MeterView Pro

USB Install

- 1/8 DIN Digital Batch Controllers with NEMA 4X, IP65 Front
- Pulse, Open Collector, NPN, PNP, TTL, Switch Contact, Sine Wave (Coil), Square Wave Inputs
- Dual-Line 6-Digit Display, 0.6" (15 mm) & 0.46" (12 mm)
- Isolated 5, 10 or 24 VDC Flowmeter Power Supply
- 2 or 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Options
- Free PC-Based, On-Board, MeterView Pro USB Programming Software
- No Assembly Required
- K-Factor, Internal Scaling, or External Calibration
- Start / Pause / Stop, Change Batch with Front Panel Buttons
- Display Batch Total, Rate, Grand Total, Count or Preset
- Single or Multi-Stage Batch Control (Up to 8 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
- Optional SunBright Display Models for Outdoor Applications
- Operating Temperature Range: -40 to 65°C (-40 to 149°F)
- UL & C-UL Listed. E160849; 508 Industrial Control Equipment
- Input Power Options: 85-265 VAC / 90-265 VDC or 12-24 VDC / 12-24 VAC
- Programmable Display, Function Keys & Digital Input
- Light / Horn & Button Accessories
- Control Station Accessory for Remote Operation
- 3-Year Warranty

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Disclaimer

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⚠ **CAUTION**

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

⚠ **WARNINGS**

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

⚠ **WARNING**
Cancer and Reproductive Harm - www.P65Warnings.ca.gov

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 PROVU 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 PROVU 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 front panel buttons and the instructions in this manual to do so.

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Introduction

The PROVU PD6310 is an easy-to-use batch controller ideal for simplifying independent batch control operations where local control is preferred to expensive and expansive plant operation systems. Its superluminous LED digits make it easily readable in smoke, dust, fog, and, with the optional SunBright display, even direct sunlight.

The controller comes programmed for easy front panel start, pause, stop, and batch size (preset) changes. Display line 2 can be programmed to display rate, grand total, batch count, or preset by cycling the Stop (F3) button. A digital input is standard.

Single and multi-stage batching is possible with up to four (4) on-board relays and four (4) external relays with the external relay module. Each pre-close relay may have a unique pre-close 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 1% of the programmed preset value.

At least two SPDT relays are included for use in batch control or rate alarms.

The batch controller also shares all common PROVU Series features, including an isolated 24 VDC transmitter power supply and Modbus RTU Serial communications.

Ordering Information

Standard Models

85-265 VAC Model	12-24 VDC Model	Options Installed
PD6310-6R2	PD6310-7R2	2 relays
PD6310-6R4	PD6310-7R4	4 relays
PD6310-6R5	PD6310-7R5	2 relays & 4-20 mA output
PD6310-6R7	PD6310-7R7	4 relays & 4-20 mA output

SunBright Display Models

85-265 VAC Model	12-24 VDC Model	Options Installed
PD6310-6H2	PD6310-7H2	2 relays
PD6310-6H4	PD6310-7H4	4 relays
PD6310-6H5	PD6310-7H5	2 relays & 4-20 mA output
PD6310-6H7	PD6310-7H7	4 relays & 4-20 mA output

Accessories

Model	Description
PDA1002	DIN rail mounting kit for two devices
PDA1004	4 SPST (Form A) relays module
PDA1044	4 digital inputs & 4 digital outputs module
PDA1232	RS-232 serial adapter
PDA1485	RS-485 serial adapter
PDA7485-I	RS-232 to RS-485 isolated converter
PDA8008	USB Adapter
PDA8232-N	USB to RS-232 non-isolated converter
PDA8485-I	USB to RS-485 isolated converter
PDA-LH	Light / horn accessory
MOD-LH	Light / horn / enclosure modification
PDA2360	Plastic control stations series
PD659	Signal isolators, splitters, & conditioners
PD9501	Multi-function calibrator
PDX6901	Snubber: 0.01 µF/470 Ω, 250 VAC

Enclosures

Series	Meters	Material
PDA2300	1-10	Plastic NEMA 4X
PDA2500	1-6	Plastic NEMA 4X
PDA2600	1-6	Stainless Steel NEMA 4X
PDA2700	1-6	Painted Steel NEMA 4
PDA2800	1-2	Plastic NEMA 4X
PDA3400	1-3	Plastic NEMA 4X

Need help selecting the right enclosure?
Go to www.predig.com/esu

Replacement Option Cards

Model	Options Installed
PD1102	2 relays
PD1103	4-20 mA output
PD1104	4 relays
PD1105	2 relays & 4-20 mA output
PD1107	4 relays & 4-20 mA output

Light / Horn Accessories
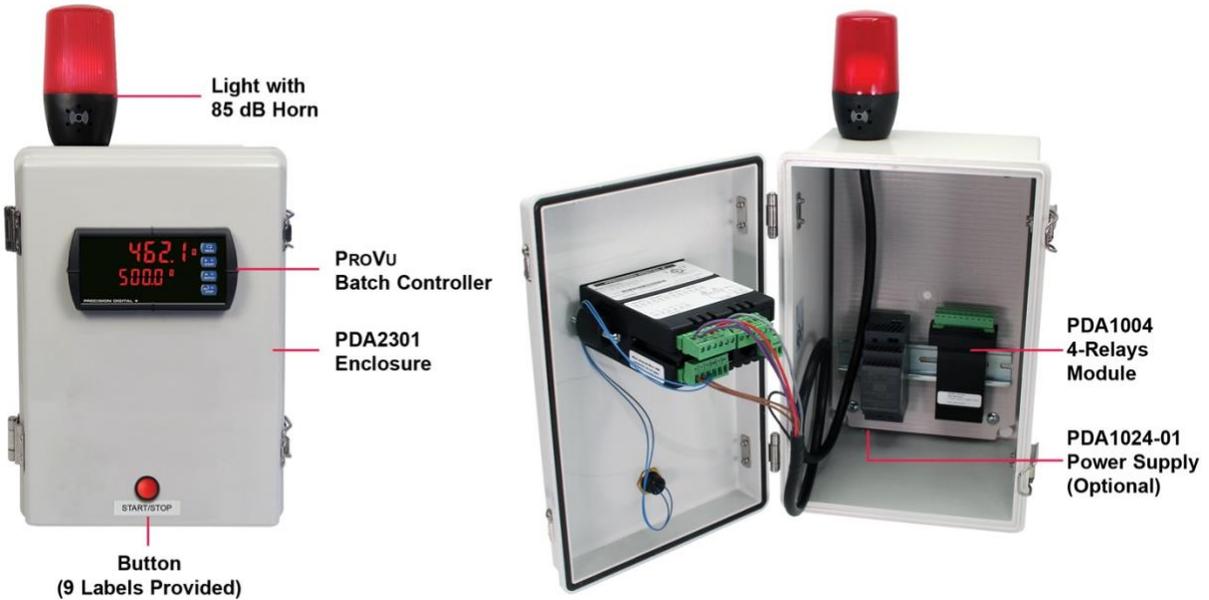
PʀOVU Meter Shown in a PDA2301 Enclosure with MOD-LHRB1 Red Light / Horn and Button. Controller & Enclosure Sold Separately. Assembly Required.

MOD-LH

Model	Description
MOD-LHRB1	Red Light / Horn and Button with Holes Drilled in Enclosure[1]
MOD-LHGB1	Green Light / Horn and Button with Holes Drilled in Enclosure[1]
MOD-LHYB1	Yellow Light / Horn and Button with Holes Drilled in Enclosure[1]
MOD-LHBB1	Blue Light / Horn and Button with Holes Drilled in Enclosure[1]
MOD-LHWB1	White Light / Horn and Button with Holes Drilled in Enclosure[1]
MOD-LH5CB1	Light / Horn with User Choice of Red, Green, Yellow, Blue or White Light, Button, and Holes Drilled in Enclosure[1]

Note:

1. This MOD supplies the Light / Horn and Button. The enclosure comes pre-drilled with holes for Light / Horn and Button and the user performs the installation and wiring. Meter and enclosure are sold separately. The Light / Horn hole is in the back left corner of the enclosure and the Button is centered on the cover of the enclosure below the meter about an inch off the bottom of the cover except on the PDA3400 series where it is mounted on the side of the enclosure.

PDA-LH & PDA-BUTTON

Model	Description
PDA-LHR	Red Light / Horn
PDA-LHG	Green Light / Horn
PDA-LHY	Yellow Light / Horn
PDA-LHB	Blue Light / Horn
PDA-LHW	White Light / Horn
PDA-LHW	White Light / Horn
PDA-LH5C	Light / Horn with User Choice of Red, Green, Yellow, Blue or White Light
PDA-BUTTON1R	Red Button
PDA-BUTTON1G	Green Button
PDA-BUTTON1B	Blue Button

PDA2364 Control Station

Model	Description
PDA2364-MSBS	Menu, Start, Batch, and Stop Buttons

Note: Note: Control stations with one button may be connected directly to the meter via the F4 terminal. A PDA1044 (4) digital inputs & (4) digital outputs module is required to operate the control stations of more than one button. See *Remote Batch Control* on page *20* for details.

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

Helpful Videos

Precision Digital's PROVU Series is a powerful line of 1/8 DIN meters that boasts advanced functionality for various applications. The following videos might be of interest.

PROVU Batch Controllers
These provide simple batch control with features like preclose relays and automatic overrun correction.

https://www.predig.com/videos/KN6Y6R0I1OE
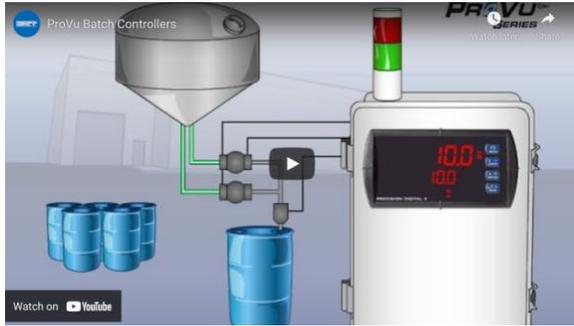
PROVU Function Keys Tutorial
Learn how the PROVU's function keys increase the utility of the PROVU.

https://www.predig.com/videos/WMBYKlavW-Q

Connect a PROVU to a PC Using MeterView Pro
Learn how easy it is to use MeterView Pro software.

https://www.predig.com/videos/PC_Connect

Connect a 2-Wire 4-20 mA Transmitter to a PROVU
Learn how to connect your transmitter to a PROVU.

https://www.predig.com/videos/4-20_mA_Connections

MeterView Pro USB Programming Software
Learn how easy it is to program a PROVU PD6000 process meter.

https://www.predig.com/videos/MVPro_SW

ProtEX-MAX Explosion-Proof Family
The ProtEX-MAX Series has been designed to offer the functions and features of any ProVu in a great looking explosion-proof housing.

https://www.predig.com/videos/ProtEXMAX_Overview

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Specifications

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

General

Display	Line 1: 0.6" (15 mm) high, red LEDs Line 2: 0.46" (12 mm) high, red LEDs 6 digits: each (-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 *Front Panel Buttons and Status LED Indicators* on page *21* 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 front panel buttons, digital inputs, or PC and MeterView Pro software.
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.

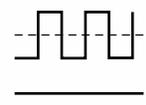|	
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 controllers may share one 5 A fuse
Normal Mode Rejection	Greater than 60 dB at 50/60 Hz
Isolation	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category 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

Connections	Removable screw terminal blocks accept 12 to 22 AWG wire, RJ45 for external relays, digital I/O, and serial communication adapters.
Enclosure	1/8 DIN, high impact plastic, UL 94V-0, color: black
Front Panel	NEMA 4X, IP65
Mounting	1/8 DIN panel cutout required: 3.622" x 1.772" (92 mm x 45 mm) Two panel mounting bracket assemblies are provided.
Tightening Torque	Screw terminal connectors: 5 lb-in (0.56 Nm)
Overall Dimensions	4.68" x 2.45" x 5.64" (119 mm x 62 mm x 143 mm) (W x H x D)
Weight	9.5 oz (269 g)
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.
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 at the rear of the controller. 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 seven, 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.

Pulse Input

Inputs	Field selectable: Pulse or square wave 0-5 V, 0-12 V, or 0-24 V @ 30 kHz; TTL; open collector 4.7 kΩ pull-up to 5 V @ 30 kHz; NPN or PNP transistor, switch contact 4.7 kΩ pull-up to 5 V @ 40 Hz; Modbus PV (Slave)
Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ±10%. All models selectable for 24, 10, or 5 VDC supply (internal jumper J4). 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 4. Flowmeter Supply Voltage Selection* on page *17*. When the Light / Horn is powered by the transmitter power supply, see MOD-LH Light / Horn's transmitter power supply specification in MOD-LH manual for additional details. Light / Horn power not available for 5 or 10 VDC supplies.
Low Voltage Mag Pickup (Isolated)	Sensitivity: 40 mVp-p to 8 Vp-p
Minimum Input Frequency	0.001 Hz Minimum frequency is dependent on high gate setting.
Maximum Input Frequency	30,000 Hz (10,000 for low voltage mag pickup)
Input Impedance	Pulse input: Greater than 300 kΩ @ 1 kHz. Open collector/switch input: 4.7 kΩ pull-up to 5 V.

Input Threshold

	Low	High
	1.6 V	3.3 V

3.3 V
1.6 V
0 V

Accuracy	±0.03% of calibrated span ±1 count
Temperature Drift	Rate display is not affected by changes in temperature.
Multi-Point Linearization	2 to 32 points
Low-Flow Cutoff	0.1 to 999,999 (0 disables cutoff function). Point below at which display always shows zero.
Decimal Point	Up to five decimal places or none: *d.ddddd*, *dd.ddd*, *ddd.dd*, *dddd.d*, *ddddd*, or *dddddd*
Calibration	May be calibrated using K-factor, internal calibration, or by applying an external calibration signal.
K-Factor	Field programmable K-factor converts input pulses to rate in engineering units. May be programmed from 0.00001 to 999,999 pulses/unit.
Calibration Range	Input 1 signal may be set anywhere in the range of the controller; input 2 signal may be set anywhere above or below input 1 setting. Minimum input span between any two inputs is 10 Hz. An error message will appear if the input 1 and input 2 signals are too close together.
Filter	Programmable contact de-bounce filter: 40 to 999 Hz maximum input frequency allowed with low speed filter.
Gate	Low gate: 0.1-99.9 seconds High gate: 2.0-999.9 seconds

Relays

Rating	2 or 4 SPDT (Form C) internal and/or 4 SPST (Form A) external; rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads; see *Switching Inductive Loads* on page *19* 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 front panel buttons, F4 terminal at back of controller, 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]
Additional Relays	An external module, model PDA1004, is available to add 4 SPST 3 A relays to the controller.

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

Isolated 4-20 mA Transmitter Output

Output Source	Rate/process, total, grand total, max, min, set points 1-8, 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

USB Connection

Function	Programming only
Compatibility	USB 2.0 Standard, Compliant
Connector Type	Micro-B receptacle
Cable	USB A Male to Micro-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.

On-Board 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 *50* 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
Additional I/O	Up to 2 external modules, model PDA1044 with 4 digital inputs and 4 digital outputs each can be added.

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 PROVU Modbus Register Tables located at www.predig.com for details.

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 Micro USB B) RS-232 adapter, RS-485 adapter and 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
UL File Number	E160849
Front Panel	UL Type 4X, NEMA 4X, IP65; panel gasket provided
Low Voltage Directive	EN 61010-1 Safety requirements for measurement, control, and laboratory use

Electromagnetic Compatibility

Emissions	EN 55022 Class A ITE emissions requirements
Radiated Emissions	Class A
AC Mains Conducted Emissions	Class A
Immunity	EN 61326-1 Measurement, control, and laboratory equipment EN 61000-6-2 EMC heavy industrial generic immunity standard
RFI - Amplitude Modulated	80 -1000 MHz 10 V/m 80% AM (1 kHz) 1.4 - 2.0 GHz 3 V/m 80% AM (1 kHz) 2.0 - 2.7 GHz 1 V/m 80% AM (1 kHz)
Electrical Fast Transients	±2kV AC mains, ±1kV other
Electrostatic Discharge	±4kV contact, ±8kV air
RFI - Conducted	10V, 0.15-80 MHz, 1kHz 80% AM
AC Surge	±2kV Common, ±1kV Differential
Surge	1KV (CM)
Power-Frequency Magnetic Field	30 A/m 70%V for 0.5 period
Voltage Dips	40%V for 5 & 50 periods 70%V for 25 periods
Voltage Interruptions	<5%V for 250 periods

Note:

Testing was conducted on controllers installed through the covers of grounded metal enclosures with cable shields grounded at the point of entry representing installations designed to optimize EMC performance.

EU Declaration of Conformity

EU Declaration of Conformity is available in the Documentation CD provided with the product under the EU DoC menu.

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 remove the controller from its case to complete the installation, wiring, and setup of the controller for most applications. Instructions are provided for changing the Flowmeter power supply to output 5 or 10 VDC instead of 24 VDC. See *Figure 4. Flowmeter 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.

Panel Mounting Instructions

- Prepare a standard 1/8 DIN panel cutout – 3.622" x 1.772" (92 mm x 45 mm). Refer to *Figure 1. 1/8 DIN Panel Cutout* and Mounting below for more details.
- Clearance: allow at least 6.0" (152 mm) behind the panel for wiring.
- Panel thickness: 0.04" - 0.25" (1.0 mm - 6.4 mm). Recommended minimum panel thickness to maintain Type 4X rating: 0.06" (1.5 mm) steel panel, 0.16" (4.1 mm) plastic panel.
- Remove the two mounting brackets provided with the controller (back-off the two screws so that there is ¼" (6.4 mm) or less through the bracket. Slide the bracket toward the front of the case and remove).
- Insert controller into the panel cutout.
- Install mounting brackets and tighten the screws against the panel. To achieve a proper seal, tighten the mounting bracket screws evenly until controller is snug to the panel along its short side. DO NOT OVER TIGHTEN, as the rear of the panel may be damaged.

A 3.622" (92 mm)
B 1.772" (45mm)

Square Corners to 0.060" (1.5mm) Max Radius

Panel Cutout to DIN 43700

Tolerances:
A: +0.032 (+0.8mm)
     -0.000 (-0.0mm)
B: +0.024 (+0.6mm)
     -0.000 (-0.0mm)
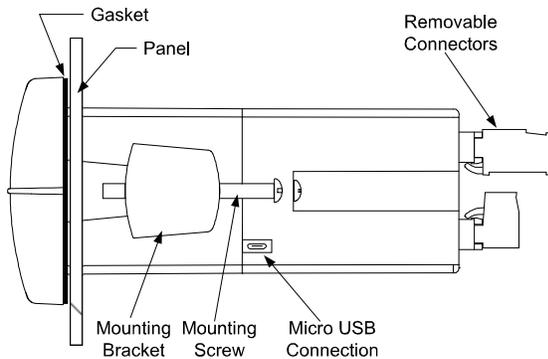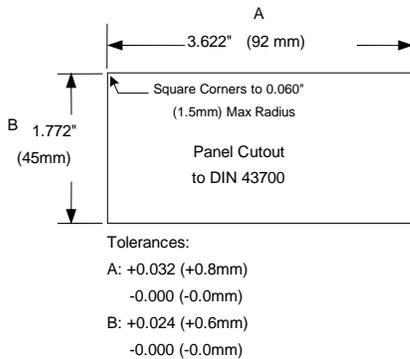
DO NOT apply AC or DC power to the controller when using the USB connection.

Figure 1. 1/8 DIN Panel Cutout and Mounting

Mounting Dimensions
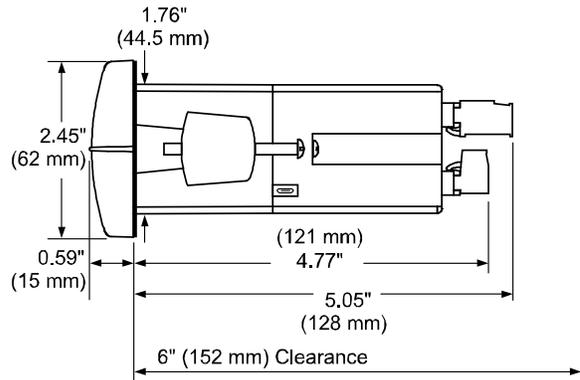
Figure 2. Controller Dimensions - Side View
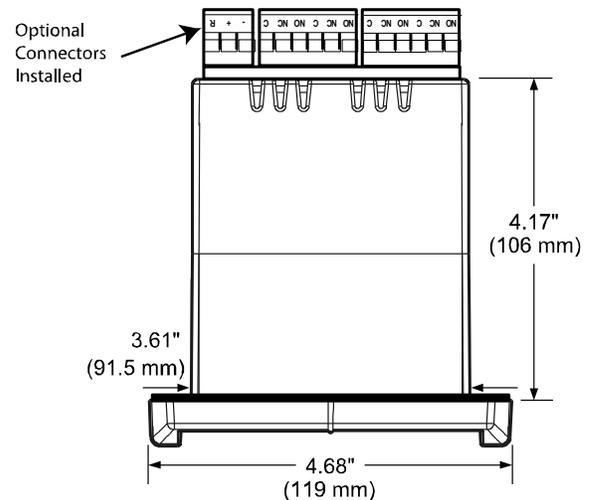
Figure 3. Controller Dimensions - Top View

Download free 3-D CAD files of these instruments to simplify your drawings!
predig.com/documentation-cad

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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 front panel buttons.

MeterView Pro Software

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

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

2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."
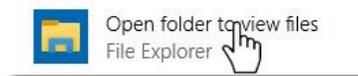
If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."
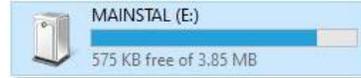
3. Double-click on the file named "MAStart." The program will open a few windows and install two programs on your computer. Simply follow the on-screen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."
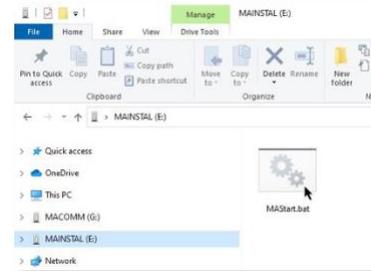
4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your controller.
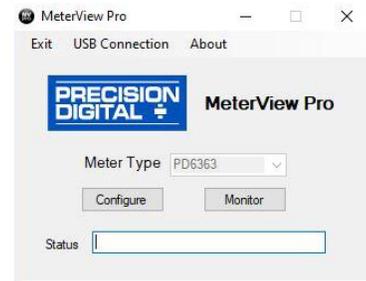
> **Note:** If you decide to update your MeterView Pro software, once the installation has completed, you will be asked if you want to update the setup files located on the controller itself. This way, you will always have the most current version on the controller for future installs.

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

Flowmeter Supply Voltage Selection (P+, P-)

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

If the transmitter requires 5 or 10 VDC excitation, the internal jumper J4 must be configured accordingly.

To access the voltage selection jumper:

1. Remove all the connectors.
2. Unscrew the back cover.
3. Slide the back cover about 1 inch.
4. Configure the J4 jumper, located behind the input signal connector, for the desired excitation voltage as shown.
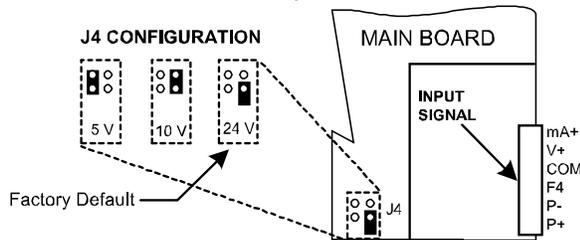
Figure 4. Flowmeter Supply Voltage Selection

Connections

All connections are made to removable screw terminal connectors located at the rear of the controller.

⚠ 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 controller, shows the location of all connectors available with requested configuration.

Note: ## on the following figures refers to power and display options. (Example: PD6310-6H5)
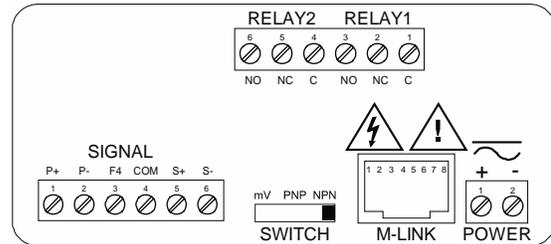
Figure 5. PD6310-##2 Connectors Label
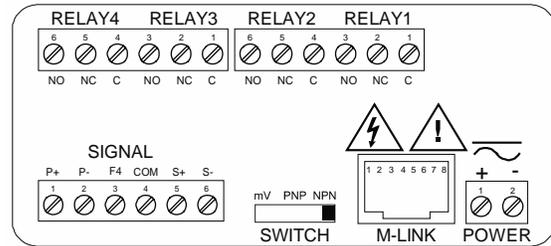
Figure 6. PD6310-##4 Connectors Label
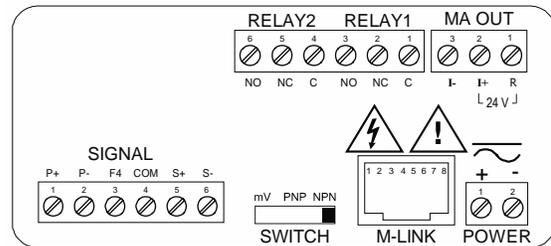
Figure 7. PD6310-##5 Connectors Label
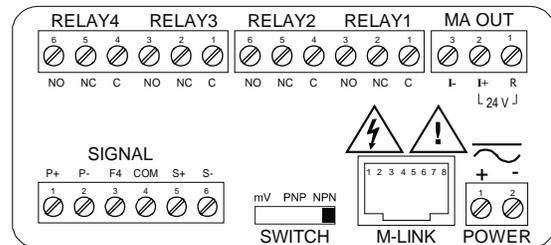
Figure 8. PD6310-##7 Connectors Label

⚠ WARNING

- **DO NOT** connect any equipment other than Precision Digital's expansion modules, cables, or controllers to the RJ45 M LINK connector. Otherwise damage will occur to the equipment and the controller.

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.
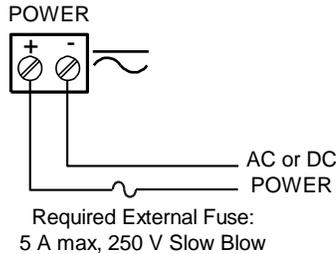
Figure 9. Power Connections

Pulse Signal Connections

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

The following figures show examples of signal connections.

Setup and programming is performed through the front panel buttons.
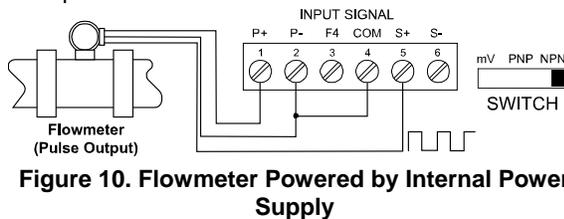
Figure 10. Flowmeter Powered by Internal Power Supply
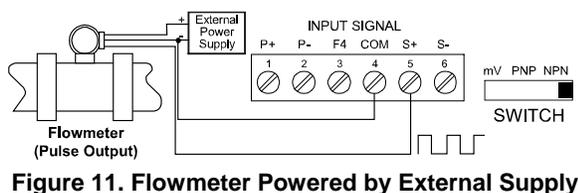
Figure 11. Flowmeter Powered by External Supply
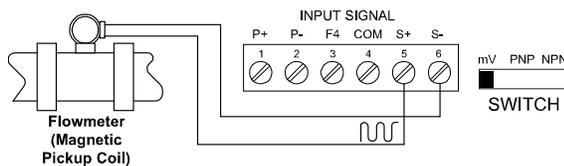
Figure 12. Self-Powered Magnetic Pickup Coil Flowmeter
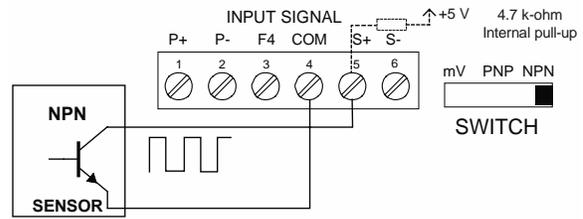
Figure 13. NPN open Collector Input
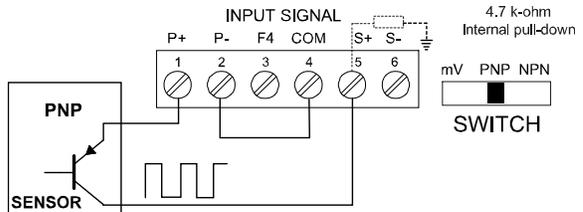
Figure 14. PNP Sensor Powered by Internal Supply
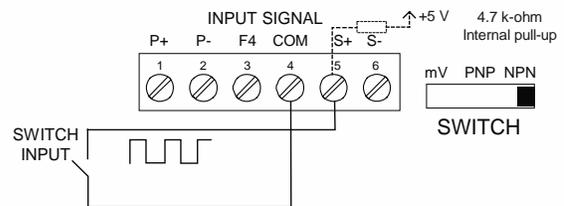
Figure 15. Switch Input Connections

Modbus RTU Serial Communications

Serial communications connection is made to an RJ45 connector labeled M-LINK. Use the PDA1232 for RS-232 interfacing, or the PDA1485 for RS-485 interfacing. The same port is used for interfacing with all expansion modules (*e.g.* external relays, digital I/O).

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.
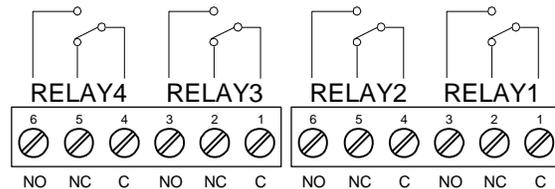
Figure 16. Relay Connections

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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:
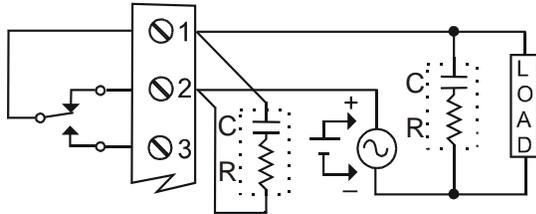
Figure 17. AC and DC Loads Protection

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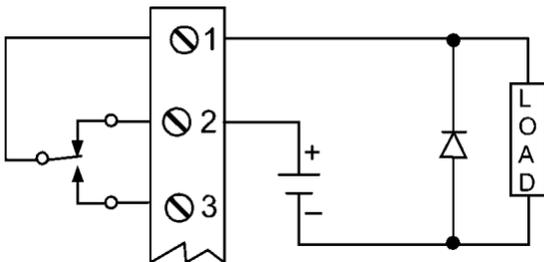
Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 18. 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.

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 *50* for a complete list of capabilities.
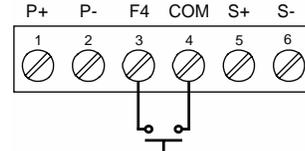
Figure 19. F4 Digital Input Connections

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.
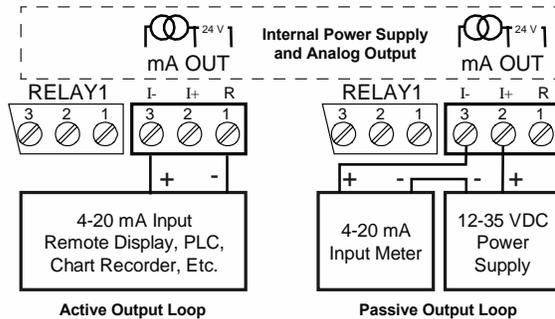
Figure 20. 4-20 mA Output Connections

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.
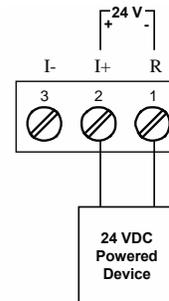
Figure 21. Analog Output Supply Powering Other Devices

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External Relay & Digital I/O Connections

The relay and the digital I/O expansion modules PDA1004 & PDA1044 are connected to the meter using a CAT5 cable provided with each module. The two RJ45 connectors on the expansion modules are identical and interchangeable; they are used to connect additional modules to the system.
Note: The jumper located between the RJ45 connectors of the PDA1044 must be removed on the second digital I/O module in order for the system to recognize it as module #2.

⚠ WARNING

- **DO NOT** connect or disconnect the expansion modules with the power on! More detailed instructions are provided with each optional expansion module.

Figure 22. Expansion Module & DIN Rail Mounting Kit
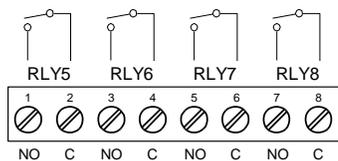
Figure 23. External Relays Module Connections
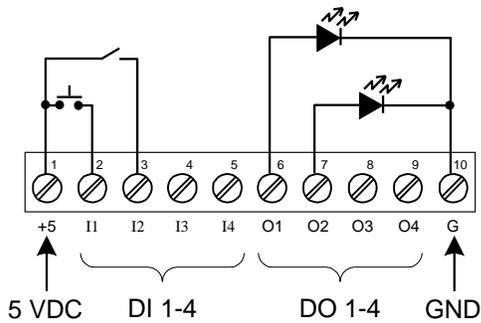
Figure 24. Digital I/O Module Connections

Remote Batch Control Connections

The batch controller can be operated via the front panel push buttons or a remote control station using the PDA1044 Digital I/O module as illustrated in *Figure 25. Controller to Control Station Connection.*

Figure 25. Controller to 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 *38*.

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.
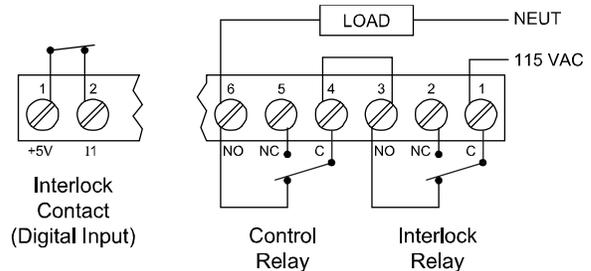
Figure 26. Interlock Connection

Setup & Programming

> There is **no need to recalibrate** the controller when first received from the factory.
>
> The controller is **factory calibrated** prior to shipment for frequency in Hz (pulses/sec) with calibration equipment that is certified to NIST standards.

Overview

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

Jumper J4 located inside the controller, behind the input signal connector, is used to select the excitation voltage (24 V [*Default Setting*], 10 V or 5 V) which is supplied to the P+ and P- wiring terminals.

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

Front Panel Buttons and Status LED Indicators

Button Symbol	Description
MENU	Menu
F1 START	START (Right arrow/F1)
F2 BATCH	BATCH (Up arrow/F2)
F3 STOP	STOP (Enter/F3)

LED	State	Indication
1-8	Steady	Alarm condition based on set and reset points, independent of relay status in certain configurations. (Available on all meter configurations, including those without relays installed)
1-8	Flashing	Relay interlock switch open
1-8 & 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 ouput in manual control mode

Programming

- 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 press or hold 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.

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**
5EtuP	*Setup*	Enter *Setup* menu
InPut	*Input*	Enter *Input* selection menu
totRL	*Total*	Enable or disable totalizer features
un it5	*Units*	Select the display units/tags
rRtE	*Rate*	Select the display units for rate
totRL	*Total*	Select the display units for total
GtotRL	*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
InCRL	*Input Calibration*	Enter the *Input Calibration* menu
FRctor	*K-factor Scaling*	Programs unit to convert input pulse to rate in engineering units
5CRLE	*Scale*	Enter the *Scale* menu
CRL	*Calibrate*	Enter the *Calibrate* menu
InP 1	*Input 1*	Calibrate input 1 signal or program input 1 value
d i5 1	*Display 1*	Program display 1 value
InP 2	*Input 2*	Calibrate input 2 signal or program input 2 value (up to 32 points)
d i5 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.
nodE	*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 r5t	*Grand total reset*	Program grand total reset mode: auto or manual
dSPLRY	*Display*	Enter the *Display* menu
L inE 1	*Display Line 1*	Press Enter to assign the Upper display parameter (default: PV or rate)
L inE 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
rELRY	*Relay*	Enter the *Relay* menu
RSS iGn	*Assignment*	Assign relays to rate, total (batch control), grand total, or Modbus controlled.
RS iGn 1	*Assign 1*	Relay 1-2 assignment
totRL	*Total*	Assign relay to batch control
GtotRL	*Grand total*	Assign relay to grand total
nrbuS	*Modbus*	Assign relay to Modbus input
rRtE	*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
Rct 1	*Action 1*	Set relay 1 action[1]
Ruto	*Automatic*	Set relay for automatic reset
R-nrRn	*Auto-manual*[1]	Set relay for automatic & manual reset any time[1] (relays assigned to rate)
LRtcH	*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]
RLtErn	*Alternate*	Not applicable to batch controller
5RnrPL	*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

Display Functions and Messages		
Display	**Parameter**	**Action/Setting Description**
r5t 1	*Reset 1*	Program reset point 1
rLY 2	*Relay 2*	Relays 2-8 setup. Relays 5-8 are shown, only if expansion relay module is installed.
FA 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
dELAY	*Delay*	Enter relay *Time Delay* menu
dLY 1	*Delay 1*	Enter relay 1 time delay setup
On 1	*On*	Set relay 1 On time delay
OFF 1	*Off*	Set relay 1 Off time delay
Aout	*Analog output*	Enter the *Analog output* scaling menu
d i5 1	*Display 1*	Program display 1 value
Out 1	*Output 1*	Program output 1 value (e.g. 4.000 mA)
d i5 2	*Display 2*	Program display 2 value
Out 2	*Output 2*	Program output 2 value (e.g. 20.000 mA)
rE5Et	*Reset*	Press Enter to access the *Reset* menu
r5t H i	*Reset high*	Press Enter to reset max display
r5t Lo	*Reset low*	Press Enter to reset min display
r5t HL	*Reset high & low*	Press Enter to reset max & min displays
r5t t	*Reset total*	Press Enter to reset total
r5t Gt	*Reset grand total*	Press Enter to reset grand total
r5t bc	*Reset batch count*	Press Enter to reset batch count
Contrl	*Control*	Enter Manual Control menu
Auto	*Automatic*	Press Enter to set controller for automatic operation
n ⁊An	*Manual*	Press Enter to manually control relays or analog output operation
PASS	*Password*	Enter the *Password* menu
PASS 1	*Password 1*	Set or enter Password 1
PASS 2	*Password 2*	Set or enter Password 2
PASS 3	*Password 3*	Set or enter Password 3
totAL	*Total password*	Set or enter password for manual reset

Display Functions and Messages		
Display	**Parameter**	**Action/Setting Description**
GtotAL	*Grand total password*	Set or enter password for manual reset
nonr5t	*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.*

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.

24
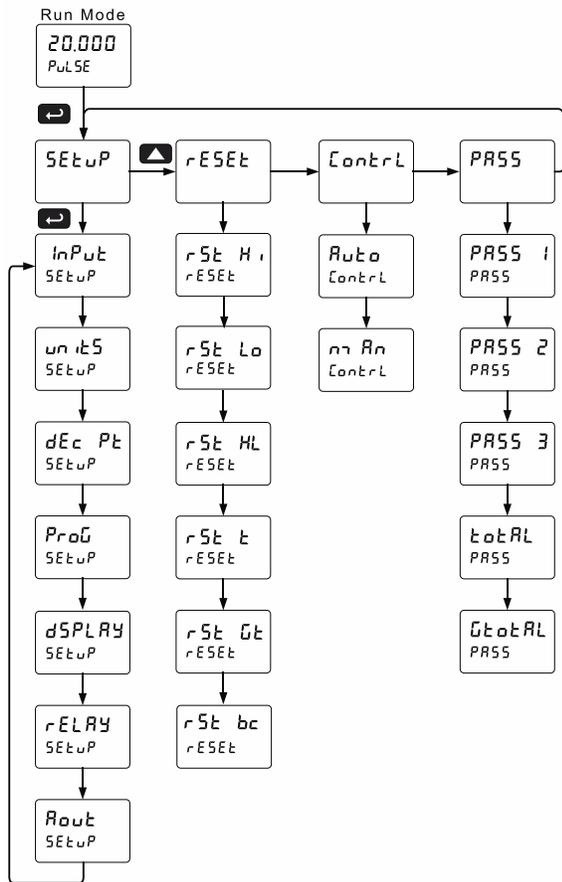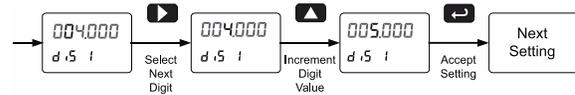
Setting Up the Batch Controller (5EtuP)

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.
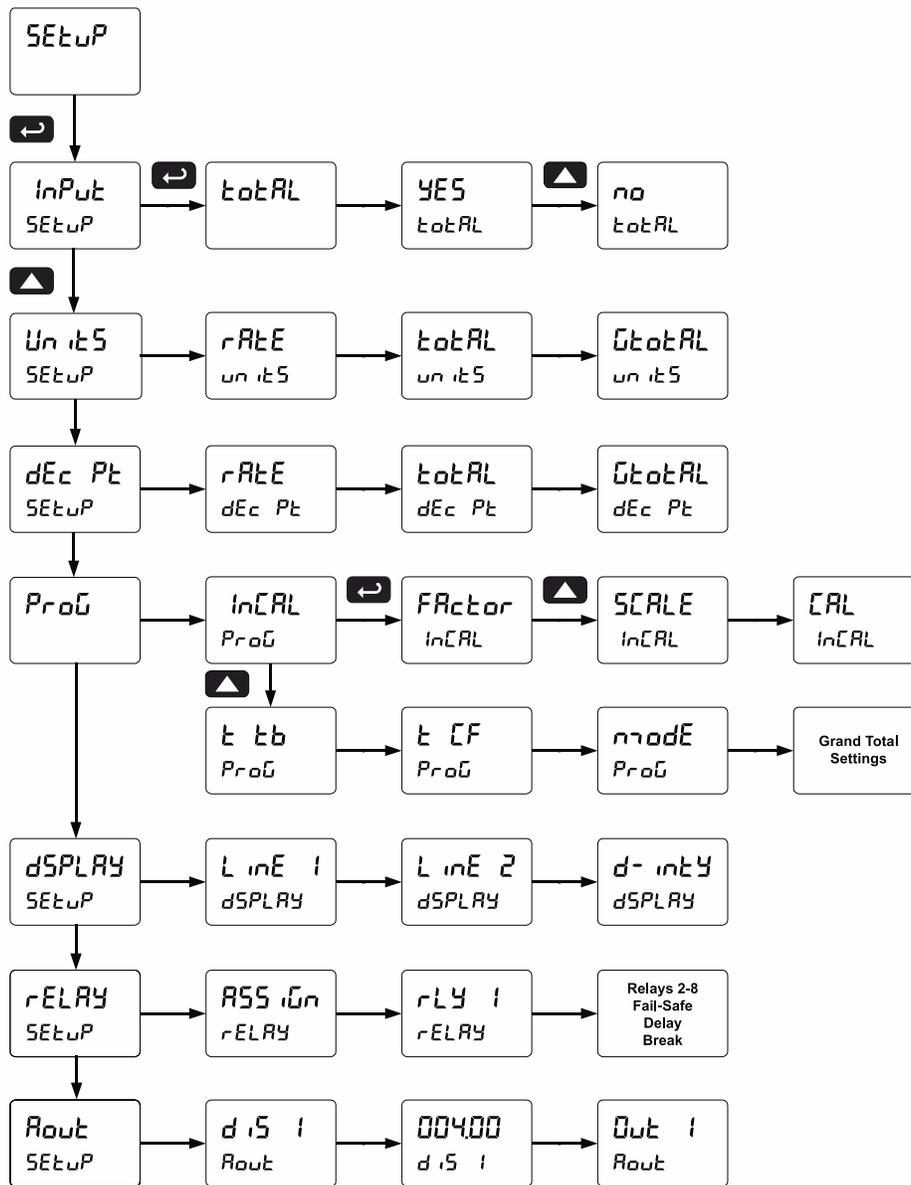
Setting the Input Signal (*InPut*)

There is a switch, located to the right of the input connector, which must be configured according to the input level and type. Jumper J4 located inside the controller, behind the input signal connector, is used to select the excitation voltage (24 V [*Default setting*], 10 V or 5 V) which is supplied to the P+ and P- wiring terminals.

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

Setting the Totalizer & Batch Control Features (*totRL*)

After the input type is entered, set the *totRL* parameter to "*YES*" to enable batch control (this is set by default). If the *totRL* features are disabled, most batching features and functions are hidden from the menus.
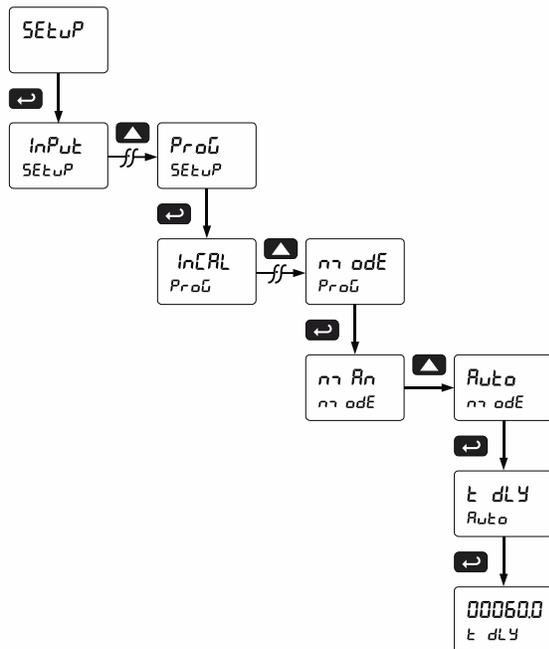
Setting the Input Units or Custom Tags (*unitS*)

Enter the input unit or custom tag that will be displayed if alternating rate, total, or grand total and units is selected in the *unitS* menu, or *d unit* is selected as the Lower display parameter. See the *Setting the Display Parameter & Intensity* (*dSPLRY*) flow chart on page *30* 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		X	X
E	E		Y	Y
F	F		Z	Z
G	G		-	-
g	g		/	/
H	H		]	]
h	h		[	[
I	I		=	=
i	i		0	Degree(<)
J	J			Space

Notes:

1. *Degree symbol represented by (<) if programming with MeterView Pro.*

2. *The letters "m" and "w" use two 7-segment LEDs each; when selected the characters to the right are shifted one position.*

3. *Press and hold up arrow to auto-scroll the characters in the display.*

Setting the Decimal Point (dEc Pt)

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

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

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

Programming the Batch Controller (ProG)

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

The *Program* menu contains the following menus:

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

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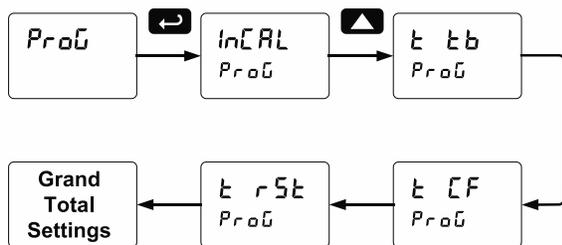

Additional parameters, not needed for most applications, are programmed in the *Advanced Features* menu; see *Advanced Setup & Programming* on page *46*.

Input Calibration Method (InCAL)

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

- Use the *Factor* menu to enter a K-Factor
- Use the *Scale* menu to enter the scaling without a signal source.
- Use the *Calibrate* menu to apply a signal from a signal source.
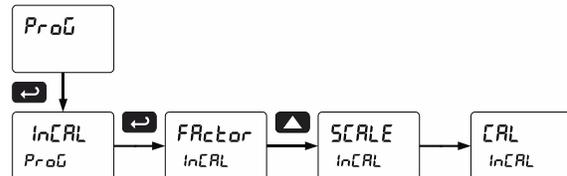
⚠ IMPORTANT

- The K-Factor, 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 *49* for details.

K-Factor Calibration (FActor)

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

Scaling the Controller (SCALE)

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

A signal source is not needed to scale the controller; simply program the inputs and corresponding display values.
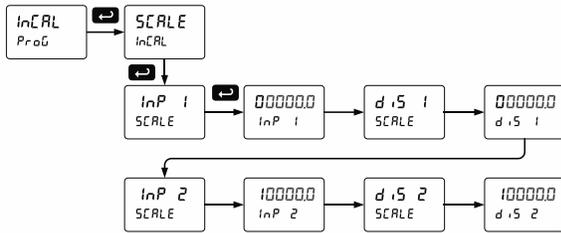
Note: The display values (diS 1 and diS 2) need to be in units of measure per second. For example, if the rate at 1000 Hz is 13.20 gal/min, this must be converted to gal/sec. In this scenario, the numbers input into the SCALE menu would be as follows:

InP 1: 0.0
diS 1: 0.00
InP 2: 1000.0
diS 2: 0.22

> For instructions on how to program numeric values see *Setting Numeric* Values, page 24.

Error Message (Error)

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

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

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

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

Minimum Input Span

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

Time Base, Total Conversion Factor & Total Reset

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

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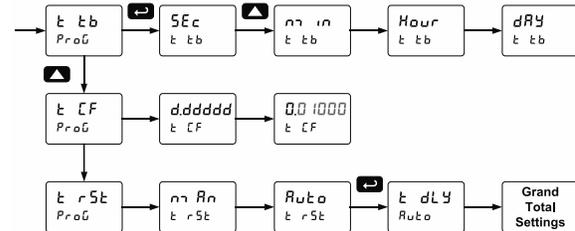
Time Base

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.

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Batch Start Mode (ᴨᴚodᴇ)

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 *42*.

Automatic Batch Control

In automatic mode, the controller operates as described in *Automatic Batch Control* on page 43.

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 dᴌʉ).

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 grand total can also be reset via the front panel button, via a switch across the on-board F4 terminal, the PDA1044 digital I/O expansion module, 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 *40* for details.

Calibrating the Controller with External Source (ᴄᴙᴌ)

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

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

Note: The display values (d ıS ı and d ıS ꜱ) need to be in units of measure per second.

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

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

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Setting the Display Parameter & Intensity (dSPLAY)

Display line 1 (L inE 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 inE 2) can be programmed to display:

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

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

Display Menu
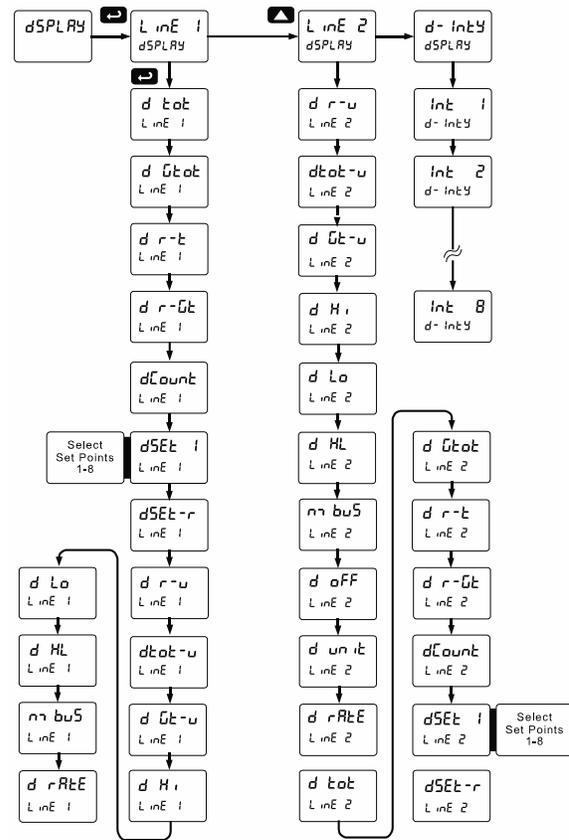
Display Intensity (d- IntY)

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

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

Display Configurations

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

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

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)

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.
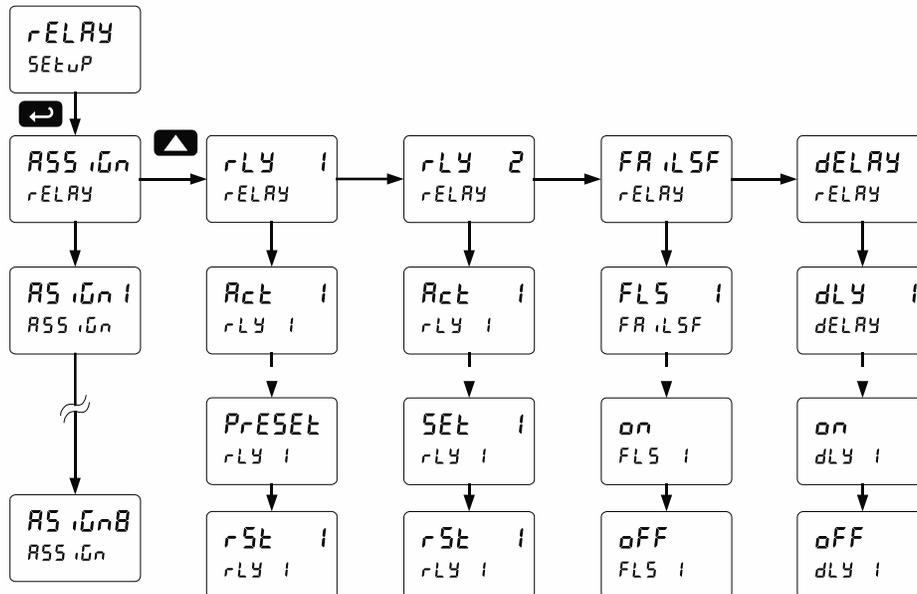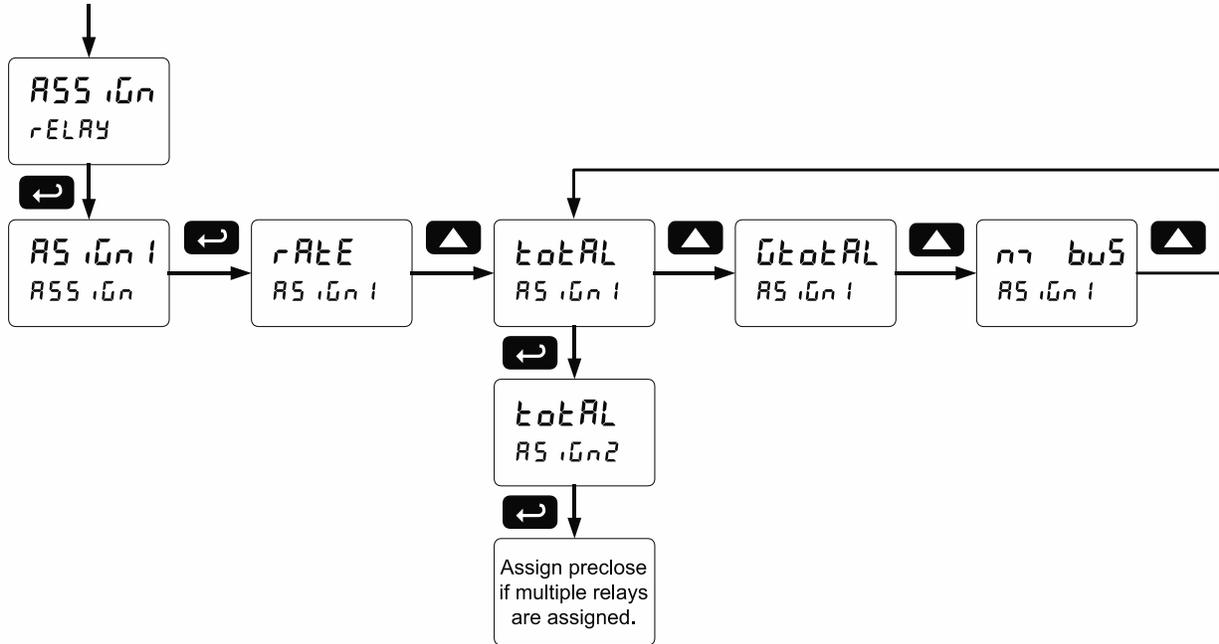

Note: The setup of relays 3-8 follows the same pattern shown here for relay 2.

Relay Assignment (ᴿ55 ᵢᴳn)

The relays can be assigned to any of the following parameters:
1.   Rate for low or high alarm indication
2.   Total for batch control relays
3.   Grand total for alarm indication or sampling

Assign preclose if multiple relays are assigned.

⚠ **IMPORTANT**

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

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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 ᴛoᴛᴀL as the assignment. Relays set to ᴛoᴛᴀL 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 ᴛoᴛᴀL.

Programming Alarm Set and Reset Points

High alarm: program set point above reset point.

Low alarm: program set point below reset point.

The deadband is determined by the difference between set and reset points. Minimum deadband is one display count. If the set and reset points are programmed with the same value, the relay will reset one count below the set point.
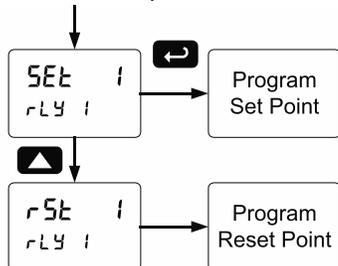
Note: Changes are not saved until the reset point has been accepted.

Setting Fail-Safe Operation

In fail-safe mode of operation, the relay coil is energized when the process variable is within safe limits and the relay coil is de-energized when the alarm condition exists. The fail-safe operation is set independently for each relay. Select on to enable or select oFF to disable fail-safe operation. Failsafe mode should not be used on batch relays assigned to total.

Programming Time Delay

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

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

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

Automatic Batch Control Operation

The following graph shows automatic batch operation

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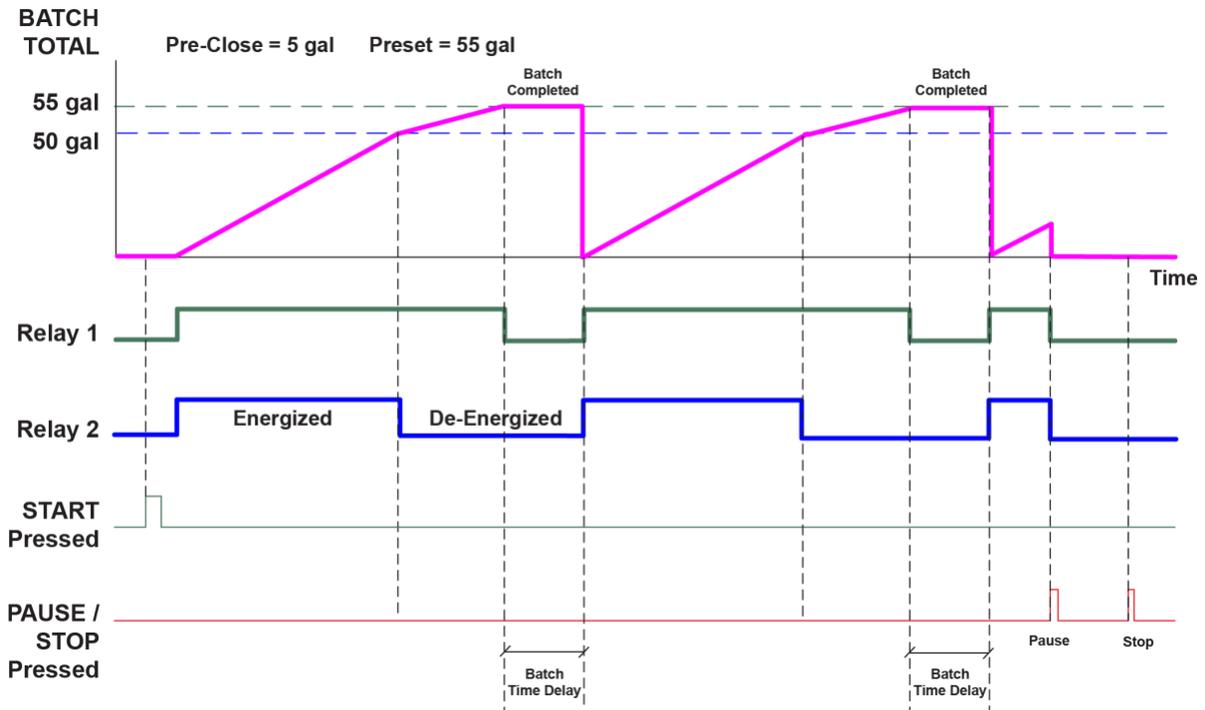
When START is pressed, a short delay occurs before the low flow alarm sensing is activated. Each relay can be programmed with additional ON delay to satisfy various conditions and applications.

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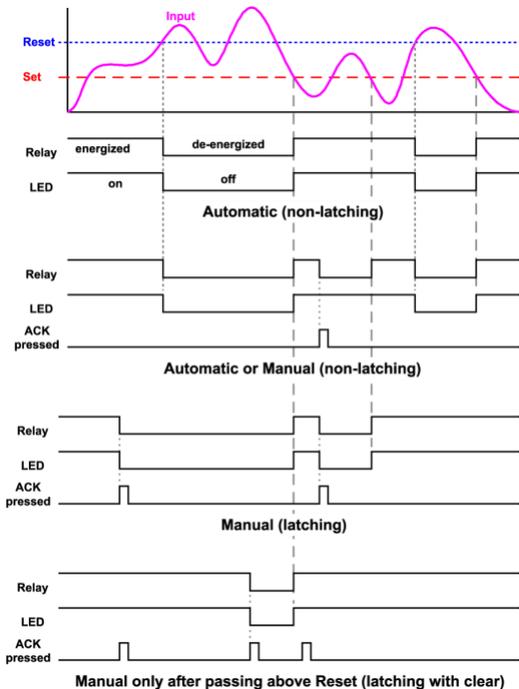
Relay and Alarm Operation Diagrams

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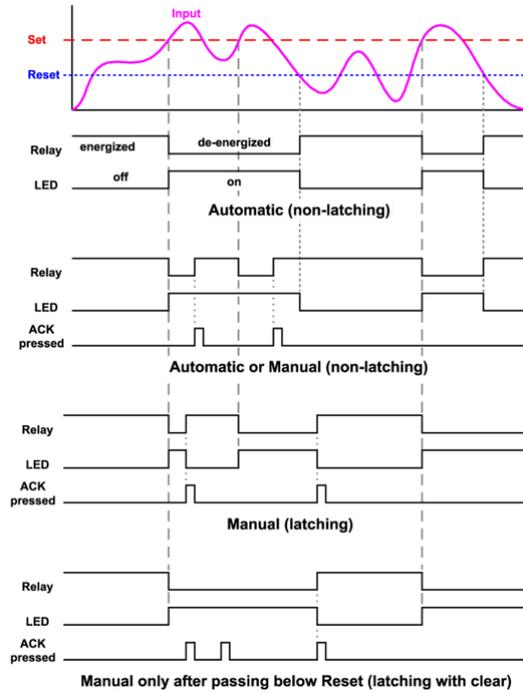
High Alarm Operation (Set > Reset)
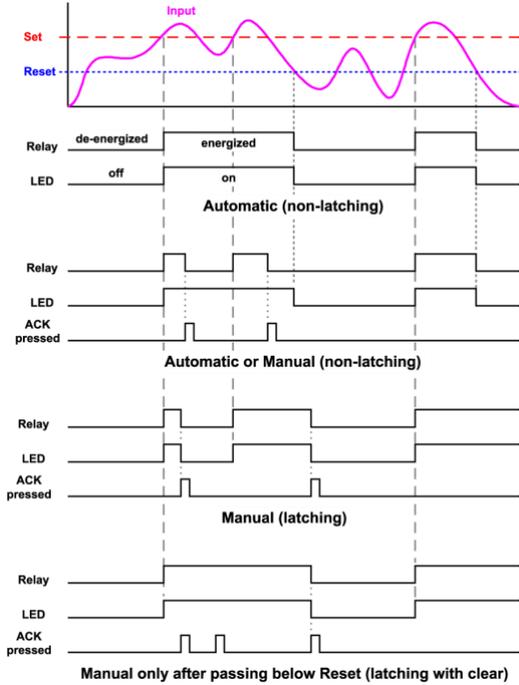
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

### Low Alarm Operation (Set < Reset)

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

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

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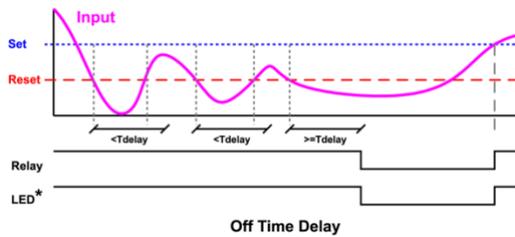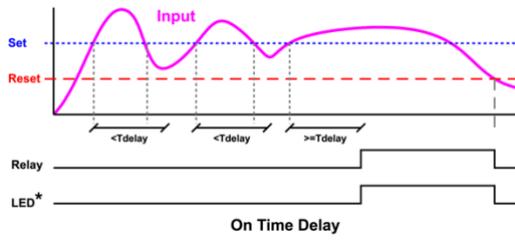
Low Alarm with Fail-Safe Operation (Set < Reset)
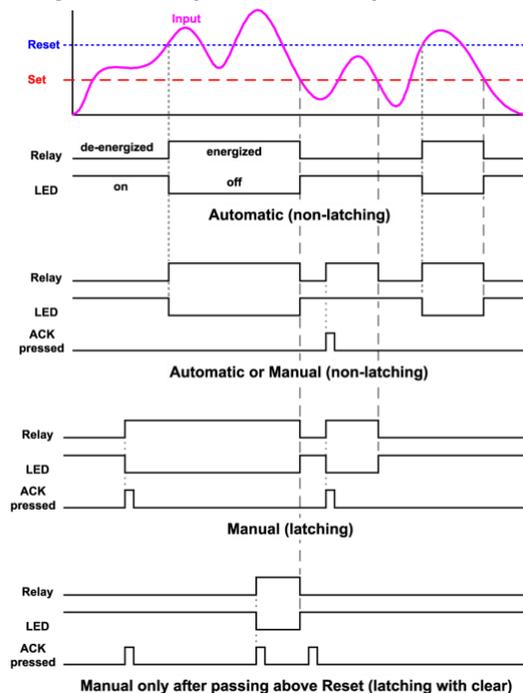
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.
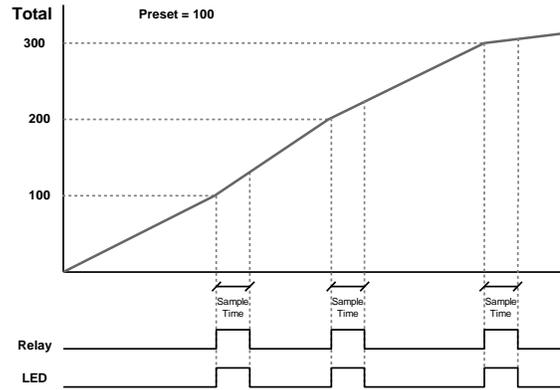
Time Delay Operation

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

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

Total Relay Sampling Operation

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

Relay Operation Details

Overview

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

These capabilities include front panel alarm status LEDs and 2 or 4 internal relays and/or 4 external relays expansion module.

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 *41*.

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 and 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 meters, even those without relays installed, and provide status indication for the following:

LED	Status		LED	Status
1	Alarm 1		5	Alarm 5
2	Alarm 2		6	Alarm 6
3	Alarm 3		7	Alarm 7
4	Alarm 4		8	Alarm 8

Note: LEDs 5-8 require the external relay module PDA1004 to be connected.

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 PD6300 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. For information on using pump alternation control for level, see the PD6000 instruction manual.

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 (SAᴨๅ t), every time the set point rate is reached.

A total sampling relay will activate for the sample time (SAᴨๅ t), every time the process has batched the amount programmed for the set point (See the diagrams on page 36 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.

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:
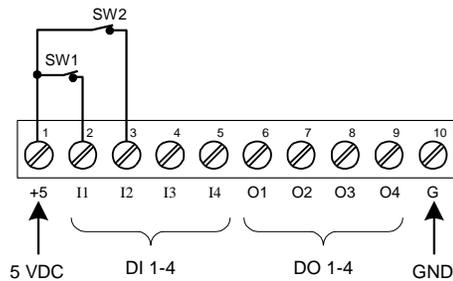
1. Access the *Setup – Relay – Action* menu and set the action to off.
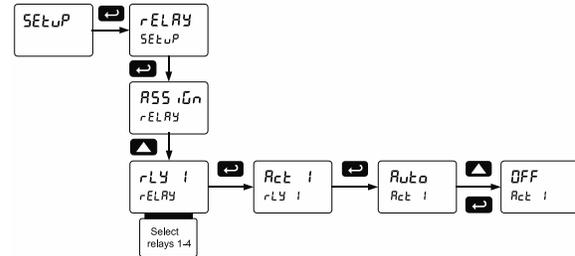
2. In the Advanced features – *User* menu program any of the digital inputs to Force On any of the internal relays (1-4).

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.

Scaling the 4-20 mA Analog Output (Aout)

The 4-20 mA analog output can be scaled to provide a 4-20 mA signal for any 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 instructions on how to program numeric values, see *Setting Numeric Values on* page *24*.
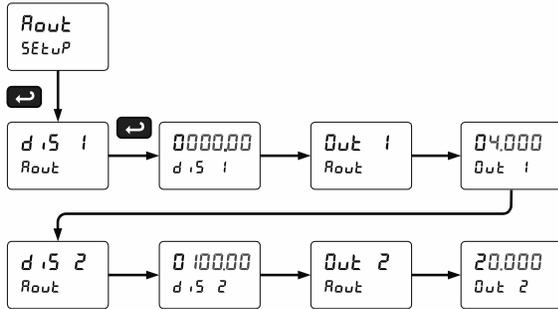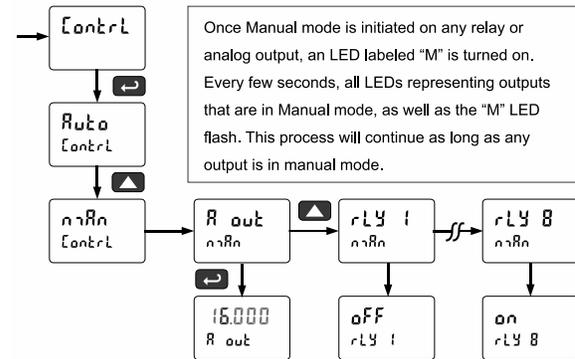

Reset Menu (rESEt)

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 *24*.
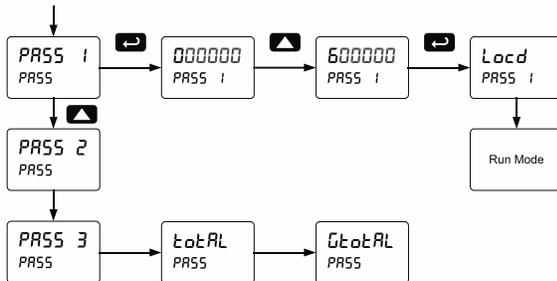
Grand Total Reset Password & Non-Resettable Total

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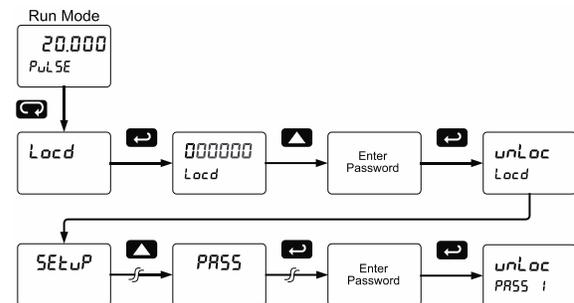
If the correct six-digit password is entered, the controller displays the message unLoc (unlocked) and the protection is disabled until a new password is programmed.

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 on board (and 4 available with an external expansion module) 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 PD6310. This setup will establish a 55 gallon preset for the batch, with a main valve (high flow) that will close at 50 gallons, and a trickle valve (low or restricted flow) that will close at 55 gallons. After the batch, the preset will be changed to 80 gallons.

Two-Stage Batch Control Setup Using Relays 1 & 2

The following table shows the parameters as they appear within the SEtuP menu entry rELAY.

Parameter	Setting	Function
rELAY	ASSıGn	Press Enter to enter the relay assignment parameters.
ASıGn1	totAL	Assign relay 1 to batch total control.
ASıGn2	totAL	Assign relay 2 to batch total control.
PrEcLS totAL		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 3-8.
rLY 1 rELAY		Select relay 1 setup.
Act 1 rLY 1		Configure activation of relay 1.
Act 1	Auto	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 3-8.

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

If only one stage batch control was desired, with one relay for control, then one would set the assignment of relay 2, ASS ıGn2, 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.

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.
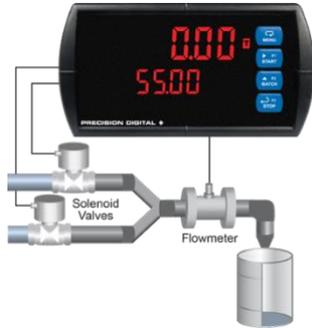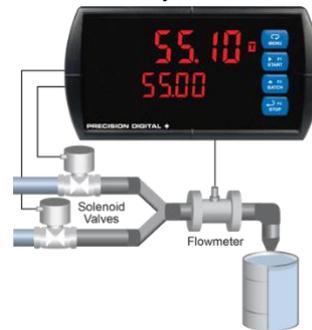

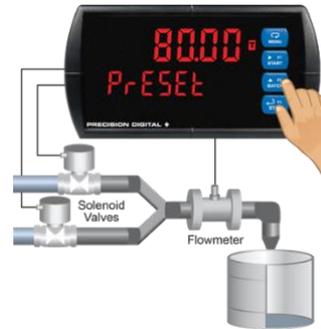2. The START button is pressed. Both valves open. The barrel begins to fill.
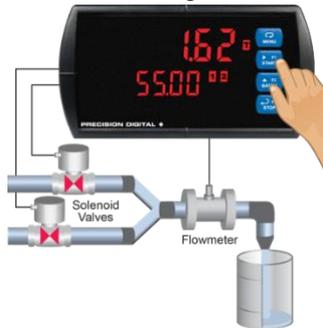
3. When the batch total reaches a value of 50.00 (Preset [55.00] – Pre-close [5.00]) the full-flow valve closes. The fill rate of the tank slows as a result.
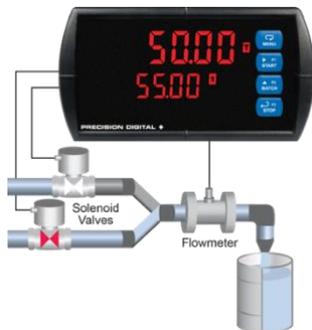
4. When the batch is complete, the restricted-flow valve closes. If overrun occurs, then the next batch will adjust for this offset amount to maintain accuracy.

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.
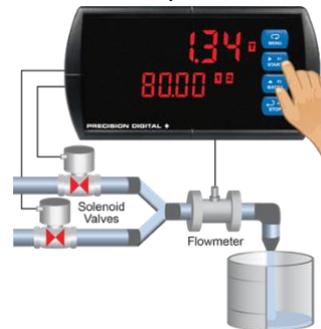
Additional Features

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.

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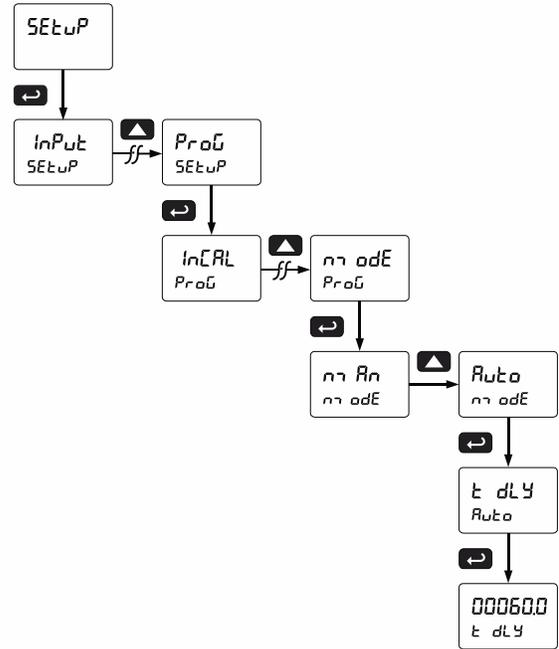
The time delay allows time for removing the full barrel and putting an empty barrel in place. Once the process starts, the operator does not have to press any buttons; except to pause or stop the batch process.

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.
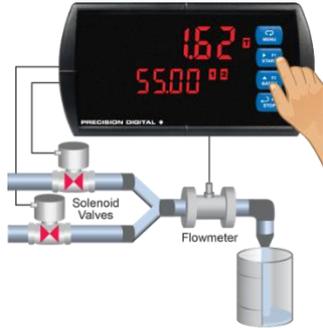

4. When the batch is complete, the restricted-flow valve closes. If overrun occurs, then the next batch will adjust for this offset amount to maintain accuracy.
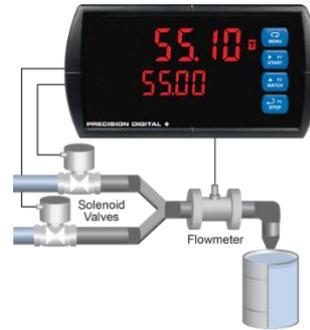
5. After the batch is completed, the operator removes the full barrel and places an empty barrel; the new batch starts automatically after 60 seconds (Time Delay).
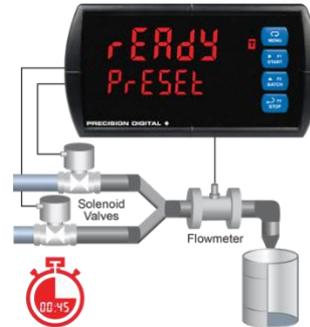
6. The new batch begins automatically after 60 seconds, both relays activate and both valves open.
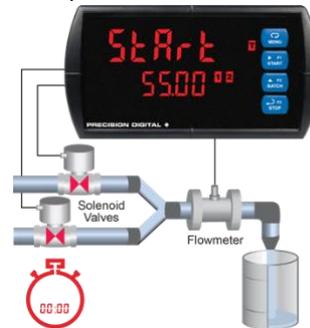
7. At the end of the shift, press STOP twice to stop the batch process.
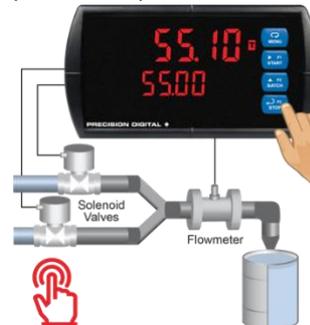
Setup with MeterView Pro

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.
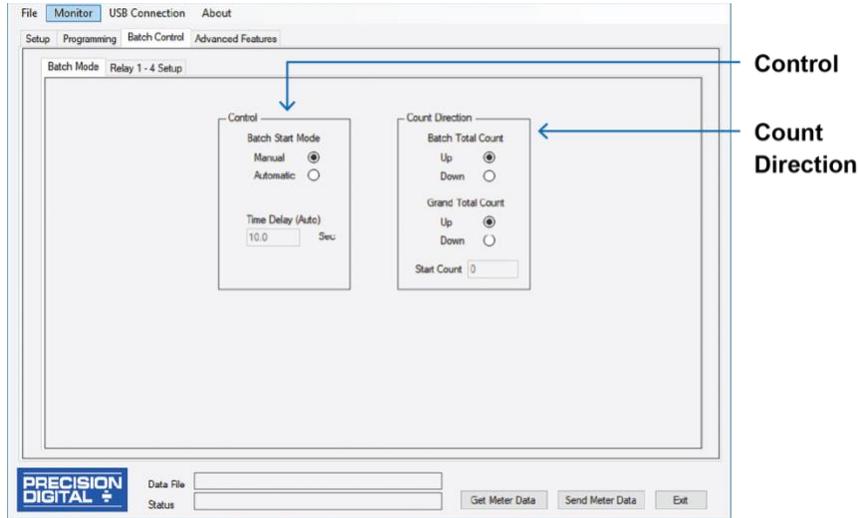
Control

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.
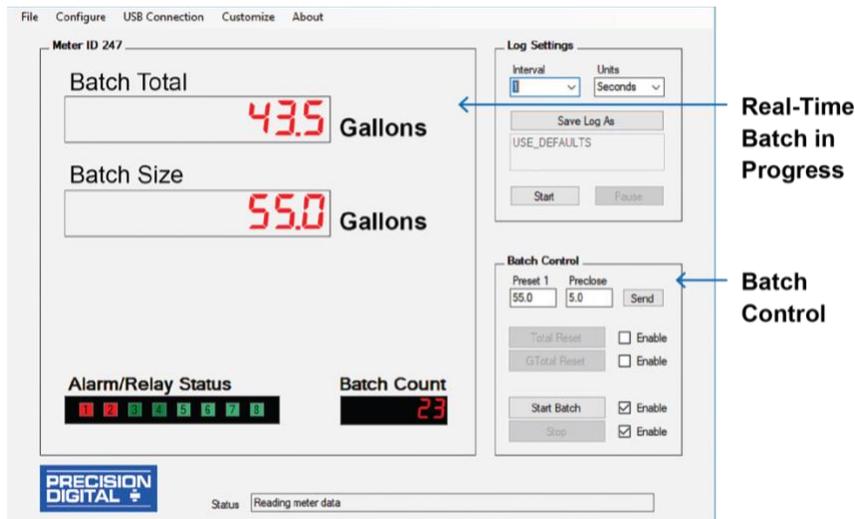
Real-Time Batch in Progress

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

Advanced Features Menu & Display Messages

The following table shows the functions and messages of the *Advanced Features* menu in the order they appear in the menu.

Advanced Features Menu & Display Messages

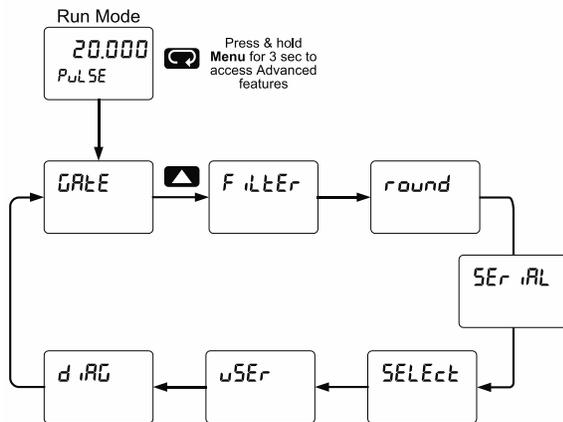| Display	Parameter	Action/Setting
GAtE	Gate	Gate settings
Lo G	Low Gate	Program low gate value
Hi G	High Gate	Program high gate value
FiLtEr	Filter	Set noise filter value
Hi SPd	High Speed Filter	Program High Speed Filter
Lo SPd	Low Speed Filter	Program Low Speed Filter
round	Round	Set the rounding value for display variables

Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
SEriAL	Serial	Set serial communication parameters
SLAV 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
PArity	Parity	Select parity Even, Odd, or None with 1 or 2 stop bits
t-bYt	Time byte	Set byte-to-byte timeout
SELEct	Select	Enter the Select menu (function, cutoff, out)
Functn	Input Signal Conditioning	Select linear
LinEAr	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
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
down	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
ForcE	Force output	Force analog output value for loop break
IGnorE	Ignore	Ignore loop break condition
mAX	Maximum	Program maximum mA output allowed
min	Minimum	Program minimum mA output allowed
CALib	Calibrate	Calibrate 4-20 mA output (internal reference source used for scaling the output)
4 mA	4 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution

Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
20 mʌA	*20 mA output*	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
uSEr	*User I/O*	Assign function keys and digital I/O
F1	*F1 function key*	Assign F1 function key
F2	*F2 function key*	Assign F2 function key
F3	*F3 function key*	Assign F3 function key
F4	*F4 function*	Assign F4 function (digital input)
dI1	*Digital input 1*	Assign digital input 1 – 8, if expansion modules are connected
dO1	*Digital output 1*	Assign digital output 1 – 8, if expansion modules are connected
dIAG	*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 *50* 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

F4 Operation

A digital input, F4, is standard on the controller. This digital input is programmed identically to function keys F1, F2, and F3. The input is triggered with a contact closure to COM, or with an active low signal. During operation, F4 operates according to the way is has been programmed in the *Advanced Features – User* menu. See *Programmable Function Keys User Menu* (uSEr) on page *50* 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 ɪnEAr) on page *49* 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 Hɪ), Min (d Lo), or toggle between Max and Min (d HL) every 10 seconds.
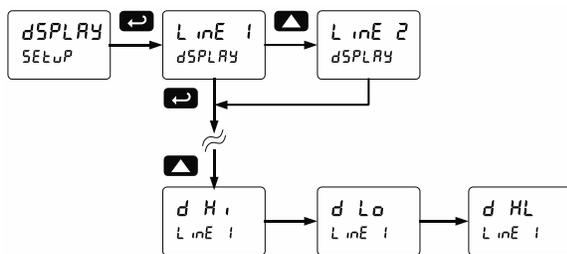
⚠ **CAUTION**

- 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.

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 (SErɪAL)

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, an RS-232 or RS-485 adapter is required; see *Ordering Information* on page *6* for details.

⚠ **CAUTION**

- **DO NOT** connect any equipment other than Precision Digital's expansion modules, cables, or controllers to the RJ45 M LINK connector. Otherwise damage will occur to the equipment and the controller.

Notes
1. *More detailed instructions are provided with each optional serial communications adapter.*
2. *Refer to the PROVU Modbus Register Tables located at www.predig.com for details.*
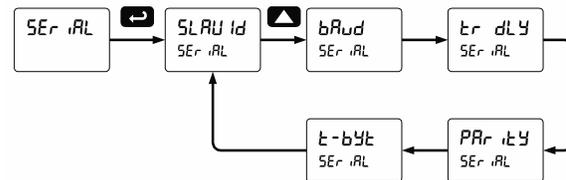
When using more than one controller in a multi-drop mode, each controller must be provided with its own unique address. The controller address (Slave ID) may be programmed between 1 and 247. The transmit delay may be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop bits.

Select Menu (SELEct)

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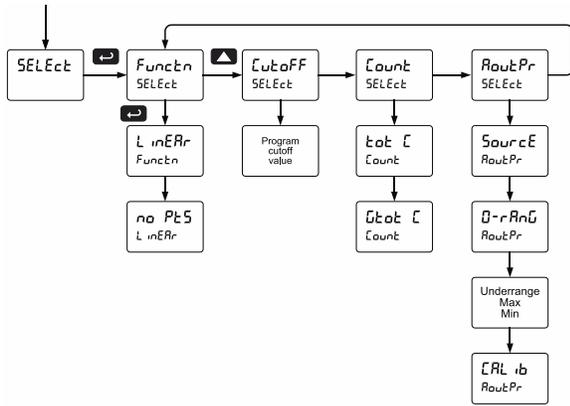
Input Signal Conditioning (Functn)

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

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

Multi-Point Linearization (L inEAr)

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

Low-Flow Cutoff (CutoFF)

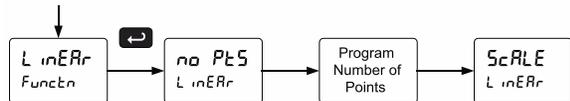The low-flow cutoff feature allows the controller to be programmed so that the sometimes unsteady output at low flow rates always displays zero on the controller. The cutoff can be disabled to display negative values.

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

Total and Grand Total Count Direction (Count)

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

Analog Output Programming (RoutPr)

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

1. Source: Source for generating the 4-20 mA output (e.g. Rate)
2. Overrange: Analog output value with display in overrange condition
3. Underrange: Analog output value with display in underrange condition
4. 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.
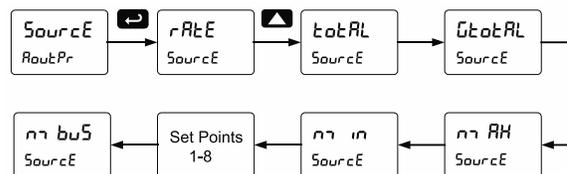
Analog Output Calibration

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.

Programmable Function Keys User Menu (uSEr)

⚠️ **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 (a digital input located on the input signal connector), and up to eight additional digital inputs 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.

Up to eight digital outputs can be assigned to a number of actions and functions executed by the controller (i.e. alarms, relay acknowledgement, reset max, min, or max & min, tare, and reset tare). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.

Function Keys & Digital I/O Available Settings

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

Display	Description
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

Display	Description
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
Contrl	Directly access the manual control menu
diSAbL	Disable the selected function key or digital I/O
AcK	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 8)
mEnu	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 expansion module to achieve interlock functionality. See *Setting Up the Interlock Relay (Force On) Feature* on page *38* for details about interlock relays.
ALm 1*	Provide indication when alarm 1 (*through 8) has been triggered (digital outputs only)

Troubleshooting

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

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

Diagnostics Menu (d ıAG)

The *Diagnostics* menu is located in the *Advanced Features Menu*; to access the *Diagnostics* menu refer to page 46.

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 46.

Testing the Display LEDs

To test all LEDs on the display:
1. Go to the *Diagnostics* menu (d ıAG) 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 (ınFo) or press the Menu button to return to Run Mode.

Determining Software Version

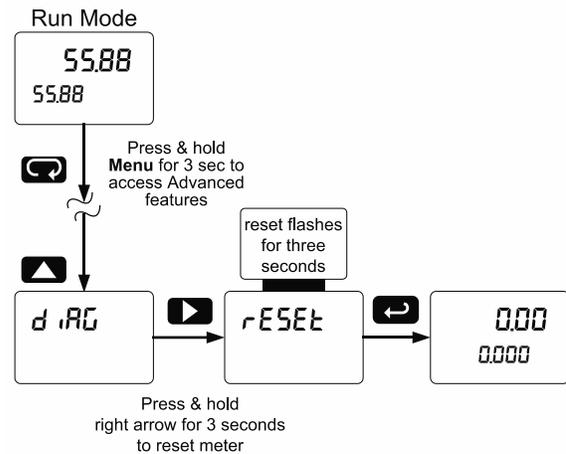To determine the software version of a controller:
1. Go to the *Diagnostics* menu (d ıAG) and press Enter button.
2. Press Up arrow button and scroll to Information menu (ınFo).
3. Press Enter to access the software number (SFt) and version (UEr) information. Write down the information as it is displayed. 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 *46*.
2. Press Up arrow to go to *Diagnostics* (d ıAG) 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.

Run Mode

Press & hold **Menu** for 3 sec to access Advanced features

reset flashes for three seconds

Press & hold right arrow for 3 seconds to reset meter

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	Pulse
Total	YES	Total enabled
Units	unitS	Rate / total / G total Pulse / Pulse / Pulse
Rate decimal point	dddddd	1 Place
Total decimal point	dddddd	1 Place
Grand Total decimal point	dddddd	0 Places
K-Factor	FRctor	1.000
Function	Functn	Linear
Number of points	no PtS	2
Programming	ProG	Scale
Input 1	InP 1	00000.0
Display 1	diS 1	00000.0
Input 2	InP 2	10000.0
Display 2	diS 2	10000.0
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	nodE	Manual
Grand total time base	Gt tb	Second
Grand total conversion factor	t CF	1.000
Grand total reset	t rSt	Manual
Relay 1 assignment	RS iGn1	Total
Relay 2 assignment	RS iGn2	Total
Relay 2 pre-close	PrECLS	No
Relay 3 assignment	RS iGn3	Rate
Relay 4 assignment	RS iGn4	Rate
Relay 1 action	Rct 1	Automatic
Batch preset	PrESEt	100.0
Relay 2 action	Rct 2	Automatic
Relay 2 set point	SEt 2	200.0
Relay 3 action	Rct 3	Automatic
Relay 3 set point	SEt 3	3.000
Relay 3 reset point	rSt 3	2.500

Factory Defaults & User Settings

Parameter	Display	Default Setting
Relay 4 action	Rct 4	Automatic
Relay 4 set point	SEt 4	4.000
Relay 4 reset point	rSt 4	3.500
Fail-safe relay 1	FLS 1	Off
Fail-safe relay 2	FLS 2	Off
Fail-safe relay 3	FLS 3	Off
Fail-safe relay 4	FLS 4	Off
On delay relay 1	On 1	0.0 sec
Off delay relay 1	OFF 1	0.0 sec
On delay relay 2	On 2	0.0 sec
Off delay relay 2	OFF 2	0.0 sec
On delay relay 3	On 3	0.0 sec
Off delay relay 3	OFF 3	0.0 sec
On delay relay 4	On 4	0.0 sec
Off delay relay 4	OFF 4	0.0 sec
Display 1 analog out	diS 1	0
Output 1 value	Out 1	4.000 mA
Display 2 analog out	diS 2	1000.0
Output 2 value	Out 2	20.000 mA
Source analog output	SourcE	Rate/process
Overrange output	O-rRnG	21.000 mA
Underrange output	u-rRnG	3.000 mA
Loop break output	brERX	1.000 mA
Filter	FiLtEr	Hi Speed
Cutoff value	CutoFF	0.0 (disabled)
Maximum output	nRX	23.000 mA
Minimum output	nin	1.000 mA
Slave ID (Address)	SLRU id	247
Baud rate	bRud	9600
Transmit delay	tr dLY	50 ms
Parity	PRrity	Even
Byte-to-byte timeout	t-bYt	010 (0.1 sec)
F1 function key	F1	Start
F2 function key	F2	Preset
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

Factory Defaults & User Settings

Parameter	Display	Default Setting
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 front panel 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 front panel 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	Check: 1. The input signal type and make sure it corresponds with the position of the input switch. 2. The input signal voltage level 3. If a *Low-Flow Cutoff* has been programmed, the controller will display zero below that point, regardless of the input.
Controller displays error message during calibration (Error)	Check: 1. Signal connections 2. Input switch position 3. Minimum input span requirements
Controller displays 999999 -99999	Check: 1. The input signal frequency 2. K-Factor value or scaling, time base, and decimal point
Display is unstable	Check: 1. Input signal stability and value 2. Display scaling vs. input signal 3. Increase the gate settings to average more pulses
Display reading is not accurate	Check: 1. K-Factor value provided by the flowmeter manufacturer 2. Time base selected 3. Scaling or calibration
Display response is too slow	Check: Filter and gate values
Display does not respond to input changes, reading a fixed number	Check: Display assignment, it might be displaying max, min, or set point.
Display alternates between 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 51. 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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