Helios PD2-6210 Analog Input Batch Controller
Instruction Manual

HELIOS

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MeterView Pro
USB Install

- Large Display NEMA 4X, IP65 Wall Mounted Batch Controller
- 0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and ±10 V Field Selectable Inputs with ±0.03% Accuracy
- Large Dual-Line 6-Digit Display, 1.8" (46 mm) Digits Readable up to 100 Feet (30 Meters) Away
- Isolated 24 VDC @ 200 mA Transmitter 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
- Start / Pause / Stop, Change Batch Remote Capabilities
- Display Batch Total, Rate, Grand Total, Count or Preset
- Single or Multi-Stage Batch Control (Up to 4 Relays)
- Automatic Overrun 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 Inputs
- On-Board USB & RS-485 Serial Communications
- Modbus RTU Communication Protocol Standard
- 5 Digital Inputs & 4 Digital Outputs Standard
- Password Protection
- Light / Horn & Button Accessory
- Control Station Accessory for Remote Operation
- 3-Year Warranty

Disclaimer
> The information contained in this document is subject to change without notice. Precision Digital makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

⚠ **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

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

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FREE MeterView Pro Programming Software

The 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**

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.

Table of Contents

Table of Figures

Introduction

The Helios PD2-6210 is a multi-purpose, easy to use, large-display batch controller ideal for simplifying independent batch control operations where local control is preferred to expensive and expansive 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 (2) 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 (4) 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 current and voltage signals (e.g. 4-20 mA, 0-10 V). Three of the programming buttons can be set for custom operation. A fully loaded PD2-6210 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
PD2-6210-6H2	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	2 relays
PD2-6210-6H7		4 relays 4-20 mA output

12-24 VDC Models

Model	Standard Features	Options Installed
PD2-6210-7H2	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	2 relays
PD2-6210-7H7		4 relays 4-20 mA output

Accessories

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

PDA2364 Control Station

Model	Description
PDA2364-MSBS	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 *22* for details.

Light / Horn Accessories

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

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

Note:

1. Specify MOD-PD2LH model as a separate item on the order for the Helios to order the Light / Horn & Button accessory installed and wired. 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 *15* for details.

Model	Description
PDA6260	2" Pipe Mounting Kit for PD2

Signal Splitter & Conditioner Accessories

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

Useful Tools

PD9501 Multi-Function Calibrator

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

PD9502 Low-Cost Signal Generator

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

Specifications

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

General

Display	Dual-line: 1.8" (46 mm) high, red LEDs
	6 digits per line (-99999 to 999999), with lead zero blanking
Display Intensity	Eight user selectable intensity levels. Default is six.
Display Update Rate	5/second (200 ms)
LED Status Indicators	See *LED Status Indicators* on page *23* for details.
Overrange	Display flashes 999999
Underrange	Display flashes -99999
Default Display Assignment	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.
Custom Display Assignment	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.
Alternating Display	Displays alternate every 10 seconds when display is selected, or the batch is paused.
Programming Methods	Four programming buttons, digital inputs, PC and MeterView Pro software, or Modbus registers.
Noise Filter	Programmable from 2 to 199 (0 will disable filter)
Filter Bypass	Programmable from 0.1 to 99.9% of calibrated span
Recalibration	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
Max/Min Display	Max/min readings reached by the process are stored until reset by the user or until power to the controller is cycled.
Rounding	Select 1, 2, 5, 10, 20, 50, or 100
	(e.g. rounding = 10, value = 123.45, display = 123.50).
Password	Three programmable passwords restrict modification of programmed settings and two prevent resetting the totals. Pass 1: Allows use of function keys and digital inputs Pass 2: Allows use of function keys, digital inputs and editing set/reset points Pass 3: Restricts all programming, function keys, and digital inputs. Total Password: Prevents resetting the total manually Gtotal Password: Prevents resetting the grand total manually
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.

Power Options	85-265 VAC 50/60 Hz; 90-265 VDC, 20 W max; 12-24 VDC, 12-24 VAC, 15 W max. Powered over USB for configuration only.
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 controllers may share one 5 A fuse
Normal Mode Rejection	Greater than 60 dB at 50/60 Hz
Isolation	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.

Environmental	Operating temperature range:
	  -40 to 65°C (-40 to 149°F)
	Storage temperature range:
	  -40 to 85°C (-40 to 185°F)
	Relative humidity:
	  0 to 90% non-condensing
	Note: Printed circuit boards are conformally coated.

Connections	Power, signal, relays, mA out: Removable screw terminal blocks accept 12 to 22 AWG wire. RS-485: Removable screw terminal block accepts 16 to 30 AWG wire. Digital I/O: Non-removable screw terminal blocks accept 16 to 30 AWG wire.
Enclosure	UL Type 4X, IP65 rated. Polycarbonate & glass blended plastic case, color: gray. Includes four PG11 through-hole conduit openings, with two factory installed PG11, IP68, black nylon threaded hole plugs with backing nuts.
Mounting	Wall Mounting: Four (4) mounting holes provided for mounting controller to wall. See *Wall Mounting Instructions* on page *14* for additional details. Pipe Mounting: Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See *Pipe Mounting Instructions* on page *15* for additional details.
Tightening Torque	Power, signal, relays, mA out terminals: 5 lb-in (0.56 Nm) Digital I/O and RS-485: 2.2 lb-in (0.25 Nm)
Overall Dimensions	10.63" x 12.59" x 4.77" (270 mm x 319.7 mm x 121.2 mm) (W x H x D)
Weight	6.10 lbs (2.76 kg)
Warranty	3 years parts & labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Batch Controller Rate/Totalizer Display

Rate Display Indication	-99999 to 999999, lead zero blanking. "R" LED illuminates while displaying rate.
Batch Total & Grand Total Display	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.
Batch Total Decimal Point	Up to five decimal places or none: dddddd, ddddd, dddd, ddd, dd, or dddddd Total decimal point is independent of rate decimal point.
Totalizer	Calculates total based on rate and field programmable multiplier to display total in engineering units. Time base must be selected according to the time units in which the rate is displayed.
Time Base	Second, minute, hour, or day
Batch Control Mode	Automatic or manual batch control
Manual Batch	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.
Automatic Batch	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.
Batch Time Delay	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.
Batch Preset	The F2 key is assigned to the preset. The preset value is the total volume to be batched in each cycle.
Batch Pre-Close	The pre-close value is equal to the volume amount before reaching the preset value (batch size).
Single or Multi-Stage	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.
Multiple Presets	Each relay de-energizes at its own preset value.
Remote Operation	Start / Stop / Batch Size buttons may be operated remotely using the PDA2364-MSBS control station
Start	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.
Pause / Stop	The F3 key is assigned to PAUSE / STOP. Press F3 once to pause and press it again to stop the batch process.

Automatic Overrun Correction	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.
Count Up or Count Down	Batch total and grand total can set to count up or count down, independently.
Start / Stop Batch	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.
High or Low Flow Alarm	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).
Grand Totalizer Rollover	Grand totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
Grand Total Overflow	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.
Grand Total Alarms	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.
Programmable Delay on Release	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.
Grand Total Reset	Via front panel button, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
Grand Total Reset Password	Grand total passwords may be entered to prevent resetting the grand total from the front panel.
Non-Resettable Grand Total	The grand total can be programmed as a non-resettable total by entering the password "050873".

⚠ CAUTION

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

Process Input

Inputs	Field selectable: 0-20, 4-20 mA ±10 V (0-5, 1-5, 0-10 V) Modbus PV (Slave)
Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ±10%. All models selectable for 24, 10, or 5 VDC supply (Switch labeled P+/P-). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max. 5 & 10 VDC supply rated @ 50 mA max. Refer to *Figure 8. Transmitter Supply Voltage Selection* on page *17* and *Figure 25. 4-20 mA Output Connections* on page *22*. When the Light / Horn is powered by the transmitter power supply, see MOD-PD2LH Light / Horn's transmitter power supply specification in MOD-PD2LH manual for additional details. Light / Horn power not available for 5 or 10 VDC supplies.
Accuracy	±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span
Temperature Drift	0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient
Input Signal Conditioning	Linear, square root, or programmable exponent
Multi-Point Linearization	2 to 32 points
Programmable Exponent	User selectable from 1.0001 to 2.9999 for open channel flow
Low-Flow Cutoff	0.1 to 999,999 (0 disables cutoff function). Point below at which the display always shows zero.
Decimal Point	Up to five decimal places or none: *dddddd*, *ddddd*, *dddd*, *ddd*, *dd*, or *dddddd*

Calibration Range	Input Range	Minimum Span Input 1 & Input 2
	4-20 mA	0.15 mA
	±10 V	0.10 V
	An error message will appear if the input 1 and input 2 signals are too close together.	

Input Impedance	Voltage ranges: greater than 500 kΩ Current ranges: 50 - 100 Ω (depending on resettable fuse impedance)
Input Overload	Current input protected by resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.
HART Transparency	The controller does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption. The controller is not affected if a HART communicator is connected to the loop. The controller does not display secondary HART variables.

Relays

Rating	2 or 4 SPDT (Form C) internal rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads; see *Switching Inductive Loads* on page *20* for details.
Relay Assignment	Relays may be assigned to batch control total, sampling, rate, or grand total alarms.
Pre-Close	0-100% of batch size, individually user programmable for each additional batch control relay beyond the first.
Alarm Deadband	0-100% of span, user programmable
High or Low Flow Alarm	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).
Relay Operation	• Manual or automatic batch control • Automatic (non-latching)[1] and/or manual alarm reset (acknowledge) • Latching (requires manual acknowledge) with or without clear • Pump alternation control (N/A to batch) • Sampling (based on set point and time) • Off (disable unused relays and enable Interlock feature) • Manual on/off control mode
Relay Reset (Acknowledge)	User selectable via programming buttons, F4 digital input, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
Alarm Time Delay	0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay.
Fail-Safe Operation	Programmable and independent for each relay. *Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.*
Alarm Auto Initialization	When power is applied to the controller, relays will reflect the state of the input to the controller.[1]

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

USB Connection

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

Isolated 4-20 mA Transmitter Output

Output Source	Rate/process, total, grand total, max, min, set points 1-4, Modbus register, or manual control mode
Scaling Range	1.000 to 23.000 mA for any display range.
Calibration	Factory calibrated: 4.000 to 20.000 = 4-20 mA output
Analog Out Programming	23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break
Accuracy	± 0.1% FS ± 0.004 mA
Temperature Drift	0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient *Note: Analog output drift is separate from input drift.*
Isolated Transmitter Power Supply	Terminals I+ & R: 24 VDC ± 10%. May be used to power the 4-20 mA output or other devices. All models rated @ 40 mA max.
External Loop Power Supply	35 VDC maximum

Output Loop Resistance	Power supply	Minimum	Maximum
	24 VDC	10 Ω	700 Ω
	35 VDC (external)	100 Ω	1200 Ω

Additional 4-20 mA Outputs	The PD659-1MA-2MA can split the optional 4-20 mA output into two isolated 4-20 mA outputs
0-10 VDC Output	The PD659-1MA-1V can convert the optional 4-20 mA output to a 0-10 VDC output

RS-485 Serial Communications

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

Modbus® RTU Serial Communications

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

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

Digital Input (F4)

Function	Start/Stop batch, remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *53* for a complete list of capabilities.
Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM
Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

Digital Inputs & Outputs

Function	Terminals provided for remote operation of all four programming / operation buttons (use PDA2364-MSBS control station). Other uses include acknowledge/reset relays and reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *53* for a complete list of capabilities.
Channels	4 digital inputs & 4 digital outputs
Digital Input Logic High	3 to 5 VDC
Digital Input Logic Low	0 to 1.25 VDC
Digital Output Logic High	3.1 to 3.3 VDC
Digital Output Logic Low	0 to 0.4 VDC
Source Current	10 mA maximum output current
Sink Current	1.5 mA minimum input current
+5 V Terminal	To be used as pull-up for digital inputs only. Connect normally open push buttons across +5 V & DI 1-4.

⚠ **WARNING**

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

MeterView Pro Software

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

Compliance Information

Safety

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

Safety Information

⚠ CAUTION
- Read complete instructions prior to installation and operation of the 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 *14* 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 transmitter power supply to output 5 or 10 VDC instead of 24 VDC, see *Figure 8. Transmitter Supply Voltage Selection* on page *17*.

Unpacking

Remove the 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.
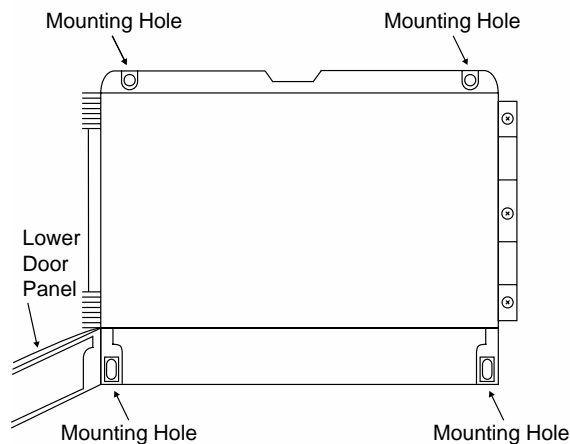
Figure 1. Controller Mounting Holes Location
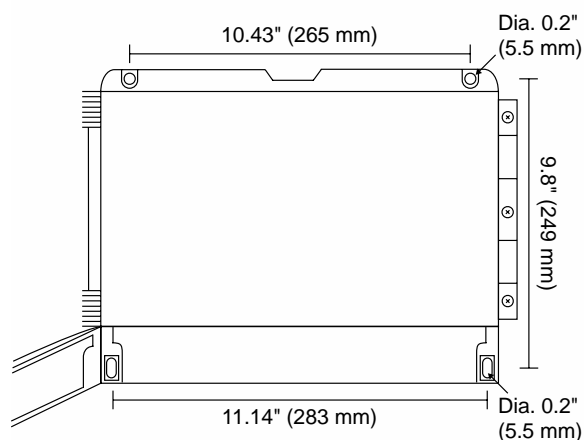
Figure 2. Controller Mounting Holes Dimensions

Mounting Dimensions
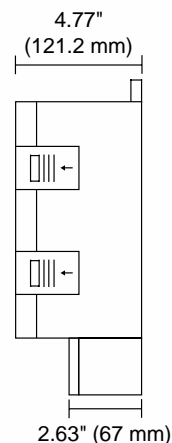
Figure 3. Controller Dimensions – Side View
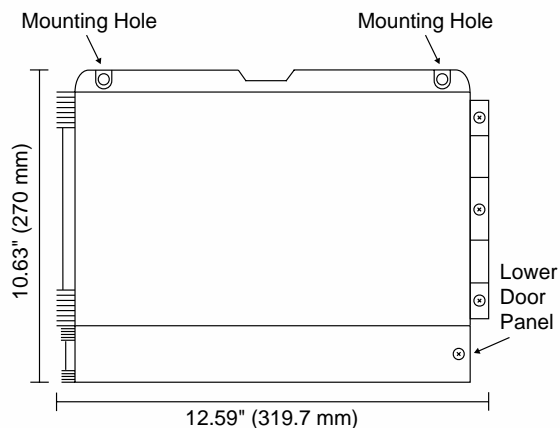
Figure 4. Controller Dimensions - Front View

Conduit Holes Location
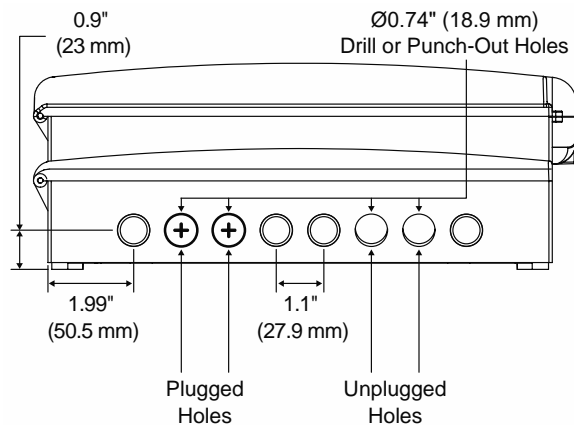
Figure 5. Conduit Holes Location – Bottom View

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 7. Horizontal Pipe Mount Assembly

Figure 6. Vertical Pipe Mount Assembly

15

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**

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 automatica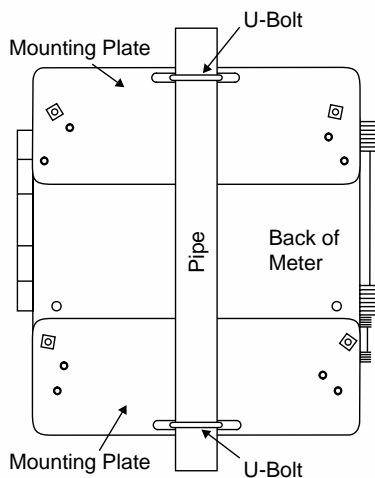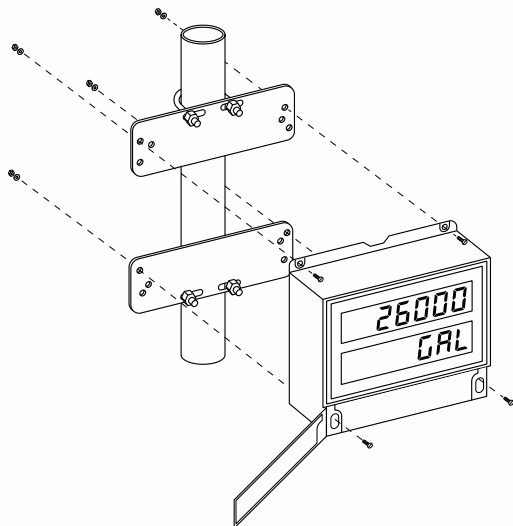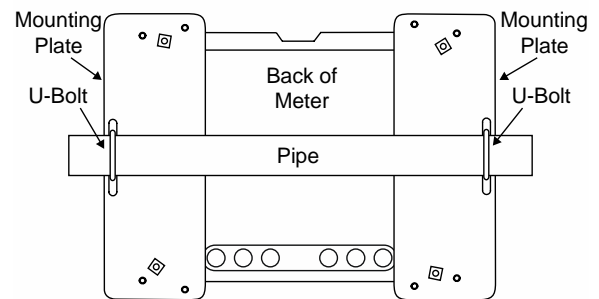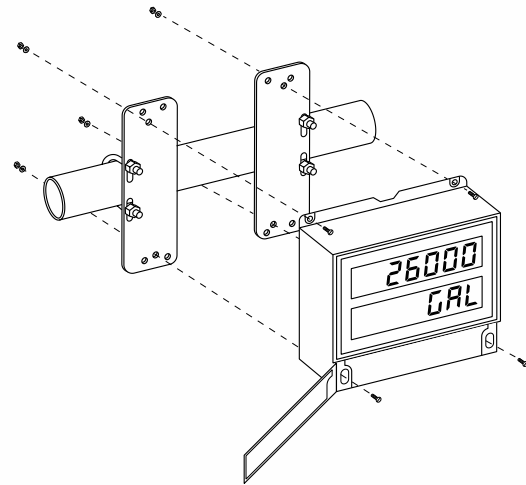lly install the driver software it needs to talk to the controller. Follow the on-screen instructions and allow sufficient time for the process to complete. This can take a few minutes. If the process is interrupted, then it could leave the system in an unstable condition.

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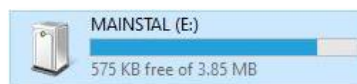
3. Double-click on the file named "MAStart." The program will open a few windows and install two programs on your computer. Simply follow the on-screen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."
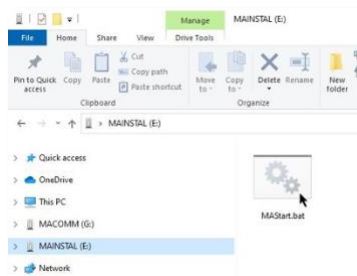
4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your controller.
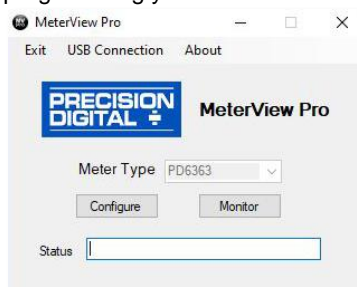
Note: If you decide to update your MeterView Pro software, once the installation has completed, you will be asked if you want to update the setup files located on the controller itself. This way, you will always have the most current version on the controller for future installs.

⚠ **WARNING**

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

Transmitter 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 transmitter or sensor.

If the transmitter requires 5 or 10 VDC excitation, the switch labeled P+/P- must be configured accordingly.

To access the voltage selection switch:

1. Turn off the power to the 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 transmitter excitation.
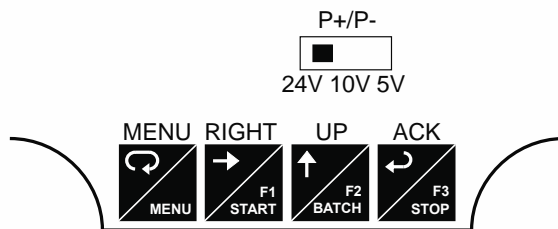
Figure 8. Transmitter Supply Voltage Selection

Connections

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

> ⚠️ **CAUTION**

- Use copper wire with 60°C or 60/75°C insulation for all line voltage connections. Observe all safety regulations. Electrical wiring should be performed in accordance with all applicable national, state, and local codes to prevent damage to the 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.
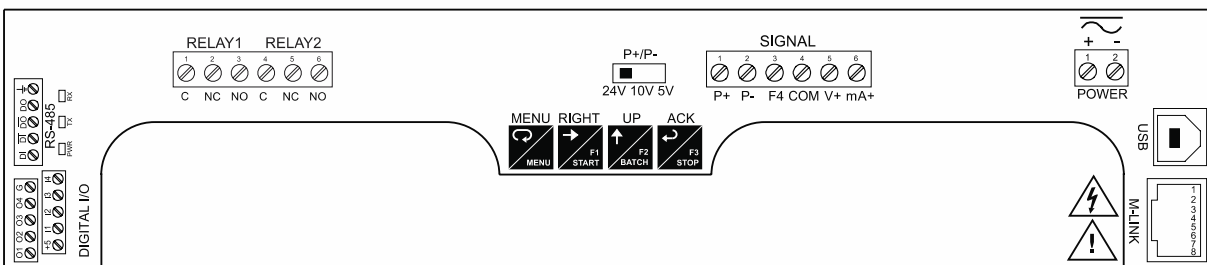
Figure 9. PD2-6210-6H2 / 7H2 Connectors Label
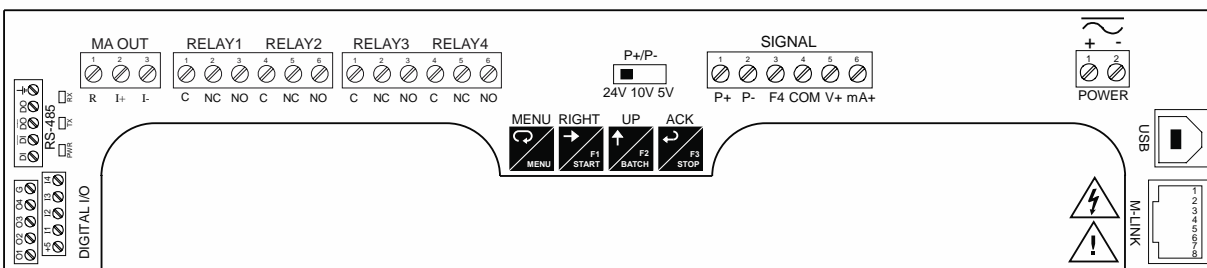
Figure 10. PD2-6210-6H7 / 7H7 Connectors Label

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.
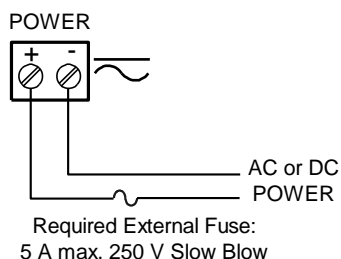
Figure 11. Power Connections

Signal Connections

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

Current and Voltage Connections

The following figures show examples of current and voltage connections.

There are no switches or jumpers to set up for current and voltage inputs. Setup and programming is performed through the programming buttons or MeterView Pro software.
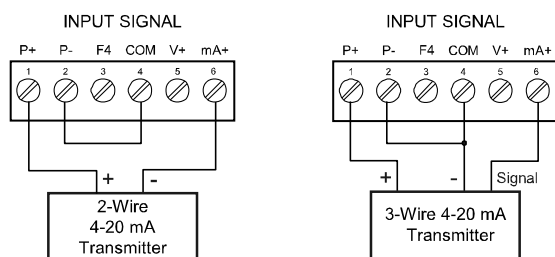
Figure 12. Transmitter Powered by Internal Supply
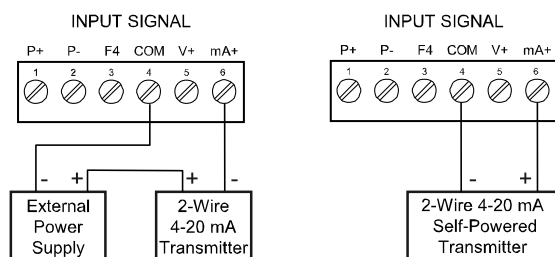
Figure 13. Transmitter Powered by Ext. Supply or Self-Powered

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

The fuse limits the current to a safe level when it detects a fault condition, and automatically resets itself when the fault condition is removed.
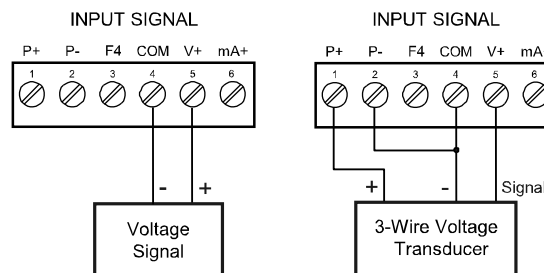
Figure 14. Voltage Input Connections

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

Relay Connections

Relay connections are made to two six-terminal connectors labeled RELAY1 – RELAY4. Each relay's C terminal is common only to the normally open (NO) and normally closed (NC) contacts of the corresponding relay. The relays' C terminals should not be confused with the COM (common) terminal of the INPUT SIGNAL connector.
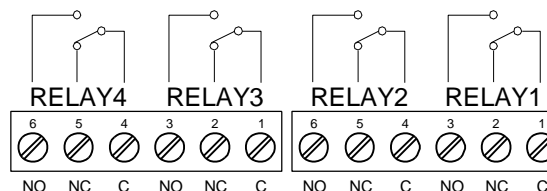
Figure 15. Relay Connections

19

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:
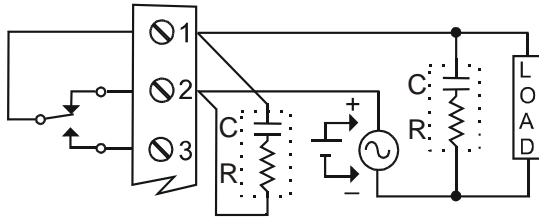
Figure 16. AC and DC Loads Protection

Choose R and C as follows:

R: 0.5 to 1 Ω for each volt across the contacts
C: 0.5 to 1 µF for each amp through closed contacts

Notes:
1. *Use capacitors rated for 250 VAC.*
2. *RC networks may affect load release time of solenoid loads. Check to confirm proper operation.*
3. *Install the RC network at the controller's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.*
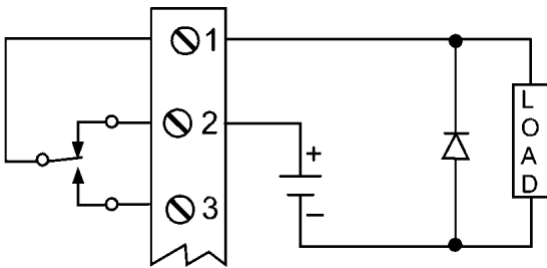
Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 17. Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

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

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

RS-485 Connections

The RS-485 connections are made to a five terminal connector used for Modbus® RTU serial communications. The RS-485 terminals include Transmit Data (DO) and (/DO), Receive Data (DI) and (/DI), and Signal Ground. See *Modbus RTU Serial Communications* (5Er ıRL) on page *50* 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.
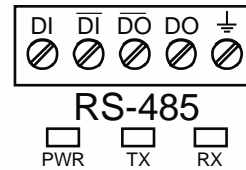
Figure 18. RS-485 Connection

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 (5Er ıRL) menu is displayed and press Enter, RddrE5 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
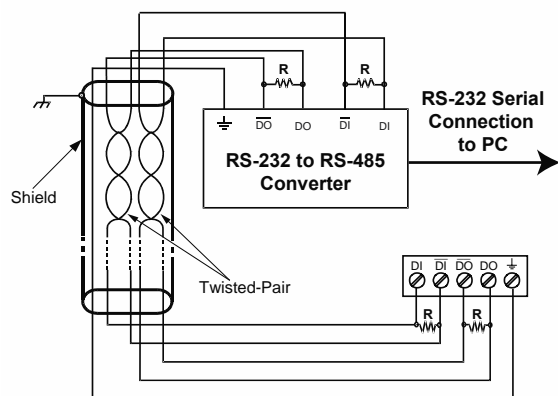
Figure 19. Five-Wire RS-485 Connections
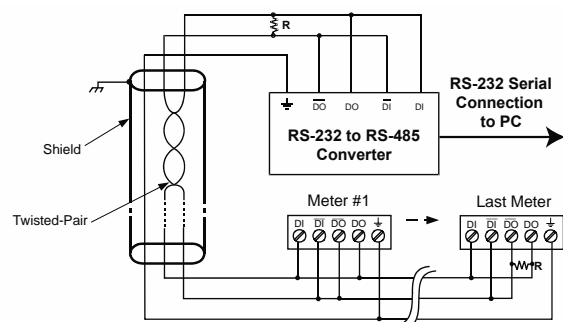
Figure 20. Three-Wire RS-485 Multi-Drop Connections

Notes:

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

RS-485 Converter Connections

Figure 21 below details the wiring connections from the RS-485 connector to an RS-485 serial converter (such as the PDA7485-I or PDA8485-I) for a five-wire network.

RS-485 Connector to RS-485 Serial Converter Connections	
RS-485 Connector	RS-485 to USB or RS-232 Converter
$\perp$	$\perp$
$\overline{DO}$	$\overline{DI}$
DO	DI
$\overline{DI}$	$\overline{DO}$
DI	DO

Figure 21. Connections for RS-485 Connector to Serial Converter

Three-Wire Connection

In order to wire the five pins for use as a three-wire half-duplex RS-485 connection, it is necessary to create a jumper connection between DI to DO and /DI to /DO- as shown below.
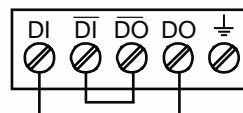
Figure 22. Three-Wire RS-485 Connection

Digital I/O Connections

Digital inputs and outputs are provided in order to expand the functionality of the 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.
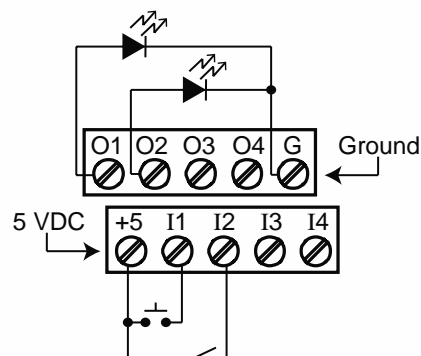
Figure 23. Digital Input and Output Connections

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 *53* for a complete list of capabilities.
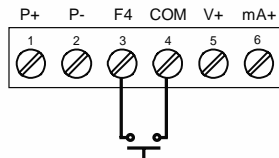
Figure 24. F4 Digital Input Connections

4-20 mA Output Connections

Connections for the 4-20 mA transmitter output are made to the connector terminals labeled MA OUT. The 4-20 mA output may be powered internally or from an external power supply.
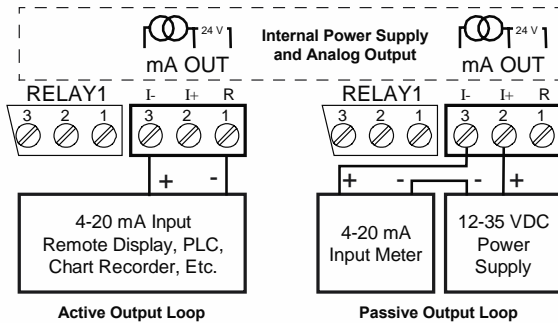
Figure 25. 4-20 mA Output Connections

Analog Output 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.
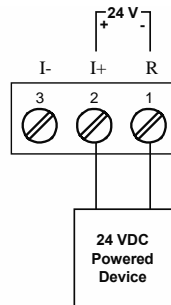
Figure 26. Analog Output Supply Powering Other Devices

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 27. Controller to PDA2364-MSBS Control Station Connection.*
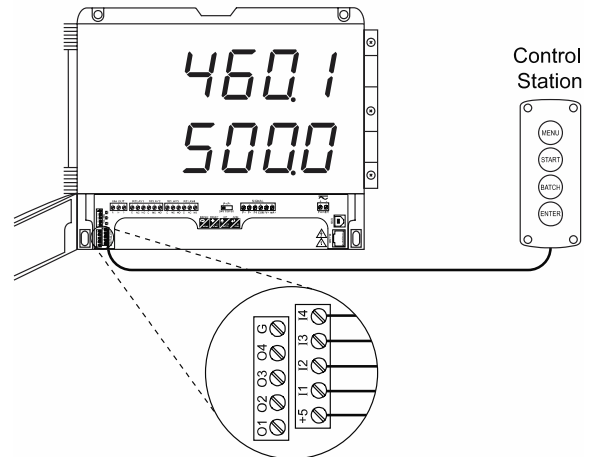
Figure 27. Controller to PDA2364-MSBS Control Station Connection

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.
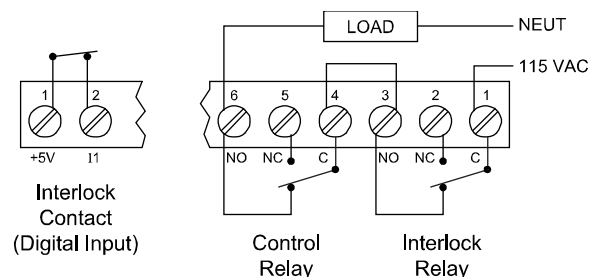
Figure 28. Interlock Connection

Setup and Programming

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

Overview

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

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

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

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
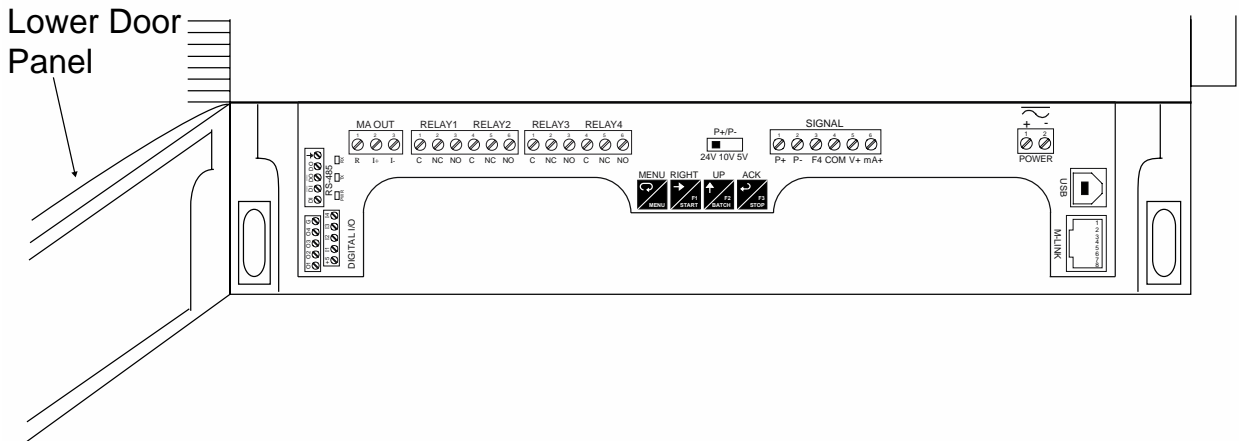
Button	Description	Button	Description
MENU	**Menu**	UP	**BATCH** **Up Arrow/F2**
RIGHT	**START** **Right Arrow/F1**	ACK	**STOP** **Acknowledge (Enter)/F3**

- 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 *22* 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**
SEtuP	*Setup*	Enter *Setup* menu
InPut	*Input*	Enter *Input* selection menu
UoLt	*0-10 VDC*	Set input for ±10 VDC input
nⁿA	*4-20 mA*	Set input for 4-20 mA input
totAL	*Total*	Enable or disable totalizer features
unitS	*Units*	Select the display units/tags
rAtE	*Rate*	Select the display units for rate
totAL	*Total*	Select the display units for total
GtotAL	*Grand Total*	Select the display units for grand total
dEc Pt	*Decimal point*	Set decimal point for rate, total, grand total
ProG	*Program*	Enter the *Program* menu
InCAL	*Input Calibration*	Enter the *Input Calibration* menu
SCALE	*Scale*	Enter the *Scale* menu
CAL	*Calibrate*	Enter the *Calibrate* menu
InP 1	*Input 1*	Calibrate input 1 signal or program input 1 value
diS 1	*Display 1*	Program display 1 value
InP 2	*Input 2*	Calibrate input 2 signal or program input 2 value (up to 32 points)
diS 2	*Display 2*	Program display 2 value (up to 32 points)
Error	*Error*	Error, calibration not successful, check signal or programmed value
t tb	*Total time base*	Enter totalizer time base for seconds, minutes, hours or day.
t CF	*Total conversion factor*	Enter the conversion factor decimal point and the conversion factor.
modE	*Batch mode*	Automatic or manual batch control
t dLY	*Time delay*	Set time delay for automatic batch restart
Gt tb	*Grand total time base*	Program grand total time base

Display Functions and Messages		
Display	**Parameter**	**Action/Setting Description**
Gt CF	*Grand total conversion factor*	Program grand total conversion factor
Gt rSt	*Grand total reset*	Program grand total reset mode: auto or manual
dSPLAY	*Display*	Enter the *Display* menu
LinE 1	*Display Line 1*	Press Enter to assign the Upper display parameter (default: PV or rate)
LinE 2	*Display Line 2*	Press Enter to assign the Lower display parameter (default: total)
d-IntY	*Display intensity*	Set display intensity level from 1 to 8
rELAY	*Relay*	Enter the *Relay* menu
ASSiGn	*Assignment*	Assign relays to rate, total (batch control), grand total, or Modbus controlled.
ASiGn 1	*Assign 1*	Relay 1-2 assignment
totAL	*Total*	Assign relay to batch control
GtotAL	*Grand total*	Assign relay to grand total
nⁿbuS	*Modbus*	Assign relay to Modbus input
rAtE	*Rate*	Assign relay to rate
PrEcLS	*Batch total relay pre-close*	For relays beyond the first assigned to total, a pre-close amount may be entered.
rLY 1	*Relay 1*	Relay 1 setup
Act 1	*Action 1*	Set relay 1 action[1]
Auto	*Automatic*	Set relay for automatic reset
A-nⁿAn	*Auto-manual[1]*	Set relay for automatic & manual reset any time[1] (relays assigned to rate)
LAtcH	*Latching[1]*	Set relay for latching operation (relays assigned to rate) [1]
Lt-CLr	*Latching-cleared[1]*	Set relay for latching operation with manual reset only after alarm condition has cleared (relays assigned to rate) [1]
ALtErn	*Alternate*	Not applicable to batch controller
SAnⁿPL	*Sampling*	Set relay for sampling operation (rate or GT)
OFF	*Off*	Disable relay and front panel status LED (Select Off to enable Interlock feature)
PrESEt	*Preset*	Set batch preset
SEt 1	*Set 1*	Program set point 1

25

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 *Fail-safe* menu
FLS 1	*Fail-safe 1*	Set relay 1 fail-safe operation
on	*On*	Enable fail-safe operation
oFF	*Fail-safe off*	Disable fail-safe operation
dELRY	*Delay*	Enter relay *Time Delay* menu
dLY 1	*Delay 1*	Enter relay 1 time delay setup
On 1	*On*	Set relay 1 On time delay
OFF 1	*Off*	Set relay 1 Off time delay
brERH	*Loop break*	Set relay condition if loop break detected (For mA input only)
iGnorE	*Ignore*	Ignore loop break condition (Processed as a low signal condition)
On	*On*	Relay goes to alarm condition when loop break is detected
OFF	*Off*	Relay goes to non-alarm condition when loop break is detected
Rout	*Analog output*	Enter the *Analog output* scaling menu
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 *Reset* menu
rSt H i	*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

Display Functions and Messages

Display	Parameter	Action/Setting Description
ContrL	*Control*	Enter Manual Control menu
Ruto	*Automatic*	Press Enter to set controller for automatic operation
mRn	*Manual*	Press Enter to manually control relays or analog output operation
PRSS	*Password*	Enter the *Password* menu
PRSS 1	*Password 1*	Set or enter Password 1
PRSS 2	*Password 2*	Set or enter Password 2
PRSS 3	*Password 3*	Set or enter Password 3
totRL	*Total password*	Set or enter password for manual reset
GtotRL	*Grand total password*	Set or enter password for manual reset
nonrSt	*Non-resettable*	Non-resettable grand total set after entering "050873" for Gtotal password
unLoc	*Unlocked*	Program password to lock controller
Locd	*Locked*	Enter password to unlock controller
999999 -99999	*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.

26

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.
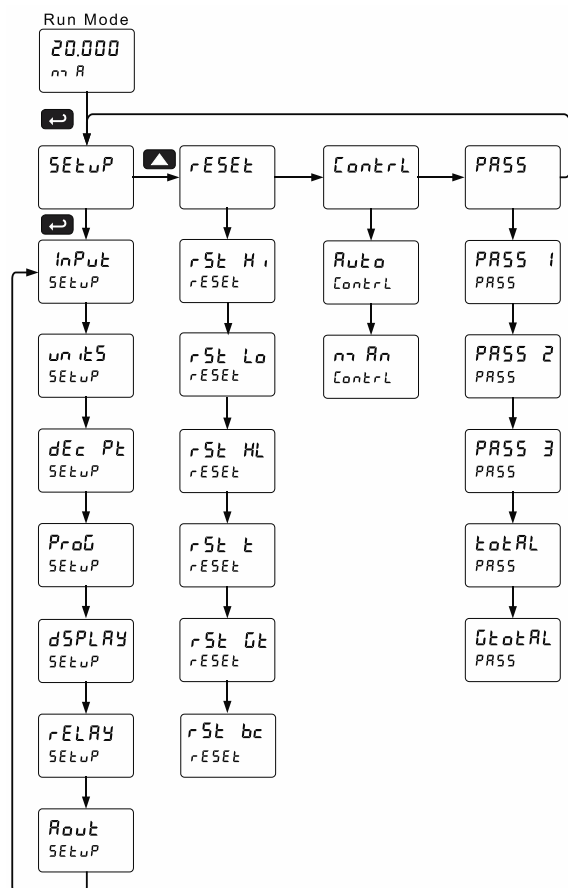
Setting Numeric Values

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.
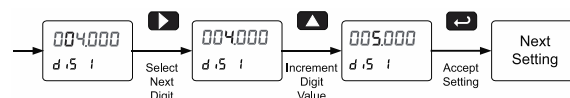
Setting Up the Batch Controller (5EtuP)

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.
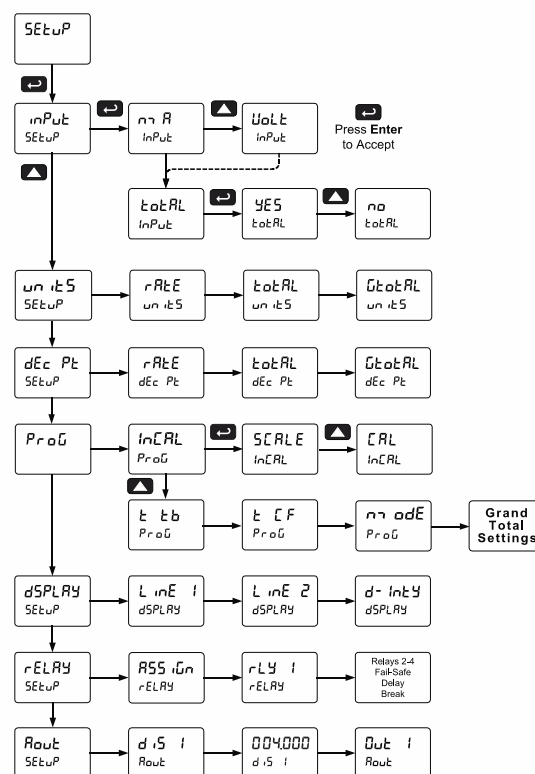
Setting the Input Signal (InPut)

Enter the *Input* menu to set up the controller to accept current (miA) or voltage (UoLt) inputs.

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

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

Setting the Totalizer & 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.
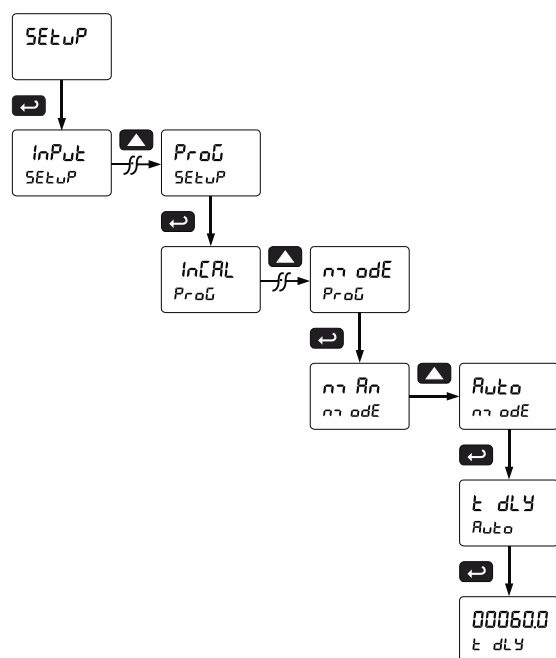
Setting the Input Units or Custom Tags (un itS)

Enter the input unit or custom tag that will be displayed if alternating rate, total, or grand total and units is selected in the un itS menu, or d un it is selected as the Lower display parameter. See the *Setting the Display Parameter & Intensity (dSPLAY)* 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		Display	Character
0	0		H	K
1	1		L	L
2	2		m	m
3	3		n	n
4	4		O	O
5	5		o	o
6	6		P	P
7	7		q	q
8	8		r	r
9	9		S	S
A	A		t	t
b	b		u	u
C	C		V	V
c	c		w	w
d	d		H	X
E	E		Y	Y
F	F		Z	Z
G	G		-	-
g	g		/	/
H	H		]	]
h	h		[	[
I	I		=	=
i	i		0	Degree(<)
J	J			Space

Notes:

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

Setting the Decimal Point (dEc Pt)

The decimal point 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 or calibrated (CAL) by applying an input. 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. Scale without a signal source
    b. 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.

Note: The Scale and Calibrate functions are exclusive of each other. The controller 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 (L inEAr) menu on page 51 for details.
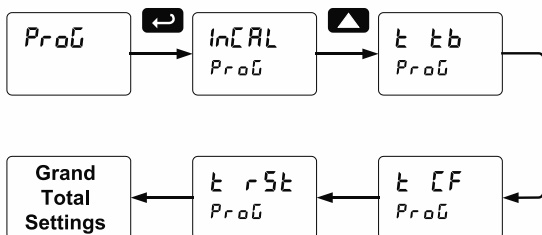
Additional parameters, not needed for most applications, are programmed in the *Advanced Features* menu; see *Advanced Setup & Programming* on page *48*.

Input Calibration Method (InCAL)

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

- Use the *Scale* menu to enter the scaling without a signal source.
- Use the *Calibrate* menu to apply a signal from a signal source.
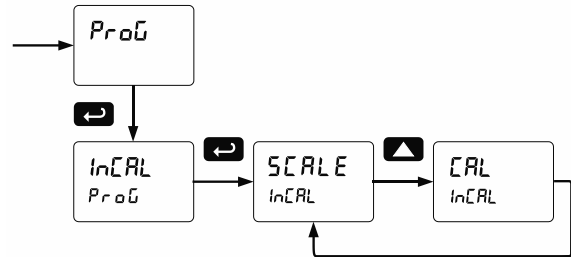
Note: The Scale and Calibrate functions are exclusive of each other. The controller uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in the Advanced menu prior to scaling and calibration of the controller. See Multi-Point Linearization (L inEAr) menu on page 51 for details.

Scaling the Controller (SCALE)

The 4-20 mA and the ±10 VDC 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.
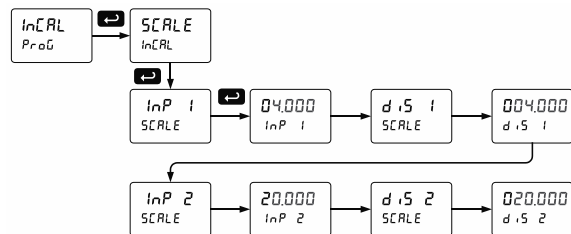
For instructions on how to program numeric values see *Setting Numeric* Values, page 27.

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

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

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^3, etc.
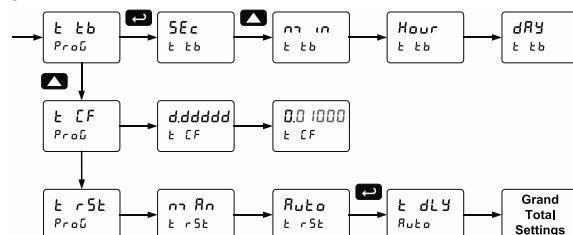
Time Base

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 (ɳɿodɛ)

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 (ᴛ dLY).

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 (CAL)

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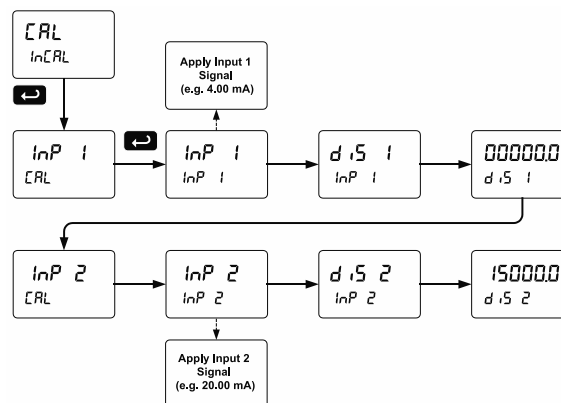
Note: Inputs for the above example are:
Input 1: 4.00 mA; Display 1: 0.0 Gallons
Input 2: 20.00 mA; Display 2: 15000.0 Gallons

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

31

Setting the Display Parameter & Intensity (dSPLAY)

Display line 1 (L ınE 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 ınE 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
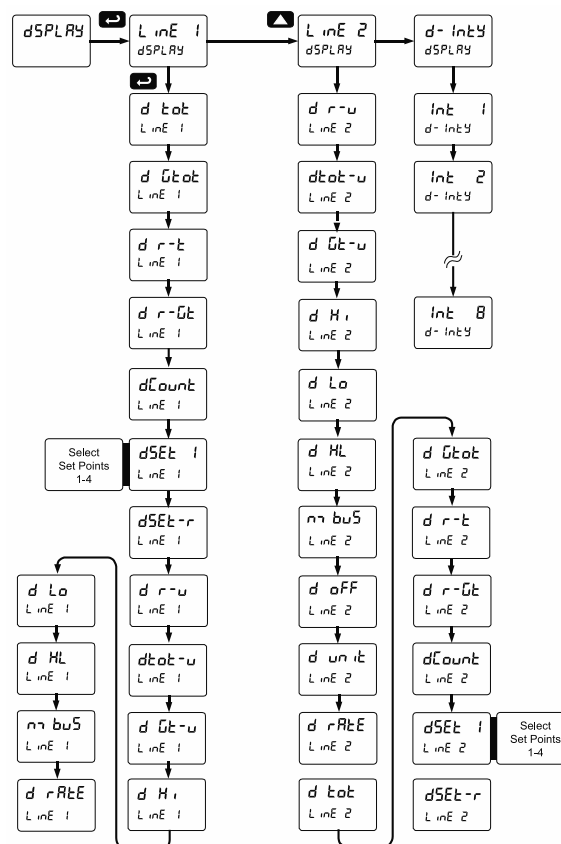
Display Intensity (d-ıntY)

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**

32
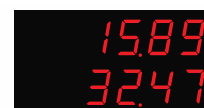
Setting the Relay Operation (rELAY)

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

> ⚠️ **CAUTION**
> • During setup, the relays do not follow the input and they will remain in the state found prior to entering the Relay menu.

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

3. Set and reset points; batch preset
4. Fail-safe operation
   a. On (enabled)
   b. Off (disabled)
5. Time delay
   a. On delay (0-999.9 seconds)
   b. Off delay (0-999.9 seconds)
6. Relay action for loss (break) of 4-20 mA input (ignore, on, off)

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.
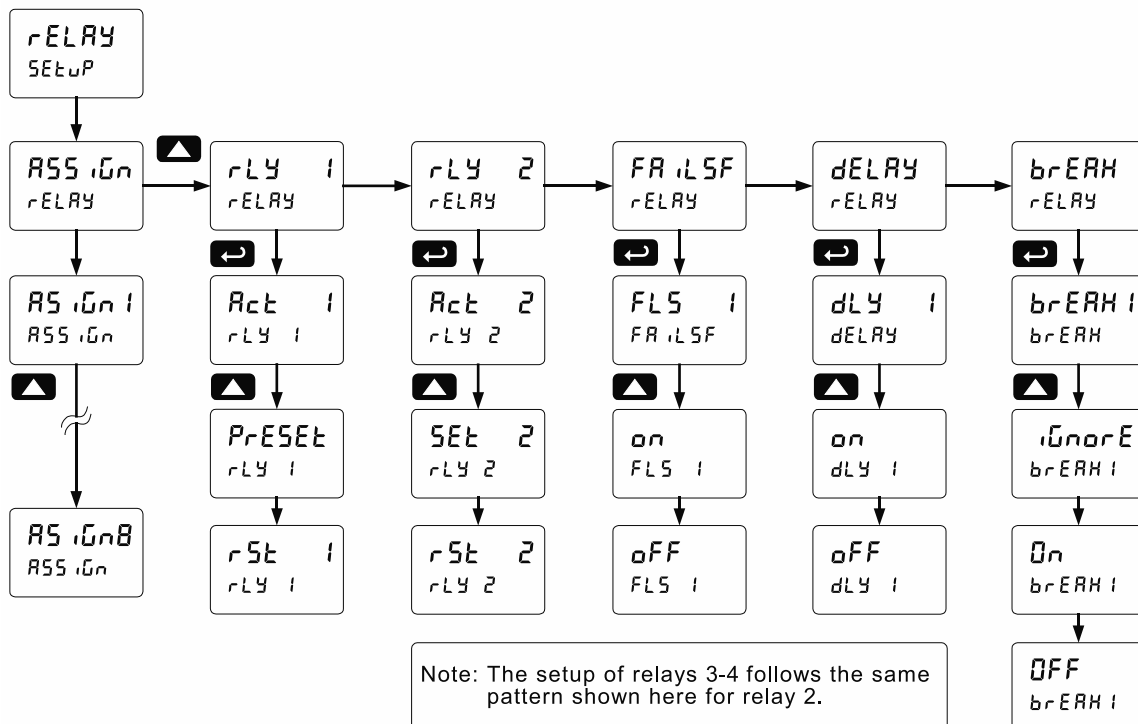
Relay Assignment (ASSiGn)

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
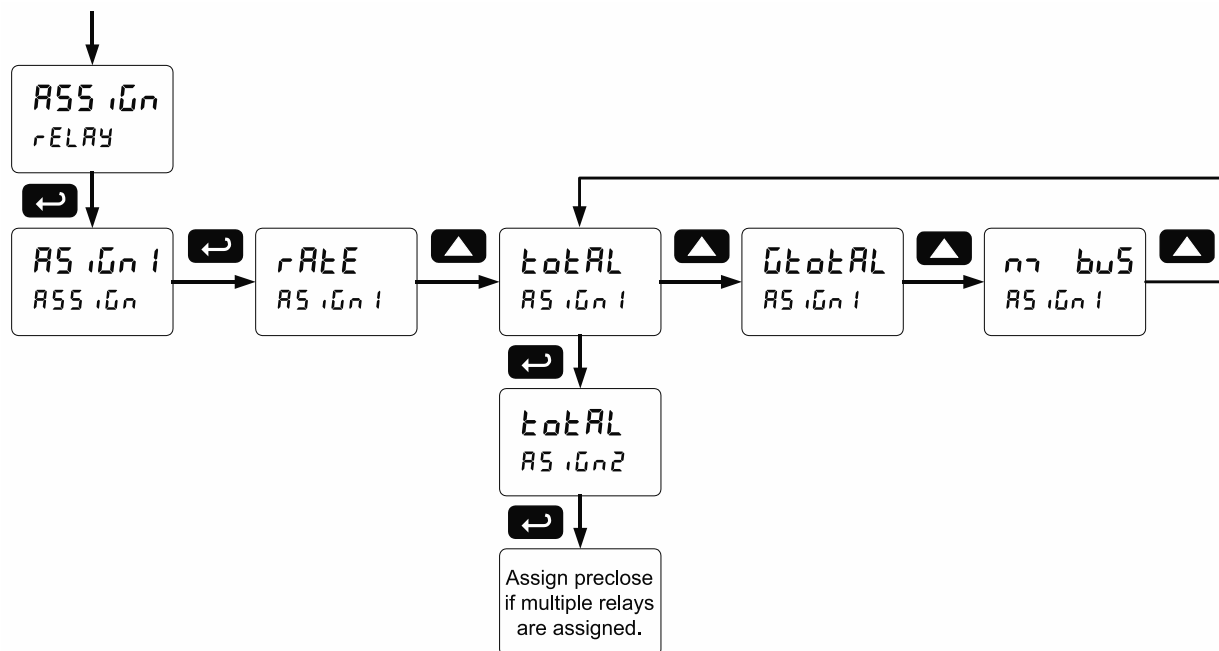
⚠ IMPORTANT

- 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 `totAL` as the assignment. Relays set to `totAL` 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 `totAL`.

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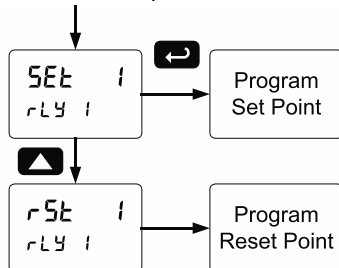
Note: Changes are not saved until the reset point has been accepted.

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.

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

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

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

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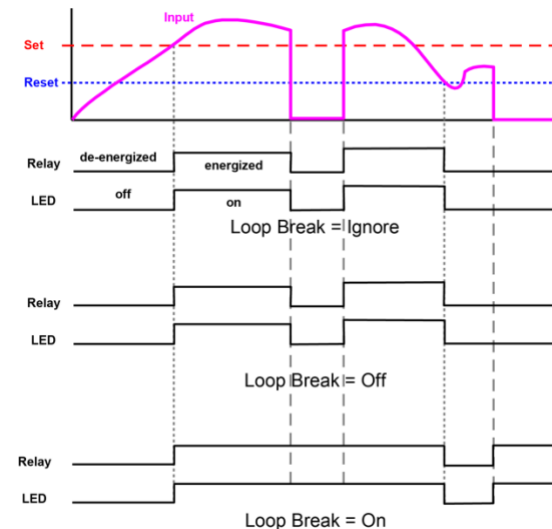
Automatic Batch Control Operation

The following graph shows automatic batch operation

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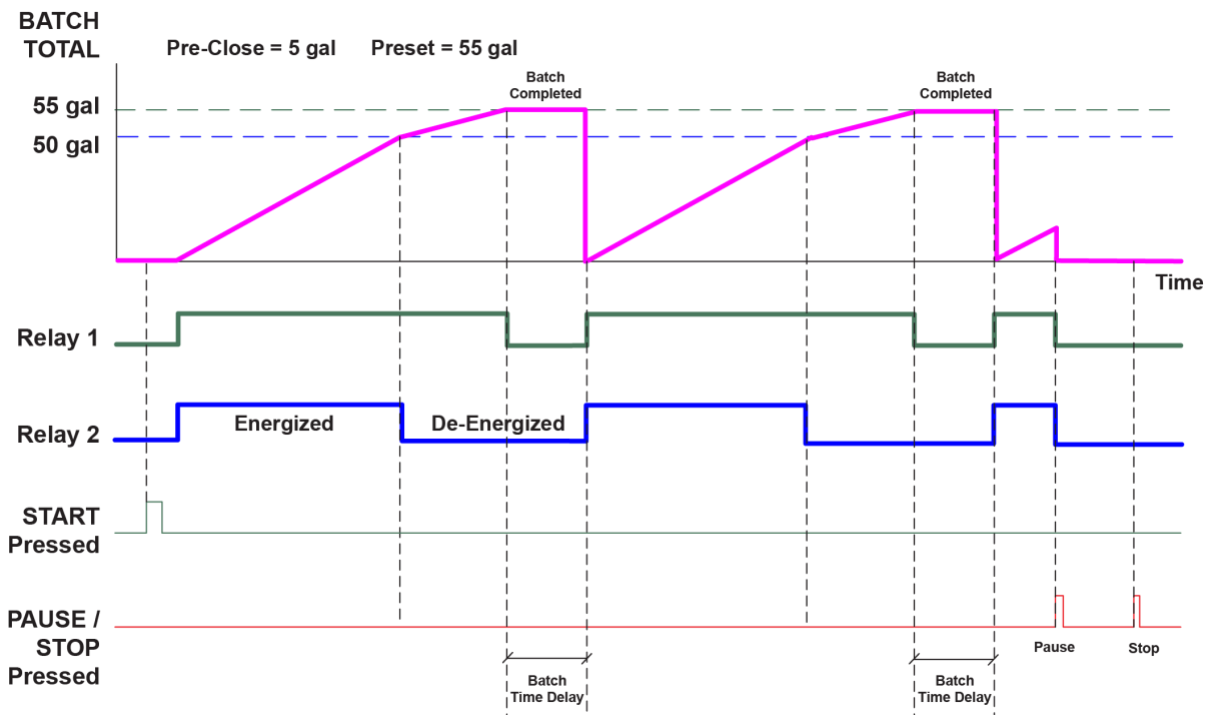
When START is pressed, a short delay occurs before the low flow alarm sensing is activated. Each relay can be programmed with additional ON delay to satisfy various conditions and applications.

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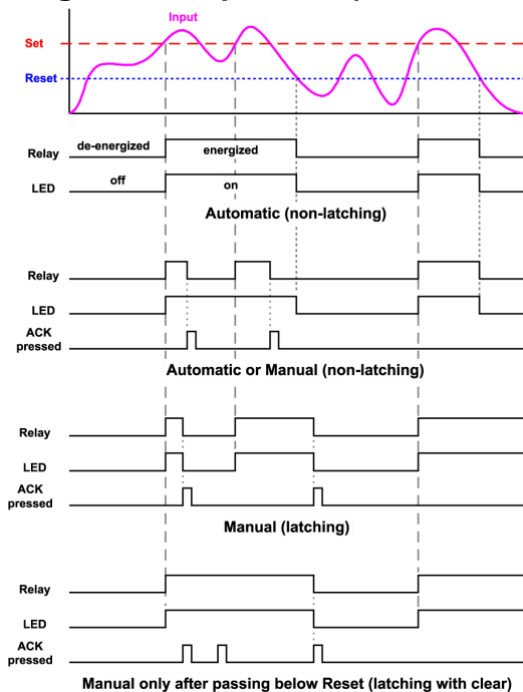
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

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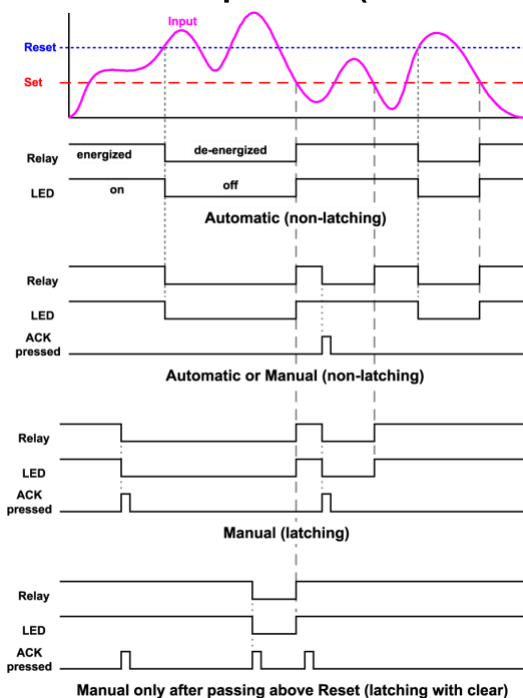
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

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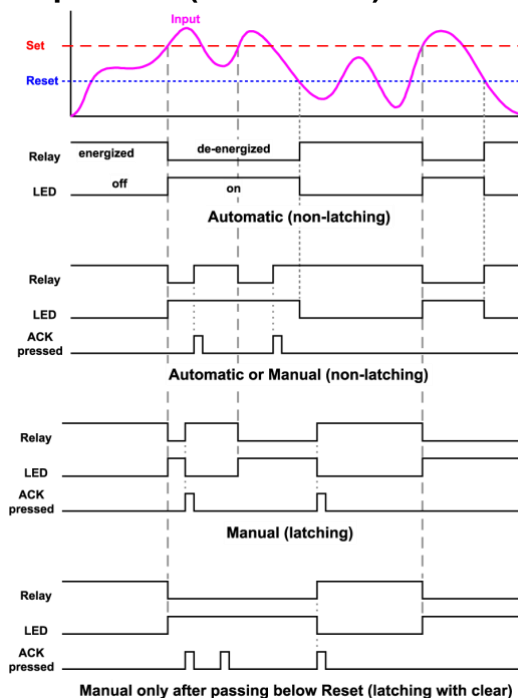
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

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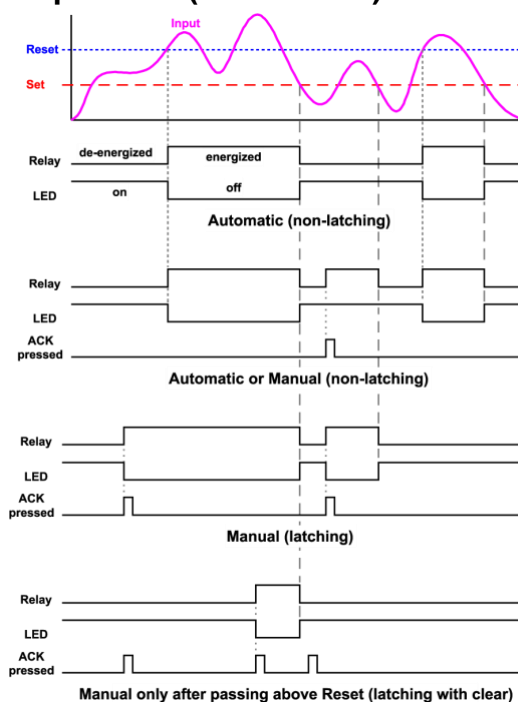
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

37

Time Delay Operation

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

On Time Delay
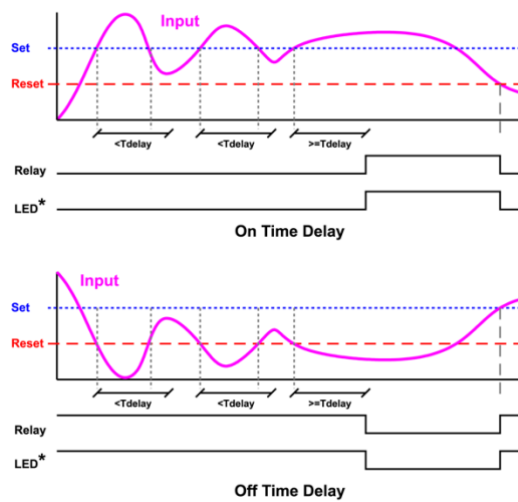
Off Time Delay

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

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

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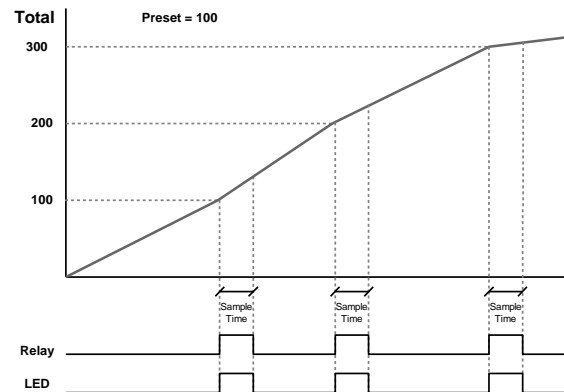
When the total reaches the preset, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the preset value is added to the total.

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 PD2-6200 instruction manual.

Automatic Reset (𝐀𝐮𝐭𝐨)

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 (5Rn⌐ ᒐ), every time the set point rate is reached.

A total sampling relay will activate for the sample time (5Rn⌐ ᒐ), 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

Red Light
with 85 dB Horn

NEMA 4X / IP65

Button
(9 Labels
Provided)

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.
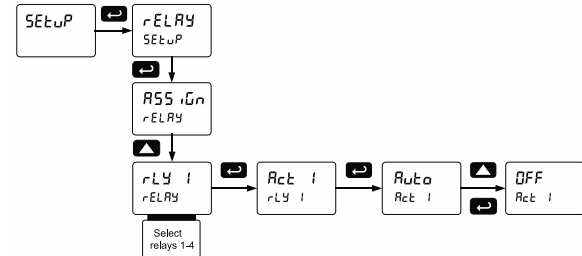
2. In the Advanced features – *User* menu program any of the digital inputs to Force On any of the internal relays (1-4).
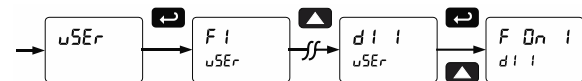
3. Connect a switch or dry contact between the +5V terminal and the corresponding digital input (dI-1 to dI-4) terminal.
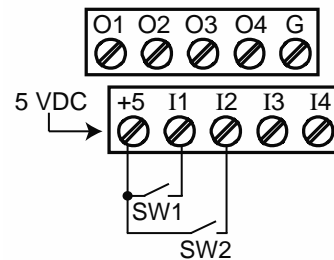
Interlock Relay Operation Example

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 *27, Analog Output Value for Loss of 4-20 mA Input (Loop Break)* on page *52.*
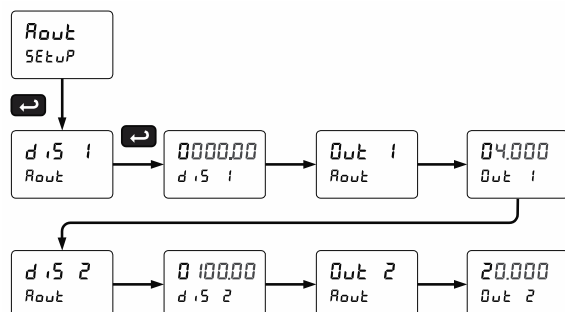
Reset Menu (`rESEt`)

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" (`rSt Hl`).

Manual Control Menu (`Contrl`)

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.

Once Manual mode is initiated on any relay or analog output, an LED labeled "M" is turned on. Every few seconds, all LEDs representing outputs that are in Manual mode, as well as the "M" LED flash. This process will continue as long as any output is in manual mode.

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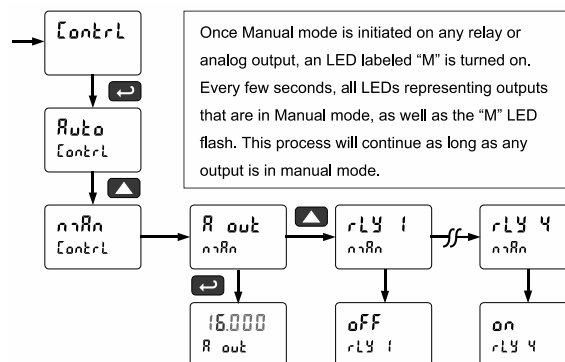
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings and to program the non-resettable totalizer.

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 *27*.

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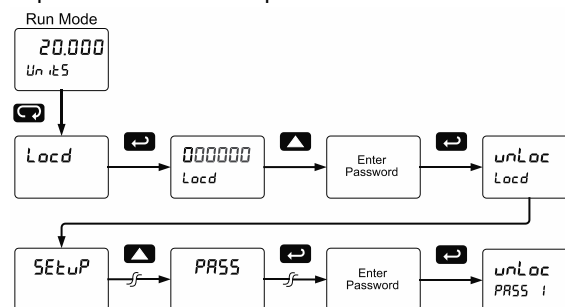
If the password entered is incorrect, the controller displays the message Locd (Locked) for about two seconds, and then it returns to Run Mode. To try again, press Enter while the *Locked* message is displayed.

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**

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 PD2-6210. 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 5EtuP menu entry rELRY.

Parameter	Setting	Function
rELRY	RSS iɓn	Press Enter to enter the relay assignment parameters.
RS iɓn 1	totRL	Assign relay 1 to batch total control.
RS iɓn2	totRL	Assign relay 2 to batch total control.
PrEcLS totRL		Press Enter to access pre-close selection for multi-stage control.
PrEcLS	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.
rLY 1 rELRY		Select relay 1 setup.
Rct 1 rLY 1		Configure activation of relay 1.
Rct 1	Ruto	Always set to Auto for batch control function.
rLY 1	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 rELRY menu.

If only one stage batch control was desired, with one relay for control, then one would set the assignment of relay 2, RSS iɓn2, 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

1. 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.
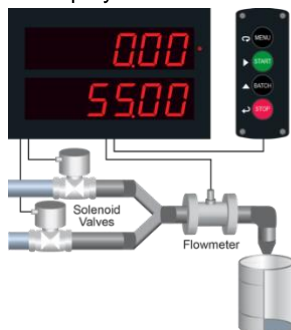
2. The START button is pressed. Both valves open. The barrel begins to fill.
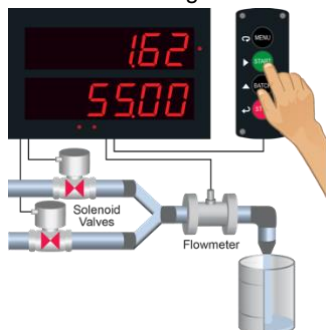
3. When the batch total reaches a value of 50.00 (Preset [55.00] – Pre-close [5.00]) the full-flow valve closes. The fill rate of the tank slows as a result.
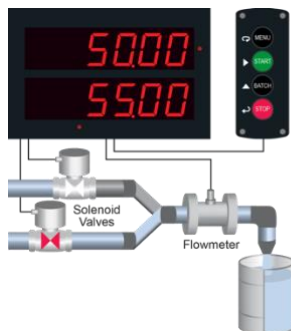
4. When the batch is complete, the restricted-flow valve closes. If overrun occurs, then the next batch will adjust for this offset amount to maintain accuracy.

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

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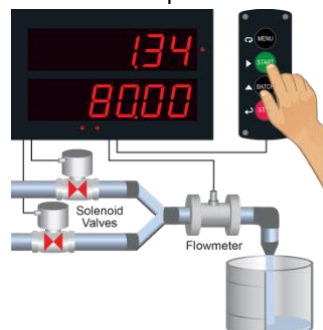
Additional Features

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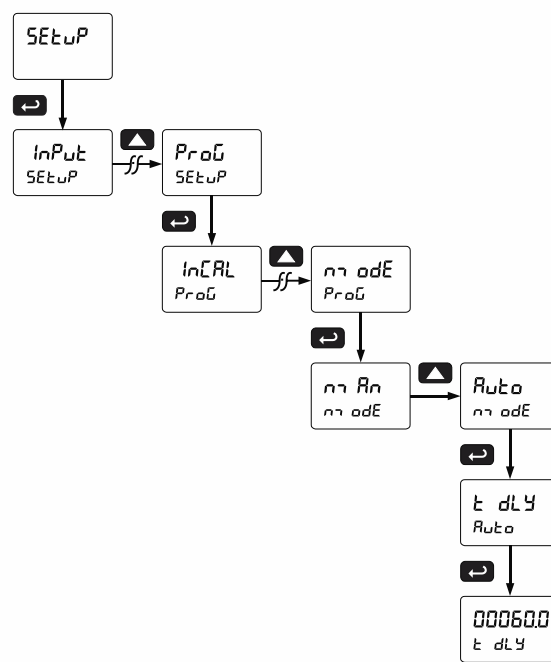
The time delay allows time for removing the full barrel and putting an empty barrel in place. Once the process starts, the operator does not have to press any buttons; except to pause or stop the batch process.

Automatic Batch Control Operation

1. 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.
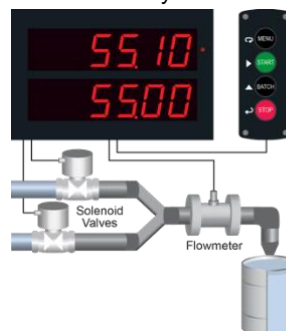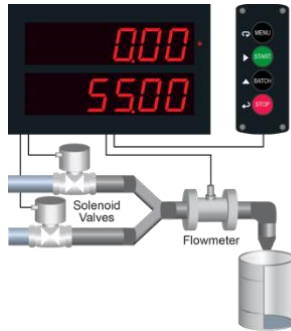

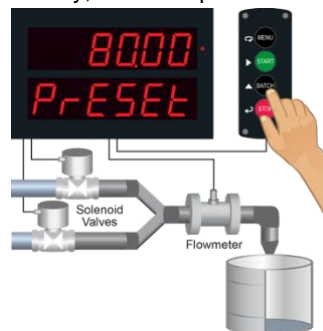2. The START button is pressed. Both valves open. The barrel begins to fill.
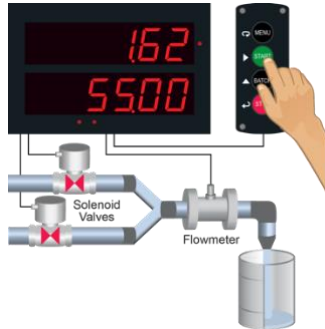
3. When the batch total reaches a value of 50.00 (Preset [55.00] – Pre-close [5.00]) the full-flow valve closes. The fill rate of the tank slows as a result.


4. 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.
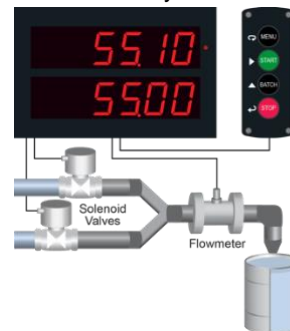
5. After the batch is completed, the operator removes the full barrel and places an empty barrel; the new batch starts automatically after 60 seconds (Time Delay).
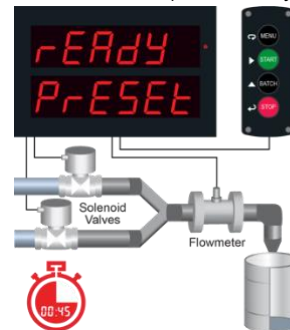
6. The new batch begins automatically after 60 seconds, both relays activate and both valves open.
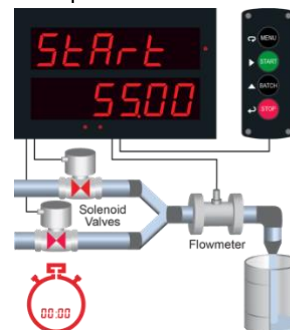
7. At the end of the shift, press STOP twice to stop the batch process.
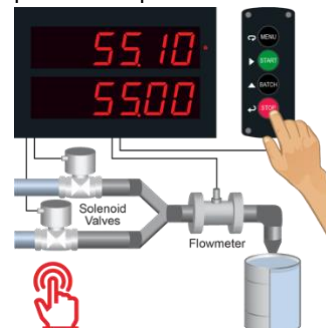
Setup with MeterView Pro

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.
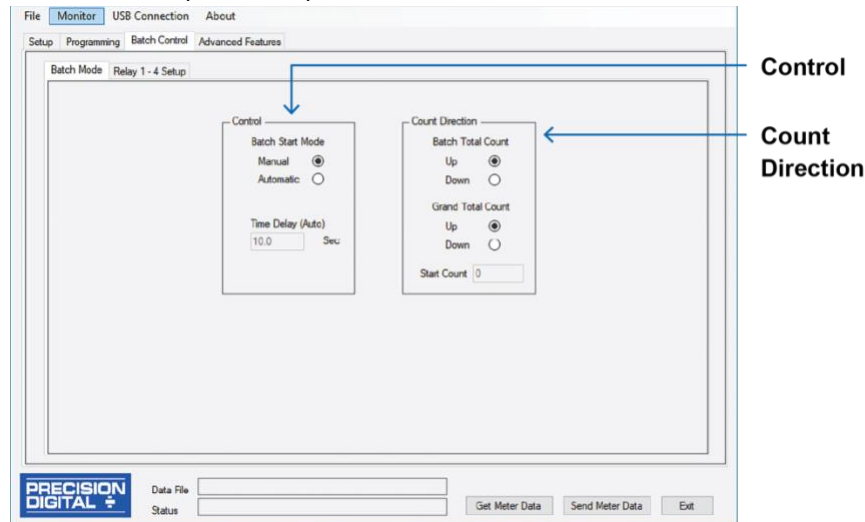
Control

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.
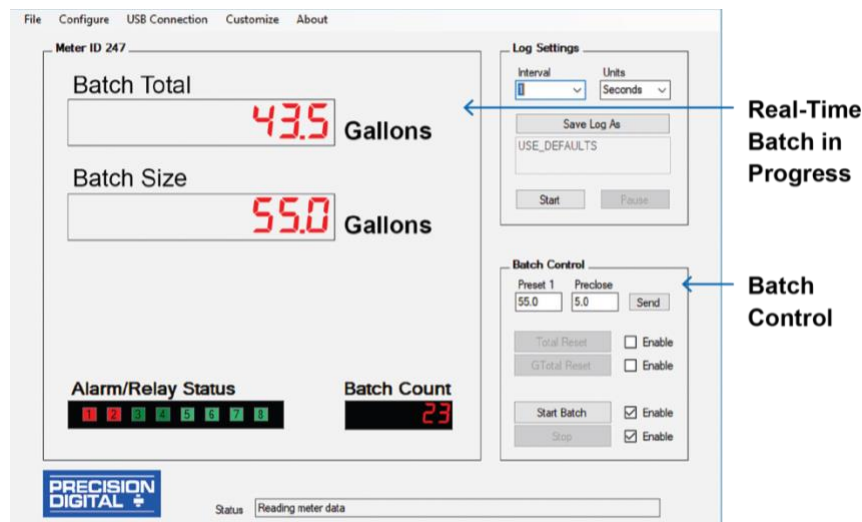
Real-Time Batch in Progress

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.
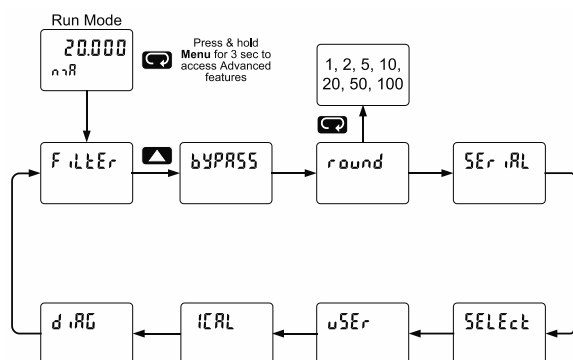
Advanced Features Menu & Display Messages

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
FiltEr	Filter	Set noise filter value
bYPASS	Bypass	Set filter bypass value
round	Round	Set the rounding value for display variables
SEriAL	Serial	Set serial communication parameters
SLAU id	Slave ID	Set slave ID or controller address
bAud	Baud rate	Select baud rate
tr dLY	Transmit delay	Set transmit delay for serial communication
PAr itY	Parity	Select parity Even, Odd, or None with 1 or 2 stop bits

Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
t-bYt	Time byte	Set byte-to-byte timeout
SELEct	Select	Enter the Select menu (function, cutoff, out)
Functn	Input Signal Conditioning	Select linear, square root, or programmable exponent
L inEAr	Linear	Set controller for linear function and select number of linearization points
no PtS	Number of points	Set controller for 2 to 32-point linearization
SquArE	Square root	Set controller for square root extraction
ProG E	Programmable exponent	Set controller for programmable exponent and enter exponent value
CutoFF	Cutoff	Set low-flow cutoff
Count	Count	Set the totals to count up or down from a set value
tot C	Total count	Set the batch to count up to or down from the preset
uP	Up	Set the total to count up
douun	Down	Set the total to count down
Gtot C	Grand total count	Set the grand total to count up or down from a defined value
C Strt	Count start	Set the starting grand total value when counting down
AoutPr	Analog output programming	Program analog output parameters
SourcE	Source	Select source for the 4-20 mA output
O-rAnG	Overrange	Program mA output for display overrange
u-rAnG	Underrange	Program mA output for display underrange
brEAK	Loop Break	Set analog output value if input loop break is detected
ForcE	Force output	Force analog output value for loop break
IGnorE	Ignore	Ignore loop break condition
nAX	Maximum	Program maximum mA output allowed
n in	Minimum	Program minimum mA output allowed
CAL ib	Calibrate	Calibrate 4-20 mA output (internal reference source used for scaling the output)
4 nA	4 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
20 nA	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
F1	*F1 function key*	Assign F1 function key
F2	*F2 function key*	Assign F2 function key
F3	*F3 function key*	Assign F3 function key
F4	*F4 function*	Assign F4 function (digital input)
di 1	*Digital input 1*	Assign digital input 1 – 4
dO 1	*Digital output 1*	Assign digital output 1 – 4
ICAL	*Internal source calibration*	Enter internal source calibration (used for scaling the controller without a signal source)
C CAL	*Current calibration*	Calibrate 4-20 mA current input (internal reference source used for scaling the input)
C Lo	*Current low*	Calibrate low current input (e.g. 4 mA)
C Hi	*Current high*	Calibrate high current input (e.g. 20 mA)
U CAL	*Voltage calibration*	Calibrate voltage input
U Lo	*Voltage low*	Calibrate low voltage input (e.g. 0 V)
U Hi	*Voltage high*	Calibrate high voltage input (e.g. 10 V)
d iAG	*Diagnostics*	Display parameter settings
LEd t	*LED test*	Test all LEDs
InFo	*Information*	Display software number and version
ErASE	*Erase*	Erase MeterView Pro software stored in controller's memory

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 (uSEr)* on page *53* for details. The following table shows the default setting for each of the function keys.

Function Key/Button	Default Setting	Action
F1/START	StArt	Start batch
F2/BATCH	PrESEt	Change preset
F3/STOP	StoP	Pause/stop batch
F4/Digital Input	SrtStP	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 *21* for details. The F4 is triggered with a contact closure to COM or with an active low signal. During operation, digital inputs operate according to the way they are programmed in the Advanced Features – User menu. See *Programmable Function Keys User Menu (uSEr)* on page *53* 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* (L ınEAr) on page *51* 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 Hı), Min (d Lo), or toggle between Max and Min (d HL) every 10 seconds.
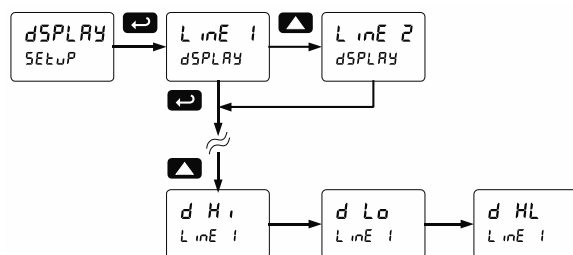
> ⚠️ **CAUTION**
> - Note that changing the default programming of the upper or lower displays may affect viewing the batch total (upper display) or preset (lower display) of the batch process.

Noise Filter (F ıLtEr)

The noise filter is available for unusually noisy signals that cause an unstable process variable display. The noise filter averages the input signal over a certain period. The filter level determines the length of time over which the signal is averaged. The filter level can be set between 2 and 199. The higher the filter level, the longer the averaging time and so the longer it takes the display to settle to its final value. Setting the filter level to zero disables the filter function.

Noise Filter Bypass (bYPASS)

The noise filter bypass changes the behavior of the controller so that small variations in the signal are filtered out but large abrupt changes in the input signal are displayed immediately. The bypass value determines the minimum amount of signal change to be displayed immediately. All signal changes smaller than the bypass value are filtered or averaged by the controller. The noise filter bypass may be set between 0.1 and 99.9% of full scale.

Rounding Feature (round)

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

Rounding causes the display to round to the nearest value according to the rounding selected.

Modbus RTU Serial Communications (SEr ıAL)

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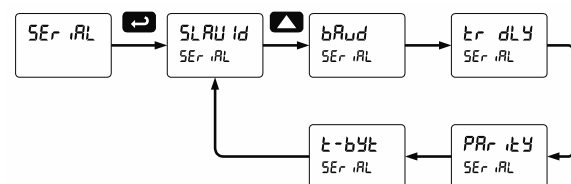
When using more than one controller in a multi-drop mode, each controller must be provided with its own unique address. The controller address (Slave ID) may be programmed between 1 and 247. The transmit delay may be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop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

Select Menu (SELEct)

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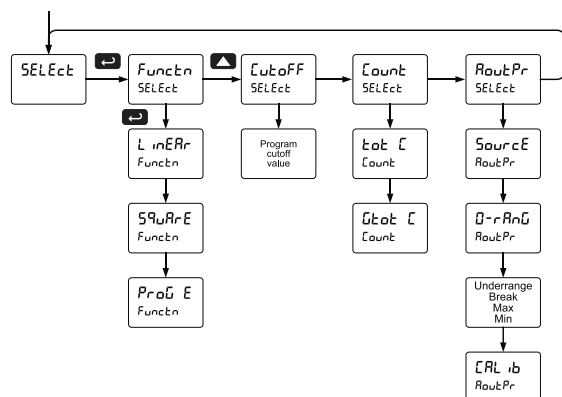
Input Signal Conditioning (Functn)

The *Function* menu is used to select the input signal conditioner applied to the input: linear, square root, or programmable exponent. 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.

Square Root Linearization (SquArE)

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

Programmable Exponent Linearization (ProG E)

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

Multi-Point Linearization (LinEAr)

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 such as those from level transmitters used to measure volume in odd-shaped tanks or to convert level to flow using weirs and flumes with complex exponent.
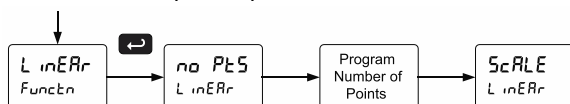
Low-Flow Cutoff (CutoFF)

The low-flow cutoff feature allows the controller to be programmed so that the often-unsteady output from a differential pressure transmitter, 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. Break: Analog output value when loop break is detected
5. Max: Maximum analog output value allowed regardless of input
6. Min: Minimum analog output value allowed regardless of input
7. Calibrate: Calibrate the internal 4-20 mA source reference used to scale the 4-20 mA output

Analog Output Source

The source for generating the 4-20 mA output may be assigned to the rate/process variable, total, grand total, maximum or minimum value reached by the rate/process, one of the set points, or the Modbus PV input.
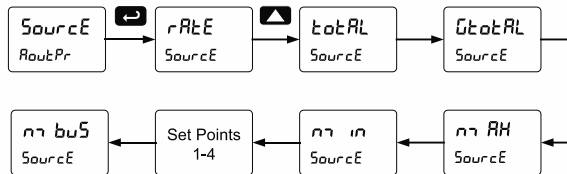
Analog Output Value for Loss of 4-20 mA Input (Loop Break)

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

Analog Output Calibration

To perform the analog output calibration, it's recommended to use a milliamp meter with a resolution of at least 0.1 µA 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 PD2-6210 4-20 mA output to a current loop that includes a power supply (internal or external 12 to 24 VDC), and the mA input on the digital meter. See *Figure 25. 4-20 mA Output Connections* on page *22* for details.
2. Turn on all devices. Allow for a 15 to 30 minute warm-up.
3. Go to the Advanced Features menu, and navigate to the Analog Output Programming (ᴿₒᵤₜₚᵣ)/Calibration (ᶜᴬᴸ ᵢᵦ) menu and press **Enter**.
4. The display will show ᵺ ₙᵢᴿ. The PD2-6210 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 ²ᵘ ₙᵢᴿ. The PD2-6210 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.). 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
StArt	Starts the batch process
StoP	Stops the batch process
SrtStP	Allows the same function key to both start and stop the batch process
rLY d	Disable all relays until a button assigned to *enable relays* (rLY E) is pressed
rLY E	Enable all relays to function as they have been programmed
O HoLd	Hold current relay states and analog output as they are until a button assigned to *enable relays* (rLY E) is pressed
d HoLd	Hold the current display value, relay states, and analog output momentarily while the function key or digital input is active. The process value will continue to be calculated in the background.
Ln1 Hi	Display maximum display value on line 1
Ln1 Lo	Display minimum display value on line 1
Ln1 HL	Display maximum & minimum display values on line 1
Ln2 Hi	Display maximum display value on line 2
Ln2 Lo	Display minimum display value on line 2
Ln2 HL	Display maximum & minimum display values on line 2
Ln2 Gt	Display the grand total on line 2
Ln2 bc	Display the batch count on line 2

Display	Description
Contrl	Directly access the manual control menu
diSAbL	Disable the selected function key or digital I/O
AcH	Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching
rESEt	Directly access the reset menu
rSt t	Reset the total
rSt Gt	Reset the grand total
rSt bc	Reset the batch count
rSt Hi	Reset the maximum display value
rSt Lo	Reset the minimum display value
rSt HL	Reset the maximum & minimum display values
rELAY	Directly access the relay menu
PrESEt	Change the preset value
SEt 2*	Directly access the set point menu for relay 2 (*through 4)
n7Enu	Mimic the menu button functionality (digital inputs only)
riGHt	Mimic the right arrow/F1 button functionality (digital inputs only)
uP	Mimic the up arrow/F2 button functionality (digital inputs only)
EntEr	Mimic the enter/F3 button functionality (digital inputs only)
F On 1*	Force relay 1 (*through 4) into the on state. This function is used in conjunction with a digital input to achieve interlock functionality. See *Setting Up the Interlock Relay (Force On) Feature* on page *40* for details about interlock relays.
ALn7 1*	Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)

Internal Source Calibration (ICAL)

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

The use of a calibrated signal source is necessary to calibrate the internal source of the controller. The controller's internal source is what allows the user to scale the controller without applying a signal.

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

Notes:

1. *If controller is in operation and it is intended to accept only one input type (e.g. 4-20 mA), recalibration of other input is not necessary.*

2. *Allow the controller to warm up for at least 15 minutes before performing the internal source calibration procedure.*

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

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

2. Press the Up arrow button to scroll to the *Internal calibration* menu (ICAL) and press Enter.

3. The controller displays either current calibration (C CAL) or voltage calibration (u CAL), according to the input setup. Press Enter to start the calibration process.

   Example of *Internal Calibration* for current input:

4. The controller displays *low* input current message (C Lo). Apply the low input signal and press Enter. The display flashes for a moment while the controller is accepting the low input signal.

5. After the display stops flashing, a number is displayed with the leftmost digit brighter than the rest. The bright digit is the active digit that can be changed by pressing the Up arrow button. Press the Right arrow button to move to the next digit.

6. Set the display value to correspond to the input signal being calibrated, typically 4.000 mA.

7. The display moves to the *high* input calibration (C Hi). Apply the high input signal and press Enter.

8. Set the display for the high input calibration, in the same way as it was set for the low input calibration, typically 20.000 mA.
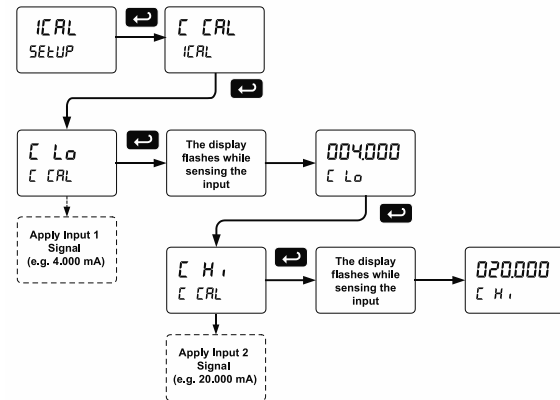
The graphic above shows the calibration of the current input. The voltage input is calibrated in a similar way.

Tips:

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

Error Message (Error)

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

After the error message is displayed, the 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:

5. Input signal is not connected to the proper terminals or it is connected backwards.

6. Wrong signal selection in *Setup* menu.

7. Minimum input span requirements not maintained.

8. Input 1 signal inadvertently applied to calibrate input 2.

Minimum Input Span

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

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

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 iAG)

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 iAG) and press Enter button.
2. Press Up arrow button and scroll to *LED Test* menu (LEd t)
3. Press the Enter button to activate the LED Test. The 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 (inFo) 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 iAG) and press Enter button.
2. Press Up arrow button and scroll to Information menu (InFo).
3. Press Enter to access the software number (SFt) and version (UEr) information. Write down the information as it is displayed. Continue pressing Enter until all the information is displayed.
4. The 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 iAG) menu
3. Press and hold Right arrow for three seconds, press Enter when display flashes rESEt.
    Note: If Enter is not pressed within three seconds, the display returns to the *Diagnostics* menu.
4. The controller goes through an initialization sequence (similar as on power-up) and loads the factory default settings.
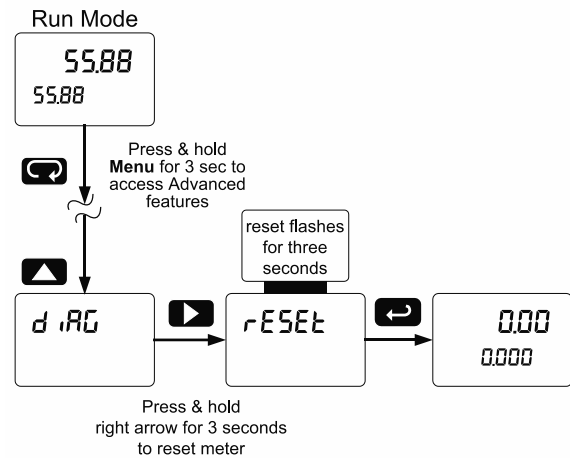
Factory Defaults & User Settings

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	InPut	4-20 mA
Total	YES	Total enabled
Units	un it5	Rate / total / G total mA / mA / mA
Rate decimal point	dddddd	3 Places
Total decimal point	dddddd	1 Place
Grand Total decimal point	dddddd	0 Places
Function	Functn	Linear
Number of points	no Pt5	2
Programming	ProG	Scale
Input 1	InP 1	4.000 mA
Display 1	di5 1	4.000
Input 2	InP 2	20.000 mA
Display 2	di5 2	20.000
Display line 1	LinE 1	Display batch total
Display line 2	LinE 2	Display preset
Display intensity	d-IntY	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	t CF	1.000
Grand total reset	t r5t	Manual
Relay 1 assignment	R5 iGn1	Total
Relay 2 assignment	R5 iGn2	Total
Relay 2 pre-close	PrECL5	No
Relay 3 assignment	R5 iGn3	Rate
Relay 4 assignment	R5 iGn4	Rate
Relay 1 action	Rct 1	Automatic
Batch preset	PrESEt	100.0
Relay 2 action	Rct 2	Automatic
Relay 2 set point	5Et 2	200.0
Relay 3 action	Rct 3	Automatic
Relay 3 set point	5Et 3	3.000
Relay 3 reset point	r5t 3	2.500
Relay 4 action	Rct 4	Automatic

Factory Defaults & User Settings

Parameter	Display	Default Setting
Relay 4 set point	5Et 4	4.000
Relay 4 reset point	r5t 4	3.500
Fail-safe relay 1	FL5 1	Off
Fail-safe relay 2	FL5 2	Off
Fail-safe relay 3	FL5 3	Off
Fail-safe relay 4	FL5 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
Loop break relay 1	iGnorE	Ignore
Loop break relay 2	iGnorE	Ignore
Loop break relay 3	iGnorE	Ignore
Loop break relay 4	iGnorE	Ignore
Display 1 analog out	di5 1	4.000
Output 1 value	Out 1	4.000 mA
Display 2 analog out	di5 2	20.000
Output 2 value	Out 2	20.000 mA
Source analog output	SourcE	Rate/process
Overrange output	O-rAnG	21.000 mA
Underrange output	u-rAnG	3.000 mA
Loop break output	brEAX	1.000 mA
Filter	FiltEr	70
Bypass	bYPR55	0.2
Cutoff value	CutoFF	0.0 (disabled)
Maximum output	mRX	23.000 mA
Minimum output	min	1.000 mA
Slave ID (Address)	5LRU id	247
Baud rate	bRud	9600
Transmit delay	tr dLY	50 ms
Parity	PRr itY	Even
Byte-to-byte timeout	t-bYt	010 (0.1 sec)
F1 function key	F 1	Start
F2 function key	F2	Preset

Factory Defaults & User Settings

Parameter	Display	Default Setting
F3 function key	F3	Stop
F4 function	F4	Start/Stop
Digital input 1	di 1	Menu
Digital input 2	di 2	Right arrow
Digital input 3	di 3	Up arrow
Digital input 4	di 4	Enter
Digital output 1-4	do 1	Alarm 1-4
Password 1	PASS 1	000000 (unlocked)
Password 2	PASS 2	000000 (unlocked)
Password 3	PASS 3	000000 (unlocked)
Total password	totAL	000000 (unlocked)
Grand total password	GtotAL	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, Locd 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	If a *Low-Flow Cutoff* Value has been programmed, the controller will display zero below that point, regardless of the input – which can appear like the controller is not responding to an input change. Check to make sure the problem is not being caused by an undesired low-flow cutoff value. To prevent the display from showing a negative value, set the low-flow cutoff to a value greater than zero.
Controller displays error message during calibration (Error)	Check: 1.　Signal connections 2.　Input selected in *Setup* menu 3.　Minimum input span requirements
Controller displays 999999 -99999	Check: 1.　Input selected in *Setup* menu 2.　Corresponding signal at Signal connector
Display is unstable	Check: 1.　Input signal stability and value 2.　Display scaling vs. input signal 3.　Filter and bypass values (increase)
Display response is too slow	Check filter and bypass values
Display reading is not accurate	1.　Input signal conditioner selected: Linear, square root, etc. 2.　Scaling or calibration
Display does not respond to input changes, reading a fixed number	Check: 　Display assignment, it might be displaying max, min, or set point.
Display alternates between 1.　Hi and a number 2.　Lo and a number	Press Menu to exit max/min display readings.
Relay operation is reversed	Check: 1.　Fail-safe in Setup menu 2.　Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1.　Relay action in *Setup* menu 2.　Set and reset points
Flashing relay status LEDs	Relays in manual control mode or relay interlock switches opened.
Controller not communicating with application programs	Check: 1.　Serial adapter and cable 2.　Serial settings 3.　Controller address and baud rate
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

Fax: (508) 655-8990

Email: support@predig.com

Sales Support

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

Fax: (508) 655-8990

Email: sales@predig.com

Place Orders

Email: orders@predig.com

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