PROVU PD6310-WM NTEP Certified Pulse Input Batch Controller Instruction Manual

PROVU® SERIES

MeterView Pro
USB Install

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Weights & Measures

- NTEP Certified Weighing and Measuring Device
- Mechanically Secured Programming Lockout
- Pulse, open collector, NPN, PNP, TTL, switch contact, sine wave (coil), square wave Inputs
- 5, 10, or 24 V Flowmeter Power Supply
- K-Factor, internal scaling, or external calibration
- Start, batch, pause, & stop with front panel buttons
- Display batch total + rate, grand total, batch count or preset
- Single or multi-stage batching with up to 8 relays
- Automatic overflow protection
- Manual control or automatic batching
- Dual-Line Display
- NEMA 4X and IP65 Rated Front Panel
- UL Listed & CE Marked
- Display Features 0.6" & 0.46" Digits
- Six Full Digits on Each Line
- Optional Superluminous Sunlight Readable Display
- Free USB Programming Software & Cable
- 2 or 4 Relays + Isolated 4-20 mA Output Options

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⚠ !	⚠ ⚡
CAUTION: *Read complete instructions prior to installation and operation of the controller.*	**WARNING**: *Risk of electric shock or personal injury.*

⚠ ⚡

Warning

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.

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.

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Introduction

The PROVU® PD6310-WM Series are NTEP® Certified pulse input batch controllers certified as weighing and measuring devices. These easy-to-use batch controllers are ideal for weights and measures applications, and provide simple independent batch control operation where local control is preferred to expensive and expansive operation systems. Their superluminous LED digits make it easily readable in smoke, dust, fog, and, with the optional SunBright® display, even direct sunlight.

The controller has a mechanically secured programming lockout feature. A cable with compression seal may be secured to prevent the removal of the rear case, preventing access to the programming lockout jumper.

The controller comes programmed for easy front panel start, pause, stop, and batch size (preset) changes. The bottom display 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 4 on-board relays and 4 with the external relay module. Each batch control relay may have a unique preclose amount when used for multi-stage batching.

Manual start batching is default, but automatic batching with a restart after a programmed time delay from the completion of the last batch, is also possible.

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

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

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

Ordering Information

85-265 VAC Model	12-24 VDC Model	Options Installed
PD6310-6H2-WM	PD6310-7H2-WM	2 relays (PD1102*)
PD6310-6H4-WM	PD6310-7H4-WM	4 relays (PD1104*)
PD6310-6H5-WM	PD6310-7H5-WM	2 relays & 4-20 mA output (PD1105*)
PD6310-6H7-WM	PD6310-7H7-WM	4 relays & 4-20 mA output (PD1107*)
*Model number for replacement option card.		

Accessories

Model	Description
PDA1002	DIN rail mounting kit for two expansion modules
PDA1200	Meter copy cable
PDA1232	RS-232 PROVU serial adapter
PDA1485	RS-485 PROVU serial adapter serial adapter
PDA7485-I	RS-232 to RS-422/485 isolated converter
PDA8232-N	USB to RS-232 non-isolated converter
PDA8485-I	USB to RS-422/485 isolated converter
PDA8008	USB PROVU serial adapter
PDA2811	1 Meter Plastic NEMA 4X Enclosure
PDA2812	2 Meter Plastic NEMA 4X Enclosure
PDX6901	Suppressor (snubber): 0.01 µF/470 Ω, 250 VAC

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.
Default Display Assignment	The Upper display shows batch total. The Lower display shows rate with alternating units, and can be switched to show grand total, batch count, or preset with the STOP key.
Custom Display Assignment	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.
Alternating Display	Displays alternate every 10 seconds when display is selected or the batch is paused.
Display Intensity	Eight user selectable intensity levels
Display Update Rate	5/second (200 ms)
Overrange	Display flashes 999999
Underrange	Display flashes -99999
Front Panel	NEMA 4X, IP65
Programming Methods	Four front panel buttons, digital inputs, PC and MeterView Pro software, or cloning using Copy function.
Programming Lockout	Programming lockout jumper. Seal loop and loop attachment features to prevent access to the lockout jumper.
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.
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 or 12-24 VDC ± 10%, 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
Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ± 10%. 12-24 VDC powered models selectable for 24, 10, or 5VDC supply (internal jumper J4). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max, @ 50 mA max for 5 or 10 VDC supply.
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 Storage temperature range: -40 to 85°C 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
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

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

Maximum Input Frequency	30,000 Hz (10,000 for low voltage mag pickup)
Input Impedance	Pulse input: Greater than 300 kΩ @ 1 kHz. Open collector/switch input: 4.7 kΩ pull-up to 5 V.
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	0-999999 (0 disables cutoff function)
Decimal Point	Up to five decimal places or none: *d.ddddd*, *d.dddd*, *d.ddd*, *d.dd*, *d.d*, 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.
Time Base	Second, minute, hour, or day
Gate	Low gate: 0.1-99.9 seconds High gate: 2.0-999.9 seconds
F4 Digital Input Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM.
F4 Digital Input Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

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: *d.ddddd*, *d.dddd*, *d.ddd*, *d.dd*, *d.d*, 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.
Grand Totalizer Rollover	Grand totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
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.*

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 page 18 for details.
Relay Assignment	Relays may be assigned to batch control total, sampling, rate, or grand total alarms.
Preclose	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 Alarm	User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turn off).

Relay Operation	Batch control Automatic (non-latching)[1] Sampling Off (disable unused relays and enable Interlock feature) Manual on/off control mode Secondary Functions[2] Pump alternation control (2 to 8 relays) Latching (requires manual acknowledge)
Relay Reset	User selectable via front panel buttons, digital inputs, or PC 1. Automatic reset only (non-latching), when the input passes the reset point or total is reset to zero. 2. Automatic + manual reset at any time (non-latching) 3. Manual reset only, at any time (latching) 4. Manual reset only after alarm condition has cleared (L) *Note: Digital inputs may be assigned to acknowledge relays programmed for manual reset. It is not recommended to change the functions of front panel buttons to manual reset.*
Alarm Time Delay	0 to 999.9 seconds, on & off relay time delays Programmable and independent for each relay.
Fail-Safe Operation	Programmable and independent for each relay. *Note: Relay coil is energized in non-alarm condition.* *In case of power failure, relay will go to alarm state.*
Alarm Auto Initialization	When power is applied to the controller, relays will reflect the state of the input to the controller.[1]

1. *Alarms are active only when the batch is running.*
2. *These functions are not functional when the unit is being used as a batch controller with total set to yes.*

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. Refer to Figure 22 on page 19. 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

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.

PDA1044 Digital Input & Output Expansion Module

Channels	4 digital inputs & 4 digital outputs per module
System	Up to 2 modules for a total of 8 inputs & 8 outputs
Digital Input Logic High	3 to 5 VDC
Digital Input Logic Low	0 to 1.25 VDC
Digital Output Logic High	3.1 to 3.3 VDC
Digital Output Logic Low	0 to 0.4 VDC
Source Current	10 mA maximum output current
Sink Current	1.5 mA minimum input current
+5 V Terminal	To be used as pull-up for digital inputs only Connect normally open pushbuttons across +5 V & DI 1-4.

MeterView Pro

System Requirements	Microsoft® Windows® XP/Vista/7/8/10
Communications	USB 2.0 (Standard USB A to Micro USB B)
Configuration	Configure meters one at a time

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 61010-1:2010 Safety requirements for measurement, control, and laboratory use

NTEP Weights and Measures Certification

Certificate Number	14-061
Definition	Register for Meter Stationary Wholesale Liquid Register/Controller Digital Electronic Model: PD63XX Series and PD8-63XX Series
Evaluation Criteria	NIST Handbook 44 Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, 2014 Edition. NCWM Publication 14 Measuring Devices, 2014 Edition.

National Conference on Weights and Measures (NCWM) National Type Evaluation Program (NTEP) Certificate of Conformance available at www.predig.com

Electromagnetic Compatibility

Emissions	EN 55022:2010 Class A ITE emissions requirements
Radiated Emissions	Class A
AC Mains Conducted Emissions	Class A
Immunity	EN 61326-1:2013 Measurement, control, and laboratory equipment EN 61000-6-2:2005 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 PD6300 series meters installed through the covers of grounded metal enclosures with cable shields grounded at the point of entry representing installations designed to optimize EMC performance. All hardware is identical to the PD6310 controllers.*

Declaration of Conformity available at www.predig.com

Safety Information

⚠ **!**	
CAUTION: *Read complete instructions prior to installation and operation of the controller.*	**WARNING**: *Risk of electric shock or personal injury.*

⚡ **Warning!**	*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 transmitter power supply to output 5 or 10 VDC instead of 24 VDC, see page 13.

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

1. Prepare a standard 1/8 DIN panel cutout – 3.622" x 1.772" (92 mm x 45 mm). Refer to Figure 1 for more details.
2. Clearance: allow at least 6.0" (152 mm) behind the panel for wiring.
3. 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.
4. Remove the mounting bracket mounted on the controller (back-off the screw so that there is ¼" (6.4 mm) or less through the bracket. Slide the bracket toward the front of the case and remove). Note what side this bracket is mounted to.
5. Locate the security bracket packed in the wire security seal kit. The security bracket can be identified by wire loop pass-through located next to the mounting screw.
6. Insert controller into the panel cutout.
7. Mount each bracket. Be sure the security bracket is located on the side of the case with the wire loop pass-through holes.
8. 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.
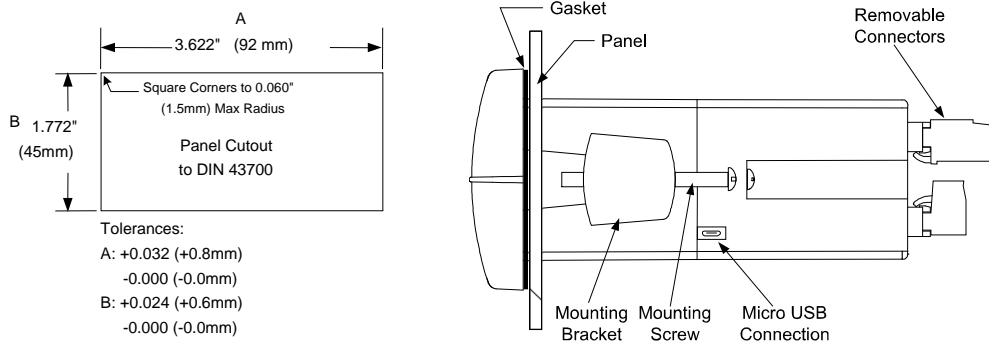
Figure 1: 1/8 DIN Panel Mounting

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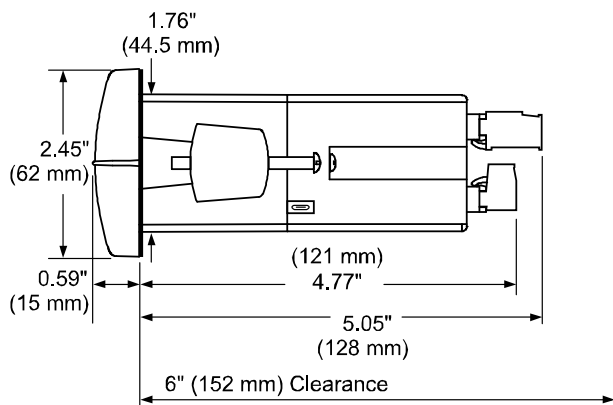
Figure 2: Controller Dimensions - Side View
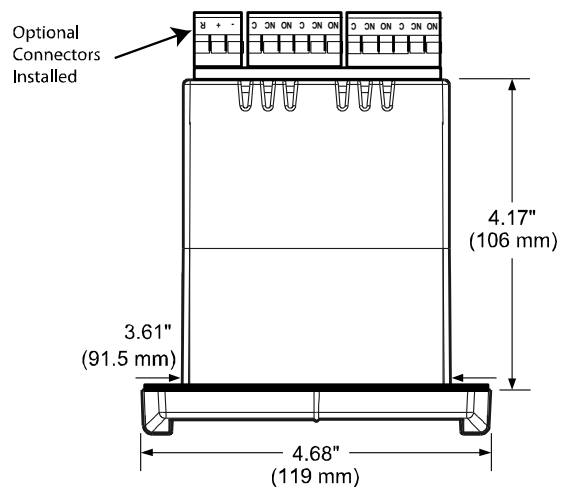
Figure 3: Controller Dimensions - Top View

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Transmitter Supply Voltage Selection (P+, P-)

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

If the transmitter requires 5 or 10 VDC excitation, the 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.
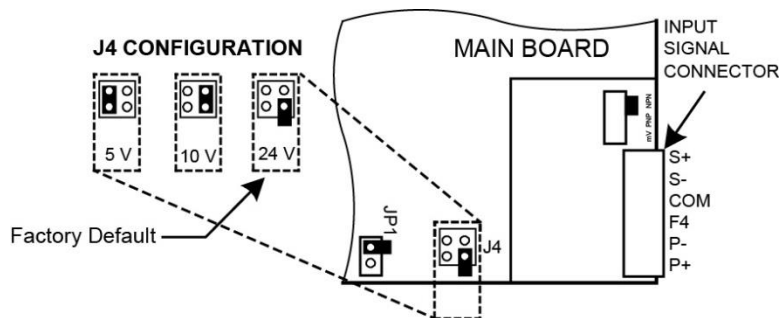
Figure 4: Transmitter Supply Voltage Selection

Programming Lockout Jumper (NTEP Lockout)

All controllers include a programming lockout jumper. With this jumper installed, the controller will not allow access to the programming menus. If the Menu button is pressed, the controller will display Locked Seal (LoCd SEAL). The controller will still allow all batch controller operations to function, such as the START, BATCH, and STOP buttons.

> ⚠️ **Complete Setup Before Installing Lockout Jumper**
> *Set up the controller with all necessary settings prior to installing the lockout jumper.*
> *Installing the programming lockout jumper will prevent access to the programming menus.*

The jumper may be removed to regain access to the programming menus.

Combined with sealing the rear case to restrict access to the programming lockout jumper, the controller meets the requirements for National Conference on Weights and Measures (NCWM) National Type Evaluation Program (NTEP) certification.

To secure the programming lockout jumper with a wire security seal, refer to *Wire Security Seal Installation (NTEP Seal)*, see page 15.

To access and enable the programming lockout jumper:

1. Remove all the connectors.
2. Unscrew the back cover.
3. Slide the back cover about 1 inch.
4. Configure the JP1 jumper, located behind the input signal connector, for the desired programming lockout operation (lockout on or off) as shown.
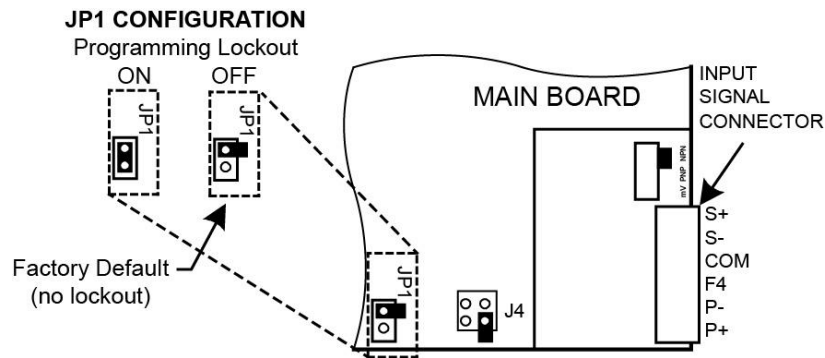
Figure 5: Programming Lockout Jumper Selection

Wire Security Seal Installation (NTEP Seal)

All controllers include mechanical features to install a wire security seal. This seal secures the rear case portion of the controller, preventing unauthorized access to the programming lockout jumper.

Combined with using the programming lockout jumper to restrict access to the programming, the controller meets the requirements for National Conference on Weights and Measures (NCWM) National Type Evaluation Program (NTEP) certification.

To enable the programming lockout jumper, refer to Programming Lockout Jumper (NTEP Lockout), see page 14.

Note: Installation instructions for PD8-6310-WM Explosion Proof model differ from what is described below. Due to the lack of a mounting bracket, there is an additional wire loop pass-through hole in the front portion of the controller housing. See Security Seal Installation Guide included with your controller.

To install the wire security seal:

1. Locate the wire security seal and security seal mounting bracket packed with the controller. Install the panel meter as described in *Panel Mounting* Instructions on page 12.

   Be sure the security seal mounting bracket is located on the side of the case with the wire loop pass-through holes. This bracket can be identified by wire loop pass-through located next to the mounting screw.
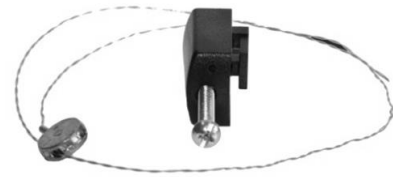
Figure 6: Wire Security Seal and Bracket

2. Pass the wire security loop through the wire loop pass-through holes on the rear portion of the controller housing.

Figure 7: Wire Loop through Rear Case Pass-Through

3. Pass the wire loop through the wire loop pass-through holes on the security bracket. The pass-through is located next to the mounting screw.

Figure 8: Wire Loop through Security Bracket Pass-Through

4. With the wire loop through the rear of the case and the mounting bracket, pass the loop back through the crimp seal end. Tighten the loop such that it will prevent the rear of the case from being removed while the loop is in place.

5. The wire loop may now be tagged, crimped, and sealed to mechanically secure the rear case. This will secure the programming lockout jumper.

Figure 9: Close and Crimp Seal Wire Security Loop

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.

⚡ **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.***
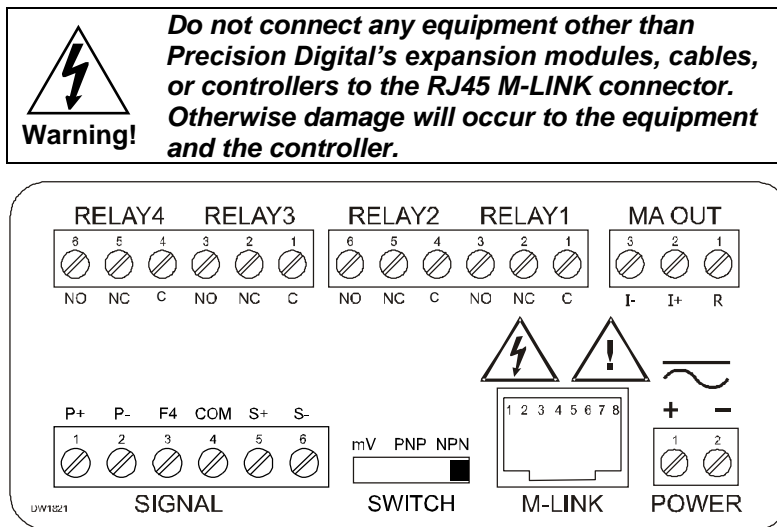
Figure 10: Connector Labeling for Fully Loaded PD6310

Power Connections

Power connections are made to a two-terminal connector labeled POWER on Figure 6. The controller will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention.
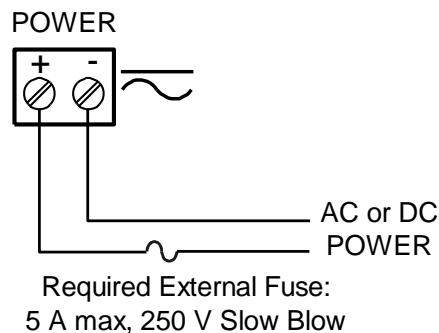
Figure 11: Power Connections

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Pulse Input Signal Connections

Signal connections are made to a six-terminal connector labeled SIGNAL on Figure 10. 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.
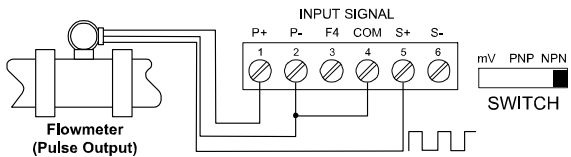
Figure 12: Flowmeter Powered by Internal Power Supply
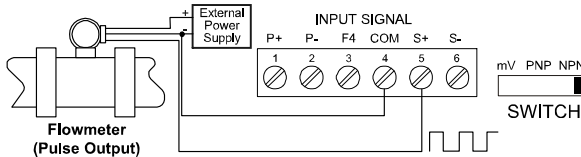
Figure 13: Flowmeter Powered by External Supply
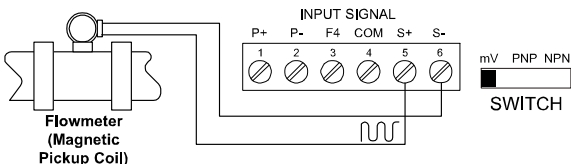
Figure 14: Self-Powered Magnetic Pickup Coil Flowmeter
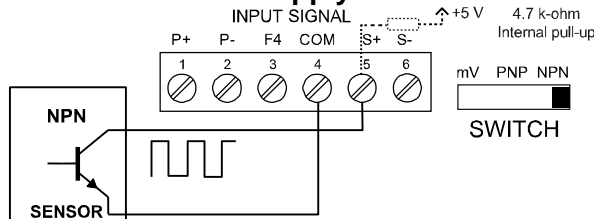
Figure 15: NPN open Collector Input
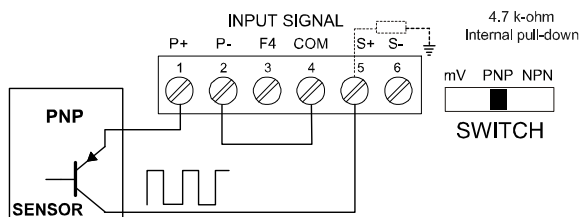
Figure 16: PNP Sensor Powered by Internal Supply
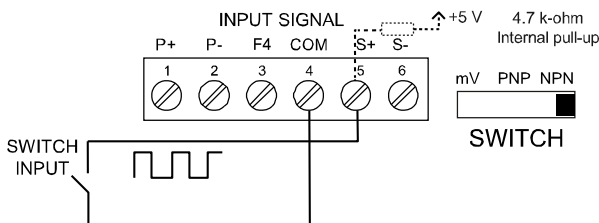
Figure 17: Switch Input Connections

Modbus RTU Serial Communications

Serial communications connection is made to an RJ45 connector labeled M-LINK on Figure 7. Use the PDA1232 for RS-232 interfacing, the PDA1485 for RS-485 interfacing, or the PDA8008 for USB 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 on Figure 7. Each relay's C terminal is common only to the normally open (NO) and normally closed (NC) contacts of the corresponding relay. The relays' C terminals should not be confused with the COM (common) terminal of the INPUT SIGNAL connector.
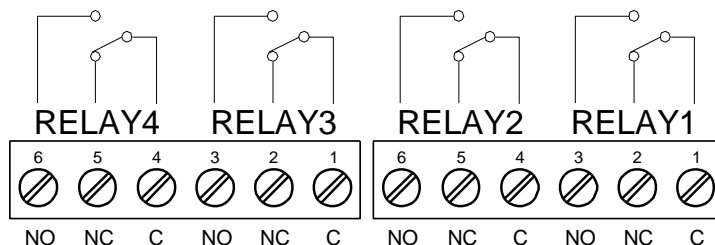
Figure 18: Relay Connections

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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:
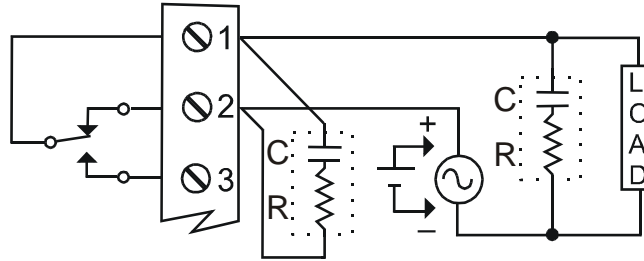
Figure 19: AC and DC Loads Protection

Choose R and C as follows:

R: 0.5 to 1 Ω for each volt across the contacts

C: 0.5 to 1 µF for each amp through closed contacts

Notes:

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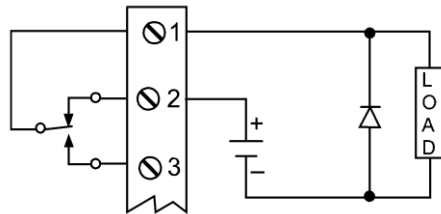
Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 20: Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

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

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

F4 Digital Input Connections

A digital input, F4, is standard on the meter. This digital input connected with a normally open closure across F4 and COM, or with an active low signal applied to F4.
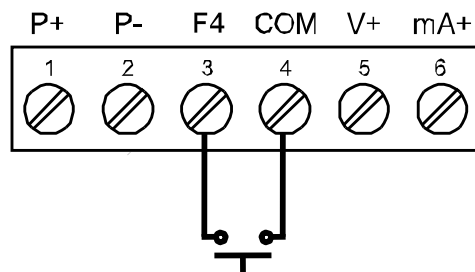
Figure 21: F4 Digital Input Connections

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.
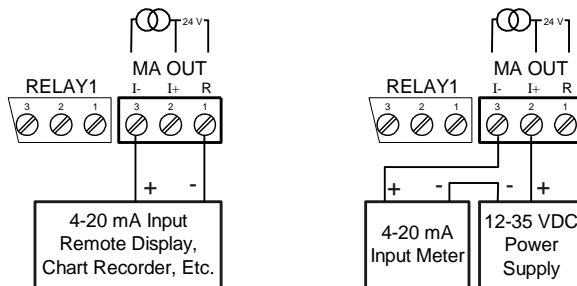
Figure 22: 4-20 mA Output Connections

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.

External Relay & Digital I/O Connections

The relay and the digital I/O expansion modules PDA1004 & PDA1044 are connected to the controller 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.***
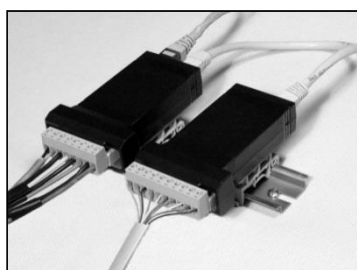
Figure 23: Expansion Modules & DIN Rail Mounting Kit
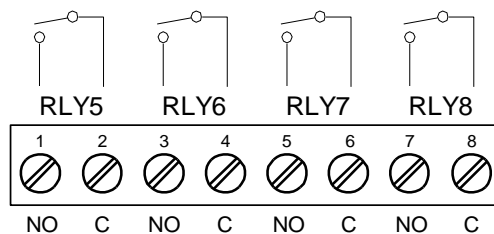
Figure 24: External Relays Module Connections
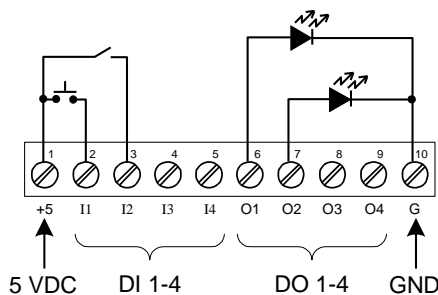
Figure 25: Digital I/O Module Connections

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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 trigger the interlock relay. This feature is enabled by configuring the relay, and relative digital input(s) (see page 40). In one example, dry interlock contacts are connected in series to one digital input which will be used to force on (energize) the assigned interlock power relay when all interlock contacts are closed (safe). The interlock relay front panel LED flashes when locked out. The interlock relay would be wired in-series with the load (N/O contact). See below.
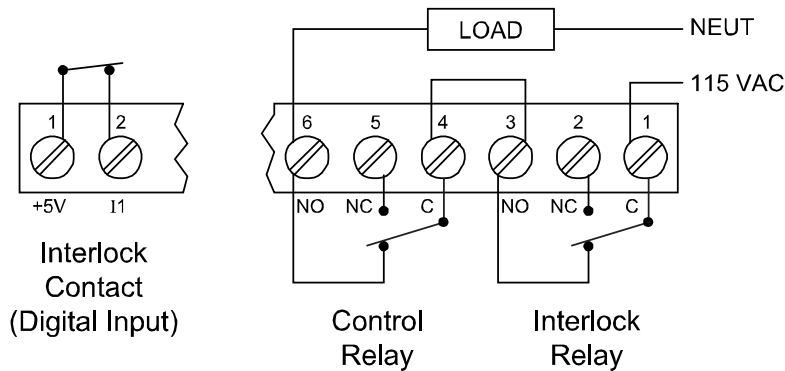
Figure 26: Interlock Connection

Basic Operation and Programming

> The controller has been factory calibrated to read input frequency in Hz (pulses/sec). The calibration equipment is certified to NIST standards.

Overview

Most setup and programming is done through the front panel buttons.

The PD6310 has one 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.

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		LED	Status
MENU	Menu		1-8	Relay 1 – 8 indicator
F1 START	START (Right arrow/F1)		R	Rate indicator
F2 BATCH	BATCH (Up arrow/F2)		T	Batch Total indicator
F3 STOP	STOP (Enter/F3)		G T	Grand Total indicator
Note: *F4 is a digital input. Alarms 5-8 enabled when relay expansion module is installed.*			▲	Total overflow indicator
			M	Manual control relays &/or analog output

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.

Controller Operation

The controller accepts pulses (e.g. ±40mV to ± 8V), square wave (0-5, 0-12V, or 0-24V), open collector NPN, PNP, TTL, or switch contact signals.

These signals are scaled to represent rate in engineering units   from -99999 to 999999. The pulse signals may be scaled with a K-factor to represent a total for the batch, and grand total.

The default configuration displays batch total on the upper display, and a selection of rate, grand total, batch count, and preset on the lower display.

When in pause or stop mode, the display will alternate the numeric value with the run status in the upper display and the display label for the lower display.

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 analog or pulse signal.

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.

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 cycle lower display values of rate (or other lower display programmed parameter), grand total, batch count, and preset.

⚠ !	***Only STOP Button Enabled if a Batch is Running*** *During a batch process, only the pause/stop functions of the STOP button will function. No other buttons will be functional.*

Batch Control Operation Example

The following example shows how two stage batch control functions. 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 100 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	ASSiGn	Press Enter to enter the relay assignment parameters.
ASiGn1	totAL	Assign relay 1 to batch total control.
ASiGn2	totAL	Assign relay 2 to batch total control.
PrEcLS totAL		Press Enter to access preclose selection for multi-stage control.
PrEcLS	YES	Yes to enable a preclose value for relay 2.
YES	00005.0	Set the preclose 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	00055.0	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 preclose, 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, `ASiGn2`, to off, rate, or grand total.

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

Batch Control Operation

1. A new container is prepared for the batch. Both valves are closed. Note that the upper display may show the batch total from the last batch.
2. The START button is pressed. Both valves open. The barrel begins to fill as the total being dispensed is displayed on line 1. The lower window shows the rate and units, alternating.
3. When the batch total reaches 50 gallons, the preset (55) minus the preclose amount (5) for relay 2, relay 2 deactivates to close the main valve. The barrel fills more slowly as a result, improving accuracy.
4. When the batch total equals the preset, relay 1 deactivates, closing valve 1. Filling stops.
5. The BATCH button is pressed, and a new preset is entered, 100 gallons, and the enter/STOP button is pressed to confirm it.
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, 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.

MANUAL MULTI-STAGE BATCH CONTROL OPERATION

System Setup

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.
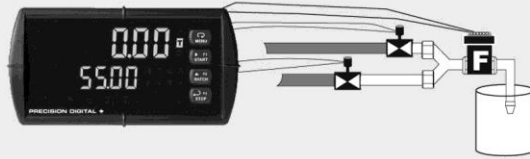
Batch Start

2. The START button is pressed, with both valves open. The barrel begins to fill.

Preclose Valve

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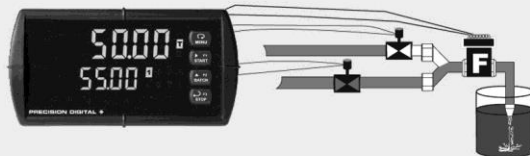
Completed Batch

4. When the batch total equals the preset amount, the restricted-flow valve closes. The barrel is now full. If some overrun occurs, the next batch will adjust for this offset amount to maintain accuracy.
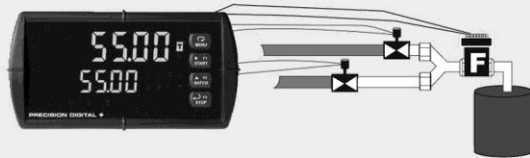
Change Preset

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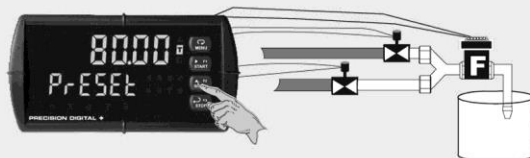
Begin New Batch

6. Press the START key and a new batch will begin. With both valves open, the process continues.
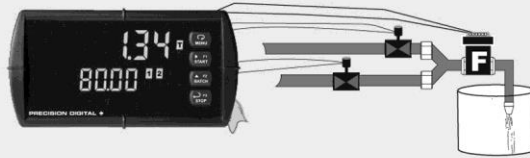
Pause/Stop

7. At any time, the STOP button may be pressed, once to Pause the process, or twice to cancel the batch, which stops the process.

VALVE KEY LEGEND

FLOWMETER

SOLENOID VALVE

⊠ = VALVE CLOSED

◁▷ = VALVE OPEN
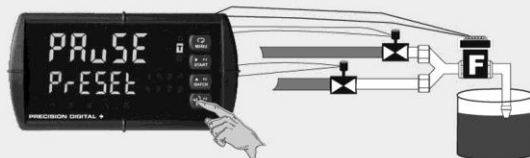
MeterView® Pro Software

The meter can also be programmed using the PC-based MeterView Pro software included with the meter. This software can be installed on any Microsoft® Windows® (XP/Vista/7/8/10) computer by connecting the meter's onboard USB. The meter is powered by the USB connection, so there is no need to wire anything prior to programming the meter, though USB is intended only for meter configuration.

MeterView Pro Installation

1. Connect one end of the provided USB cable to the meter and the other end to the computer. The computer will automatically install the driver software it needs to talk to the meter.
   Only one meter may be connected at a time. Attaching multiple meters will cause a conflict with the meter software.
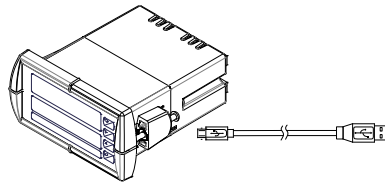
2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."
   If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."

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 onscreen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."

4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your meter.
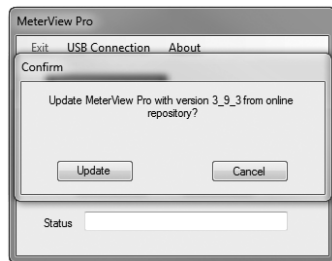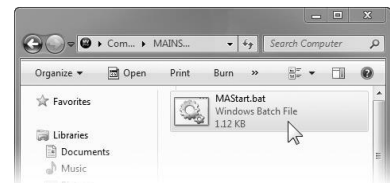
Note: If you decide to update your MeterView Pro software, once the installation has completed, you will be asked if you want to update the setup files located on the meter itself. This way, you will always have the most current version on the meter for future installs.

⚠ **Warning!**	*Do not unplug the meter while the new installation files are being written to it. The meter will display υϛrΙΕΕ during the process and you will receive an onscreen notification once the process is complete.*

Data logging for one meter at a time is available with MeterView Pro software. More advanced data acquisition may be accomplished by using any Modbus RTU compliant software. Additional information regarding configuration and monitoring of the meter using MeterView Pro software is available online. Go to **www.predig.com/meterview-pro**.

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	Parameter	Action/Setting Description	Display	Parameter	Action/Setting Description
SEtuP	Setup	Enter *Setup* menu	Gt CF	Grand total conversion factor	Program grand total conversion factor
InPut	Input	Enter *Input* selection menu	Gt rSt	Grand total reset	Program grand total reset mode: auto or manual
totAL	Total	Enable or disable totalizer features	dSPLAY	Display	Enter the *Display* menu
un itS	Units	Select the display units/tags	L inE 1	Line 1	Press Enter to assign the upper display parameter (default: PV or rate)
rAtE	Rate	Select the display units for rate	L inE 1	Line 2	Press Enter to assign the lower display parameter (default: total)
totAL	Total	Select the display units for total	d- IntY	Display intensity	Set display intensity level from 1 to 8
GtotAL	Grand Total	Select the display units for grand total	rELAY	Relay	Enter the *Relay* menu
dEc Pt	Decimal point	Set decimal point for rate, total, grand total	ASS iGn	Assignment	Assign relays to rate, total (batch control), grand total, or Modbus controlled.
ProG	Program	Enter the *Program* menu	AS iGn1	Assign 1	Relay 1-2 assignment
InCAL	Input Calibration	Enter the *Input Calibration* menu	totAL	Total	Assign relay to batch control
FActor	K-factor Scaling	Programs unit to convert input pulse to rate in engineering units	GtotAL	Grand total	Assign relay to grand total
SCALE	Scale	Enter the *Scale* menu	m buS	Modbus	Assign relay to Modbus input
CAL	Calibrate	Enter the *Calibrate* menu	rAtE	Rate	Assign relay to rate
InP 1	Input 1	Calibrate input 1 signal or program input 1 value	PrEcLS	Batch total relay preclose	For relays beyond the first assigned to total, a preclose amount may be entered.
d iS 1	Display 1	Program display 1 value	rLY 1	Relay 1	Relay 1 setup
InP 2	Input 2	Calibrate input 2 signal or program input 2 value (up to 32 points)	Act 1	Action 1	Set relay 1 action[1]
d iS 2	Display 2	Program display 2 value (up to 32 points)	Auto	Automatic	Set relay for automatic reset
Error	Error	Error, calibration not successful, check signal or programmed value	A-m An	Auto-manual[1]	Set relay for automatic & manual reset any time[1] (relays assigned to rate)
t tb	Total time base	Enter totalizer time base for seconds, minutes, hours or day.	LAtcH	Latching[1]	Set relay for latching operation (relays assigned to rate) [1]
t CF	Total conversion factor	Enter the conversion factor decimal point and the conversion factor.	Lt-CLr	Latching-cleared[1]	Set relay for latching operation with manual reset only after alarm condition has cleared (relays assigned to rate)[1]
m odE	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	Parameter	Action/Setting Description	Display	Parameter	Action/Setting Description
ALtErn	Alternate[2]	Set relay for pump alternation control (relays assigned to rate)[2]	rSt Hi	Reset high	Press Enter to reset max display
SAmPL	Sampling	Set relay for sampling operation (rate or GT)	rSt Lo	Reset low	Press Enter to reset min display
OFF	Off	Disable relay and front panel status LED (Select Off to enable Interlock feature)	rSt HL	Reset high & low	Press Enter to reset max & min displays
PrESEt	Preset	Set batch preset	rSt t	Reset total	Press Enter to reset total
SEt 1	Set 1	Program set point 1	rSt Gt	Reset grand total	Press Enter to reset grand total
rSt 1	Reset 1	Program reset point 1	rSt bc	Reset batch count	Press Enter to reset batch count
rLY 2	Relay 2	Relays 2-8 setup. Relays 5-8 are shown, only if expansion relay module is installed.	Contrl	Control	Enter Control menu
FAiLSF	Fail-safe	Enter Fail-safe menu	Auto	Automatic	Press Enter to set controller for automatic operation
FLS 1	Fail-safe 1	Set relay 1 fail-safe operation	mAn	Manual	Press Enter to manually control relays or analog output operation
on	On	Enable fail-safe operation	PASS	Password	Enter the Password menu
oFF	Fail-safe off	Disable fail-safe operation	PASS 1	Password 1	Set or enter Password 1
dELAY	Delay	Enter relay Time Delay menu	PASS 2	Password 2	Set or enter Password 2
dLY 1	Delay 1	Enter relay 1 time delay setup	PASS 3	Password 3	Set or enter Password 3
On 1	On	Set relay 1 On time delay	totAL	Total password	Set or enter password for manual reset
OFF 1	Off	Set relay 1 Off time delay	GtotAL	Grand total password	Set or enter password for manual reset
Aout	Analog output	Enter the Analog output scaling menu	nonrSt	Non-resettable	Non-resettable grand total set after entering "050873" for Gtotal password
diS 1	Display 1	Program display 1 value	unLoc	Unlocked	Program password to lock controller
Out 1	Output 1	Program output 1 value (e.g. 4.000 mA)	Locd	Locked	Enter password to unlock controller
diS 2	Display 2	Program display 2 value	999999 -99999	Flashing display	Overrange condition Underrange condition
Out 2	Output 2	Program output 2 value (e.g. 20.000 mA)			
rESEt	Reset	Press Enter to access the Reset menu			

1. During operation, only the STOP button will function, to stop/pause the batch. As a result, relay alarms cannot be manually reset.
2. This setting used for level control applications. It is not appropriate if using this controller for batching applications.

Main Menu Map

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

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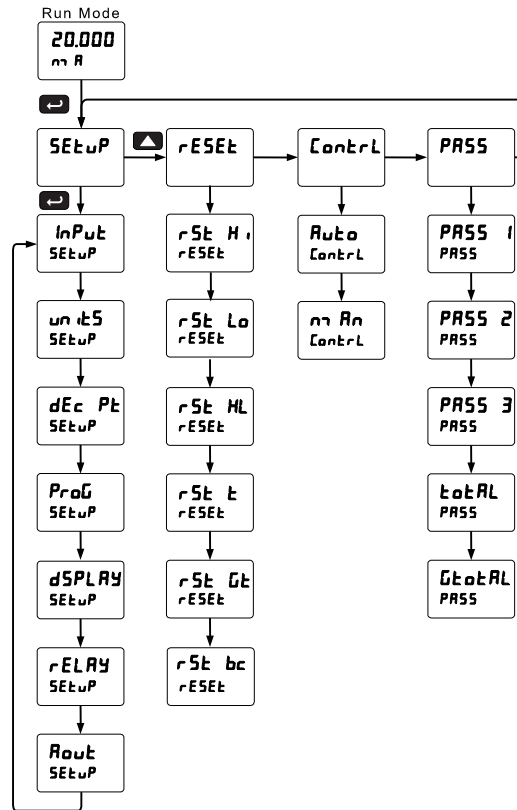
Setting Numeric Values

The numeric values are set using the Right and Up arrow buttons. Press Right arrow to select next digit and Up arrow to increment digit value.

The digit being changed is displayed brighter than the rest.

Press and hold up arrow to auto-increment the display value.

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

Setting Up the Batch Controller (SEtuP)

The *Setup* menu is used to select:

1. Input signal the controller will accept
2. Enable or disable totalizer and batching features
3. Select the display units/tags
4. Decimal point position
5. Program menu for scaling or calibration
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.

```
                        ┌─────────┐
                        │  SEtuP  │
                        └─────────┘
                            │ ↵
              ┌─────────┐   ↵   ┌─────────┐       ┌─────────┐  ▲  ┌─────────┐
              │  inPut  │──────>│  totAL  │──────>│   YES   │────>│   no    │
              │  SEtuP  │       │         │       │  totAL  │     │  totAL  │
              └─────────┘       └─────────┘       └─────────┘     └─────────┘
                  │ ▲
              ┌─────────┐       ┌─────────┐       ┌─────────┐     ┌─────────┐
              │  unitS  │──────>│  rAtE   │──────>│  totAL  │────>│ GtotAL  │
              │  SEtuP  │       │  unitS  │       │  unitS  │     │  unitS  │
              └─────────┘       └─────────┘       └─────────┘     └─────────┘
                  │
              ┌─────────┐       ┌─────────┐       ┌─────────┐     ┌─────────┐
              │  dEc Pt │──────>│  rAtE   │──────>│  totAL  │────>│ GtotAL  │
              │  SEtuP  │       │  dEc Pt │       │  dEc Pt │     │  dEc Pt │
              └─────────┘       └─────────┘       └─────────┘     └─────────┘
                  │
              ┌─────────┐       ┌─────────┐  ↵  ┌─────────┐  ▲  ┌─────────┐   ┌─────────┐
              │  ProG   │──────>│  InCAL  │────>│ FActor  │────>│  SCALE  │──>│   CAL   │
              │         │       │  ProG   │     │  InCAL  │     │  InCAL  │   │  InCAL  │
              └─────────┘       └─────────┘     └─────────┘     └─────────┘   └─────────┘
                  │                 │ ▲
                  │             ┌─────────┐     ┌─────────┐     ┌─────────┐   ┌──────────┐
                  │             │  t tb   │────>│  t CF   │────>│  m odE  │──>│  Grand   │
                  │             │  ProG   │     │  ProG   │     │  ProG   │   │  Total   │
                  │             └─────────┘     └─────────┘     └─────────┘   │ Settings │
                  │                                                           └──────────┘
              ┌─────────┐       ┌─────────┐       ┌─────────┐     ┌─────────┐
              │ dSPLAY  │──────>│  LinE 1 │──────>│  LinE 2 │────>│ d-IntY  │
              │  SEtuP  │       │ dSPLAY  │       │ dSPLAY  │     │ dSPLAY  │
              └─────────┘       └─────────┘       └─────────┘     └─────────┘
                  │
              ┌─────────┐       ┌─────────┐       ┌─────────┐     ┌──────────┐
              │ rELAY   │──────>│ ASSiGn  │──────>│  rLY 1  │────>│ Relays 2-8│
              │  SEtuP  │       │ rELAY   │       │  rELAY  │     │ Fail-Safe │
              └─────────┘       └─────────┘       └─────────┘     │  Delay    │
                  │                                               │  Break    │
                  │                                               └──────────┘
              ┌─────────┐       ┌─────────┐       ┌─────────┐     ┌─────────┐
              │  Aout   │──────>│  diS 1  │──────>│ 004.000 │────>│  Out 1  │
              │  SEtuP  │       │  Aout   │       │  diS 1  │     │  Aout   │
              └─────────┘       └─────────┘       └─────────┘     └─────────┘
```
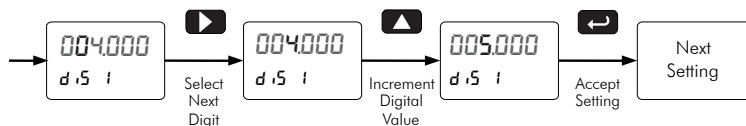
29

Scaling and Calibration

It is very important to read the following information, before proceeding to program the controller:

- There is **no need to recalibrate** the controller when first received from the factory.
- All inputs are factory calibrated. The calibration equipment used is certified to NIST standards.
- Use the *Scale* menu to enter the scaling without a signal source.
- Use the *Calibrate* menu to apply a signal from a calibrator or a flowmeter for the scaling.

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*, 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.

*Default setting

Setting the Totalizer and Batching 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 (un it5)

Enter the input unit or custom tag that will be displayed if alternating rate, total, or grand total and units is selected in the *un it5* menu, or *d un it* is selected as the line 2 parameter. See the flow chart on page 35 to access the display menu to show the unit or tag on line 2. The engineering units or custom legends can be set using the following 7-segment character set:

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

Notes:

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

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

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

Setting the Decimal Point (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.

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)

It is **very important** to read the following information, before proceeding to program the controller:

- The controller has been factory calibrated to read input frequency in Hz (pulses/sec). The calibration equipment is certified to NIST standards.
- Use the K-Factor menu to match the rate/totalizer with a flowmeter's k-factor (pulse/unit of measure).
- Use the *Scale* menu to scale process inputs without a signal source. A calibrated signal source is not needed to scale the controller.

The *Program* menu contains the following menus:

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

The process inputs may be calibrated or scaled to any display value within the range of the controller.
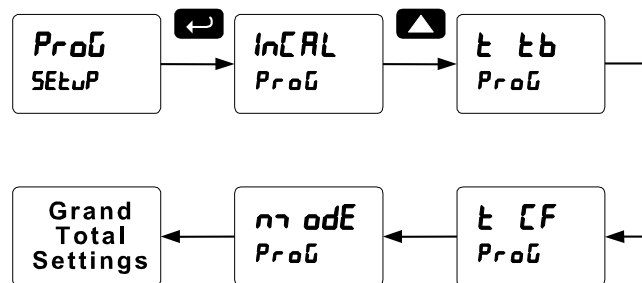
Additional parameters, not needed for most applications, are programmed in the *Advanced Features* menu; see Advanced Operation and Programming on page 46.

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.

Note: The K-Factor, Scale, and Calibrate functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set for Scale and Calibrate accordingly under the Number of Points (noPtS) menu selection prior to scaling and calibration of the meter, see page 50 for details.
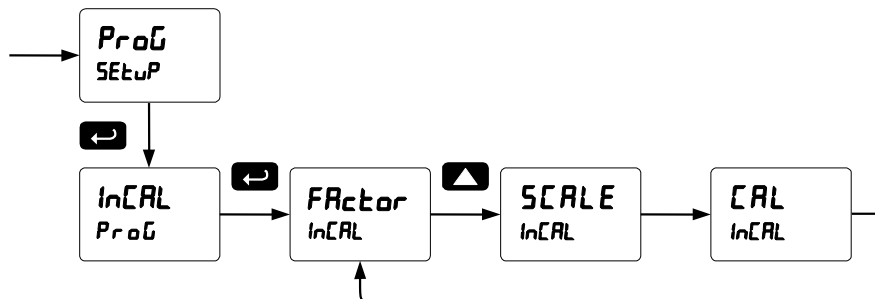
K-Factor Calibration (FActor)

The meter 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 meter will automatically calculate the flow rate using the k-factor and the time base selected.

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Scaling the Controller (SCALE)

The pulse inputs can be scaled to display the input frequency process variable as engineering units.

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

For instructions on how to program numeric values see *Setting Numeric Values*, page 28.
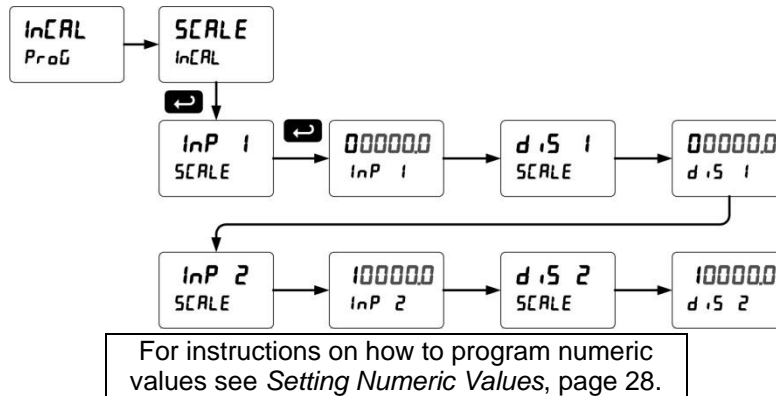
Note: The display values (dIS 1 and dIS 2) need to be in units of measure per second.

For example: If the rate at 1000 Hz is 13.2 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: 0.000
InP 2: 1000.0
dIS 2: 0.220

Set the time base set to minutes (see below) and the meter will display 13.2 gal/min at 1000 Hz

Error Message (Error)

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

After the error message is displayed, the 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.

Time Base, Total Conversion Factor & Total Reset

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

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

Time Base

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

Total & Grand Total Conversion Factor

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

Batch Start Mode (ꓵꓵ odE)

The batch controller may operate in manual or automatic mode. In manual mode, the controller operates as defined in Controller Operation as described on page 22. In automatic mode, the batch process will automatically begin after a completed batch. The time delay for the restart may be 0.1 to 999.9 seconds (t dLY). Automatic batch start will only occur after a successful batch. A manually stopped batch will require a manual start to begin a new batch process.

Grand Total Reset

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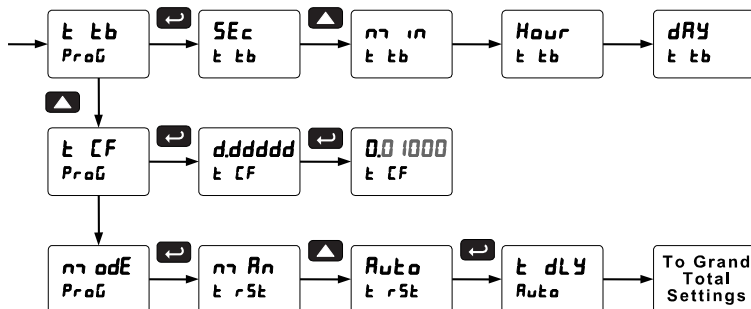

Non-Resettable Totalizer

The total and grand total can be password-protected to prevent unauthorized resets. The grand total can be programmed as a non-resettable total, see page 45 for details.

Calibrating the Controller with External Source (CAL)

To scale the controller without a signal source, refer to Scaling the Controller (SCALE) page 32.

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.
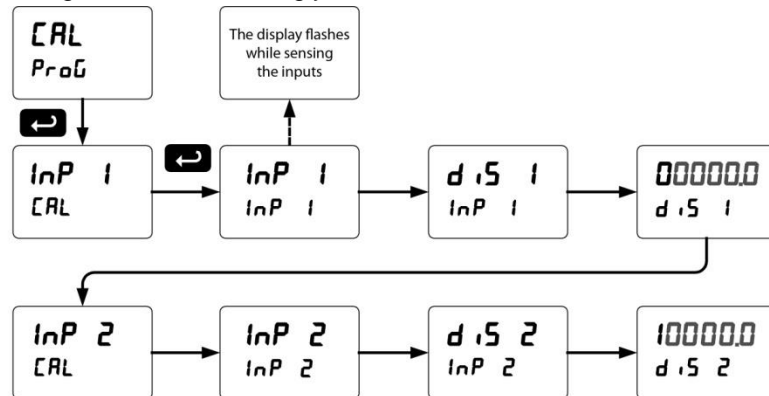
Note: The display values (dis 1 and dis 2) need to be in units of measure per second.

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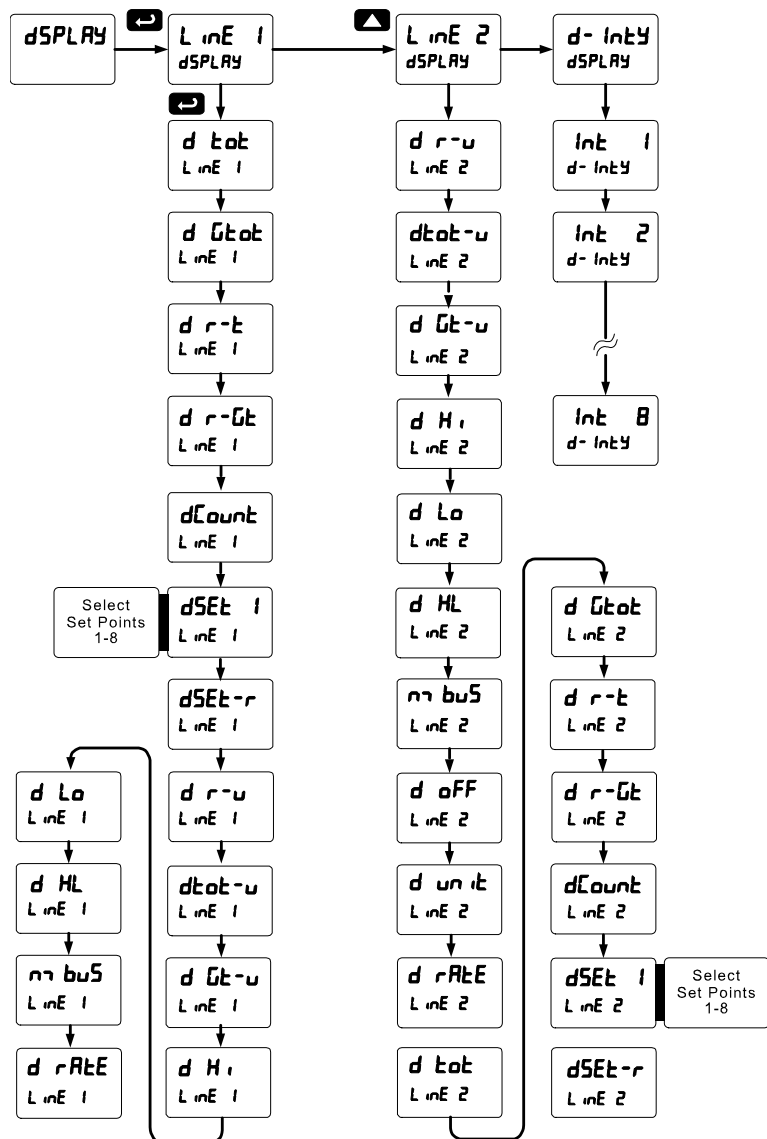
Display Intensity: The meter has eight display intensity levels to give the best performance under various lighting conditions. Select intensity 8 for outdoor applications. The default intensity setting is 8.

All models have Sunbright sunlight readable displays. For direct sunlight readability, set the controller for the highest display intensity.

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

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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 (automatic reset only, for level applications unrelated 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 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.

> ⚠ **Rate Alarms Only Active During a Batch Process**
>
> *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.*
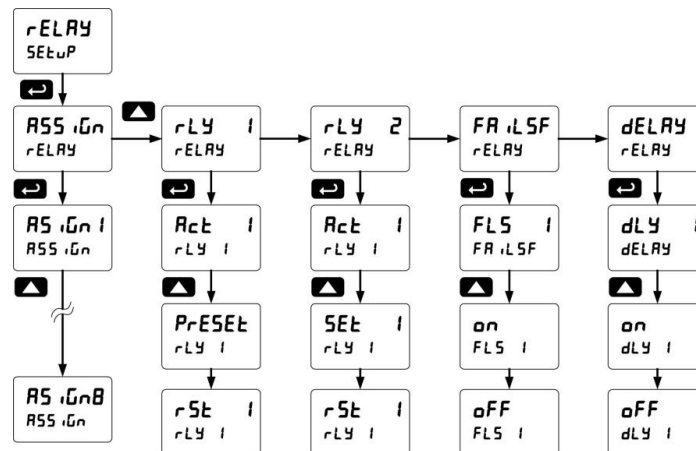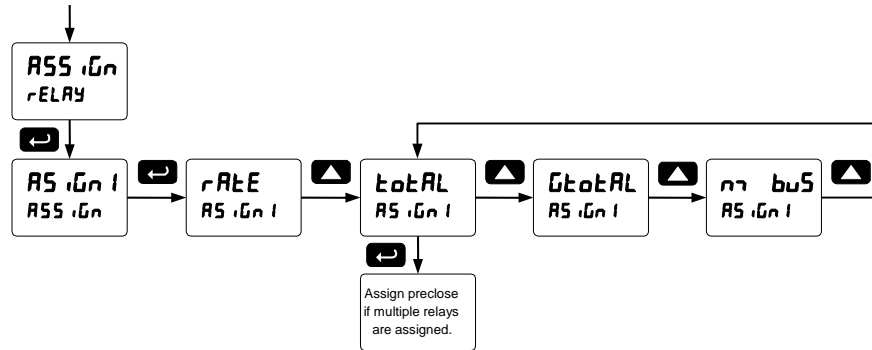

Note: The setup of relays 3-8 follows the same pattern shown here for relay 2.

Relay Assignment (*RSS 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

Assign preclose if multiple relays are assigned.

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

Setting the Relay Action

Operation of the relays is programmed in the *Action* menu. The relays are commonly set up for any of the following modes of operation:
1. Always set to Auto for Batch control operation. Also for automatic reset (non-latching) of alarms.
2. Sampling (the relay is activated for a user-specified time)
3. Off (relay state 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 then 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 (automatic reset only, for level applications, unrelated to batch control.)

Setting Batch Control Relays

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

Programming Alarm Set and Reset Points

High alarm indication: program set point above reset point.

Low alarm indication: program set point below reset point.

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

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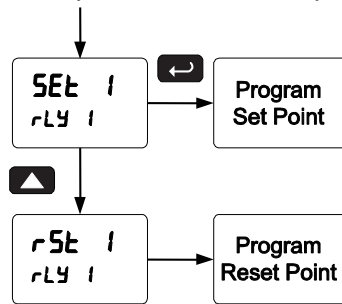
Setting Fail-Safe Operation

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

Programming Time Delay

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

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

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

Relay 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, minus any preclose amount programmed for batch (total) relays after the first.

For an example of batch control operation, see Batch Control Operation Example on page 23.

Typical applications for alarms are low and high flow alarms or grand total limit alarms. Note that rate alarms are only enabled during a batching process, and deactivate when the processes 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 (ie: 2 second sample relay activation every 100 gallons batched).

There are three basic ways the relays can be used:

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

Relays Initialization

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

Fail-Safe Operation

The following table indicates how alarm relays behave based on the fail-safe selection for each relay:

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

Fail-Safe Selection	De-Energized State		Energized 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

Front Panel LEDs

The LEDs on the front panel provide status indication for the following:

The controller is supplied with four alarm points that include front panel LEDs to indicate alarm conditions. This standard feature is particularly useful for alarm applications that require visual-only indication. The LEDs are controlled by the set and reset points programmed by the user. When the display

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

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 enabled during a batching process, and deactivate when the processes are 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 manuals available at www.predig.com.

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 PD6300 instruction manuals available at www.predig.com.
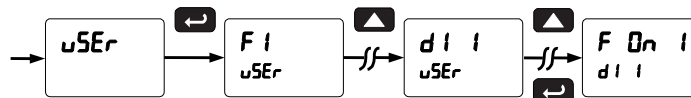
Setting up the Interlock Relay (Force On) Feature

Relays 1-4 can be set up as interlock relays. To set up the relays for the interlock feature:
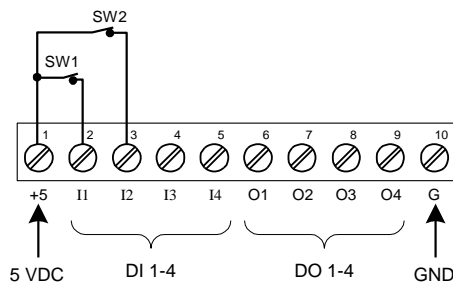
1. Access the *Setup – Relay – Action* menu and set the action to off.
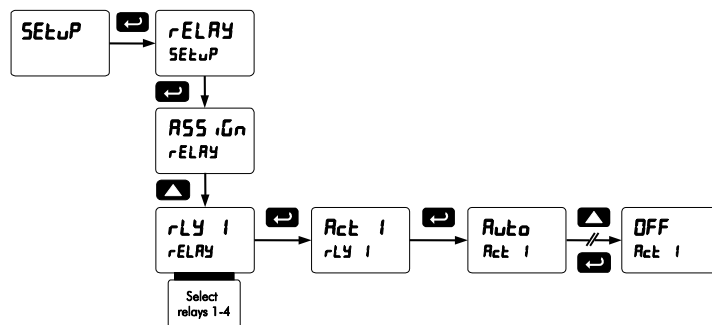
2. In the Advanced features – *User* menu program any of the digital inputs to Force On any of the internal relays (1-4).

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 off) 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).

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 of time

A rate sampling relay will activate for the sample time (5Rⁿ⁻ ᴛ), up to 600.0 seconds, every time the set point rate is reached.

A total sampling relay will activate for the sample time (5Rⁿ⁻ ᴛ), up to 600.0 seconds every time the process has batched the amount programmed for the set point, and every time this amount has been batched afterward. (See the diagram below for 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 when the batch total interval reaches a certain set point.

Relay and Alarm Operation Diagrams

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

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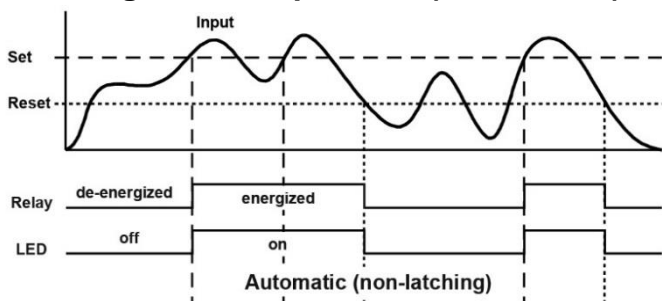
Low Alarm Operation (Set < Reset)
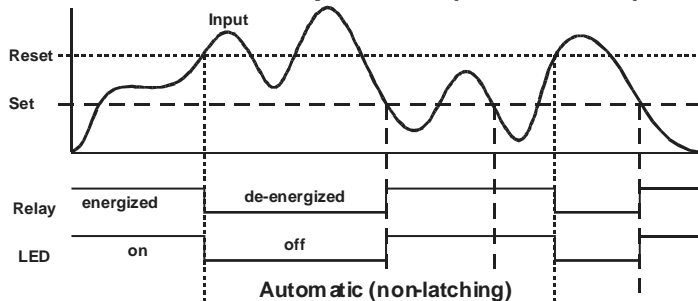
High Alarm with Fail-Safe Operation (Set > Reset)

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.

Rate Relay Sampling Operation

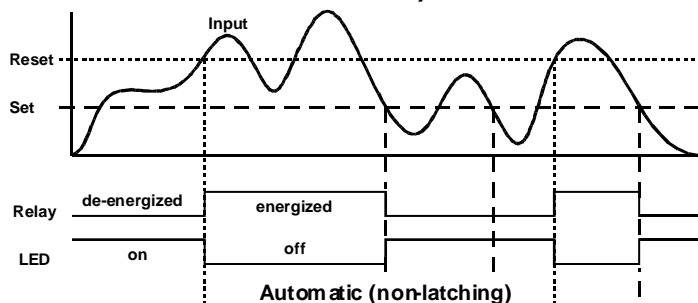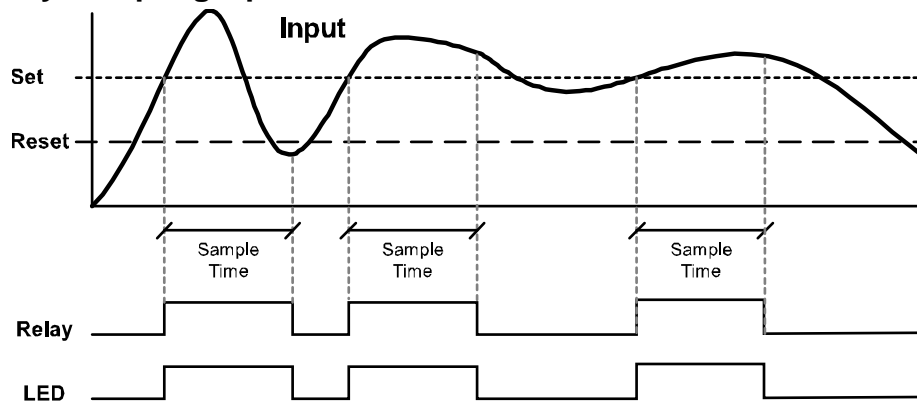When the signal crosses the set point, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the set point is crossed, going up for high alarms and going down for low alarms.

The sample time can be programmed between 0.1 and 600.0 seconds.

Total Relay Sampling Operation

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

Time Delay Operation

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

On Time Delay
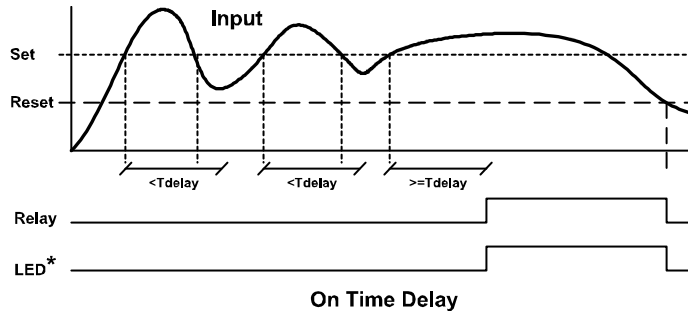
Off Time Delay

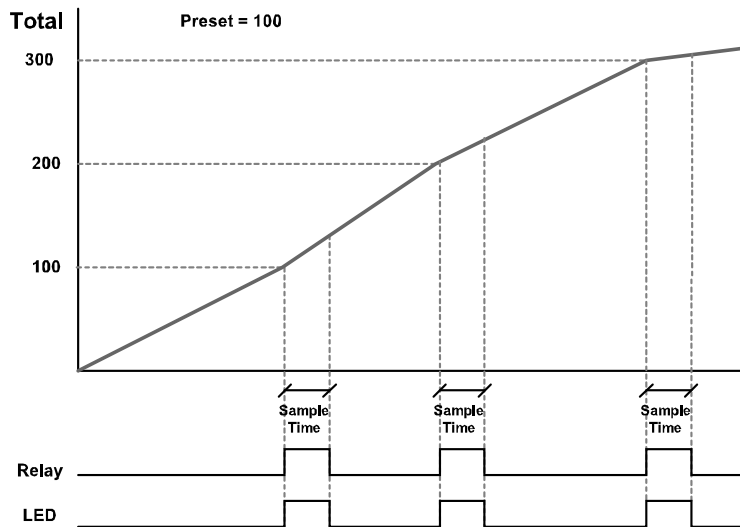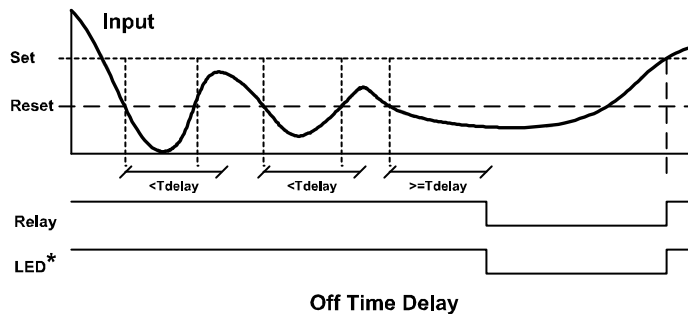When the signal crosses the set point, the *On* time delay timer starts and the relay trips when the time delay has elapsed. If the signal drops below the set point (high alarm) before the time delay has elapsed, the *On* time delay timer resets and the relay does not change state. The same principle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

Note: If "Automatic or Manual (A-n٦ An)" reset mode is selected, the LED follows the reset point and not the relay state when the relay is acknowledged.

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.
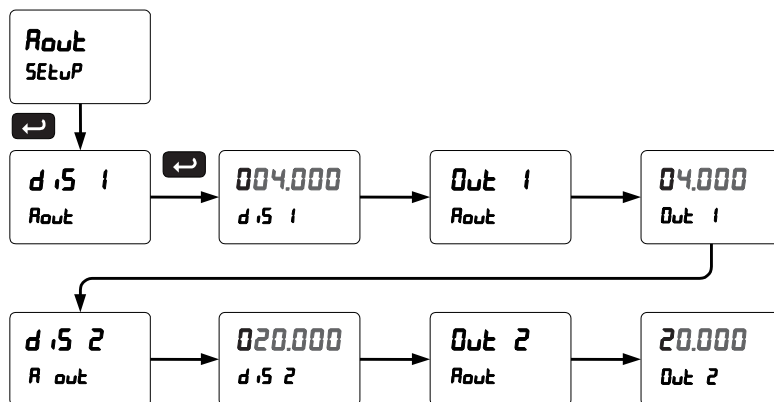
For instructions on how to program numeric values see *Setting Numeric Values*, page 28.

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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`).

Control Menu (`Contrl`)

The *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`)

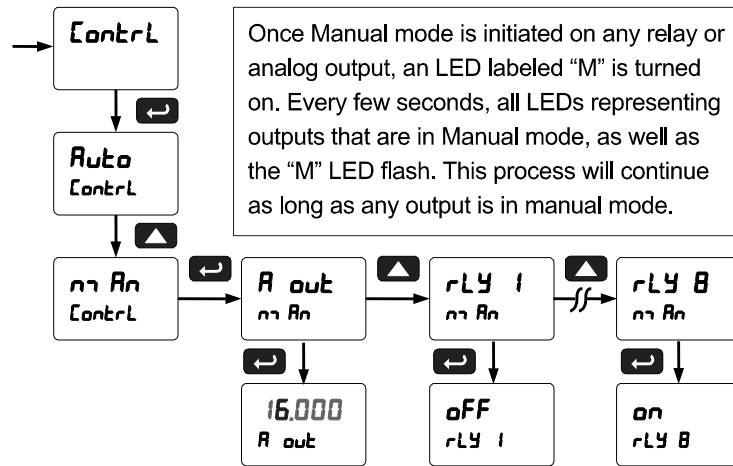The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings and to program the non-resettable totalizer.

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 28.
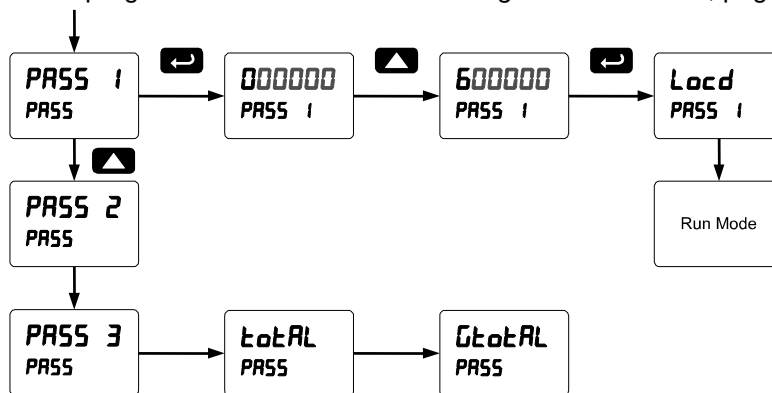
Grand Total Reset Password & Non-Resettable Total

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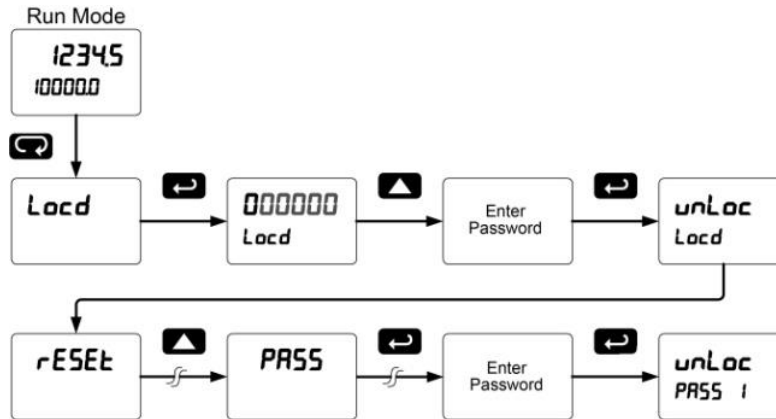
If the correct six-digit password is entered, the controller displays the message *unLoc* (unlocked) and the protection is disabled until a new password is programmed.

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.

Advanced Operation and Programming

In addition to the functions described in Controller Operation on page 22, the following advanced operation and display features may be programmed. Configuring these features may disable some default batch controller features, or make running a batch operation impossible. These functions should only be used by users who are sure of their need in their application.
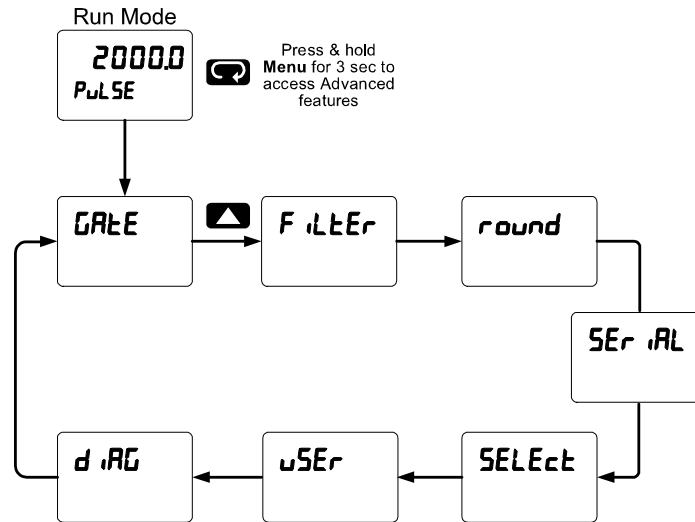
Advanced Features Menu

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 back 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.

Display	Parameter	Action/Setting	Display	Parameter	Action/Setting
GAtE	Gate	Gate settings	PAritY	Parity	Select parity Even, Odd, or None with 1 or 2 stop bits
Lo G	Low gate	Program Low gate value			
Hi G	High gate	Program High gate value	t-bYt	Time byte	Set byte-to-byte timeout
FiLtEr	Filter	Set noise filter value	SELEct	Select	Enter the Select menu (function, cutoff, out)
Hi SPd	High Speed Filter	Program High Speed Filter	Functn	Signal Input Conditioning	Select linear, square root, or programmable exponent
Lo SPd	Low Speed Filter	Program Low Speed Filter			
round	Round	Set the rounding value for display variables	LinEAr	Linear	Set controller for linear function and select number of linearization points
SEriAL	Serial	Set serial communication parameters	CutoFF	Cutoff	Set low-flow cutoff
SLAUE id	Slave ID	Set slave ID or controller address	Count	Count	Set the totals to count up or down from a set value
bAud	Baud rate	Select baud rate	tot C	Total count	Set the batch to count up to or down from the preset
tr dLY	Transmit delay	Set transmit delay for serial communication			

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Display	Parameter	Action/Setting
uP	Up	Set the total to count up
doujn	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 program-ming	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
m AX	Maximum	Program maximum mA output allowed
m in	Minimum	Program minimum mA output allowed
CAL ib	Calibrate	Calibrate 4-20 mA output (internal reference source used for scaling the output)

Display	Parameter	Action/Setting
4 m A	4 mA output	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
20 m A	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)
di 1	Digital input 1	Assign digital input 1 – 8, if expansion modules are connected
dO 1	Digital output 1	Assign digital output 1 – 8, if expansion modules are connected
d iAG	Diagnostics	Display parameter settings
LEd t	LED test	Test all LEDs
inFo	Information	Display software information
ErASE	Erase	Erase MeterView Pro software stored in meter's memory

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Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. The following table shows the default setting for each of the function keys.

Function Key/Button	Default Setting	Action
F1/START	5tArt	Start batch
F2/BATCH	PrESEt	Change preset
F3/STOP	5toP	Pause/stop batch
F4/Digital Input	5rt5tP	Start/stop batch

F4 Operation

A digital input, F4, is standard on the meter. 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.

> **⚠ 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.*

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 page 50 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.

> **⚠** *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 Hi), Min (d Lo), or toggle between Max and Min (d HL) every 10 seconds.
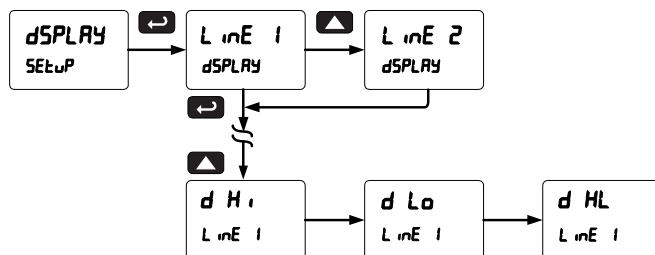
> **⚠** *Note that changing default the programming of line 1 or line 2 will interfere with seeing the batch total (line 1) or rate (line 2) of the batch process.*

Noise Filter (**FiLtEr**)

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

Note: The filter for a PD6310 works differently. There are two available settings: Hi Speed and Lo Speed (programmable from 2 to 50).

Rounding Feature (**round**)

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

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

Modbus RTU Serial Communications (**SEriAL**)

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

The meter may be connected to a PC for initial configuration via the onboard micro USB connection. For ongoing digital communications with a computer or other data terminal equipment, an RS-232, or RS-485 option is required; see *Ordering Information* on page 6 for details.

⚡ 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.**

Note: More detailed instructions are provided with each optional serial communications adapter. Note: Refer to the ProVu® Modbus Register Tables located at www.predig.com for details.

Note: Changes made to the Serial menu are initialized after the MENU key is pressed or after navigating through the remainder of the serial parameters (i.e. pass the t-byte parameter).
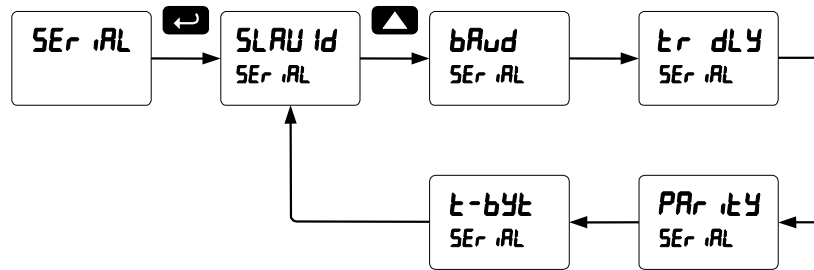
When using more than one controller in a multi-drop mode, each controller must be provided with its own unique address. The controller address (Slave ID) may be programmed between 1 and 247. The transmit delay may be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop bits.

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Select Menu (SELEct)

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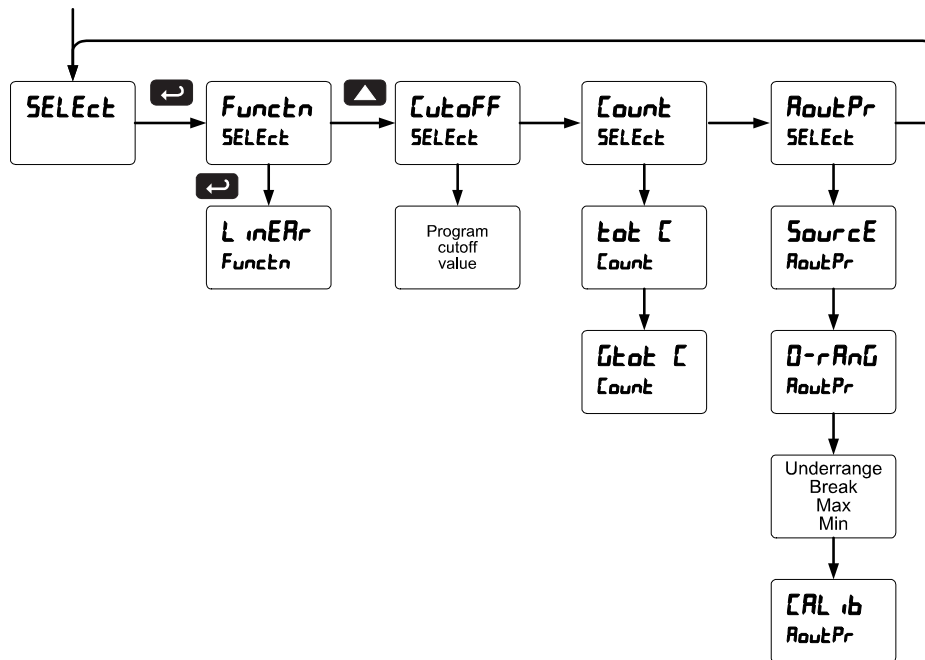
Signal Conditioning Selection (Functn)

The *Function* menu is used to select the number of points used in the linear conditioning function applied to the input.

Controllers are set up at the factory for linear function with 2-point linearization.

Multi-Point Linearization (LinEAr)

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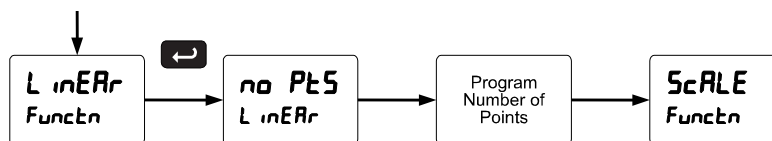
Low-Flow Cutoff (CutoFF)

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

The cutoff value may be programmed from 0 to 999999. The controller will display zero below the cutoff value. Programming the cutoff value to zero disables the cutoff feature.

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 set value to zero.

Analog Output Programming (ꞁoutPr)

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

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

Analog Output Source

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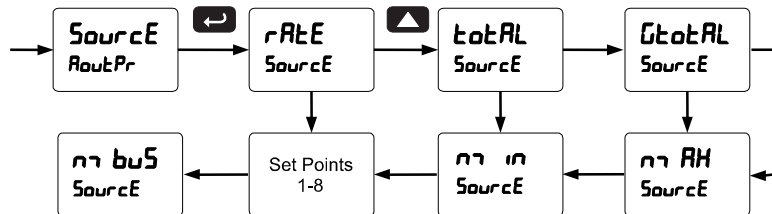
Analog Output Calibration

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

> ⚠ *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 signal input 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 meter 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 meter (i.e. alarms, relay acknowledgement, reset max, min, or max & min, tare, and reset tare). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.

Function Keys & Digital I/O Available Settings

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

Display	Description
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 as they are until a button assigned to *enable relays* (rLY E) is pressed
d Hold	Hold the current display value momentarily while the function key or digital input is active. The process value will continue to be calculated in the background.
Ln1 Hi	Display maximum display value on line 1
Ln1 Lo	Display minimum display value on line 1
Ln1 HL	Display maximum & minimum display values on line 1
Ln2 Hi	Display maximum display value on line 2
Ln2 Lo	Display minimum display value on line 2
Ln2 HL	Display maximum & minimum display values on line 2
Ln2 Gt	Display the grand total on line 2
Ln2 bc	Display the batch count on line 2
Contrl	Directly access the control menu
diSAbL	Disable the selected function key or digital I/O

Display	Description
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 page 40 for details about interlock relays.
ALm 1*	Provide indication when alarm 1 (*through 8) has been triggered (digital outputs only)

Troubleshooting

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

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

Diagnostics Menu (d iAG)

The *Diagnostics* menu is located in the *Advanced Features* menu, to access *Diagnostics* menu see Advanced Operation and Programming, page 46.

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

For a description of the diagnostic messages, *see Advanced Features Menu &* Display Messages, page 46.

Determining Software Version

To determine the software version of a controller:

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

Reset Controller to Factory Defaults

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

Instructions to load factory defaults:

1. Enter the *Advanced Features* menu. See Advanced Operation and Programming, page 46.
2. Press Up arrow to go to *Diagnostics* menu
3. Press and hold Right arrow for three seconds, press Enter when display flashes rESEt.
   Note: If Enter is not pressed within three seconds, the display returns to the *Diagnostics* menu.
4. The controller goes through an initialization sequence (similar as on power-up), and loads the factory default settings.
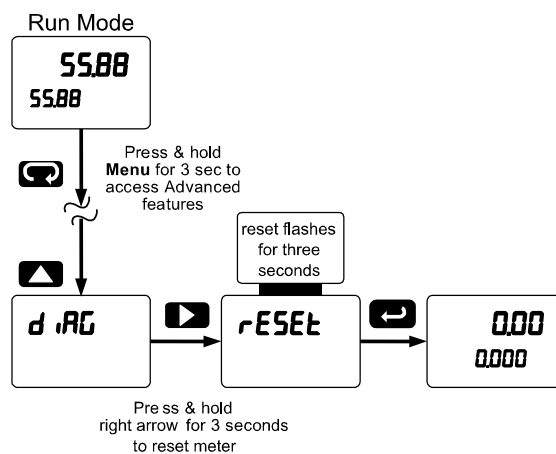
Factory Defaults & User Settings

The following table shows the factory setting for the major programmable parameters on the controller.

Parameter	Display	Default Setting	Parameter	Display	Default Setting
Total	YES	Total enabled	Relay 2 action	Act 2	Automatic
Units	un itS	Rate / total / gr. total Pulse / Pulse / Pulse	Relay 2 set point	SEt 2	200.0
Rate decimal point	ddd.ddd	1 Place	Relay 3 action	Act 3	Automatic
Total decimal point	ddddd.d	1 Place	Relay 3 set point	SEt 3	3.000
G. Total decimal point	dddddd	0 Places	Relay 3 reset point	rSt 3	2.500
K-factor	FActor	1.000	Relay 4 action	Act 4	Automatic
Function	Functn	Linear	Relay 4 set point	SEt 4	4.000
Number of points	no PtS	2	Relay 4 reset point	rSt 4	3.500
Programming	ProG	Scale	Fail-safe relay 1	FLS 1	Off
Input 1	InP 1	00000.0	Fail-safe relay 2	FLS 2	Off
Display 1	diS 1	00000.0	Fail-safe relay 3	FLS 3	Off
Input 2	InP 2	10000.0	Fail-safe relay 4	FLS 4	Off
Display 2	diS 2	10000.0	On delay relay 1	On 1	0.0 sec
Display line 1	LinE 1	Display total	Off delay relay 1	OFF 1	0.0 sec
Display line 2	LinE 2	Display rate and units	On delay relay 2	On 2	0.0 sec
Display intensity	d-IntY	8	Off delay relay 2	OFF 2	0.0 sec
Total time base	t tb	Second	On delay relay 3	On 3	0.0 sec
Total conversion factor	t CF	1.000	Off delay relay 3	OFF 3	0.0 sec
Batch mode	m odE	Manual	On delay relay 4	On 4	0.0 sec
Grand total time base	Gt tb	Second	Off delay relay 4	OFF 4	0.0 sec
Grand total conversion factor	t CF	1.000	Display 1 analog out	diS 1	0
Grand total reset	t rSt	Manual	Output 1 value	Out 1	4.000 mA
Relay 1 assignment	ASiGn1	Total	Display 2 analog out	diS 2	1000.0
Relay 2 assignment	ASiGn2	Total	Output 2 value	Out 2	20.000 mA
Relay 2 preclose	PrECLS	No	Source analog output	SourcE	Rate/process
Relay 3 assignment	ASiGn3	Rate			
Relay 4 assignment	ASiGn4	Rate			
Relay 1 action	Act 1	Automatic			
Batch preset	PrESEt	100.0			

Parameter	Display	Default Setting
Overrange output	0-rAnG	21.000 mA
Underrange output	u-rAnG	3.000 mA
Loop break output	brEAK	1.000 mA
Filter	FiLtEr	Hi Spd
Cutoff value	CutoFF	0.000 (disabled)
Maximum output	m AH	23.000 mA
Minimum output	m in	1.000 mA
Slave ID (Address)	SLAUE Id	247
Baud rate	bAud	9600
Transmit delay	tr dLY	50 ms
Parity	PAr itY	Even
Byte-to-byte timeout	t-bYt	010 (0.1 sec)

Parameter	Display	Default Setting
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	d0 1	Alarm 1-4
Password 1	PA55 1	000000 (unlocked)
Password 2	PA55 2	000000 (unlocked)
Password 3	PA55 3	000000 (unlocked)
Total password	totAL	000000 (unlocked)
Grand total password	GtotAL	000000 (unlocked)

Troubleshooting Tips

Symptom	Check/Action
No display at all	Check power at power connector
Display reads *LoCd SEAL* when the Menu button is pressed.	Remove the programming lockout jumper to access programming menus
Not able to change setup or programming, *Locd* is displayed	Controller is password-protected, enter correct six-digit password to unlock
Controller displays error message during calibration (*Error*)	Check: 1. Signal connections 2. Input selected in *Setup* menu
Controller displays 999999 -99999	Check: 1. Input selected in *Setup* menu 2. Corresponding signal at Signal connector
Display is unstable	Check: 1. Input signal stability and value 2. Display scaling vs. input signal 3. Filter values (increase)
Display response is too slow	Check filter values
Display reading is not accurate	Check scaling, k-factor, or calibration
Display does not respond to input changes, reading a fixed number	Check: Display assignment, it might be displaying max, min, or set point.
Display alternates between 1. *Hi* and a number 2. *Lo* and a number	Press Menu to exit max/min display readings.
Relay operation is reversed	Check: 1. Fail-safe in Setup menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in *Setup* menu 2. Set and reset points
Flashing relay status LEDs	Relays in manual control mode or relay interlock switches opened.
Controller not communicating with application programs	Check: 1. Serial adapter and cable 2. Serial settings 3. Controller address and baud rate
If the display locks up or the controller does not respond at all	Cycle the power to reboot the microprocessor.
Other symptoms not described above	Call Technical Support for assistance.

Note: Certain sequences of events can cause unexpected results. To solve these issues, it is best to start fresh from factory defaults and map changes ahead of time, rather than at random.

EU Declaration of Conformity

Issued in accordance with ISO/IEC 17050-1:2004.

We,

Precision Digital Corporation
233 South Street
Hopkinton, MA 01748 USA

as the manufacturer, declare under our sole responsibility that the product(s),

Model PD6310-WM ProVu Series NTEP Certified Pulse Batch Controller

to which this declaration relates, is in conformity with the European Union Directives shown below:

2014/35/EU	**Low Voltage Directive**
2014/30/EU	**EMC Directive**
2011/65/EU	**RoHS Directive**

This conformity is based on compliance with the application of harmonized or applicable technical standards and, when applicable or required, a European Union notified body certification.

Standards:

EN 55022:2003
EN 61000-6-2:2001
EN 61010-1:2001
EN 61326:2006

The standards EN 55022:2003, EN 61000-6-2:2001, EN 61010-1:2001, and EN 61326:2006 are no longer harmonized. The requirements of these standards have been checked against the harmonized standards EN 55022:2010, EN 61000-6-2:2005, EN 61010-1:2010, and EN 61326:2013 and there were no major technical changes affecting the latest technical knowledge for the products listed above.

Product Markings: CE

Signed for and on behalf of Precision Digital Corporation:

Jeffrey Peters

Name: Jeffrey Peters
Company: Precision Digital Corporation
Title: President
Date: 04/20/2016

Document No: DoC PD6310WM {042016}

How to Contact Precision Digital

- For Technical Support please

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

  Fax: (508) 655-8990

  Email: support@predig.com

- For Sales Support or to place an order please contact your local distributor or

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

  Fax: (508) 655-8990

  Email: sales@predig.com

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