i>Relay</i> menu
ፖሪት ስታቲስ	<i>Assignment</i>	Assign relays to rate, total (batch control), grand total, or Modbus controlled.
ፖሪት ስታቲስ 1	<i>Assign 1</i>	Relay 1-2 assignment
ቴቶሪ	<i>Total</i>	Assign relay to batch control
ግሪን ቴቶሪ	<i>Grand total</i>	Assign relay to grand total
ሞዱስ	<i>Modbus</i>	Assign relay to Modbus input
ፖሪት	<i>Rate</i>	Assign relay to rate
ፕሪት ፕሪት	<i>Batch total relay pre-close</i>	For relays beyond the first assigned to total, a pre-close amount may be entered.
ፖሪት 1	<i>Relay 1</i>	Relay 1 setup
ፖሪት 1	<i>Action 1</i>	Set relay 1 action <sup>1</sup>
ሞዱስ	<i>Automatic</i>	Set relay for automatic reset
ሞዱስ ሞዱስ	<i>Auto-manual<sup>1</sup></i>	Set relay for automatic & manual reset any time <sup>1</sup> (relays assigned to rate)
ፒ ላክ	<i>Latching<sup>1</sup></i>	Set relay for latching operation (relays assigned to rate) <sup>1</sup>
ፒ ላክ - ከፒ	<i>Latching-cleared<sup>1</sup></i>	Set relay for latching operation with manual reset only after alarm condition has cleared (relays assigned to rate) <sup>1</sup>
ፖሪት ፖሪት	<i>Alternate</i>	Not applicable to batch controller
ሞዱስ ሞዱስ	<i>Sampling</i>	Set relay for sampling operation (rate or GT)
ፖሪት	<i>Off</i>	Disable relay and front panel status LED (Select Off to enable Interlock feature)
ፕሪት ፕሪት	<i>Preset</i>	Set batch preset
ፖሪት 1	<i>Set 1</i>	Program set point 1

Display Functions and Messages		
Display	Parameter	Action/Setting Description
rSt 1	Reset 1	Program reset point 1
rLY 2	Relay 2	Relays 2-4 setup.
FR iLSF	Fail-safe	Enter <i>Fail-safe</i> menu
FLS 1	Fail-safe 1	Set relay 1 fail-safe operation
on	On	Enable fail-safe operation
oFF	Fail-safe off	Disable fail-safe operation
dELAY	Delay	Enter relay <i>Time Delay</i> menu
dLY 1	Delay 1	Enter relay 1 time delay setup
On 1	On	Set relay 1 On time delay
OFF 1	Off	Set relay 1 Off time delay
Route	Analog output	Enter the <i>Analog output</i> scaling menu
d iS 1	Display 1	Program display 1 value
Out 1	Output 1	Program output 1 value (e.g. 4.000 mA)
d iS 2	Display 2	Program display 2 value
Out 2	Output 2	Program output 2 value (e.g. 20.000 mA)
rESEt	Reset	Press Enter to access the <i>Reset</i> menu
rSt Hi	Reset high	Press Enter to reset max display
rSt Lo	Reset low	Press Enter to reset min display
rSt HL	Reset high & low	Press Enter to reset max & min displays
rSt t	Reset total	Press Enter to reset total
rSt Gt	Reset grand total	Press Enter to reset grand total
rSt bc	Reset batch count	Press Enter to reset batch count
Control	Control	Enter Manual Control menu
Auto	Automatic	Press Enter to set controller for automatic operation
man	Manual	Press Enter to manually control relays or analog output operation
PR55	Password	Enter the <i>Password</i> menu
PR55 1	Password 1	Set or enter Password 1
PR55 2	Password 2	Set or enter Password 2
PR55 3	Password 3	Set or enter Password 3
t o t RL	Total password	Set or enter password for manual reset
G t o t RL	Grand total password	Set or enter password for manual reset

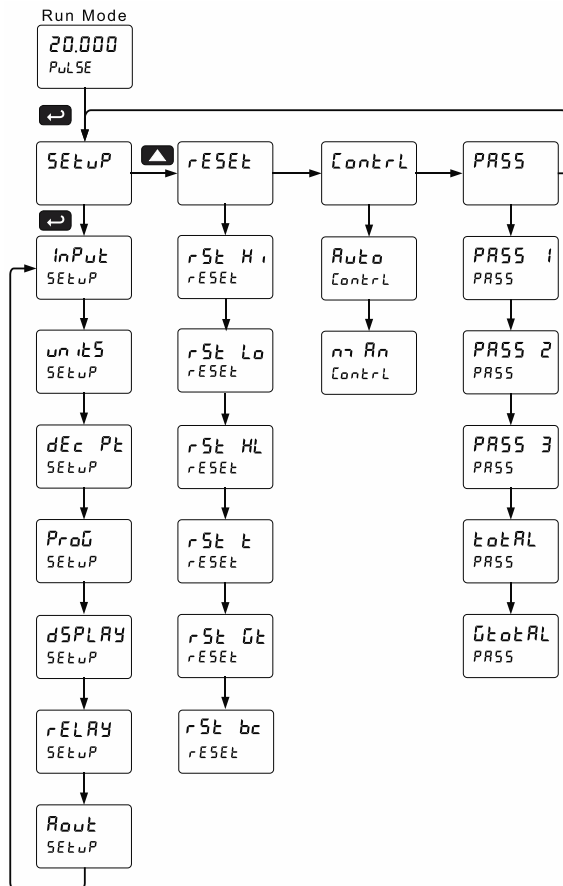
Display Functions and Messages		
Display	Parameter	Action/Setting Description
nonrSt	Non-resettable	Non-resettable grand total set after entering "050873" for Gtotal password
unLoc	Unlocked	Program password to lock controller
Locd	Locked	Enter password to unlock controller
999999 -999999	Flashing display	Overrange condition Underrange condition

1. During operation, only the STOP button will function, to stop/pause the batch. As a result, relay alarms cannot be manually reset.

## Main Menu

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

- Press Menu button when a batch is not running 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.

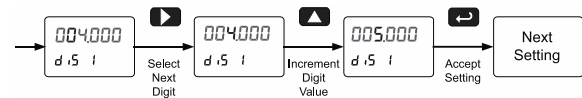


## Setting Numeric Values

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 arrow to auto-increment the display value.

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



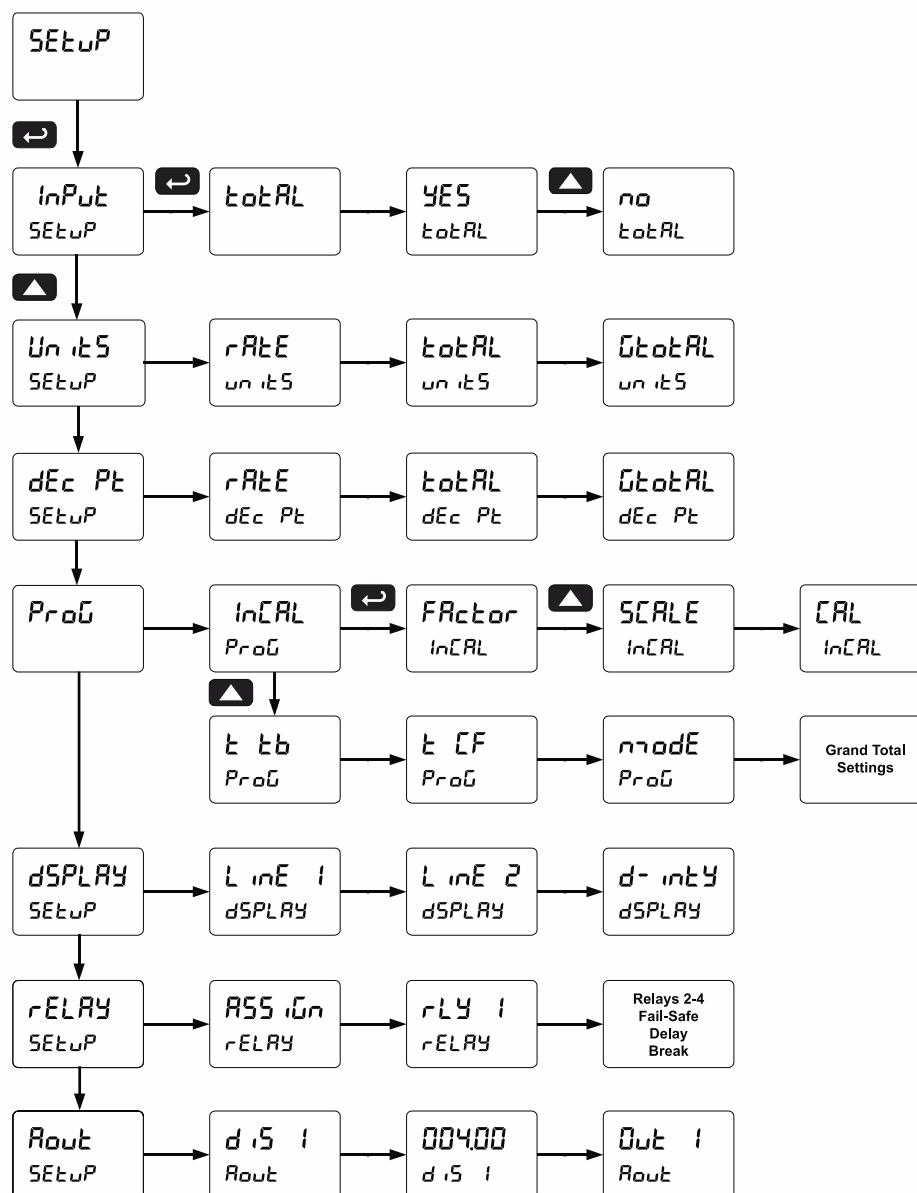


## Setting Up the Batch Controller (SEtUP)

The *Setup* menu is used to select:

1. Input signal the controller will accept
2. Enable or disable totalizer and batching features
3. Select the display units/tags
4. Decimal point position
5. Program menu for scaling or calibration, totalizer setup, manual or automatic batch mode
6. Display parameter and intensity
7. Relay operation
8. 4-20 mA analog output scaling

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



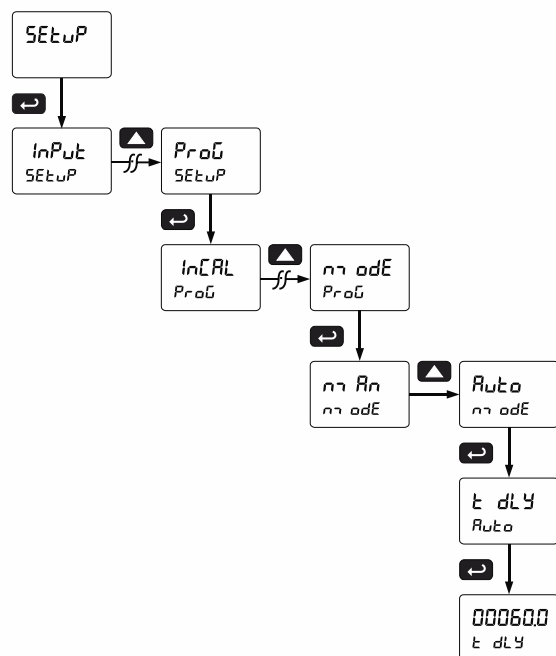
## Setting the Input Signal (InPut)

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.

The controller may be calibrated using the *K-Factor* function. Most flowmeter manufacturers provide this information with the device. Enter the *K-Factor* (Factor) menu and select the decimal point with highest resolution possible and program the K-factor value (i.e. pulses/gal). The controller will automatically calculate the flow rate using the K-factor and the time base selected.

## Setting the Totalizer & Batch Control Features (Total)

After the input type is entered, set the Total parameter to "YES" to enable batch control (this is set by default). If the Total features are disabled, most batching features and functions are hidden from the menus.



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

Enter the input unit or custom tag that will be displayed if alternating rate, total, or grand total and units is selected in the Unit menu, or d Unit is selected as the Lower display parameter. See the *Setting the Display Parameter & Intensity (dSPLE)* flow chart on page 32 to access the display menu to show the unit or tag on the display line 2. The engineering units or custom legends can be set using the following 7-segment character set:

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

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

### Notes:

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

## Setting the Decimal Point (dE c Pt)

The decimal point may be set with up to five decimal places or with no decimal point at all. The rate, total, and grand total decimal points are independent.

The decimal point selection should be made prior to scaling, calibrating or programming the controller.

Press the Up arrow to move the decimal point one place to the left. Press the Right arrow to move the decimal point one place to the right.

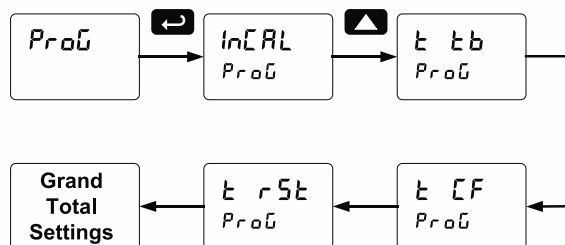
## Programming the Batch Controller (Prog)

The controller 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 controller comes factory calibrated to NIST standards, so for initial setup, it is recommended to use the (SCALE) function.

The *Program* menu contains the following menus:

1. Input Calibration
  - a. Enter K-Factor
  - b. Scale without a signal source
  - c. Calibrate with a signal source
2. Total time base & conversion factor
3. Batch mode
  - a. Manual batch control
  - b. Automatic batch control
4. Grand total time base & conversion factor
5. Grand total reset mode
  - a. Manual reset
  - b. Automatic reset with time delay

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

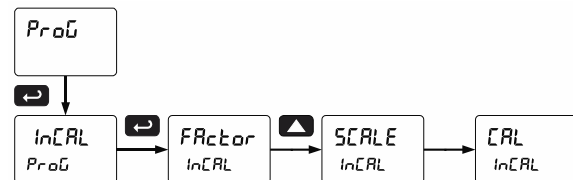


Additional parameters, not needed for most applications, are programmed in the *Advanced Features* menu; see *Advanced Setup & Programming* on page 48.

## Input Calibration Method (InCAL)

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

- Use the *Factor* menu to enter a K-Factor
- 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.
- The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in the Advanced menu prior to scaling and calibration of the controller. See *Multi-Point Linearization (LINEAR)* menu on page 52 for details.

## K-Factor Calibration (Factor)

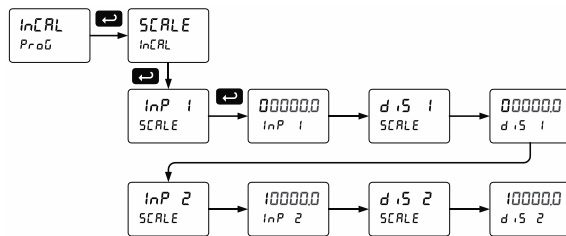
The controller may be calibrated using the *K-Factor* function. Most flowmeter manufacturers provide this information with the device. Enter the *K-Factor* (Factor) menu and select the decimal point with highest resolution possible and program the k-factor value (i.e. pulses/gal). The controller will automatically calculate the flow rate using the k-factor and the time base selected.



### Scaling the Controller (SCALE)

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

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



*Note: The display values (d 15 1 and d 15 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 SCALE menu would be as follows:*

InP 1: 0.0  
d 15 1: 0.00  
InP 2: 1000.0  
d 15 2: 0.22

For instructions on how to program numeric values see *Setting Numeric Values*, page 26.

### Error Message (Error)

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

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

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

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

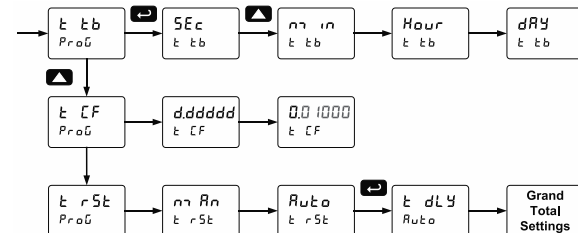
### Minimum Input Span

The minimum allowed input span is 0.10 Hz, which is the minimum difference between input 1 and input 2 signals required to complete the calibration or scaling of the controller.

### Time Base, Total Conversion Factor & Total Reset

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

The total and grand total have their own independent settings. This means that one can be displaying the value in gallons while the other displays in million gallons, liters, m<sup>3</sup>, etc.



#### Time Base

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

#### Total & Grand Total Conversion Factor

The total & grand total conversion factor is the amount by which the rate is multiplied before it is added to the total or grand total.

For Example, if the rate was ten per second and the total conversion factor was 100, the total would increase by 1000 every second. This is useful, for instance, if you want to show rate in gallons and total in thousands of gallons.

## Batch Start Mode (הסדר)

### Manual Batch Control

The batch controller may operate in manual or automatic mode. In manual mode, the controller operates as described in *Manual Batch Control* on page 44.

### Automatic Batch Control

In automatic mode, the controller operates as described in *Automatic Batch Control* on page 45.

The batch process will start when the operator presses the START button and it will automatically restart after a completed batch. The time delay for the restart may be 0.1 to 999.9 seconds (ז"ד ל"ט).

Automatic batch start will only occur after a successful batch. A manually stopped batch will require a manual start to begin a new batch process.

## Grand Total Reset

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

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

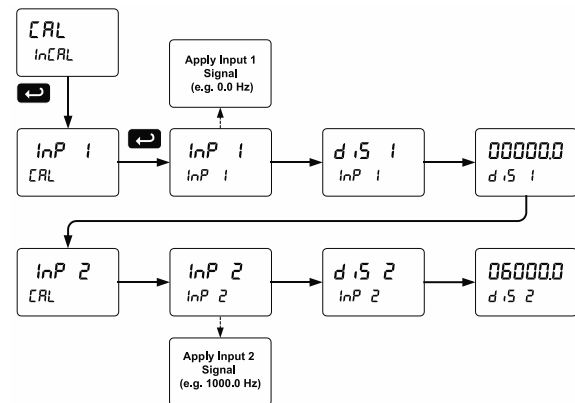
## Non-Resettable Totalizer

The grand total can be programmed as a non-resettable total, see *Grand Total Reset Password & Non-Resettable Total* on page 42 for details.

## Calibrating the Controller with External Source (CRL)

The controller can be calibrated to display the process variable in engineering units by applying the appropriate input signal and the corresponding display value.

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



**Note:** The display values (d 5 1 and d 5 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

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

## Setting the Display Parameter & Intensity (dSPLY)

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

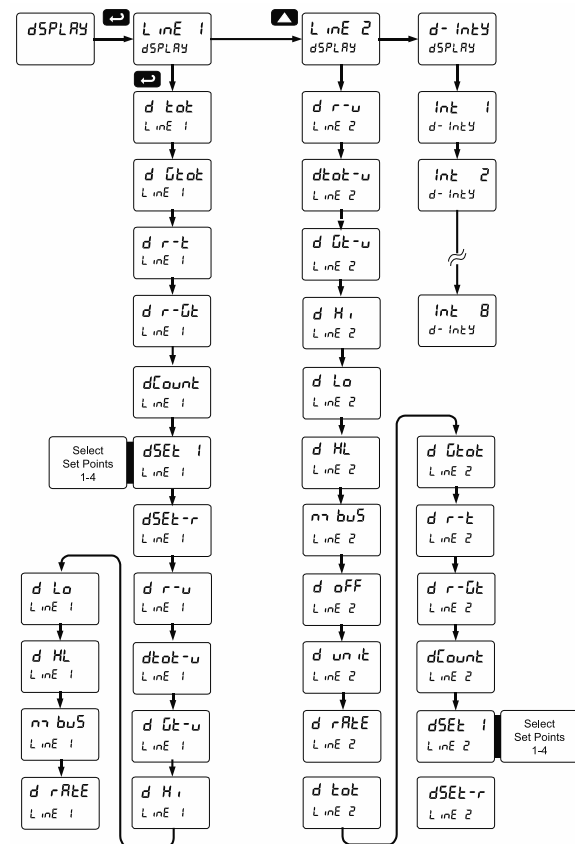
1. Display total
2. Display grand total
3. Toggle rate and total
4. Toggle rate and grand total
5. Display batch count
6. Relay set points
7. Toggle preset and rate
8. Toggle rate and units
9. Toggle total and units
10. Toggle grand total and units
11. Display max and min values
12. Display Modbus input
13. Display rate value

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

1. Toggle rate and units
2. Toggle total and units
3. Toggle grand total and units
4. Display max and min values
5. Display Modbus input
6. Off (no display)
7. Display rate units
8. Display rate
9. Display total
10. Display grand total
11. Toggle rate and total
12. Toggle rate and grand total
13. Display batch count
14. Relay set points
15. Toggle preset and rate

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

## Display Menu



## Display Intensity (d- IntY)

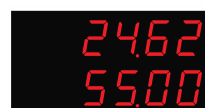
The controller has eight display intensity levels to give the best performance under various lighting conditions. Select intensity 8 for outdoor applications. The default intensity setting is 6.

For direct sunlight readability, Sunbright display models are highly recommended. See *Ordering Information* on page 6 for details.

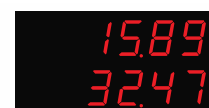
## Display Configurations

The upper and lower displays may be assigned to rate, total, grand total, batch count, preset, set points, units (lower display only), alternating R & T, R & GT, preset & rate, max & min, or a Modbus display register. Any rate/total/grand total display may be programmed to alternate with a custom unit or tag. The default display configuration consists of an upper display of batch total and a lower display of the batch preset.

The display can also be set up, so batch total is on the upper display and rate is on the lower display.



Batch Total & Preset



Batch Total & Rate



## Setting the Relay Operation (rELAY)

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

### ⚠ CAUTION

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

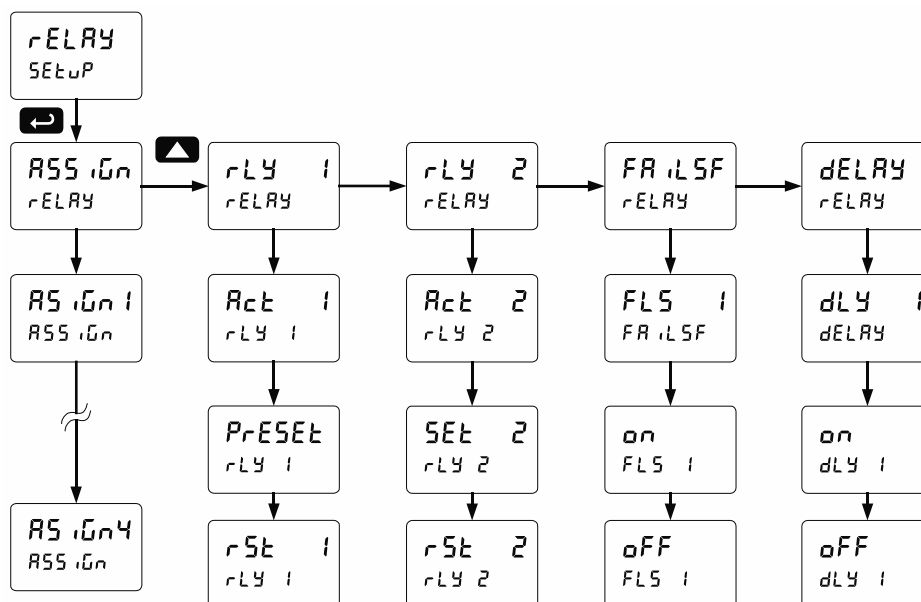
- Relay assignment
  - Rate for low and high alarm
  - Total for batch control relays
  - Grand total for grand total alarms
- Relay action
  - Automatic reset only (non-latching)
  - Automatic + manual reset when not in a batch process (non-latching)
  - Latching (manual reset when not in a batch process only)
  - Latching with Clear (manual reset when not in a batch process only after alarm condition has cleared)
  - Pump alternation control (Not applicable to batch control)
  - Sampling (the relay is activated for a user-specified time and may be assigned to rate or grand total)
  - Off (relay state can be controlled by Interlock feature)

- Set and reset points; batch preset
- Fail-safe operation
  - On (enabled)
  - Off (disabled)
- Time delay
  - On delay (0-999.9 seconds)
  - Off delay (0-999.9 seconds)

*Note: Fail-safe should not be used for relays assigned to batch control.*

### ⚠ CAUTION

- The rate alarms are active only during a batch process. As a result, rate alarms should not be programmed with manual reset, as they cannot be manually reset during a batch process, the only time they are active.

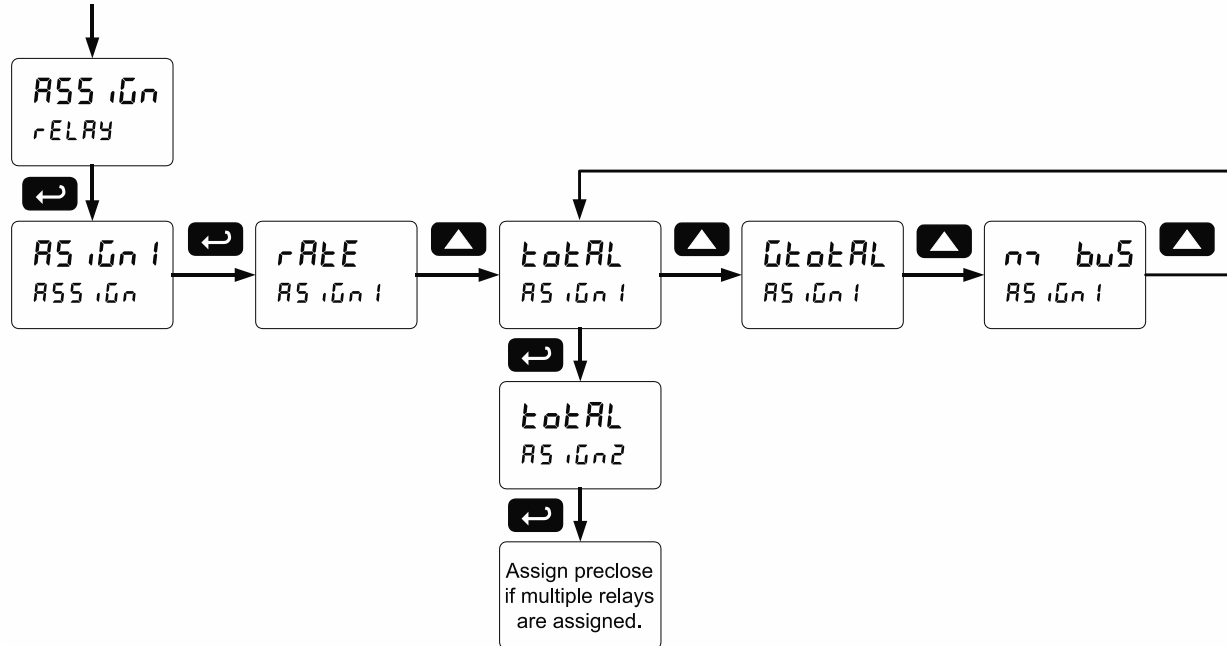


*Note: The setup of relays 3-4 follows the same pattern shown here for relay 2.*

## Relay Assignment (R55.IGN)

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

1. Rate for low or high alarm indication
2. Total for batch control relays
3. Grand total for alarm indication or sampling



### ⚠ IMPORTANT

- Relay 1 should always be assigned to "total" for batch control applications.

## Setting the Relay Action

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

1. Always set to Auto for Batch control operation. Also for automatic reset (non-latching) of alarms.
2. Sampling (the relay is activated for a user-specified time)
3. Off (relay state can be controlled by Interlock feature)

In addition, the following relay actions may be programmed. These actions are not appropriate for batch control applications but may be used when the controller is in other applications.

4. Automatic + manual reset when not in a batch process (non-latching)
5. Latching (manual reset only, when not in a batch process)
6. Latching with Clear (manual reset only when not in a batch process after alarm condition has cleared)
7. Pump alternation control (not applicable to batch control)

## Setting Batch Control Relays

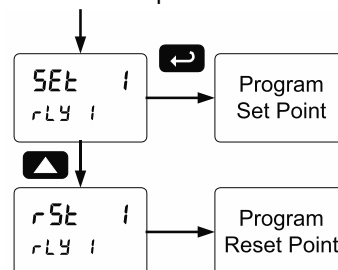
Operation of batch control relays are programmed in the *Assign* menu by selecting *EOEL* as the assignment. Relays set to *EOEL* beyond the first relay will include a pre-close parameter (*PRECLS*) option. Selecting *YES* for *PRECLS* will enable multi-stage batching with pre-close, and the valve will close prior to the end of the batch at volume equal to the preset value minus the pre-close amount entered. Selecting *NO* for *PRECLS* will have the relay perform identically to the first batch control relay set to *EOEL*.

## Programming Alarm Set and Reset Points

High alarm: program set point above reset point.

Low alarm: 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. Failsafe mode should not be used on batch relays assigned to total.

## Programming Time Delay

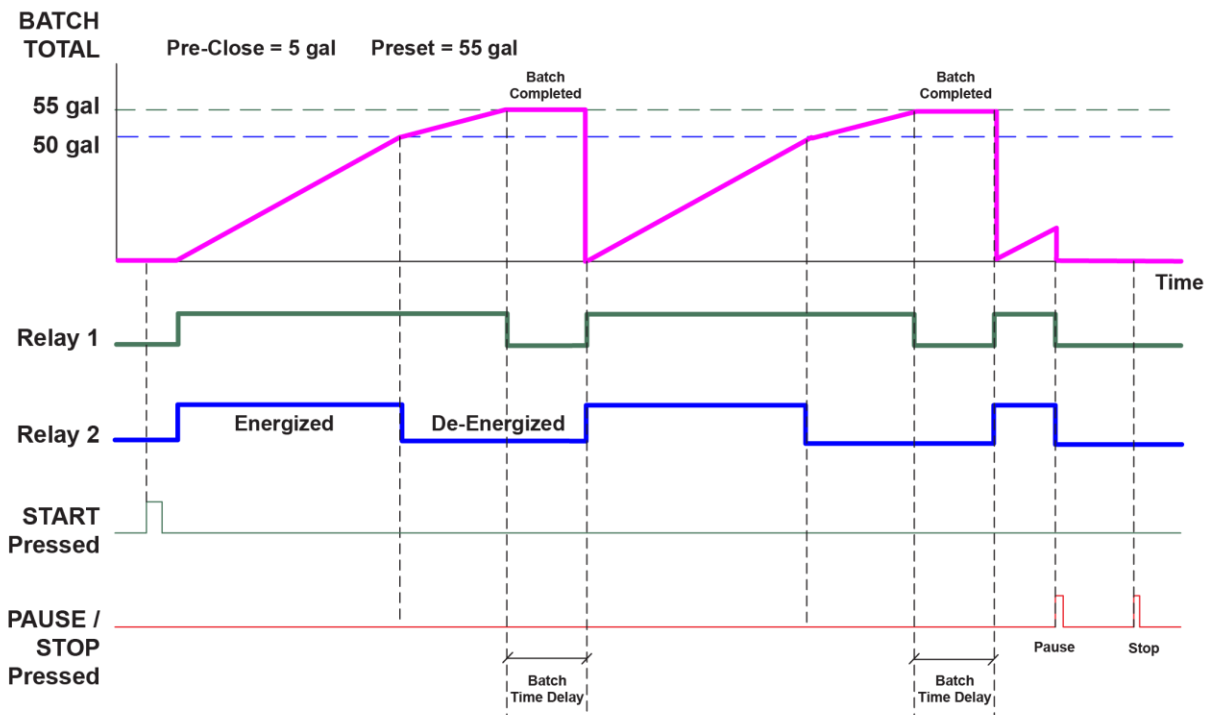
The *On* and *Off* time delays may be programmed for each relay between 0 and 999.9 seconds. The relays will transfer only after the condition has been maintained for the corresponding time delay.

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

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

## Automatic Batch Control Operation

The following graph shows automatic batch operation



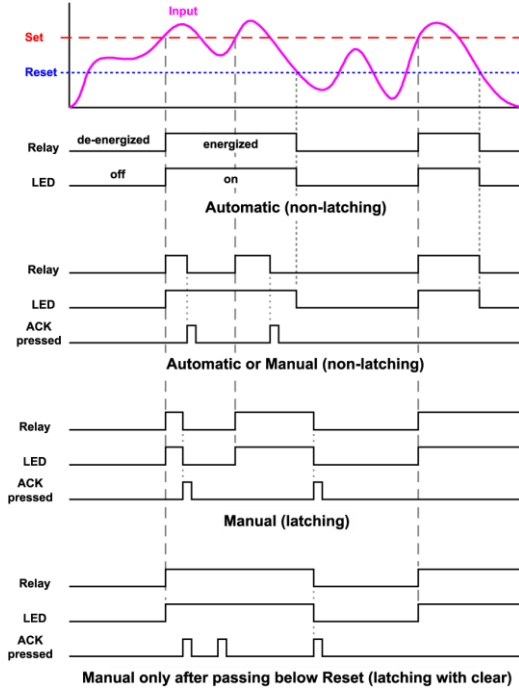
When START is pressed, a short delay occurs before the low flow alarm sensing is activated. Each relay can be programmed with additional ON delay to satisfy various conditions and applications.

1. START button is pressed
2. Both relays are energized opening both valves controlling the flow
3. At 50 gallons (pre-close = 5 gal), relay 2 closes the main valve
4. At 55 gallons (preset = 55 gal), relay 1 closes the dribble valve
5. After the Batch Time Delay elapses, a new batch starts automatically without the operator's intervention.

## Relay and Alarm Operation Diagrams

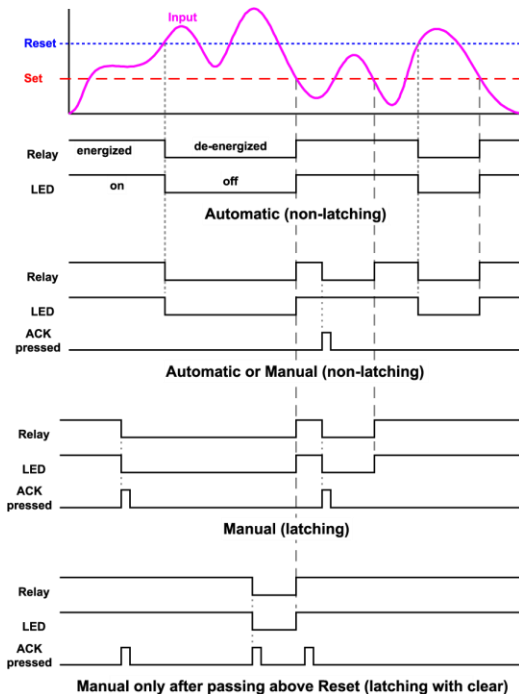
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

### High Alarm Operation (Set > Reset)



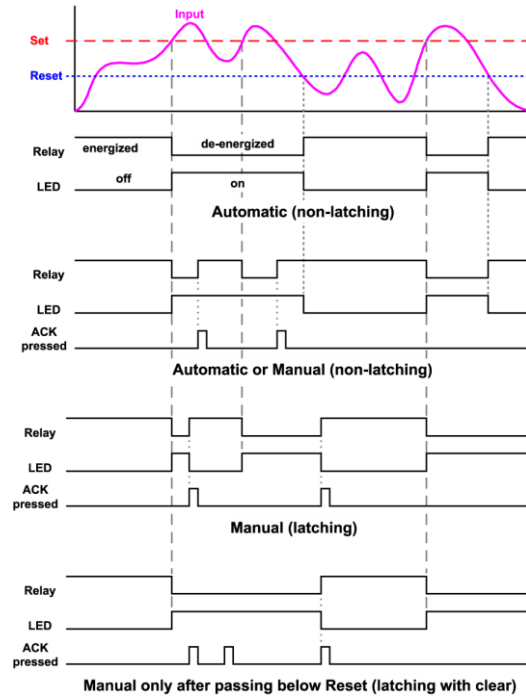
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

### Low Alarm Operation (Set < Reset)



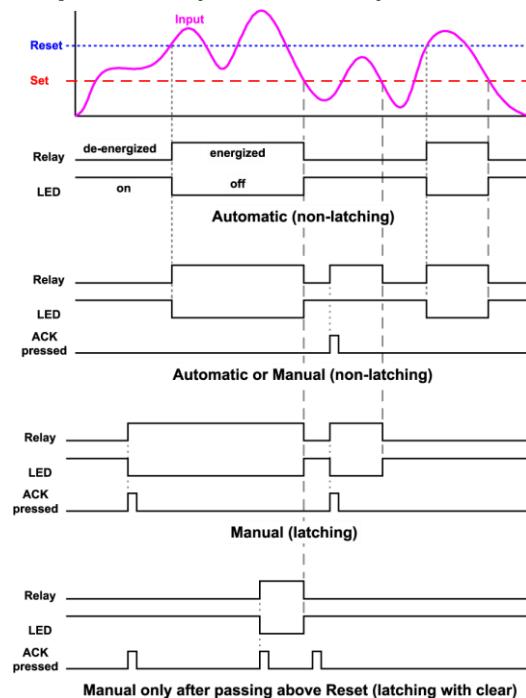
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

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



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

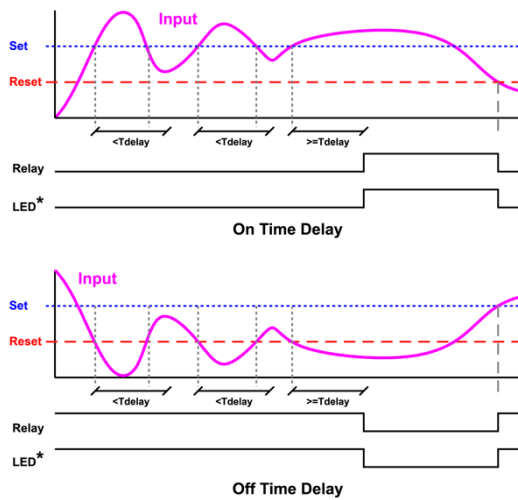
### Low Alarm with Fail-Safe Operation (Set < Reset)



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

### Time Delay Operation

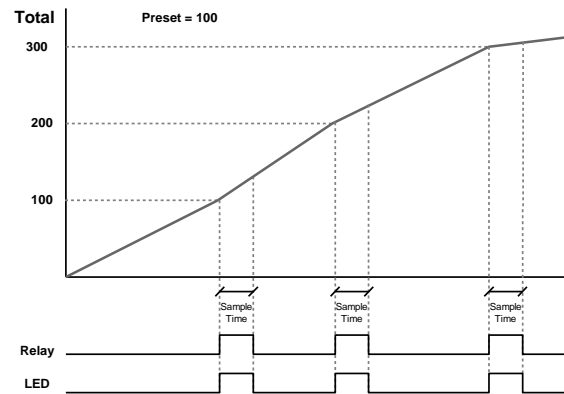
The following graphs show the operation of the time delay function.



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

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

### Total Relay Sampling Operation



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

## Relay Operation Details

### Overview

The relays of the controller can serve three roles, as batch control relays for single or multi-stage batching, as rate, or grand total alarm, or as a sampling relay based on grand total or rate alarm.

These capabilities include front panel alarm status LEDs and 2 or 4 relays.

The relays used for batch control (total) are activated when the batching process starts and deactivate when the batch total is reached. The relays assigned as pre-close are deactivated when the batch reaches the preset value minus the pre-close value.

For an example of batch control operation, see *Batch Control Operation Example* on page 43.

Typical applications for alarms are low flow and high flow alarms or grand total limit alarms. Note that rate alarms are only activated during a batch process and deactivated when the process is stopped.

The relays can also be set for sampling, where the relay will activate for a specific amount of time after a certain grand total has been reached (e.g. 10 seconds sample relay activation every 100 gallons batched).

There are three basic ways the relays can be used:

1. Batch Control (Total)
2. High or Low Alarms for Rate or Grand Total
3. Sampling (Based on Grand Total and Sample Time)

### Relays Initialization

Batch control (total) relays will activate when the start function is enabled, such as when the START button is pressed. Rate alarm relays will enable and initialize to their programmed states when the batch process is started. Grand total alarm relays will initialize to their programmed state at controller power-up.

### Fail-Safe Operation

The following table indicates how alarm 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 in de-energized state
On	Closed	Open	Open	Closed	Relays in energized state

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

### Front Panel LEDs

The alarm status LEDs on the front panel are available on all controllers and provide status indication for the following:

LED	Status
1	Batch Relay 1
2	Batch Relay 2
3	Low Flow Alarm
4	High Flow Alarm

The controller is supplied with 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. Note that rate alarms are only activated during a batch process and they are deactivated when the process is stopped.

Latching relays, or relays with manual reset, are not recommended when using this controller for batch control, as the manual reset will not be acknowledged during a batch process, when the rate alarms are active. For information on latching and manual reset alarms, see the [PD2-6300](#) instruction manual.

### Automatic Reset (Reset)

In this application, the controller 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

### Pump Alternation Control

Pump alternation control is not recommended when using this controller for batch control, as it is used only in level applications, and not with rate, total, or batching applications.



## Sample Relay Operation

The sampling function allows the operator to set a set point for a "sampling" relay. This can be done for the rate, total, or grand total. Each time the relay reaches the set point, it will close that relay's contacts for a programmed period set by the user.

A rate sampling relay will activate for the sample time (58.3 s), every time the set point rate is reached.

A total sampling relay will activate for the sample time (58.3 s), every time the process has batched the amount programmed for the set point (See the diagrams on page 38 more details). The utility of this function can, of course, be expanded beyond sampling and be used whenever a timed relay output closure is required after the batch total interval reaches a certain set point.

## Light / Horn / Button Accessories

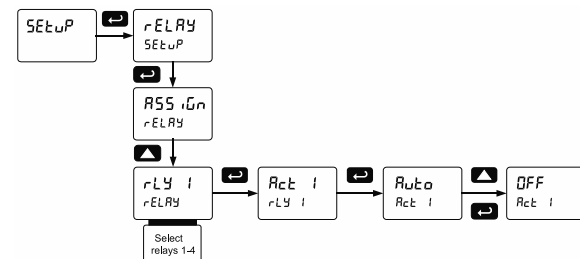


Add visible and audible ways to indicate alarm conditions on any Helios controller with the [MOD-PD2LH](#) Light / Horn / Button accessories. The light with built-in 85 dB horn, and button come mounted and wired to the Helios. Controller and accessories are ordered as separate items. See *Ordering Information*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

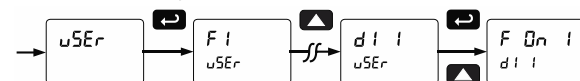
## Setting Up the Interlock Relay (Force On) Feature

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

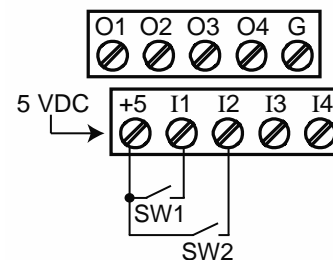
1. Access the *Setup – Relay – Action* menu and set the action to off.



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



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



## Interlock Relay Operation Example

Relays 3 & 4 are configured to energize (their front panel LEDs are steady on) when SW1 & SW2 switches (above) are closed. If the contacts to these digital inputs are opened, the corresponding front panel LEDs flash indicating this condition. The processes being controlled by the interlock relay will stop, and will re-start only after the interlock relay is re-activated by the digital inputs (switches).

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

### IMPORTANT

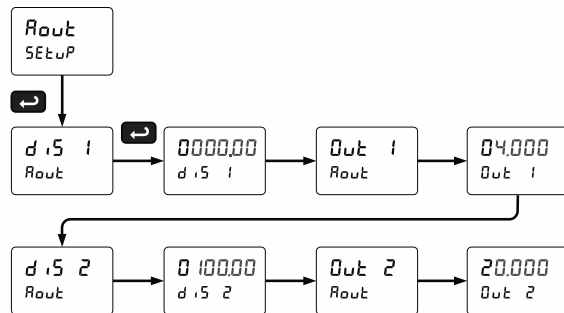
- If the digital inputs are assigned to the *Interlock Function*, then they cannot be used to program the controller remotely.

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

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

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

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



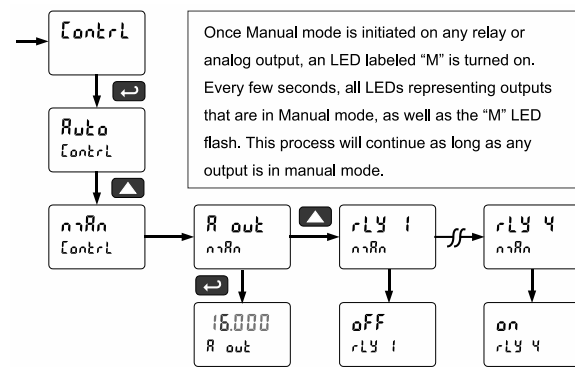
For further details, see *Setting Numeric Values* on page 26.

## Reset Menu (rESEt)

The *Reset* menu is used to reset the total, grand totals, batch count, maximum, or minimum reading (peak or valley) reached by the process; both maximum and minimum may be reset at the same time by selecting "reset high & low" (rSEt HL).

## Manual Control Menu (Control)

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



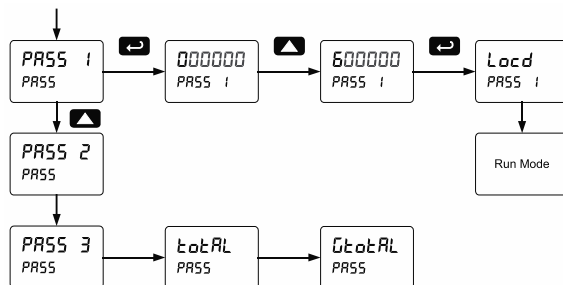
## Setting Up the Password (PR55)

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

Pass 1: Allows use of function keys and digital inputs  
 Pass 2: Allows use of function keys, digital inputs and editing set/reset points  
 Pass 3: Restricts all programming, function keys, and digital inputs.  
 Total Password: Prevents resetting the total manually  
 Gtotal Password: Prevents resetting the grand total manually

## Protecting or Locking the Controller

Enter the *Password* menu and program a six-digit password.  
 For instructions on how to program numeric values see *Setting Numeric Values*, page 26.



## Grand Total Reset Password & Non-Resettable Total

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

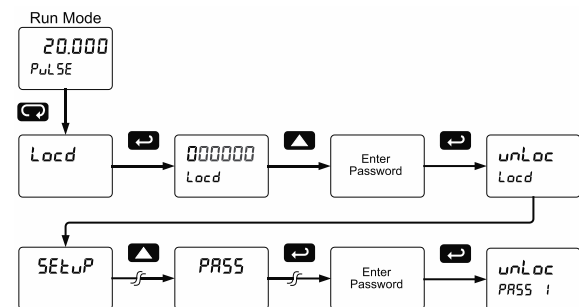
- Once the Grand Total has been programmed as "non-resettable" the feature **CANNOT** be disabled.

## Making Changes to a Password Protected Controller

If the controller is password protected, the controller 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 controller 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 controller is now unprotected until a new password is entered.



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

If the password entered is incorrect, the controller 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 controller.

## Controller Operation

The default configuration displays batch total on Line 1, and a selection of rate, grand total, and batch count, and batch preset on Line 2.

When in pause or stop mode, the display will alternate the numeric value with the run status on Line 1 and the display label for Line 2.

The controller has up to 4 relays which are used to either control the batch process in single or multi-stage batch control, or as alarms that will be active when the batch process is running. A 4-20 mA output option is also available for retransmitting the process variable.

Watch Batch Control Video at  
[www.predig.com/videos/KN6Y6R0I1OE](http://www.predig.com/videos/KN6Y6R0I1OE)

## Default Batch Control Operation

The following describes the operation of the three front panel operating keys as programmed with default settings.

### START Button

Press the START button to begin a new batch process. Press the START button to resume a batch that has been stopped.

### BATCH Button

Press the Batch button to access the Preset (batch amount) menu. Program the batch with the arrow keys, and confirm with the Enter key.

### STOP Button

Press the STOP key once during a batch to pause. Press the STOP key while paused to stop and cancel the batch. Press the STOP key while in stop/ready mode to cycle the lower display parameters: preset, grand total, and batch count (or other parameter assigned to the lower display).

### WARNING

- **Only STOP Button Enabled if a Batch is Running.** During a batch process, only the pause/stop functions are operational, other buttons are deactivated.

## Batch Control Operation Example

The following example shows how two stage batch control functions with a PD2-6310. This setup will establish a 55 gallon preset for the batch, with a main valve (high flow) that will close at 50 gallons, and a trickle valve (low or restricted flow) that will close at 55 gallons. After the batch, the preset will be changed to 80 gallons.

### Two-Stage Batch Control Setup Using Relays 1 & 2

The following table shows the parameters as they appear within the **SETUP** menu entry **RELAY**.

Parameter	Setting	Function
RELAY	RS5,GRN	Press Enter to enter the relay assignment parameters.
RS,GRN1	toREL	Assign relay 1 to batch total control.
RS,GRN2	toREL	Assign relay 2 to batch total control.
PRECL5 toREL		Press Enter to access pre-close selection for multi-stage control.
PRECL5	YES	Yes, to enable a pre-close value for relay 2.
YES	000050	Set the pre-close value to 5 for closing the valve controlling relay 2 five gallons before reaching the preset.
...		Assignment for optional relays 3-4.
RLY1 RELAY		Select relay 1 setup.
REL1 RLY1		Configure activation of relay 1.
REL1	Auto	Always set to Auto for batch control function.
RLY1	PRESET	Set the preset value for batch control.
PRESET	000550	Set 55 gallons as the preset.
...		Setup for optional relays 3-4.

The operation of relay 2 has already been assigned for multi-stage control pre-close and will not appear as a selection in the **RELAY** menu.

If only one stage batch control was desired, with one relay for control, then one would set the assignment of relay 2, **RS5,GRN2**, to off, rate, or grand total.

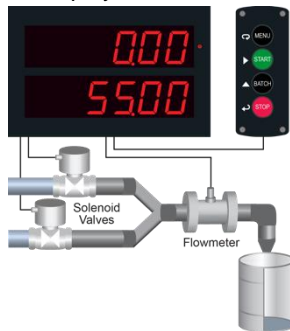
The following pages show an illustration of how the above settings control the batch operation. The display assignment shown is the default.

## Manual Batch Control

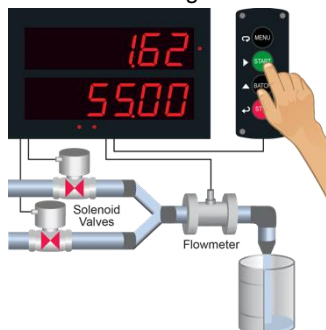
The manual batch control feature is used for batch processes where each batch must be started by the operator. The following diagrams demonstrate a typical manual batch operation with the optional [PDA2364-MSBS](#) control station for remote operation of the controller.

### Manual Batch Control Operation

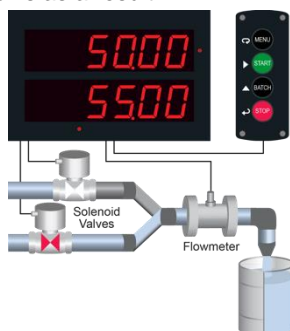
- Both valves are closed with an empty barrel in place. The batched total is displayed in the upper display, the preset is selected for the lower display.



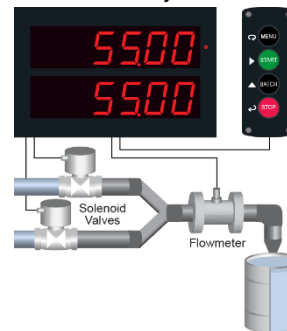
- The START button is pressed. Both valves open. The barrel begins to fill.



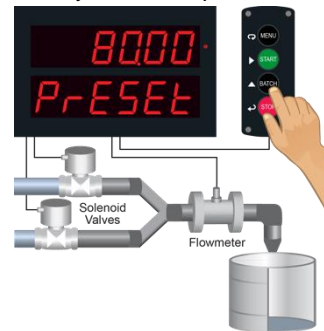
- When the batch total reaches a value of 50.00 (Preset [55.00] – Pre-close [5.00]) the full-flow valve closes. The fill rate of the tank slows as a result.



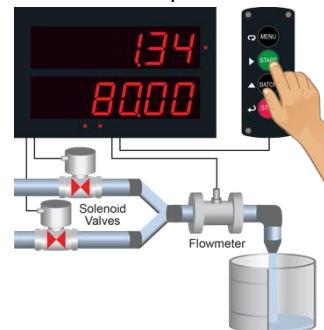
- When the batch is complete, the restricted-flow valve closes. If overrun occurs, then the next batch will adjust for this offset amount to maintain accuracy.



- After placing a new, empty barrel, a new preset fill amount may be selected with the Batch key, while the process is stopped.



- The new batch begins when the START button is pressed, so both relays activate and both valves open.



## Additional Features

At any time during the batch, the STOP button may be pressed to pause the batch. When paused, pressing the START button will continue the batch, and pressing the STOP button again will cancel the batch.

When in STOP mode, the STOP button may be pressed to cycle through alternative parameters to be displayed on the lower display, including the grand total, batch count, and preset.

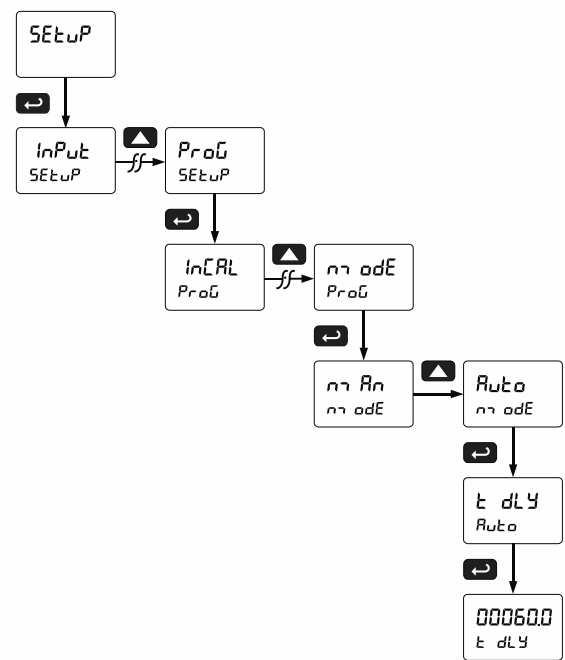
The grand total and batch count may be reset in the **rESEt** menu by pressing the MENU button and entering the reset menu. It may also be reset with digital inputs.

## Automatic Batch Control

The automatic batch control feature is used for batch processes where the batch size does not change or the operator wants the next batch to start automatically after the previous batch is complete. The following diagrams demonstrate a typical automatic batch operation with the optional [PDA2364-MSBS](#) control station for remote operation of the instrument.

### Setup for Automatic Batch Control

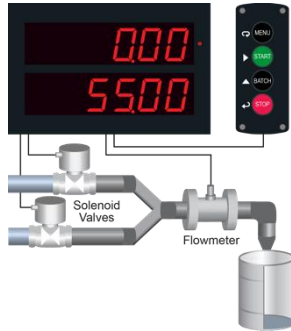
The batch controller can be configured to automatically start a new batch after the selected time delay between batches has elapsed.



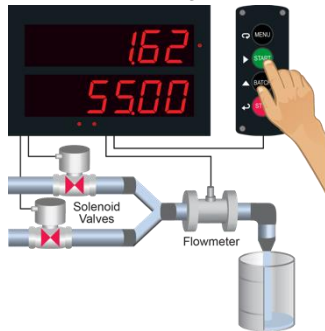
The time delay allows time for removing the full barrel and putting an empty barrel in place. Once the process starts, the operator does not have to press any buttons; except to pause or stop the batch process.

## Automatic Batch Control Operation

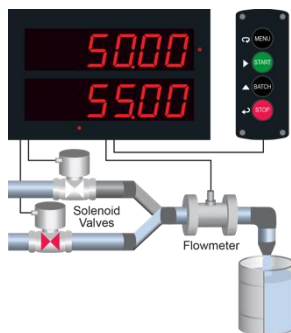
- Both valves are closed with an empty barrel in place. The batched total is displayed in the upper display, the preset is selected for the lower display.



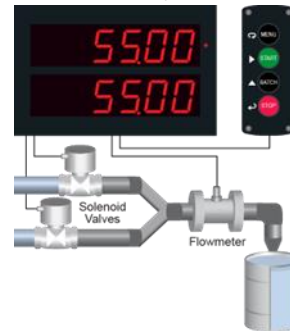
- The START button is pressed. Both valves open. The barrel begins to fill.



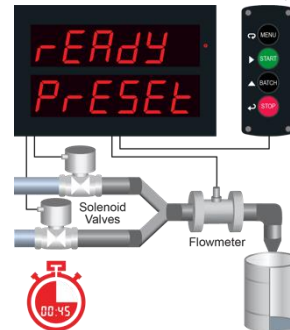
- When the batch total reaches a value of 50.00 (Preset [55.00] – Pre-close [5.00]) the full-flow valve closes. The fill rate of the tank slows as a result.



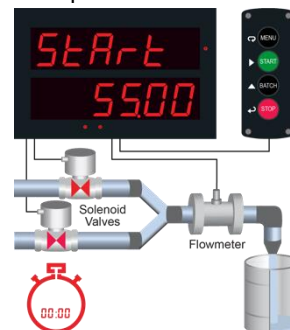
- When the batch is complete, the restricted-flow valve closes. If overrun occurs, then the next batch will adjust for this offset amount to maintain accuracy.



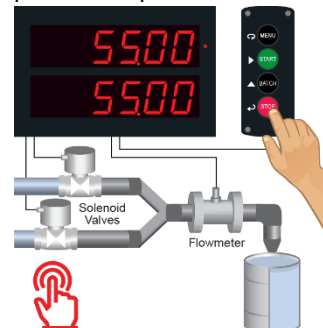
- After the batch is completed, the operator removes the full barrel and places an empty barrel; the new batch starts automatically after 60 seconds (Time Delay).



- The new batch begins automatically after 60 seconds, both relays activate and both valves open.



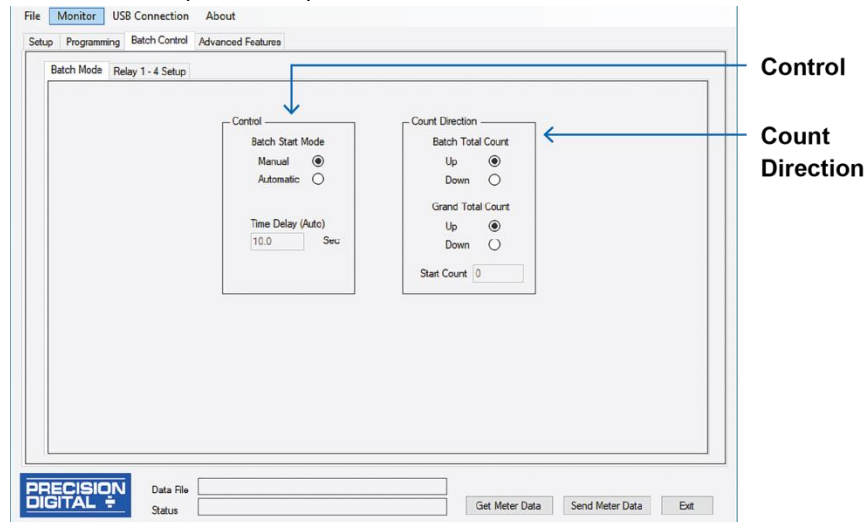
- At the end of the shift, press STOP twice to stop the batch process.





## Setup with MeterView Pro

Use MeterView Pro software to set up the batch controller for manual or automatic batch control, count up or count down operation, and set the batch preset and pre-close values.



### Control

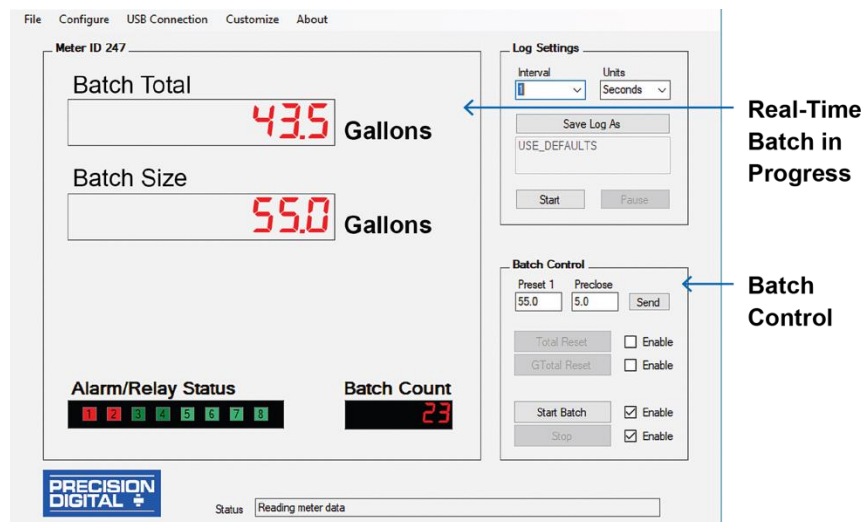
Program for automatic or manual batch operation and set time delay if automatic mode.

### Count Direction

Program the batch controller to count up or count down and set a starting count value if desired.

## Operate with MeterView Pro

MeterView Pro software also shows the Batch Size and Current Batch Total as well as allowing the user to start and stop the batch.



### Real-Time Batch in Progress

MeterView Pro software shows all the important batch-control information.

### Batch Control

MeterView Pro allows the user to set preset 1 and preclose values and start and stop the batch

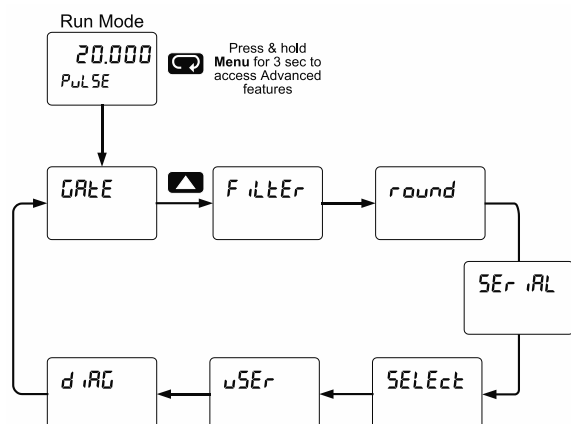
## Advanced Setup & Programming

In addition to the functions described in *Controller Operation* on page 43, the following advanced operation and display features may be programmed. Please note that configuring these features may disable some default batch controller features or it can make running a batch operation impossible. These functions should only be used by users who are sure of their need in their application.

### 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. This cannot be done during a batch process as all functions other than STOP are disabled during a batch process, including the Menu button.



### 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	Gate settings
Lo G	Low Gate	Program low gate value
Hi G	High Gate	Program high gate value
Filter	Filter	Set noise filter value
Hi Spd	High Speed Filter	Program High Speed Filter
Lo Spd	Low Speed Filter	Program Low Speed Filter
round	Round	Set the rounding value for display variables

Advanced Features Menu & Display Messages		
Display	Parameter	Action/Setting
Serial	Serial	Set serial communication parameters
Slave ID	Slave ID	Set slave ID or controller address
Baud	Baud rate	Select baud rate
Transmit delay	Transmit delay	Set transmit delay for serial communication
Parity	Parity	Select parity Even, Odd, or None with 1 or 2 stop bits
Time byte	Time byte	Set byte-to-byte timeout
Select	Select	Enter the Select menu (function, cutoff, out)
Input Signal Conditioning	Input Signal Conditioning	Select linear
Linear	Linear	Set controller for linear function and select number of linearization points
Number of points	Number of points	Set controller for 2 to 32-point linearization
Cutoff	Cutoff	Set low-flow cutoff
Count	Count	Set the totals to count up or down from a set value
Total count	Total count	Set the batch to count up to or down from the preset
Up	Up	Set the total to count up
Down	Down	Set the total to count down
Grand total count	Grand total count	Set the grand total to count up or down from a defined value
Count start	Count start	Set the starting grand total value when counting down
Analog output programming	Analog output programming	Program analog output parameters
Source	Source	Select source for the 4-20 mA output
Overrange	Overrange	Program mA output for display overrange
Underrange	Underrange	Program mA output for display underrange
Force output	Force output	Force analog output value for loop break
Ignore	Ignore	Ignore loop break condition
Maximum	Maximum	Program maximum mA output allowed
Minimum	Minimum	Program minimum mA output allowed
Calibrate	Calibrate	Calibrate 4-20 mA output (internal reference source used for scaling the output)
4 mA output	4 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
20 mA output	20 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution

Advanced Features Menu & Display Messages		
Display	Parameter	Action/Setting
uSEr	User I/O	Assign function keys and digital I/O
F 1	F1 function key	Assign F1 function key
F 2	F2 function key	Assign F2 function key
F 3	F3 function key	Assign F3 function key
F 4	F4 function	Assign F4 function (digital input)
d i 1	Digital input 1	Assign digital input 1 – 4
d O 1	Digital output 1	Assign digital output 1 – 4
d iRG	Diagnostics	Display parameter settings
LEd t	LED test	Test all LEDs
Inf o	Information	Display software number and version
ErASE	Erase	Erase MeterView Pro software stored in controller's memory

## Gate Function (GRtE)

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.

The gate function (GRtE) is the first option in the Advanced Features menu. There are two settings for the GRtE, low gate (Lo G) and high gate (H i G).

### 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 (H i 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) 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.

The filter function (F ILtEr) is the second option in the Advanced Features menu. There are two settings, Hi SPd (high speed) and Lo SPd (low speed), press **ENTER** when Lo SPd is displayed to enable the filter function. Program the filter value, so that there are no extra counts when a contact closure is completed.

#### 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

### 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 54 for details. The following table shows the default setting for each of the function keys.

Function Key/Button	Default Setting	Action
F1/START	StRt	Start batch
F2/BATCH	PrESet	Change preset
F3/STOP	StoP	Pause/stop batch
F4/Digital Input	StStP	Start/stop batch

### Digital Inputs Operation

Five (5) digital inputs, F4, DI-1 to DI-4, come standard on the controller. 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 20 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 54 for details.

#### CAUTION

- **Only STOP Operation Enabled if a Batch is Running.** During a batch process, the only function that can be performed is the pause/stop functions of the STOP button; the default programming of the F3 key. No other functions, including min/max display, manual alarm reset, or total reset, will function while a batch is running.

## Advanced Setup and Calibration

### Multi-Point Calibration & Scaling

The controller is set up at the factory for 2-point linear calibration. The number of points for multi-point calibration/scaling is set up in the *Advanced Features* menu. Up to 32 linearization points may be selected. See *Multi-Point Linearization (LINEAR)* on page 52 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 digital inputs in the *User* menu.
2. Display continuously by assigning either display to max/min through the *Display* menu.

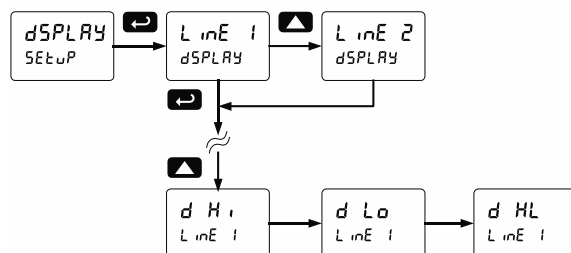
#### CAUTION

- Changing the programming of the F1-F3 function keys will disable the default batch operation of these keys, and is not recommended for batch control applications.

Any of the digital inputs can be programmed to reset the max & min readings.

#### To display max/min readings continuously:

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



#### CAUTION

- Note that changing the default programming of the upper or lower displays may affect viewing the batch total (upper display) or preset (lower display) of the batch process.

## 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.

## Modbus RTU Serial Communications (SERIAL)

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

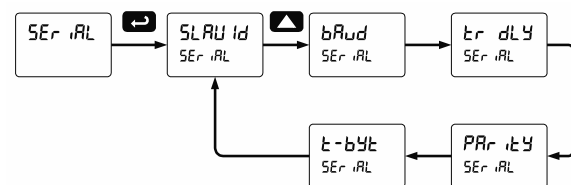
The controller may be connected to a PC for initial configuration via the on-board USB connection. For ongoing digital communications with a computer or other data terminal equipment, use the RS-485 connection with the appropriate serial converter; see *Ordering Information* on page 6 for details.

#### CAUTION

- DO NOT** connect any equipment to the RJ45 M-LINK connector. Otherwise damage will occur to the equipment and the controller.
- 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:

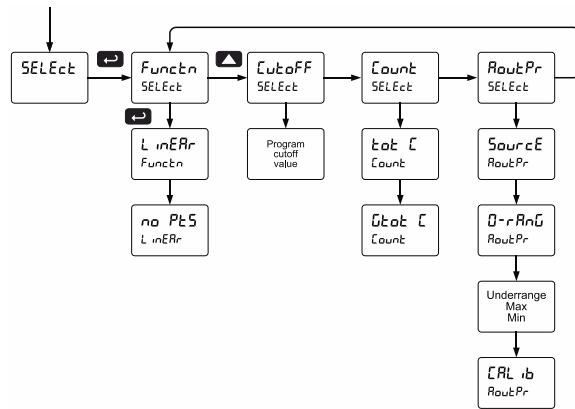
1. More detailed instructions are provided with each optional serial communications adapter.
2. Refer to the *Helios Modbus Register Tables* located at [www.predig.com](http://www.predig.com) for details.



When using more than one controller in a multi-drop mode, each controller must be provided with its own unique address. The controller 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 signal conditioner applied to the input (linear), low-flow cutoff, and analog output programming. The multi-point linearization is part of the linear function selection.



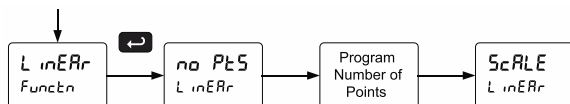
## Input Signal Conditioning (Functn)

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

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

## Multi-Point Linearization (L inERr)

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



## Low-Flow Cutoff (Cutoff)

The low-flow cutoff feature allows the controller to be programmed so that the sometimes unsteady output at low flow rates always displays zero on the controller. The cutoff can be disabled to display negative values.

The cutoff value may be programmed from 0.1 to 999999. The controller 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.

## Total and Grand Total Count Direction (Count)

By default, the batch total and grand total count up during batch processes. Count parameter allows this to change. When set to count down, the batch total will count down from the preset to 0. When set to count down, the grand total will count down from a starting value to zero.

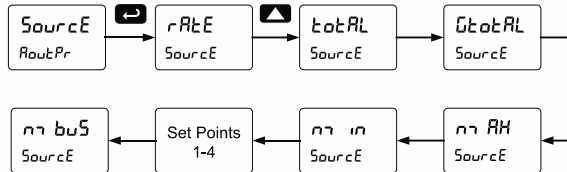
## Analog Output Programming (RoutPr)

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

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

### Analog Output Source

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



### Analog Output Calibration

To perform the analog output calibration, it's recommended to use a milliamp meter with a resolution of at least 0.1  $\mu$ A to measure the output current. The values saved internally during this procedure are used for scaling the 4-20 mA output in the *Setup* menu.

#### Analog Output Calibration Procedure

1. Wire the PD2-6310 4-20 mA output to a current loop that includes a power supply (internal or external 12 to 24 VDC), and the mA input on the digital meter. See *Figure 28. 4-20 mA Output Connections* on page 21 for details.
2. Turn on all devices. Allow for a 15 to 30 minute warm-up.
3. Go to the Advanced Features menu, and navigate to the Analog Output Programming (RatePr)/Calibration (LR) menu and press **Enter**.
4. The display will show 4 mA. The PD2-6310 mA output should now be close to 4 mA. Press **Enter** and the display will show 04.000. Enter the actual value read by the digital mA meter and press **Enter**.
5. The display will show 20 mA. The PD2-6310 mA output should now be close to 20 mA. Press **Enter** and the display will show 20.000. Enter the actual value read by the digital mA meter and press **Enter**.
6. The meter will now calculate the calibration factors and store them.
7. Press **Menu** to exit and return to Run mode.



## Programmable Function Keys User Menu (u5Er)

### ⚠ CAUTION

- Changing the programming of the F1-F3 function keys will disable the default batch operation of these keys, and is not recommended for batch control applications.

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 max & min, hold relay states, etc.). This allows the controller 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 controller (i.e. alarms, relay acknowledgement, reset max, min, or max & min, tare, and reset tare). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.

### Function Keys & Digital I/O Available Settings

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

Display	Description
5tRrŁ	Starts the batch process
5ŁoP	Stops the batch process
5rŁ5ŁP	Allows the same function key to both start and stop the batch process
rŁŸ d	Disable all relays until a button assigned to <i>enable relays</i> (rŁŸ E) is pressed
rŁŸ E	Enable all relays to function as they have been programmed
Ł HŁŁd	Hold current relay states and analog output as they are until a button assigned to <i>enable relays</i> (rŁŸ E) is pressed
d HŁŁd	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.
ŁnŁ HŁ	Display maximum display value on line 1
ŁnŁ Ło	Display minimum display value on line 1
ŁnŁ HŁ	Display maximum & minimum display values on line 1
ŁnŁ HŁ	Display maximum display value on line 2
ŁnŁ Ło	Display minimum display value on line 2
ŁnŁ HŁ	Display maximum & minimum display values on line 2
ŁnŁ ŁŁ	Display the grand total on line 2
ŁnŁ Łc	Display the batch count on line 2

Display	Description
ŁŁŁŁŁŁ	Directly access the manual control menu
d Ł5RbŁ	Disable the selected function key or digital I/O
RŁH	Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching
rŁŁŁŁŁ	Directly access the reset menu
rŁŁ Ł	Reset the total
rŁŁ ŁŁ	Reset the grand total
rŁŁ Łc	Reset the batch count
rŁŁ HŁ	Reset the maximum display value
rŁŁ Ło	Reset the minimum display value
rŁŁ HŁ	Reset the maximum & minimum display values
rŁŁ RŸ	Directly access the relay menu
PŁŁŁŁŁ	Change the preset value
5ŁŁ Ł*	Directly access the set point menu for relay 2 (*through 8)
ŁŁŁŁŁ	Mimic the menu button functionality (digital inputs only)
r ŁŁŁŁ	Mimic the right arrow/F1 button functionality (digital inputs only)
ŁP	Mimic the up arrow/F2 button functionality (digital inputs only)
ŁŁŁŁŁ	Mimic the enter/F3 button functionality (digital inputs only)
F Łn Ł*	Force relay 1 (*through 4) into the on state. This function is used in conjunction with a digital input to achieve interlock functionality. See <i>Setting Up the Interlock Relay (Force On) Feature</i> on page 40 for details about interlock relays.
RŁŁŁ Ł*	Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)

## Troubleshooting

Due to the many features and functions of the controller, it's possible that the setup of the controller does not agree with what an operator expects to see.

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

### Diagnostics Menu (d ,RŁ)

The *Diagnostics* menu is located in the *Advanced Features Menu*; to access the *Diagnostics* menu refer to page 48.

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

For a description of the diagnostic messages, see *Advanced Features Menu & Display Messages*, page 48.

### Testing the Display LEDs

To test all LEDs on the display:

1. Go to the *Diagnostics* menu (d ,RŁ) and press Enter button.
2. Press Up arrow button and scroll to *LED Test* menu (ŁŁŁ Ł).
3. Press the Enter button to activate the LED Test. The controller 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 ( ,nFŁ) or press the Menu button to return to Run Mode.

### Determining Software Version

To determine the software version of a controller:

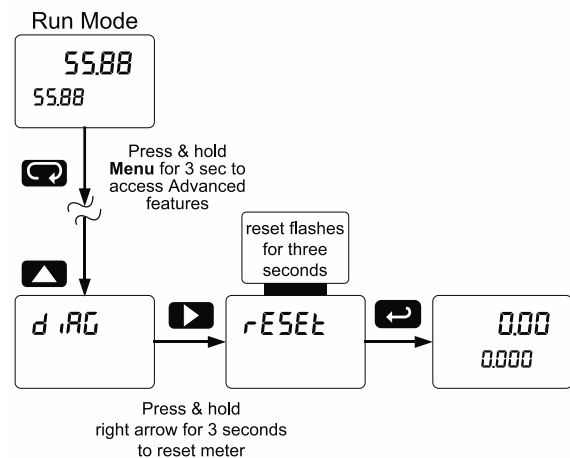
1. Go to the *Diagnostics* menu (d ,RŁ) and press Enter button.
2. Press Up arrow button and scroll to *Information* menu ( ,nFŁ).
3. Press Enter to access the software number (SFŁ) and version (ŁŁŁŁ) information. Write down the information as it is displayed. Continue pressing Enter until all the information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

## Reset Controller 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 Setup & Programming*, page 48.
2. Press Up arrow to go to *Diagnostics* (d ,RŁ) menu.
3. Press and hold Right arrow for three seconds, press Enter when display flashes rEŁŁŁ.  
Note: If Enter is not pressed within three seconds, the display returns to the *Diagnostics* menu.
4. The controller 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 the major programmable parameters on the controller.

Factory Defaults & User Settings		
Parameter	Display	Default Setting
Input type	InPulse	Pulse
Total	YES	Total enabled
Units	unit	Rate / total / G total Pulse / Pulse / Pulse
Rate decimal point	dddddd	1 Place
Total decimal point	dddddd	1 Place
Grand Total decimal point	dddddd	0 Places
K-Factor	FRctbr	1.000
Function	Function	Linear
Number of points	no Pts	2
Programming	Prpg	Scale
Input 1	InP 1	00000.0
Display 1	d.5 1	00000.0
Input 2	InP 2	10000.0
Display 2	d.5 2	10000.0
Display line 1	Line 1	Display batch total
Display line 2	Line 2	Display preset
Display intensity	d-int	6
Total time base	t tb	Second
Total conversion factor	t CF	1.000
Batch mode	modE	Manual
Grand total time base	gt tb	Second
Grand total conversion factor	gt CF	1.000
Grand total reset	gt rSt	Manual
Relay 1 assignment	RS 1n1	Total
Relay 2 assignment	RS 1n2	Total
Relay 2 pre-close	PrECL5	No
Relay 3 assignment	RS 1n3	Rate
Relay 4 assignment	RS 1n4	Rate
Relay 1 action	Rct 1	Automatic
Batch preset	PrESEt	100.0
Relay 2 action	Rct 2	Automatic
Relay 2 set point	SEt 2	200.0
Relay 3 action	Rct 3	Automatic
Relay 3 set point	SEt 3	3.000
Relay 3 reset point	rSt 3	2.500

## Factory Defaults & User Settings

Parameter	Display	Default Setting
Relay 4 action	Rct 4	Automatic
Relay 4 set point	SEt 4	4.000
Relay 4 reset point	rSt 4	3.500
Fail-safe relay 1	FLS 1	Off
Fail-safe relay 2	FLS 2	Off
Fail-safe relay 3	FLS 3	Off
Fail-safe relay 4	FLS 4	Off
On delay relay 1	On 1	0.0 sec
Off delay relay 1	OFF 1	0.0 sec
On delay relay 2	On 2	0.0 sec
Off delay relay 2	OFF 2	0.0 sec
On delay relay 3	On 3	0.0 sec
Off delay relay 3	OFF 3	0.0 sec
On delay relay 4	On 4	0.0 sec
Off delay relay 4	OFF 4	0.0 sec
Display 1 analog out	d.5 1	0
Output 1 value	Out 1	4.000 mA
Display 2 analog out	d.5 2	1000.0
Output 2 value	Out 2	20.000 mA
Source analog output	Source	Rate/process
Overrange output	OrRnG	21.000 mA
Underrange output	u-rRnG	3.000 mA
Loop break output	brERH	1.000 mA
Filter	FLtEr	Hi Speed
Cutoff value	CutOFF	0.0 (disabled)
Maximum output	maxRH	23.000 mA
Minimum output	min	1.000 mA
Slave ID (Address)	SLRU Id	247
Baud rate	bRud	9600
Transmit delay	tr dLY	50 ms
Parity	PRr LY	Even
Byte-to-byte timeout	t-byt	010 (0.1 sec)
F1 function key	F 1	Start
F2 function key	F 2	Preset
F3 function key	F 3	Stop
F4 function	F 4	Start/Stop
Digital input 1	d I 1	Menu
Digital input 2	d I 2	Right arrow
Digital input 3	d I 3	Up arrow
Digital input 4	d I 4	Enter
Digital output 1-4	dO 1	Alarm 1-4

Factory Defaults & User Settings		
Parameter	Display	Default Setting
Password 1	PR55 1	000000 (unlocked)
Password 2	PR55 2	000000 (unlocked)
Password 3	PR55 3	000000 (unlocked)
Total password	ŁŁŁŁŁ	000000 (unlocked)
Grand total password	ŁŁŁŁŁŁ	000000 (unlocked)

## Troubleshooting Tips

This controller is a highly sophisticated instrument with an extensive list of features and capabilities. If the programming buttons are used to program the controller, 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. The most recent version of the software is loaded at the factory in the internal controller's memory. A USB cable is provided for programming the controller using MeterView Pro software.

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

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, <b>Locd</b> is displayed	Controller is password-protected, enter correct six-digit password to unlock or Master Password of 508655.
Controller does not respond to input change	Check: <ol style="list-style-type: none"> <li>1. The input signal type and make sure it corresponds with the position of the input switch.</li> <li>2. The input signal voltage level</li> <li>3. If a <i>Low-Flow Cutoff</i> has been programmed, the controller will display zero below that point, regardless of the input.</li> </ol>
Controller displays error message during calibration ( <b>Error</b> )	Check: <ol style="list-style-type: none"> <li>1. Signal connections</li> <li>2. Input switch position</li> <li>3. Minimum input span requirements</li> </ol>
Controller displays <div style="text-align: center;">999999 -999999</div>	Check: <ol style="list-style-type: none"> <li>1. The input signal frequency</li> <li>2. K-Factor value or scaling, time base, and decimal point</li> </ol>
Display is unstable	Check: <ol style="list-style-type: none"> <li>1. Input signal stability and value</li> <li>2. Display scaling vs. input signal</li> <li>3. Increase the gate settings to average more pulses</li> </ol>
Display reading is not accurate	Check: <ol style="list-style-type: none"> <li>1. K-Factor value provided by the flowmeter manufacturer</li> <li>2. Time base selected</li> <li>3. Scaling or calibration</li> </ol>
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 <ol style="list-style-type: none"> <li>1. <b>Hi</b> and a number</li> <li>2. <b>Lo</b> and a number</li> </ol>	Press Menu to exit max/min display readings.
Relay operation is reversed	Check: <ol style="list-style-type: none"> <li>1. Fail-safe in Setup menu</li> <li>2. Wiring of relay contacts</li> </ol>
Relay and status LED do not respond to signal	Check: <ol style="list-style-type: none"> <li>1. Relay action in <i>Setup</i> menu</li> <li>2. Set and reset points</li> </ol>
Flashing relay status LEDs	Relays in manual control mode or relay interlock switches opened.
Controller not communicating with application programs	Check: <ol style="list-style-type: none"> <li>1. Serial adapter and cable</li> <li>2. Serial settings</li> <li>3. Controller address and baud rate</li> </ol>
If the display locks up or the controller 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 controller to factory defaults, see [Reset Controller to Factory Defaults](#) on page 55. 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

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

### Sales Support

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

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

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

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