



Series PPM Pulse Panel Meter

Instruction Manual



- 1/8 DIN Digital Panel Flow Rate/Totalizers and Tachometer with NEMA 4X, IP65 Front
- Pulse, Open Collector, NPN, PNP, TTL, Switch Contact, Sine Wave (Coil), Square Wave Inputs
- Dual-Line 6-Digit Display, 0.6" (15 mm) & 0.46" (12 mm)
- 5, 10 or 24 VDC Flowmeter Power Supply
- 2 or 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Options
- Free PC-Based, On-Board, Panel Meter Pro USB Programming Software
- No Assembly Required
- Display Rate (Speed) & Total at the Same Time
- Rate (Speed) in Units per Second, Minute, Hour, or Day
- Total, Grand Total or Non-Resetable Grand Total
- Front Panel or Remote Total Reset
- Password Protection for Total Reset
- Total Stored in Non-Volatile Memory
- Assign Any Relay for Rate (Speed) or Total
- 4-20 mA Output for Rate (Speed) or Total
- Sampling Relay
- Gate Function for Rate (Speed) Display of Slow Pulse Rates
- K-Factor, Internal Scaling, or External Calibration
- 4-20 mA Output Option Converts the Pulse Input to an Isolated 4-20 mA Output
- Operating Temperature Range: -40 to 65°C (-40 to 149°F)
- UL & C-UL Listed. E160849; 508 Industrial Control Equipment
- Input Power Options: 85-265 VAC / 90-265 VDC or 12-24 VDC / 12-24 VAC
- Programmable Display, Function Keys & Digital Input
- External 4-Relay & Digital I/O Modules
- RS-232 & RS-485 Serial Communication Options with Modbus RTU
- Wide Assortment of NEMA 4X Enclosures for up to Ten Meters
- 3-Year Warranty

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CAUTION

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

WARNINGS

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

WARNING

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

Limited Warranty

Dwyer Instruments, Inc. warrants this product against defects in material or workmanship for the specified period under "Specifications" from the date of shipment from the factory. Dwyer Instruments' liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit. See Warranty Information and Terms & Conditions on www.dwyer-inst.com for complete details.

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FREE Panel Meter Pro Programming Software



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

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

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

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

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

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

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Introduction

The PPM is a multipurpose, easy to use pulse input flow rate/totalizer tachometer ideal for flow rate, speed, total, and control applications. Its superluminous LED digits make it easily readable in smoke, dust, and fog. It accepts pulse (40 mVp-p to 8 Vp-p), square wave (0-5 V, 0-12 V, or 0-24 V), open collector, NPN, PNP, TTL or switch contact signals. Three of the front panel buttons can be custom-programmed for specific operation.

The basic model includes an isolated power supply with field selectable power of 5, 10, or 24 VDC that can be used to power the flowmeter, speed sensor or other devices. An additional isolated 24 VDC power supply is included with the 4-20 mA output option. A digital input is standard.

A fully loaded PPM pulse rate/totalizer tachometer has the following: four SPDT relays, 4-20 mA output, a power supply for the flowmeter / speed sensor and one for the 4-20 mA output. The PPM capabilities may be enhanced by adding the following external expansion modules: four SPST relays (creating an eight-relay rate/totalizer), two digital I/O modules with four inputs and four outputs each, and RS-232, RS-485, and USB communication adapters.

Ordering Information

85-265 VAC Model	12-24 VDC Model	Options Installed
PPM-100	PPM-200	No options
PPM-101	PPM-201	4-20 mA output
PPM-120	PPM-220	2 relays
PPM-121	PPM-221	2 relays & 4-20 mA output
PPM-140	PPM-240	4 relays
PPM-141	PPM-241	4 relays & 4-20 mA output

Accessories

Model	Description
PMA-01	RS-232 serial adapter
PMA-02	USB serial adapter
PMA-03	RS-422/485 serial adapter
PMA-04	RS-232 to RS-422/485 isolated converter
PMA-05	RS-232 to RS-422/485 non-isolated converter
PMA-06	USB to RS-232 non-isolated converter
PMA-07	USB to RS-422/485 isolated converter
PMA-08	USB to RS-422/485 non-isolated converter
PMA-09	Suppressor (snubber): 0.01 μ F/470 Ω , 250 VAC
PMA-10	DIN rail mounting kit for two expansion modules
PMA-11	4 SPST (Form A) relays
PMA-12	4 digital inputs & 4 digital outputs (2 may be connected)

Enclosures

Series	Meters	Material
PME-10	1-10	Plastic NEMA 4X
PME-20	1-6	Plastic NEMA 4X
PME-30	1-6	Stainless Steel NEMA 4X
PME-40	1-6	Painted Steel NEMA 4
PME-00	1-2	Plastic NEMA 4X

Specifications

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

General

Display	Line 1: 0.6" (15 mm) high, red LEDs Line 2: 0.46" (12 mm) high, red LEDs 6 digits: each (-99999 to 999999), with lead zero blanking.
Display Intensity	Eight user selectable intensity levels. Default value is six.
Display Update Rate	Rate: 10/sec to 1/100 sec (it is a function of Low Gate setting) Total: 10/second (fixed)
Overrange	Display flashes 999999
Display Assignment	Display lines 1 & 2 may be assigned to rate, total, grand total, alternate rate & total, max/min, units (line 2 only), set points, Modbus input, & more.
Programming Methods	Four front panel buttons, digital inputs, PC and Panel Meter Pro software, or Modbus registers.
Recalibration	All ranges are calibrated at the factory to read frequency in Hz. No recalibration required.
Max/Min Display	Max/min readings reached by the process are stored until reset by the user or until power to the meter is cycled.
Rounding	Select 1, 2, 5, 10, 20, 50, or 100 (e.g. rounding = 10, value = 123.45, display = 123.50).
Password	Three programmable passwords restrict modification of programmed settings and two prevent resetting the totals. Pass 1: Allows use of function keys and digital inputs Pass 2: Allows use of function keys, digital inputs and editing set/reset points Pass 3: Restricts all programming, function keys, and digital inputs. Total: Prevents resetting the total manually Gtotal: Prevents resetting the grand total manually
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
Power Options	85-265 VAC 50/60 Hz; 90-265 VDC, 20 W max; 12-24 VDC, 12-24 VAC, 15 W max. Powered over USB for configuration only.
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 meters may share one 5 A fuse
Isolation	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.
Environmental	Operating temperature range: -40 to 65°C (-40 to 149°F) Storage temperature range: -40 to 85°C (-40 to 185°F) Relative humidity: 0 to 90% non-condensing

Connections	Removable screw terminal blocks accept 12 to 22 AWG wire, RJ45 for external relays, digital I/O, and serial communication adapters.
Enclosure	1/8 DIN, high impact plastic, UL 94V-0, color: black
Front Panel	NEMA 4X, IP65
Mounting	1/8 DIN panel cutout required: 3.622" x 1.772" (92 mm x 45 mm) Two panel mounting bracket assemblies are provided.
Tightening Torque	Screw terminal connectors: 5 lb-in (0.56 Nm)
Overall Dimensions	4.68" x 2.45" x 5.64" (119 mm x 62 mm x 143 mm) (W x H x D)
Weight	9.5 oz (269 g)
Warranty	3 years parts & labor. See Warranty Information and Terms & Conditions on www.dwyer-inst.com for complete details.

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 k Ω pull-up to 5 V @ 30 kHz; NPN or PNP transistor, switch contact 4.7 k Ω pull-up to 5 V @ 40 Hz; Modbus PV (Slave)
Isolated Flowmeter Power Supply	Terminals P+ & P-: 24 VDC \pm 10%. All models selectable for 24, 10, or 5 VDC supply (internal jumper J4). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max. 5 & 10 VDC supply rated @ 50 mA max. Refer to <i>Flowmeter Supply Voltage Selection (P+, P-)</i> on page 14 for details.
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 k Ω @ 1 kHz. Open collector/switch input: 4.7 k Ω pull-up to 5 V.
Accuracy	\pm 0.03% of calibrated span \pm 1 count
Temperature Drift	Rate display is not affected by changes in temperature.
Multi-Point Linearization	2 to 32 points
Low-Flow Cutoff	0.0 to 999,999.9 (0 disables cutoff function). Point below at which display always shows zero.
Decimal Point	Up to five decimal places or none: dddddd, dddddd, dddd, ddd, dd, 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 meter; input 2 signal may be set anywhere above or below input 1 setting. Minimum input span between any two inputs is 0.10 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

Rate/Totalizer

Display Assignment	Display lines 1 & 2 may be assigned to rate, total, grand total, alternate rate/total, alternate rate/grand total, set points, alternate rate/units, alternate total/units, alternate grand total/units, display Hi, display Lo, display Hi/Lo, display Modbus, display units (line 2) and display off (line 2).
Rate Display Indication	-99999 to 999999, lead zero blanking. "R" LED illuminates while displaying rate or frequency.
Total Display & Total Overflow	0 to 999,999; automatic lead zero blanking. "T" LED is illuminated while displaying total or grand total. Up to 999,999,999 with total-overflow feature. "oF" is displayed to the left of total overflow and \blacktriangle LED is illuminated.
Alternating Display	Either display may be programmed to alternate between rate and total or rate and grand total every 10 seconds.
Total Decimal Point	Up to five decimal places or none: dddddd, dddddd, dddd, ddd, dd, or dddddd Total decimal point is independent of rate decimal point.
Totalizer	Calculates total based on rate and field programmable multiplier to display total in engineering units. Time base must be selected according to the time units in which the rate is displayed.
Totalizer Rollover	Totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
Total Overflow Override	Program total reset for automatic with 0.1 second delay and set point 1 for 999,999
Totalizer Presets	Up to eight, user selectable under setup menu. Any set point can be assigned to total and may be programmed anywhere in the range of the meter for total alarm indication.
Programmable Delay On Release	0.1 and 999.9 seconds; applied to the first relay assigned to total or grand total. If the meter is programmed to reset total to zero automatically when the preset is reached, then a delay will occur before the total is reset.
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.
Total Reset Password	Total and grand total passwords may be entered to prevent resetting the total or grand total from the front panel.
Non- Resettable Total	The grand total can be programmed as a non-resettable total by entering the password "050873".
CAUTION	
<ul style="list-style-type: none"> 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 <i>Switching Inductive Loads</i> on page 16 for details.
Relay Assignment	Relays may be assigned to rate, total, or grand total.
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	<ul style="list-style-type: none"> • Automatic (non-latching) and/or manual reset • Latching (requires manual acknowledge) with or without clear • Pump alternation control (2-8 relays) • Sampling (based on set point and time) • Off (disable unused relays and enable Interlock feature) • Manual on/off control mode
Relay Reset	User selectable via front panel button, F4 terminal at back of meter, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
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. <i>Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.</i>
Auto Initialization	When power is applied to the meter, relays will reflect the state of the input to the meter.
Additional Relays	An external module, model PMA-11, is available to add 4 SPST 3 A relays to the meter.

Isolated 4-20 mA Transmitter Output

Output Source	Rate/process, total, grand total, max, min, set points 1-8, Modbus input or manual control mode		
Scaling Range	1.000 to 23.000 mA for any display range.		
Calibration	Factory calibrated: 0.0 to 1000.0 = 4-20 mA output		
Analog Out Programming	23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break		
Accuracy	$\pm 0.1\%$ FS ± 0.004 mA		
Temperature Drift	0.4 $\mu\text{A}/^\circ\text{C}$ max from 0 to 65 $^\circ\text{C}$ ambient, 0.8 $\mu\text{A}/^\circ\text{C}$ max from -40 to 0 $^\circ\text{C}$ ambient <i>Note: Analog output drift is separate from input drift.</i>		
Isolated Transmitter Power Supply	Terminals I+ & R: 24 VDC $\pm 10\%$. May be used to power the 4-20 mA output or other devices. All models rated @ 40 mA max.		
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

USB Connection

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

On-Board Digital Input (F4)

Function	Reset total, remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values. See <i>Function Keys & Digital I/O Available Settings</i> on page 38 for a complete list of capabilities.
Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM
Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC
Additional I/O	Up to 2 external modules, model PMA-12 with 4 digital inputs and 4 digital outputs each can be added.

Modbus® RTU Serial Communications

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

Note: Refer to the PPM Modbus Register Tables located at www.dwyer-inst.com for details.

Panel Meter Pro

System Requirements	Microsoft® Windows® XP/Vista/7/8/10
Communications	USB 2.0 (for programming only) (Standard USB A to Micro USB B) RS-232 adapter, RS-485 adapter and RS-485 to USB converter (programming, monitoring, and data logging)
Configuration	Configure meters one at a time
Power	USB port provides power to the meter. DO NOT apply AC or DC power to the meter while the USB port is in use.

Compliance Information

Safety

UL & c-UL Listed	USA & Canada UL 508 Industrial Control Equipment
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

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 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.

Safety Information

⚠ CAUTION

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

⚠ WARNINGS

- Risk of electric shock or personal injury.
- Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

Installation

There is no need to remove the meter from its case to complete the installation, wiring, and setup of the meter for most applications. Instructions are provided for changing the Flowmeter power supply to output 5 or 10 VDC instead of 24 VDC. See *Figure 4: Flowmeter Supply Voltage Selection* on page 14.

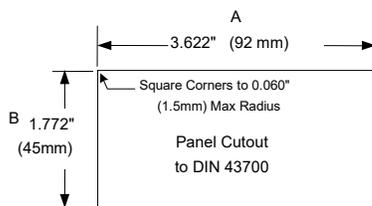
Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

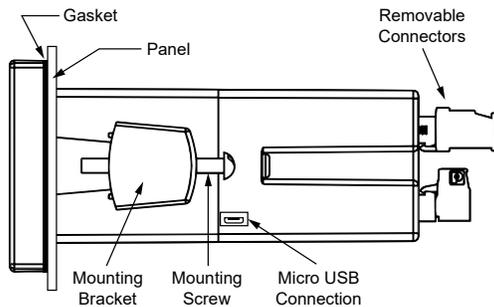
If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

Panel Mounting Instructions

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



Tolerances:
 A: +0.032 (+0.8mm)
 -0.000 (-0.0mm)
 B: +0.024 (+0.6mm)
 -0.000 (-0.0mm)



DO NOT apply AC or DC power to the meter when using the Micro USB connection.

Figure 1: 1/8 DIN Panel Cutout and Mounting

Mounting Dimensions

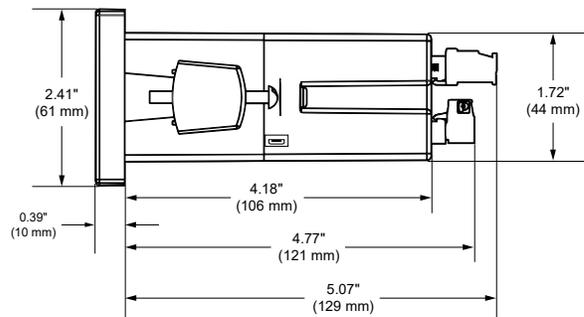


Figure 2: Meter Dimensions - Side View

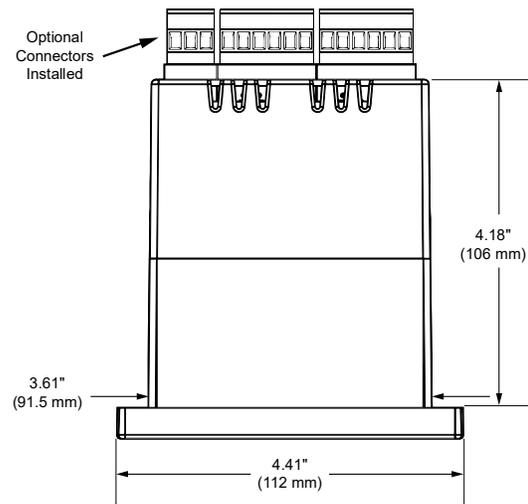


Figure 3: Meter Dimensions - Top View

Installation Overview

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

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

Panel Meter Pro Software

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

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

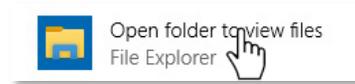
Panel Meter Pro Installation

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

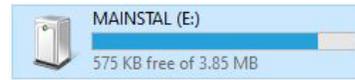
⚠️ WARNINGS

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

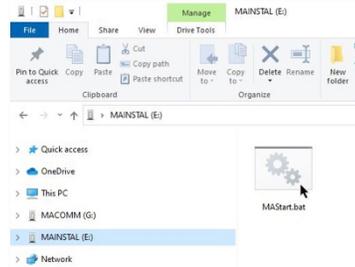
2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."



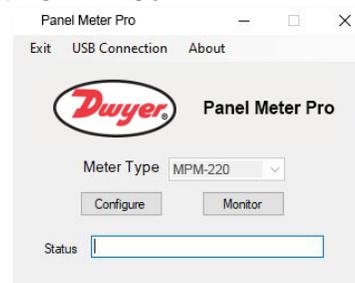
If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."



3. Double-click on the file named "MAStart." The program will open a few windows and install two programs on your computer. Simply follow the on-screen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."



4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your meter.



Note: If you decide to update your Panel Meter 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 μA during the process and you will receive an on-screen notification once the process is complete.

Flowmeter Supply Voltage Selection (P+, P-)

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

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

To access the voltage selection jumper:

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

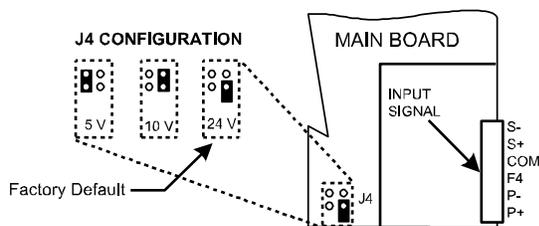


Figure 4: Flowmeter Supply Voltage Selection

Connections

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

CAUTION

- Use copper wire with 60°C or 60/75°C insulation for all line voltage connections. Observe all safety regulations. Electrical wiring should be performed in accordance with all applicable national, state, and local codes to prevent damage to the meter and ensure personnel safety.

Connectors Labeling

The connectors' label, affixed to the meter, shows the location of all connectors available with requested configuration.

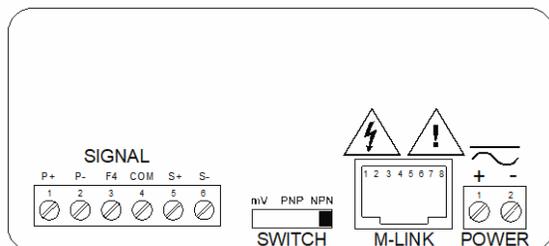


Figure 5. PPM-100 & PPM-200 Connectors Label

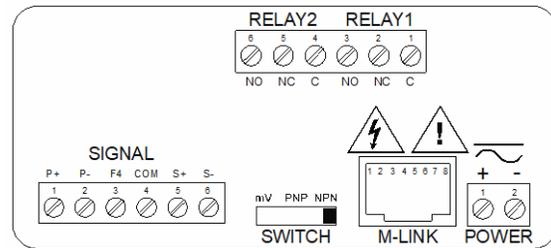


Figure 6. PPM-120 & PPM-220 Connectors Label

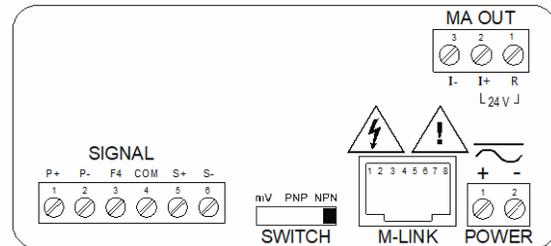


Figure 7. PPM-101 & PPM-201 Connectors Label

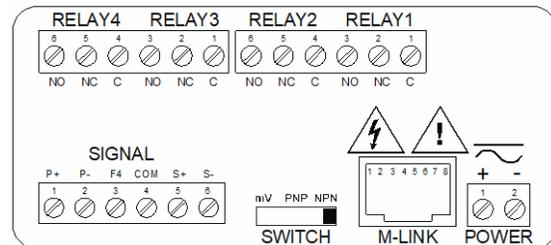


Figure 8. PPM-140 & PPM-240 Connectors Label

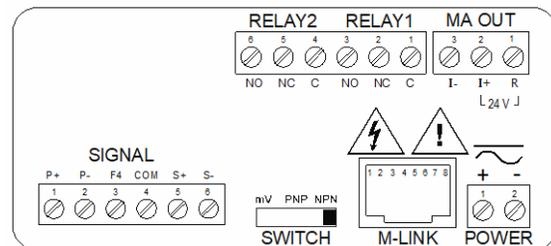


Figure 9. PPM-121 & PPM-221 Connectors Label

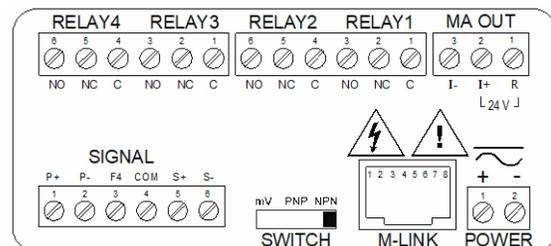


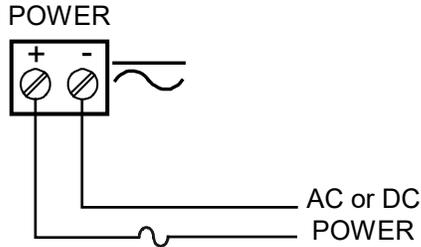
Figure 10. PPM-141 & PPM-241 Connectors Label

WARNING

- **DO NOT** connect any equipment other than Dwyer Instruments' expansion modules, cables, or meters to the RJ45 M LINK connector. Otherwise damage will occur to the equipment and the meter.

Power Connections

Power connections are made to a two-terminal connector labeled POWER. The meter will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention.



Required External Fuse:
5 A max, 250 V Slow Blow

Figure 11: Power Connections

Signal Connections

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

The following figures show examples of signal connections.

Setup and programming is performed through the front panel buttons.

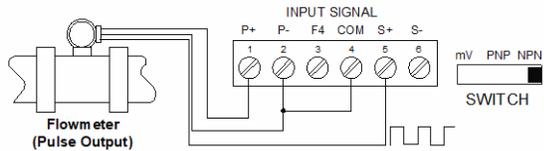


Figure 12: Flowmeter Powered by Internal Power Supply

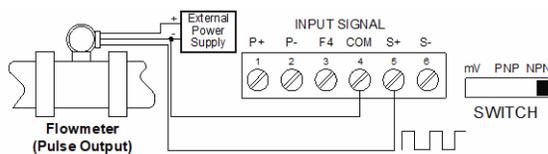


Figure 13: Flowmeter Powered by External Supply

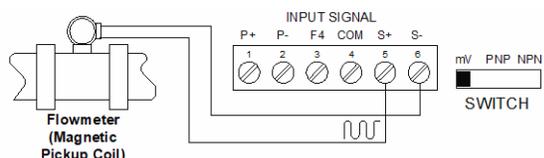


Figure 14: Self-Powered Magnetic Pickup Coil Flowmeter

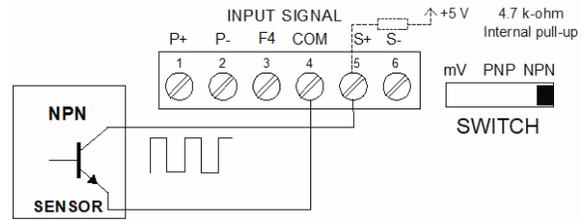


Figure 15: NPN open Collector Input

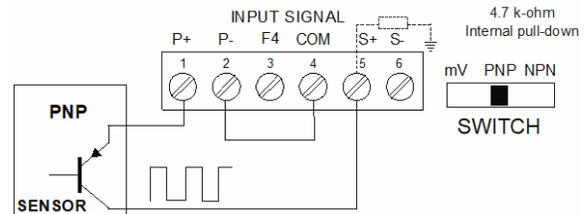


Figure 16: PNP Sensor Powered by Internal Supply

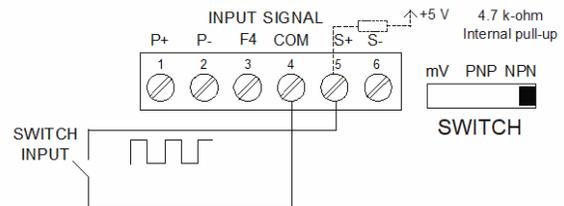


Figure 17: Switch Input Connections

Modbus RTU Serial Communications

Serial communications connection is made to an RJ45 connector labeled M-LINK. For interfacing to the MPM, use the PMA-01 for RS-232 or the PMA-03 for RS-485. The same port is used for interfacing with all expansion modules (e.g. external relays, digital I/O).

Relay Connections

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

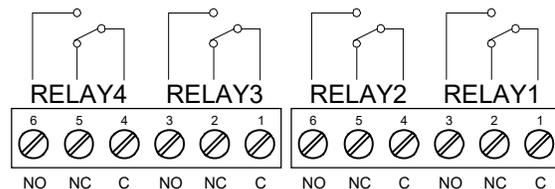


Figure 18: Relay Connections

Switching Inductive Loads

The use of snubbers to suppress electrical noise is strongly recommended when switching inductive loads to prevent disrupting the microprocessor's operation. The snubbers also prolong the life of the relay contacts. Suppression can be obtained with resistor-capacitor (RC) networks assembled by the user or purchased as complete assemblies. Refer to the following circuits for RC network assembly and installation:

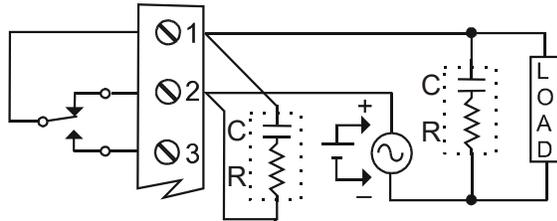


Figure 19: AC and DC Loads Protection

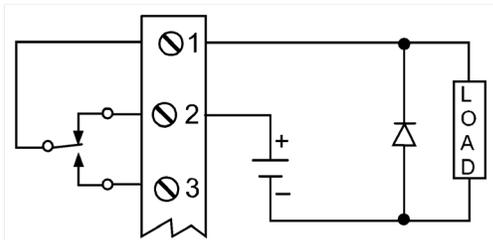
Choose R and C as follows:

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

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

Notes:

1. Use capacitors rated for 250 VAC.
2. RC networks may affect load release time of solenoid loads. Check to confirm proper operation.
3. Install the RC network at the meter's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.



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 (Snubbers) Available from Dwyer Instruments Inc.

RC networks are available from Dwyer Instruments Inc. and should be applied to each relay contact switching an inductive load. Part number: PMA-13.

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 should be connected with a normally open contact across F4 and COM, or with an active low signal applied to F4. It can be used to reset the total, for remote operation of front-panel buttons, to acknowledge/reset relays, or to reset max/min values. See *Function Keys & Digital I/O Available Settings* on page 38 for a complete list of capabilities.

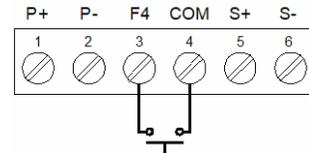


Figure 21. F4 Digital Input Connections

4-20 mA Output Connections

Connections for the 4-20 mA flowmeter 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.

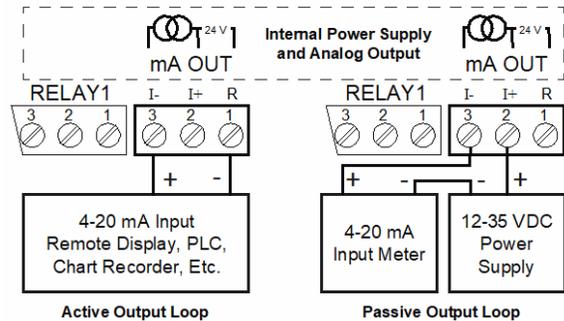


Figure 22: 4-20 mA Output Connections

Analog Output Power Supply

The internal 24 VDC power supply powering the analog output may be used to power other devices, if the analog output is not used. The I+ terminal is the +24 V and the R terminal is the return.

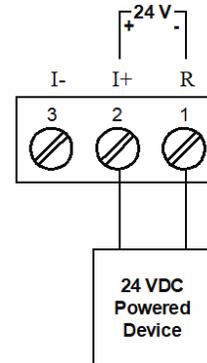


Figure 23. Analog Output Supply Powering Other Devices

External Relay & Digital I/O Connections

The relay and the digital I/O expansion modules PMA-11 & PMA-12 are connected to the meter using a CAT5 cable provided with each module. The two RJ45 connectors on the expansion modules are identical and interchangeable; they are used to connect additional modules to the system.

Note: The jumper located between the RJ45 connectors of the PMA-12 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 24. Expansion Module & DIN Rail Mounting Kit

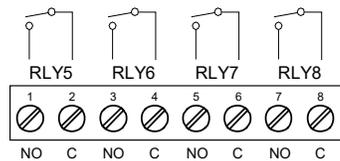


Figure 25. External Relays Module Connections

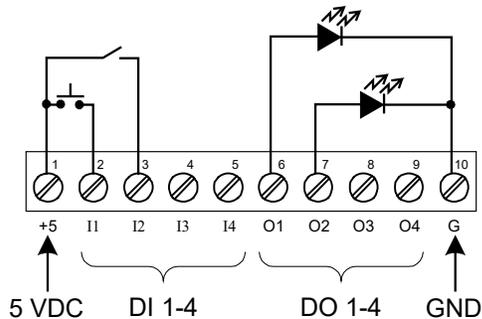


Figure 26. Digital I/O Module Connections

Interlock Relay Feature

As the name implies, the interlock relay feature reassigns one, or more, alarm/control relays for use as interlock relay(s). Interlock contact(s) are wired to digital input(s) and activate the interlock relay. This feature is enabled by configuring the relay, and the corresponding digital input(s), see *Setting Up the Interlock Relay (Force On) Feature* on page 32.

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

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

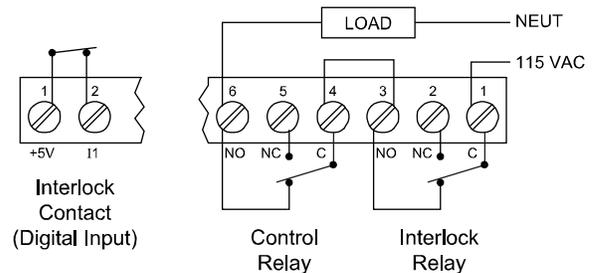


Figure 27: Interlock Connections

Setup and Programming

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

Overview

There is one switch, located to the right of the input connector, which must be configured according to the input level and type. Jumper J4 located inside the meter, 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. Setup and programming is done using Panel Meter Pro or through the front panel buttons. After power and input signal connections have been completed and verified, apply power to the meter.

*Default setting

Front Panel Buttons and Status LED Indicators



Button Symbol	Description	LED	Status
	Menu	1-8	Alarm 1-8 indicator
	Right arrow/F1	1-8 M	Flashing: Relay in manual control mode
	Up arrow/F2	1-8	Flashing: Relay interlock switch open
	Enter/F3		
<p>Note: F4 is a digital input. Alarms 5-8 are enabled when relay expansion module is installed.</p>		<p>Note: LEDs for relays in manual mode flash with the "M" LED every 10 seconds. "M" flashing by itself indicates Aout – manual control is used.</p>	

- 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 meter.

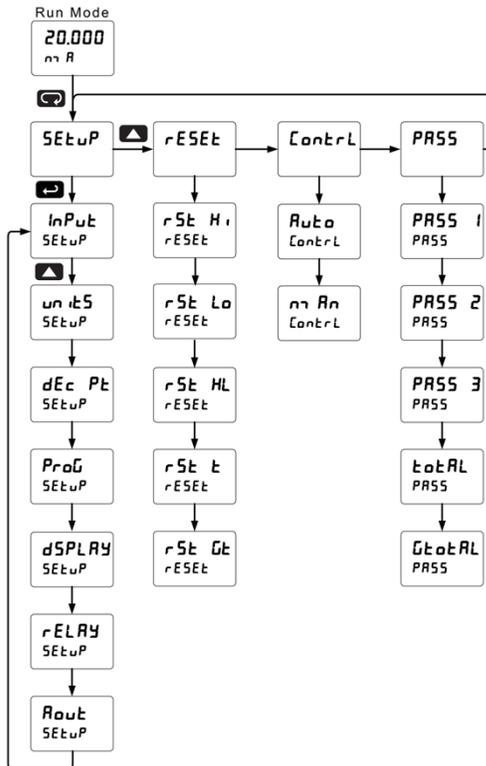
Display Functions & Messages		
Display	Parameter	Action/Setting Description
rLY 2	Relay 2	Relays 2-8 setup <i>Note: Relays 5-8 are shown, only if expansion relay module is installed.</i>
FRILSF	Fail-safe	Enter <i>Fail-safe</i> menu
FLS 1	Fail-safe 1	Set relay 1 fail-safe operation
on	On	Enable fail-safe operation
oFF	Fail-safe off	Disable fail-safe operation
dELAY	Delay	Enter relay <i>Time Delay</i> menu
dLY 1	Delay 1	Enter relay 1 time delay setup
On 1	On	Set relay 1 On time delay
OFF 1	Off	Set relay 1 Off time delay
Rout	Analog output	Enter the <i>Analog output</i> scaling menu
dS 1	Display 1	Program display 1 value
Out 1	Output 1	Program output 1 value (e.g. 4.000 mA)
dS 2	Display 2	Program display 2 value
Out 2	Output 2	Program output 2 value (e.g. 20.000 mA)
rESEt	Reset	Press Enter to access the <i>Reset</i> menu
rSt Hi	Reset high	Press Enter to reset max display
rSt Lo	Reset low	Press Enter to reset min display
rSt HL	Reset high & low	Press Enter to reset max & min displays
rSt t	Reset total	Press Enter to reset total
rSt Gt	Reset grand total	Press Enter to reset grand total
Control	Control	Enter <i>Control</i> menu
Ruto	Automatic	Press Enter to set meter for automatic operation
man	Manual	Press Enter to manually control relays or analog output operation
PR55	Password	Enter the <i>Password</i> menu
PR55 1	Password 1*	Set or enter Password 1* (*1, 2, or 3)
totRL	Total password	Set or enter password for manual reset
GtotRL	Grand total password	Set or enter password for manual reset

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

Main Menu

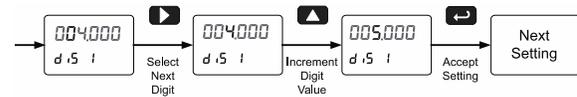
The main menu consists of the most commonly used functions: *Reset*, *Control*, *Setup*, and *Password*.

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



Setting Numeric Values

The numeric values are set using the Right and Up arrow buttons. Press Right arrow to select next digit and Up arrow to increment digit value. The digit being changed is displayed brighter than the rest. Press and hold Up to auto-increment the display value. If negative numbers are allowed, the first digit position will include a negative symbol (-) after the 9. Press the Enter button, at any time, to accept a setting or Menu button to exit without saving changes.

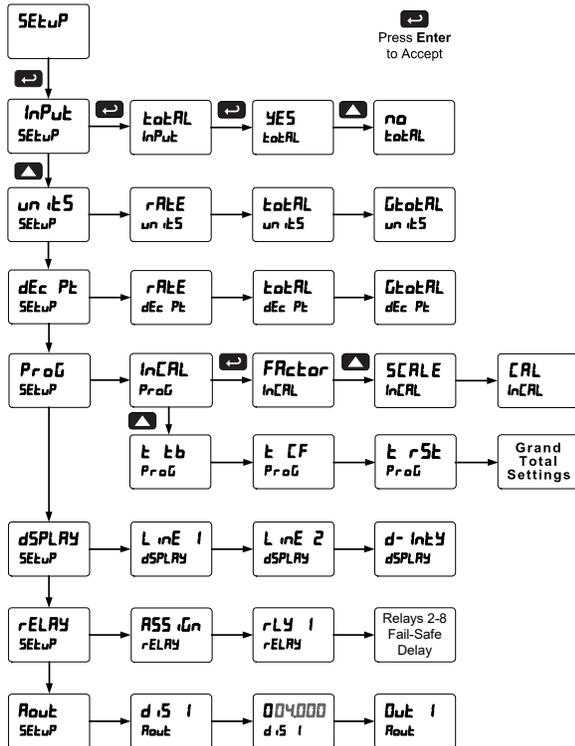


Setting Up the Rate/Totalizer Meter (SEtUP)

The *Setup* menu is used to select:

1. Enable or disable totalizer features
2. Units for Rate, Total, and Grand Total
3. Decimal point position
4. Input Calibration
5. Display parameter and intensity
6. Relay operation
7. 4-20 mA analog output scaling

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



Setting the Input Signal (InPut)

There is a switch, located to the right of the input connector, which must be configured according to the input level and type. Jumper J4 located inside the meter, 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.

Enter the Input menu to enable or disable the totalizer features.

Setting the Totalizer Features (tOTAL)

Enable or disable the totalizer features by selecting "YES" or "no" after the input type has been set up. If the totalizer features are disabled, most totalizer features and functions are hidden from the menus.

Note: The totalizer continues working in the background.

Setting the Display Units or Custom Tags (uN t5)

Use this menu to enter the unit or custom tag that will be displayed if:

1. Alternating rate, total, or grand total and units is selected in the uN t5 menu, or
2. d uN t5 is selected as the line 2 parameter.

See the *Setting the Display Parameter & Intensity (d5PLRY)* flow chart on page 26 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
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	A
b	b
C	C
c	c
d	d
E	E
F	F
G	G
g	g
H	H
h	h
I	I
i	i
J	J

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

Notes:

Degree symbol represented by (<) if programming with Panel Meter 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.

The decimal point selection should be made prior to scaling, calibrating or programming the meter. Pressing the right arrow moves the decimal point one place to the right until no decimal point is displayed, then it moves to the leftmost position.

Pressing the up arrow moves the decimal point to the left.

Programming the Rate/Totalizer (Prog)

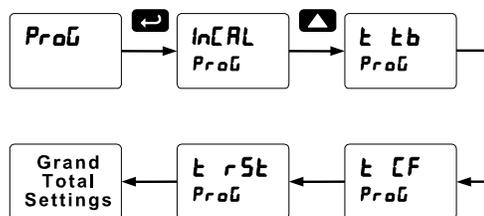
The meter may either be scaled (SCALE) without applying an input, calibrated (CAL) by applying an input, or you may use the K-Factor menu to match the rate/totalizer with a flowmeter's k-factor (pulse/unit of measure). The meter comes factory calibrated to NIST standards, so for initial setup, it is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

The *Program* menu contains the following menus:

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

Note: The Scale, Calibrate, and K-Factor functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in the Advanced menu prior to scaling and calibration of the meter. See Multi-Point Linearization (LINEAR] menu on page 36 for details.

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



Additional parameters, not needed for most applications, are programmed in the *Advanced Features* menu. See *Advanced Features Menu* on page 34.

K-Factor Calibration (FRct or)

The meter may be calibrated using the *K-Factor* function. Most flowmeter manufacturers provide this information with the device. Enter the *K-Factor* (FRct or) 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.



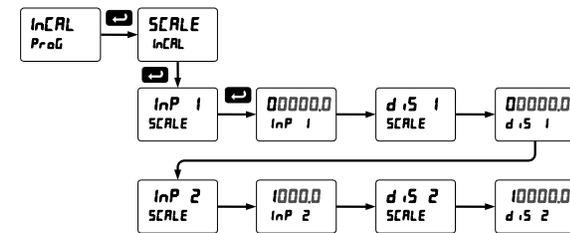
Multi-Point Calibration & Scaling

The meter is set up at the factory for 2-point linear calibration. The number of points for multi-point calibration/scaling is set up in the *Advanced Features* menu. Up to 32 linearization points may be selected. See *Multi-Point Linearization (LnEr] menu on page 36 for details.*

Scaling the Meter (SCALE)

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

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



For instructions on how to program numeric values see *Setting Numeric Values* on page 21.

Note: The display values (d .5 1 and d .5 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
d .5 1	0.000
InP 2	1000.0
d .5 2	0.220

Set the time base to minutes (see *Time Base, Total Conversion Factor & Total Reset* on page 24) 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 meter reverts to input 2 during calibration or scaling, allowing the appropriate input signal to be applied or programmed.

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

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

*Not relevant when scaling the meter.

For instructions on how to program numeric values see *Setting Numeric Values* on page 21.

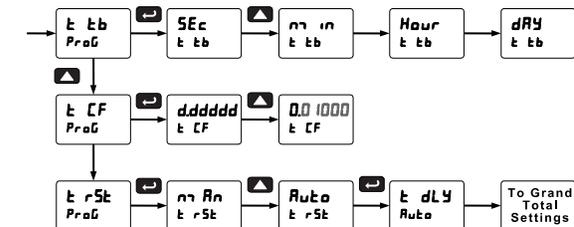
Minimum Input Span

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

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.

Total & Grand Total Reset

The totals can be programmed for automatic or manual reset. In the automatic reset mode, a programmable time delay is available to reset the total or grand total after the assigned preset is reached. The totals can also be reset via the front panel button, via a switch across the on-board F4 terminal, the PMA-12 digital I/O expansion module, or via a Modbus command.

Non-Resetable Totalizer

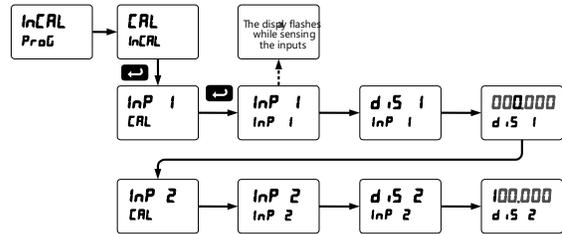
The total and grand total can be password-protected to prevent unauthorized resets. The grand total can be programmed as a non-resettable total, see *Total Reset Password & Non-Resetable Total* on page 33 for details.

Calibrating the Meter with External Source (CAL)

To scale the meter without a signal source, refer to *K-Factor Calibration* on page 23 or *Scaling the Meter* on page 24.

The meter can be calibrated to display the process variable in engineering units by applying the appropriate input signal and following the calibration procedure.

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



Note: The display values (d .5 1 and d .5 2) need to be in units of measure per second.

There is no need to warm up the meter before performing the calibration procedure.

Setting the Display Parameter & Intensity (dSPRAY)

Display line 1 (LINE 1) can be programmed to display:

1. Rate value
2. Total or grand total
3. Relay set points
4. Max & min values
5. Modbus input
6. Display rate and units
7. Rate and total
8. Rate and grand total
9. Total and units
10. Grand total and units

Display line 2 (LINE 2) can be programmed to display:

1. Rate value
2. Total or grand total
3. Relay set points
4. Max & min values
5. Engineering units or custom legends
6. Modbus input
7. Off (no display)
8. Display rate and units
9. Rate and total
10. Rate and grand total
11. Total and units
12. Grand total and units

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.

Display Flow Rate, Total or Grand Total

Line 1 can be programmed to display flow rate, total, or grand total, and line 2 can be programmed to display flow rate, total, grand total, engineering units, custom legends, or be turned off. Both lines can also display relay set points, or max and min values.



Flow Rate Indicator



Flow Totalizer



Rate & Total



Total & Grand Total

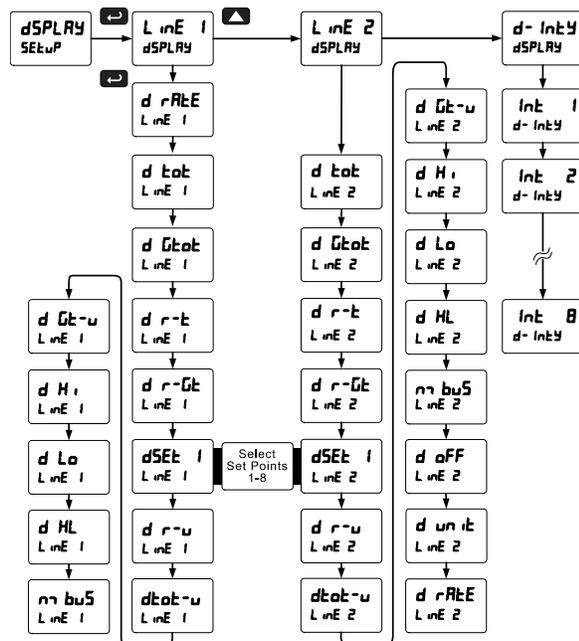
Display Toggling Between Reading & Units

The PPM can be programmed so that line 1 and line 2 toggle between the reading and their engineering units. For instance, line 1 displays flow rate, line 2 displays total, and the display toggles to show their units.



Display Intensity (d-INTY)

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



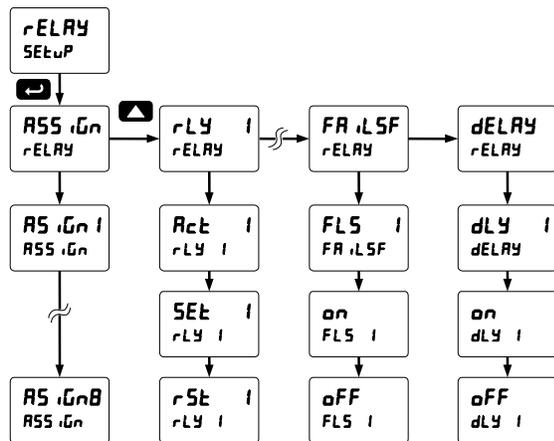
Setting the Relay Operation (rELAY)

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

CAUTION

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

- Relay assignment
 - Rate for low and high alarm
 - Total
 - Grand total
 - Modbus input
- Relay action
 - Automatic reset only (non-latching)
 - Automatic + manual reset at any time (non-latching)
 - Latching (manual reset only)
 - Latching with Clear (manual reset only after alarm condition has cleared)
 - Alternation control (automatic reset only)
 - Sampling (the relay is activated for a user-specified time)
 - Off (relay state controlled by Interlock feature)
- Set and reset points
- Fail-safe operation
 - On (enabled)
 - Off (disabled)
- Time delay
 - On delay (0-999.9 seconds)
 - Off delay (0-999.9 seconds)

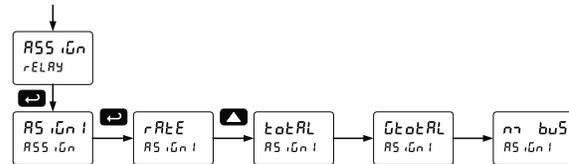


Note: The setup of relays 2-8 follows the same pattern shown here for relay 1.

Relay Assignment (ASSIGN)

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

- Rate for low or high alarm indication
- Total for alarm indication
- Grand total for alarm indication
- Modbus input

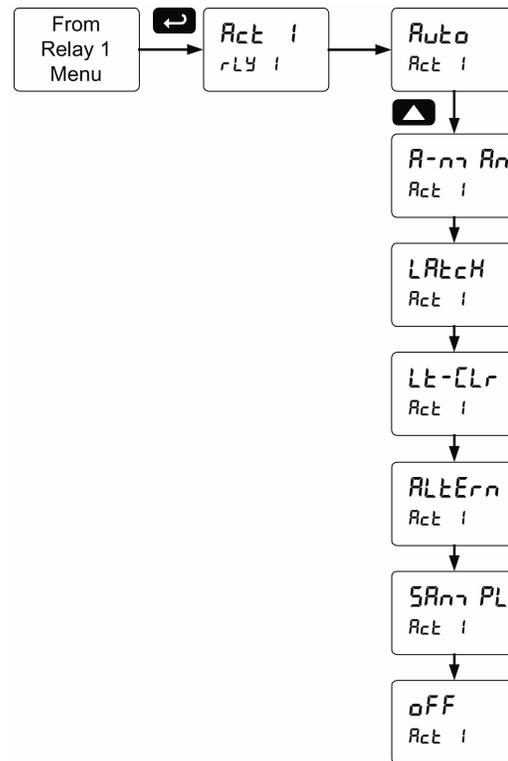


Setting the Relay Action

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

- Automatic reset (non-latching)
- Automatic + manual reset at any time (non-latching)
- Latching (manual reset only, at any time)
- Latching with Clear (manual reset only after alarm condition has cleared)
- Alternation control (automatic reset only)
- Sampling (the relay is activated for a user-specified time)
- Off (relay state controlled by Interlock feature)

The following graphic shows relay 1 action setup; relay 2-8 are set up in a similar fashion.

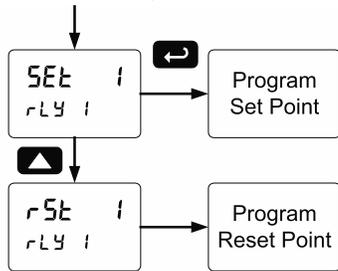


Programming Set and Reset Points

High alarm indication: program set point above reset point.

Low alarm indication: program set point below reset point.

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



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

Setting Fail-Safe Operation

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

Programming Time Delay

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

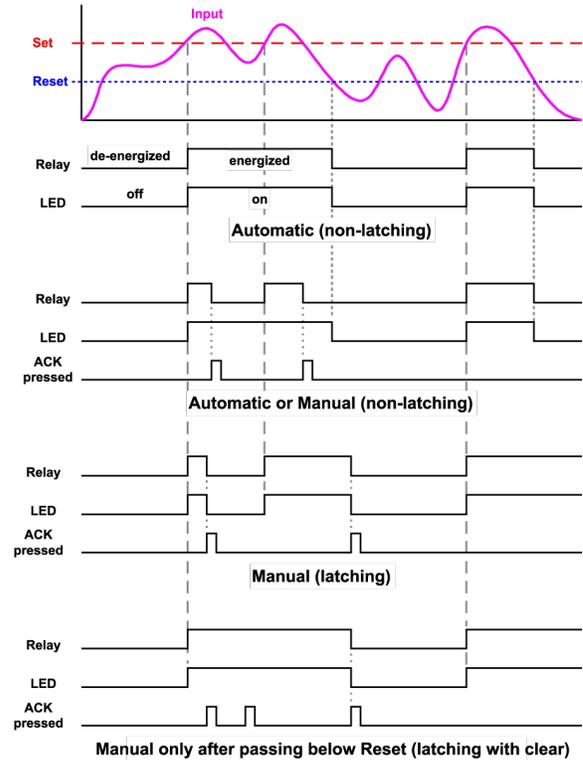
The *On* time delay is associated with the set point.

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

Relay and Alarm Operation Diagrams

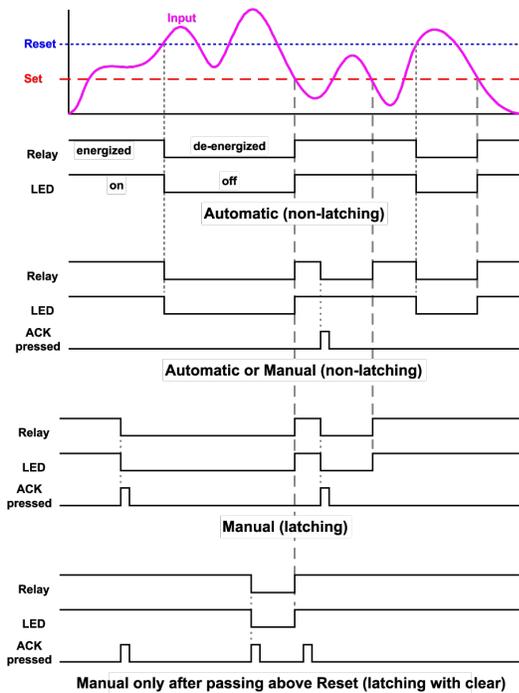
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)



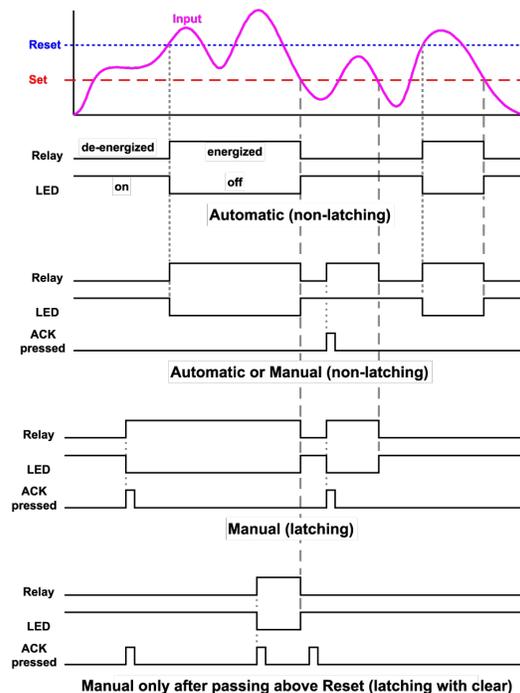
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

Low Alarm Operation (Set < Reset)



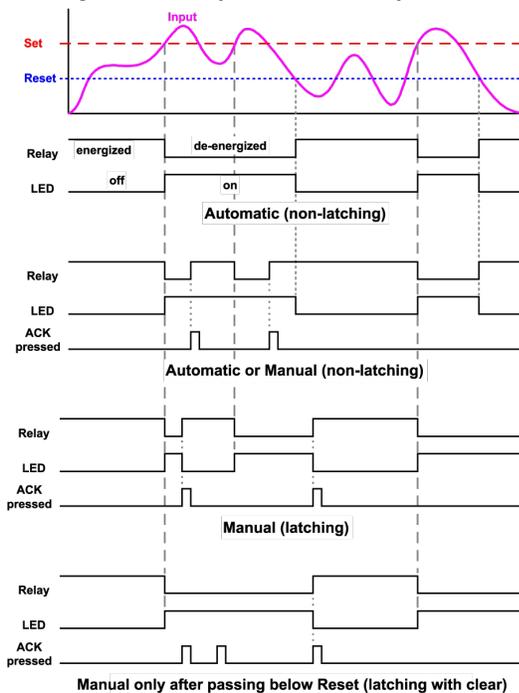
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point and then go below it.

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.

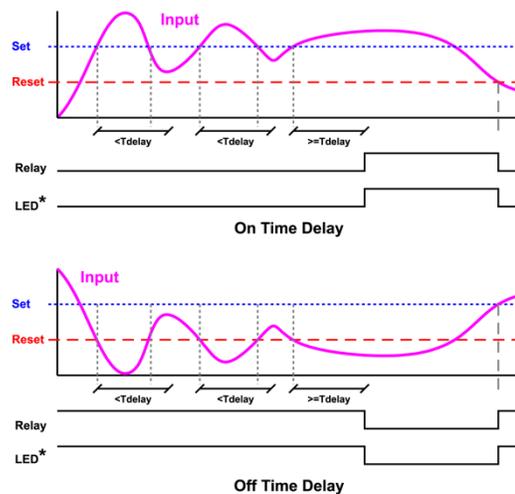
High Alarm with Fail-Safe Operation (Set > Reset)



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

Time Delay Operation

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



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

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

Relay Operation Details

Overview

The relay capabilities of the meter expand its usefulness beyond simple indication to provide users with alarm and control functions. These capabilities include front panel alarm status LEDs as well as either 2 or 4 optional internal relays and/or 4 external relays expansion module. Typical applications include high or low flow alarms and basic batch control. There are four basic ways the relays can be used:

1. High or Low Alarms with Latching or Non-Latching Relays
2. Simple On/Off Control with 100% Adjustable Deadband
3. Sampling (Based on Time)
4. Alternation Control for up to 8 Relays

Relays Auto Initialization

When power is applied to the meter, the front panel LEDs and alarm relays will reflect the state of the input to the meter. The following table indicates how the alarm LEDs and relays will react on power-up based on the set and reset points:

Alarm #	HI or LO Alarm	Set Point	Reset Point	Power-Up Reading	Relay & LED
1	HI	1000	500	499	Off
2	LO	700	900	499	On
3	LO	250	400	499	Off
4	HI	450	200	499	On

Fail-Safe Operation

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

Fail-Safe Selection	Non-Alarm State		Alarm State		Power Failure
	NO	NC	NO	NC	
Off	Open	Closed	Closed	Open	Relays go to non-alarm state
On	Closed	Open	Open	Closed	Relays go to alarm state

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

Front Panel LEDs

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

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

The meter is supplied with four alarm points that include front panel LEDs to indicate alarm conditions. This standard feature is particularly useful for alarm applications that require visual-only indication. The LEDs are controlled by the set and reset points programmed by the user. When the display reaches a set point for a high or low alarm, the corresponding alarm LED will turn on. When the display returns to the reset point the LED will go off. The front panel LEDs respond differently for latching and non-latching relays.

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

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

Latching and Non-Latching Relay Operation

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

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

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

WARNING

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

Non-Latching Relay (ᐃᐅᐅ)

In this application, the meter is set up for automatic reset (non-latching relay). Acknowledging the alarm while it is still present has no effect on either the LED or the relay. When the alarm finally goes away, the relay automatically resets and the LED also goes off.

Automatic reset only		
Condition	LED	Relay
Normal	Off	Off
Alarm	On	On
Ack (No effect)	On	On
Normal	Off	Off

Non-Latching Relay with Manual Reset (ᐃ-ᐅᐅᐅ)

In this application, the meter is set up for automatic and manual reset at any time (non-latching relay). The LED and the relay automatically reset when the meter returns to the normal condition.

In addition, the relay can be manually reset while the alarm condition still exists, but the LED will stay on until the meter returns to the normal condition.

Automatic + manual reset at any time		
Condition	LED	Relay
Normal	Off	Off
Alarm	On	On
Normal	Off	Off
Next Alarm	On	On
Ack	On	Off
Normal	Off	Off

Latching Relay (ᐅᐅᐅᐅ)

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

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

Latching Relay with Clear (ᐅᐅ-ᐅᐅᐅ)

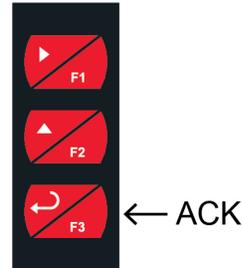
In this application, the meter is set up for manual reset only after the signal passes the reset point (alarm condition has cleared). Acknowledging the alarm while it is still present has no effect on either the LED or the relay. When the alarm is acknowledged after it returns to the normal state, the LED and the relay go off. Notice that the LED remains on, even after the meter returns to the normal condition. This is because, for latching relays, the alarm LED reflects the status of the relay, regardless of the alarm condition.

Manual reset only after alarm condition has cleared		
Condition	LED	Relay
Normal	Off	Off
Alarm	On	On
Ack (No effect)	On	On
Normal	On	On
Ack	Off	Off

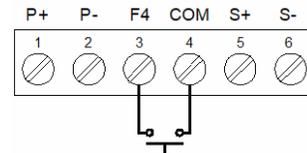
Acknowledging Relays

There are three ways to acknowledge relays programmed for manual reset:

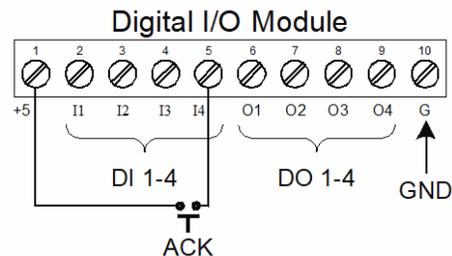
1. Via the programmable front panel function keys F1-F3 (Example: F3 assigned to ACK).



2. Remotely via a normally open pushbutton wired to the F4 terminal at the rear of the instrument.



3. One of the digital inputs and the +5 V terminals on the digital I/O expansion module.

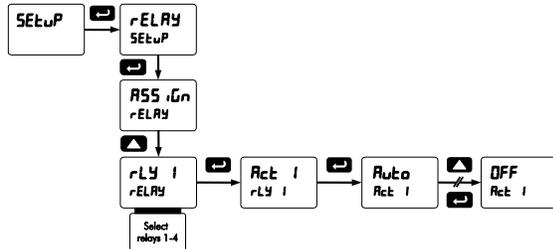


When the ACK button or the assigned digital input is closed, all relays programmed for manual reset are acknowledged.

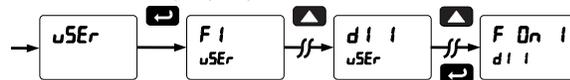
Setting Up the Interlock Relay (Force On) Feature

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

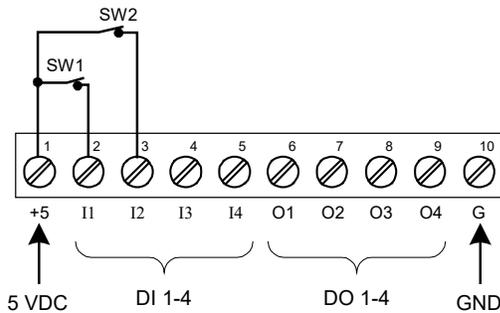
1. Access the *Setup – Relay – Action* menu and set the action to off.



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



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



Interlock Relay Operation Example

Relays 1 & 2 are configured to energize (their front panel LEDs are steady on) when SW1 & SW2 switches (above) are closed. If the contacts to these digital inputs are opened, the corresponding front panel LEDs flash indicating this condition. The processes being controlled by the interlock relay will stop, and will re-start only after the interlock relay is re-activated by the digital inputs (switches).

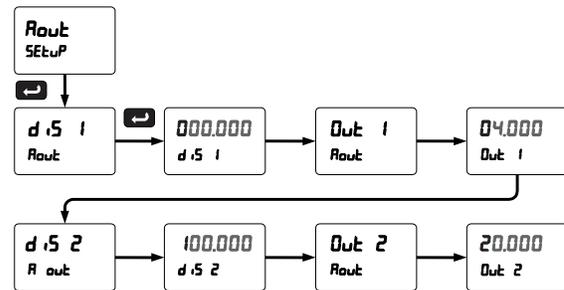
Note: If multiple digital inputs are assigned to the same relay, then the corresponding logic is (AND) – i.e. both switches must be closed to activate the relay.

Scaling the 4-20 mA Analog Output (Rout)

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



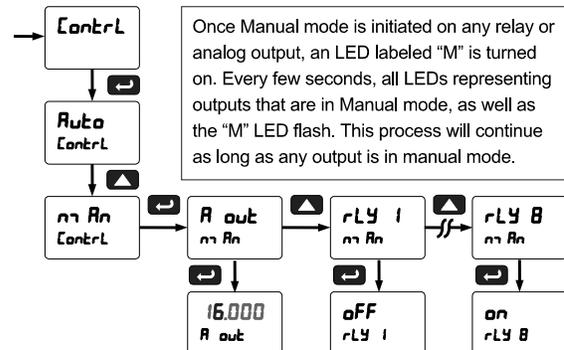
For instructions on how to program numeric values see *Setting Numeric Values* on page 21.

Reset Menu (rESEt)

The *Reset* menu is used to reset the totals, maximum or minimum reading (peak or valley) reached by the process; both may be reset at the same time by selecting “reset high & low” (rSt H/L).

Manual Control Menu (ContrL)

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



Setting Up the Password (PASS)

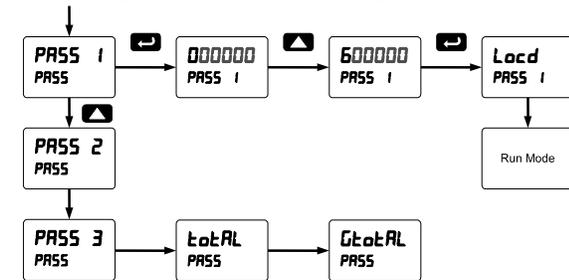
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings and to program the non-resettable totalizer.

- 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: Prevents resetting the total manually
- Gtotal: Prevents resetting the grand total manually

Protecting or Locking the Meter

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

For instructions on how to program numeric values see *Setting Numeric Values* on page 21.



Total Reset Password & Non-Resettable Total

The total and the grand total can be password-protected to prevent unauthorized total resets.

The grand total can be programmed as a non-resettable total by entering the password "050873".

CAUTION

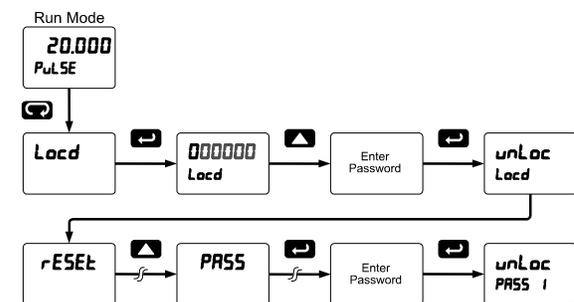
- Once the Grand Total has been programmed as "non-resettable" the feature **CANNOT** be disabled.

Making Changes to a Password Protected Meter

If the meter is password protected, the meter will display the message *Locd* (*Locked*) when the Menu button is pressed. Press the Enter button while the message is being displayed and enter the correct password to gain access the menu. After exiting the programming mode, the meter returns to its password protected condition.

Disabling Password Protection

To disable the password protection, access the *Password* menu and enter the correct password twice, as shown below. The meter is now unprotected until a new password is entered.



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

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

Did you forget the password?

The password may be disabled by entering a master password once. If you are authorized to make changes, enter the master password 508655 to unlock the meter.

seconds (0.001 Hz). The gate function can also be used to obtain a steady display reading with a fluctuating input signal.

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

Low Gate (Lo G)

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

High Gate (Hi G)

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

Gate Settings

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

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

Contact De-Bounce Filter (F dEr)

The filter function (**F dEr**) can be used for applications where the meter is set up to count pulses generated by switch contacts. The filter value can be set anywhere between 2 and 50, the higher the value, the greater the filtering.

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

Filter Settings

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

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)

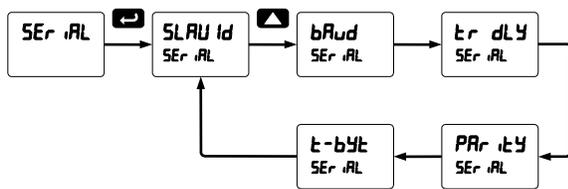
The meter is equipped with serial communications capability as a standard feature using Modbus RTU Serial Communication Protocol.

The meter may be connected to a PC for initial configuration via the on-board 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.

CAUTION

- **DO NOT** connect any equipment other than Dwyer Instruments' expansion modules, cables, or meters to the RJ45 M LINK connector. Otherwise damage will occur to the equipment and the meter.

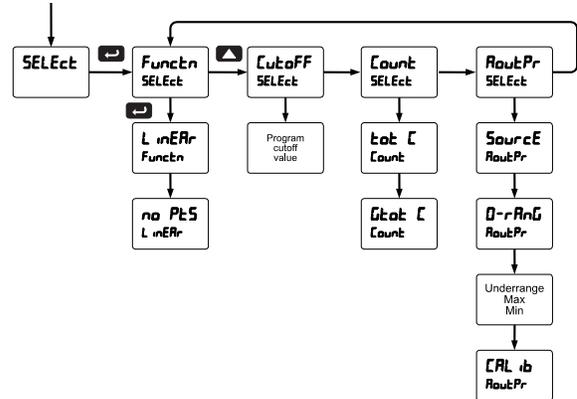
*Note: More detailed instructions are provided with each optional serial communications adapter.
Note: Refer to the PPM Modbus Register Tables located at www.dwyer-inst.com for details.*



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

Select Menu (SELEct)

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



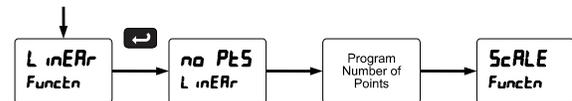
Input Signal Conditioning (Functn)

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

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

Multi-Point Linearization (L inERr)

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



Low-Flow Cutoff (CutoFF)

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

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

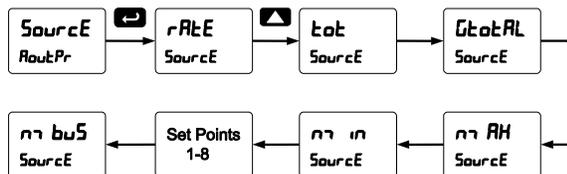
Analog Output Programming (RoutPr)

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

1. Source: Source for generating the 4-20 mA output (e.g. 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 μ A to measure the output current. The values saved internally during this procedure are used for scaling the 4-20 mA output in the *Setup* menu.

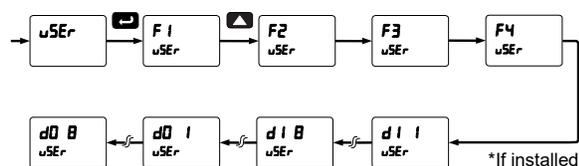
Analog Output Calibration Procedure

1. Wire the PPM 4-20 mA output to a current loop that includes a power supply (internal or external 12 to 24 VDC), and the mA input on the digital meter. See *Figure 22: 4-20 mA Output Connections* on page 16 for details.
2. Turn on all devices. Allow for a 15 to 30 minute warm-up.
3. Go to the Advanced Features menu, and navigate to the Analog Output Programming (RoutPr)/Calibration (CALIB) menu and press **Enter**.
4. The display will show 4 mA. The PPM mA output should now be close to 4 mA. Press **Enter** and the display will show 04.000. Enter the actual value read by the digital mA meter and press **Enter**.
5. The display will show 20 mA. The PPM mA output should now be close to 20 mA. Press **Enter** and the display will show 20.000. Enter the actual value read by the digital mA meter and press **Enter**.
6. The meter will now calculate the calibration factors and store them.
7. Press **Menu** to exit and return to Run mode.

Programmable Function Keys User Menu (uSEr)

The *User* menu allows the user to assign the front panel function keys F1, F2, and F3, the digital input F4 (a digital input located on the input signal connector), and up to eight additional digital inputs to access most of the menus or to activate certain functions immediately (e.g. reset total, reset grand total, 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. reset total, reset grand total, alarms, relay acknowledgement, reset or display max, min). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.



Function Keys & Digital I/O Available Settings

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

Function Keys & Digital I/O Available Settings	
Display	Description
rELRY	Directly access the relay menu
SEt i*	Directly access the set point menu for relay 1 (*through 8)
rLY d	Disable all relays until a button assigned to <i>enable relays (rLY E)</i> is pressed
rLY E	Enable all relays to function as they have been programmed
0 Hold	Hold current relay states and analog output as they are until a button assigned to <i>enable relays (rLY E)</i> is pressed
d Hold	Hold the current display value, relay states, and analog output momentarily while the function key or digital input is active. The process value will continue to be calculated in the background.
Ln1 Hi	Display maximum display value on line 1
Ln1 Lo	Display minimum display value on line 1
Ln1 HL	Display maximum & minimum display values on line 1
Ln2 Hi	Display maximum display value on line 2
Ln2 Lo	Display minimum display value on line 2
Ln2 HL	Display maximum & minimum display values on line 2
Ln2 Gt	Display the grand total on line 2
F On i*	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 <i>Setting Up the Interlock Relay (Force On) Feature</i> on page 32 for details about interlock relays.
Control	Directly access the control menu
d .SRbL	Disable the selected function key or digital I/O

Function Keys & Digital I/O Available Settings	
Display	Description
RcH	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 Hi	Reset the stored maximum display value
rSt Lo	Reset the stored minimum display value
rSt HL	Reset the stored maximum & minimum display values
dSPLY	Directly access the display menu
LnE 1	Directly access the display line 1 menu
LnE 2	Directly access the display line 2 menu
nEnu	Mimic the menu button functionality (digital inputs only)
r rHt	Mimic the right arrow/F1 button functionality (digital inputs only)
uP	Mimic the up arrow/F2 button functionality (digital inputs only)
EnEr	Mimic the enter/F3 button functionality (digital inputs only)
RLn i*	Provide indication when alarm 1 (*through 8) has been triggered (digital outputs only)

Meter Operation

The meter accepts pulses (e.g. $\pm 40\text{mV}$ to $\pm 8\text{V}$), square wave (0-5, 0-12V, or 0-24V), open collector NPN, PNP, TTL, or switch contact signals and displays these signals in engineering units from -99999 to 999999.

The dual-line display can be customized by the user to operate in such a way as to satisfy a specific application. Typically, line 1 is used for the process variable; while line 2 is used for engineering units, custom legend, total, grand total, or set point indication.

The meter can be set up to display the pulse input on line 1 and the Modbus input on line 2. The relays and analog output can be programmed to operate from the Modbus PV input.

Front Panel Buttons Operation

Button Symbol	Description
	Press to enter or exit Programming Mode, view settings, or exit max/min readings
	Press to reset max/min readings or other parameter/function assigned through the <i>User</i> menu
	Press to display max/min readings or other parameter/function assigned through the <i>User</i> menu
	Press to acknowledge relays or other parameters/function assigned through the <i>User</i> menu

Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. See *Programmable Function Keys User Menu* (u5Er) on page 38 for details.

The previous table shows the factory default settings for F1, F2, and F3.

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 it has been programmed in the *Advanced Features – User* menu. See *Programmable Function Keys User Menu* (u5Er) on page 38 for details.

Maximum/Minimum Readings

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

1. Display briefly by assigning to the F1-F3 function keys, F4 (digital input) or to the digital inputs in the *User* menu.
2. Display continuously by assigning either display to max/min through the *Display* menu.

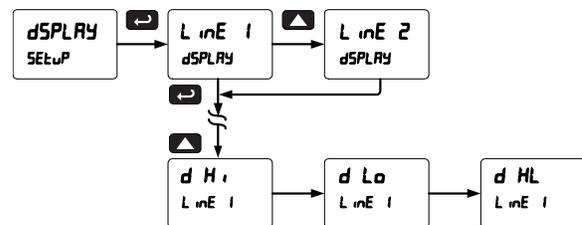
Any of the F1-F3 function keys (buttons), F4 (digital input), and the digital inputs can be programmed to reset the max & min readings. The meters are set at the factory to display the max reading by pressing the Up arrow/F2 button and to use the Right arrow/F1 button to access the *Reset* menu.

To display max reading using function key with factory defaults:

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

To display max/min readings continuously:

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



Totalizer Overflow Displays Total to 9 Digits

These flow rate/totalizers can display up to nine digits of total flow with the total overflow feature.



In the diagrams above, the flow totalizer is displaying 532,831,470 by toggling between a display of “oF 532” and “831470”. Notice the T with arrow ▲ symbol is lit up indicating the display is in overflow mode.

Troubleshooting

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

Diagnostics Menu (d iRÜ)

The *Diagnostics* menu is located in the *Advanced Features* menu, to access *Diagnostics* menu see *Advanced Features Menu* on page 34.

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 Panel Meter 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* on page 34.

Determining Software Version

To determine the software version of a meter:

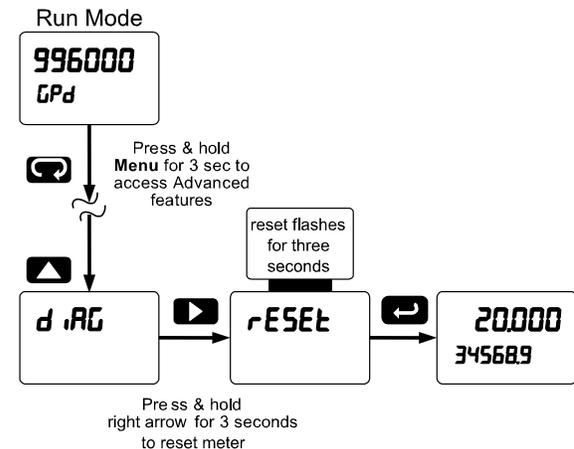
1. Go to the *Diagnostics* menu (d iRÜ) and press Enter button.
2. Press Up arrow button and scroll to Information menu (i n F a).
3. Press Enter to access the software number (S F t) and version (V E r) information. Write down the information as it is displayed. Continue pressing Enter until all the information is displayed.
4. The meter returns to Run Mode after displaying all the settings.

Reset Meter to Factory Defaults

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

Instructions to load factory defaults:

1. Enter the *Advanced Features* menu. See *Advanced Features Menu* on page 34.
2. Press Up arrow to go to *Diagnostics* (d iRÜ) 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 meter goes through an initialization sequence (similar as on power-up) and loads the factory default settings.



Factory Defaults & User Settings

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

Factory Defaults & User Settings		
Parameter	Display	Default Setting
Input type	i n P u t	Pulse
Total	Y E S	Total enabled
Units	u n i t S	Rate / total / gr. total pulse / pulse / pulse
Filter	F i l t e r	Hi Spd
K-factor	K f a c t o r	1.000
Function	F u n c t i o n	Linear
Number of points	n o P t S	2
Input 1	i n P 1	00000.0
Display 1	d i S 1	00000.0
Input 2	i n P 2	10000.0
Display 2	d i S 2	10000.0
Decimal point	d d d d d d	1 place
Cutoff value	C u t o f f	0.000 (disabled)

Factory Defaults & User Settings		
Parameter	Display	Default Setting
Display assignment	ᄀ5ᄀᄀᄀ	
Display line 1	ᄀ ᄀᄀ 1	Rate/Process
Display line 2	ᄀ ᄀᄀ 2	Total value
Display intensity	ᄀ ᄀᄀᄀ	6
Total time base	ᄀ ᄀᄀ	Second
Total conversion factor	ᄀ ᄀᄀ	1.000
Total reset	ᄀ ᄀᄀ	Manual
Grand total time base	ᄀ ᄀᄀ	Second
Grand total conversion factor	ᄀ ᄀᄀ	1.000
Grand total reset	ᄀ ᄀᄀ	Manual
Relay 1 assignment	ᄀ5 ᄀᄀ1	Total
Relay 2 assignment	ᄀ5 ᄀᄀ2	Total
Relay 3 assignment	ᄀ5 ᄀᄀ3	Rate
Relay 4 assignment	ᄀ5 ᄀᄀ4	Rate
Relay 1 action	ᄀᄀᄀ 1	Automatic
Relay 1 set point	5ᄀᄀ 1	100.0
Relay 1 reset point	ᄀ5ᄀ 1	000.0
Relay 2 action	ᄀᄀᄀ 2	Automatic
Relay 2 set point	5ᄀᄀ 2	200.0
Relay 2 reset point	ᄀ5ᄀ 2	000.0
Relay 3 action	ᄀᄀᄀ 3	Automatic
Relay 3 set point	5ᄀᄀ 3	300.0
Relay 3 reset point	ᄀ5ᄀ 3	250.0
Relay 4 action	ᄀᄀᄀ 4	Automatic
Relay 4 set point	5ᄀᄀ 4	400.0
Relay 4 reset point	ᄀ5ᄀ 4	350.0
Fail-safe relay 1	ᄀᄀ5 1	Off
Fail-safe relay 2	ᄀᄀ5 2	Off
Fail-safe relay 3	ᄀᄀ5 3	Off
Fail-safe relay 4	ᄀᄀ5 4	Off
On delay relay 1	ᄀᄀ 1	0.0 sec
Off delay relay 1	ᄀᄀᄀ 1	0.0 sec
On delay relay 2	ᄀᄀ 2	0.0 sec
Off delay relay 2	ᄀᄀᄀ 2	0.0 sec

Factory Defaults & User Settings		
Parameter	Display	Default Setting
On delay relay 3	ᄀᄀ 3	0.0 sec
Off delay relay 3	ᄀᄀᄀ 3	0.0 sec
On delay relay 4	ᄀᄀ 4	0.0 sec
Off delay relay 4	ᄀᄀᄀ 4	0.0 sec
Display 1 analog out	ᄀ ᄀ5 1	0.0
Output 1 value	ᄀᄀᄀ 1	4.000 mA
Display 2 analog out	ᄀ ᄀ5 2	1000.0
Output 2 value	ᄀᄀᄀ 2	20.000 mA
Source analog output	ᄀᄀᄀᄀᄀ	Rate/process
Overrange output	ᄀ-ᄀᄀᄀ	21.000 mA
Underrange output	ᄀ-ᄀᄀᄀ	3.000 mA
Maximum output	ᄀᄀᄀ	23.000 mA
Minimum output	ᄀ ᄀᄀ	1.000 mA
Slave ID (Address)	5ᄀᄀᄀᄀ ᄀᄀ	247
Baud rate	ᄀᄀᄀᄀ	9600
Transmit delay	ᄀᄀ ᄀᄀᄀ	50 ms
Parity	ᄀᄀᄀ ᄀᄀᄀ	Even
Byte-to-byte timeout	ᄀ-ᄀᄀᄀ	010 (0.1 sec)
F1 function key	ᄀ 1	Reset max & min
F2 function key	ᄀ 2	Line 1: Max (Hi)
F3 function key	ᄀ 3	Acknowledge relays
F4 function	ᄀ 4	Acknowledge relays
Digital input 1	ᄀ 1 1	Menu
Digital input 2	ᄀ 1 2	Right arrow
Digital input 3	ᄀ 1 3	Up arrow
Digital input 4	ᄀ 1 4	Enter
Digital output 1	ᄀᄀ 1	Alarm 1
Digital output 2	ᄀᄀ 2	Alarm 2
Digital output 3	ᄀᄀ 3	Alarm 3
Digital output 4	ᄀᄀ 4	Alarm 4
Password 1	ᄀᄀ55 1	000000 (unlocked)
Password 2	ᄀᄀ55 2	000000 (unlocked)
Password 3	ᄀᄀ55 3	000000 (unlocked)
Total password	ᄀᄀᄀᄀᄀ	000000 (unlocked)
Grand total password	ᄀᄀᄀᄀᄀ	000000 (unlocked)

Troubleshooting Tips

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

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

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, LoCd is displayed	Meter is password-protected, enter correct six-digit password to unlock
Meter does not respond to input change	If a <i>Low-Flow Cutoff</i> Value has been programmed, the meter will display zero below that point, regardless of the input – which can appear like the meter is not responding to an input change. Check to make sure the problem is not being caused by an undesired low-flow cutoff value.
Meter displays error message during calibration (Error)	Check: 1. Signal connections 2. Minimum input span requirements
Meter displays 999999 -999999	Check: 1. Input selected in <i>Setup</i> menu 2. Corresponding signal at Signal connector
Display is unstable	Check: 1. Input signal stability and value 2. Display scaling vs. input signal 3. Filter and gate values
Display response is too slow	Check filter and gate values
Display reading is not accurate	Check: Scaling or calibration
Display does not respond to input changes, reading a fixed number	Check: Display assignment, it might be displaying max, min, or set point.
Display alternates between 1. H i 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 <i>Setup</i> menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in <i>Setup</i> menu 2. Set and reset points
Flashing relay status LEDs	Relays in manual control mode or relay interlock switches opened.
Meter not communicating with application programs	Check: 1. Serial adapter and cable 2. Serial settings 3. Meter Slave ID and baud rate
If the display locks up or the meter does not respond at all	Cycle the power to reboot the microprocessor.
Other symptoms not described above	Call Technical Support for assistance.

Note: Certain sequences of events can cause unexpected results. To solve these issues, it is best to start fresh from factory defaults and use the manual as a step by step programming guide, rather than a random approach to programming. To reset the meter to factory defaults, see Reset Meter to Factory Defaults on page 40. In addition, for best results, we recommend using the free Panel Meter Pro software for all programming needs.

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