PD8-6363 Explosion-Proof Dual Pulse Input Rate/Totalizer

Instruction Manual

ProtEX™ MAX

IECEx

CE

CapTouch™

MeterView Pro

USB Install

- Fully Approved Explosion-Proof Pulse Input Flow Rate/Totalizers
- Dual Active Pulse, Square Wave, NPN, PNP, Switch, or Coil (Magnetic Pickup) Inputs
- Rate, Total, and Grand Total for Each Input Channel
- Display Rate & Total at the Same Time
- Dual-Line 6-Digit Display, 0.60" (15.2 mm) & 0.46" (12.0 mm)
- CapTouch Through-Glass Button Programming
- Display Mountable at 0°, 90°, 180°, & 270°
- Isolated 5, 10 or 24 VDC Flowmeter Power Supply
- Gate Function for Display of Slow Pulse Rates
- 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Option
- Free PC-Based, On-Board, MeterView Pro USB Programming Software
- SunBright Display Standard Feature; Great for Outdoor Applications
- Total, Grand Total or Non-Resettable Grand Total
- Front Panel or Remote Total Reset
- Password Protection for Programming and Total Reset
- Total Stored in Non-Volatile Memory
- K-Factor, Internal Scaling, or External Calibration
- Operating Temperature Range: -55 to 65°C (-67 to 149°F)
- CSA Certified as Explosion-Proof / Dust-Ignition-Proof / Flame-Proof
- ATEX and IECEx Certified as Dust-Ignition-Proof / Flame-Proof
- Input Power Options: 85-265 VAC / 90-265 VDC or 12-24 VDC / 12-24 VAC
- Programmable Display, Function Keys & Digital Inputs
- Flanges for Wall or Pipe Mounting
- Explosion-Proof Aluminum or Stainless Steel NEMA 4X / IP68 Enclosures
- On-Board RS-485 Serial Communications
- Modbus RTU Communication Protocol Standard
- Four 3/4" NPT Threaded Conduit Openings
- 3-Year Warranty

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PRECISION DIGITAL

The Complete ProtEX™ MAX Series

IECEx CE

PD8-154
4-Point Alarm Annunciator

PD8-6100
Strain Gauge Meter

PD8-158
8-Point Alarm Annunciator

PD8-6200
Analog Input Flow Rate/Totalizer

PD8-765
Process & Temperature Meter

PD8-6210
Analog Input Batch Controller

PD8-6000
Process Meter

PD8-6262
Analog Dual-Input Flow Rate/Totalizer

PD8-6001
Feet & Inches Level Meter

PD8-6300
Pulse Input Flow Rate/Totalizer

PD8-6060
Dual-Input Process Meter

PD8-6310
Pulse Input Batch Controller

PD8-6080
Modbus® Scanner with Dual Analog Input

PD8-6363
Pulse Dual-Input Flow Rate/Totalizer

PD8-6081
Feet & Inches Modbus® Scanner

PD8-7000
Temperature Meter

Go to PREDIG.COM for details on the entire ProtEX-MAX Series Meters

Disclaimer

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

⚠ CAUTION

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

⚠ WARNINGS

- Risk of electric shock or personal injury.
- This product is not recommended for life support applications or applications where malfunctioning could result in personal injury or property loss. Anyone using this product for such applications does so at his/her own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.
- Failure to follow installation guidelines could result in death or serious injury. Make sure only qualified personnel perform the installation.
- Never remove the totalizer cover in explosive environments when the circuit is live.
- Cover must be fully engaged to meet explosion-proof/dust-ignition-proof/flame-proof requirements.

⚠ WARNING

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

Limited Warranty

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

Registered Trademarks

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FREE MeterView Pro Programming Software

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

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

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

Watch MeterView Pro Software Video at www.predig.com/meterviewpro

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

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

Once your totalizer 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 totalizer is installed, you can use the front panel buttons and the instructions in this manual to do so.

⚠ WARNING

- When using the USB connection, the totalizer should only be connected to a computer when both devices are in a non-hazardous area.

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Introduction

The ProtEX-MAX PD8-6363 is an explosion-proof dual pulse input rate/totalizer ideal for flow rate, total, and flow control applications. The totalizer features a dual-line display, with a main display of 0.60" (15.2 mm) high, and a second display of 0.46" (12.0 mm) high superluminous LED digits, which can be read in any lighting condition, including direct sunlight. The totalizer is housed in a field-mountable, NEMA 4X/IP68 rated enclosure available in either aluminum or stainless steel for convenient indoor and outdoor installation.

The totalizer accepts a wide variety of pulse signals from two (2) pulse output flowmeters that can be displayed as flow rate, total and grand total. The rates, as measured by the flowmeters, are automatically aggregated into cumulative totals and grand totals which can be displayed with the rates.

Various math functions may be applied to the rate, total, and grand total of the two channels, including addition, difference, absolute difference, average, weighted average, multiplication, division, minimum, maximum, draw, ratio, and concentration.

The displays, relays, and the analog output may be assigned to the rate, total, or grand total of input channels A or B, or math result channel C. Three of the programming buttons can be set for custom operation.

A fully loaded ProtEX-MAX PD8-6363 dual-input flow rate/totalizer comes with four SPDT relays, a 4-20 mA output, five digital inputs and four digital outputs, and RS-485 serial communications. The four relays can be used for alarm indication or process control applications. The 4-20 mA isolated output, Modbus RTU serial communications, and digital I/O features make the ProtEX-MAX an excellent addition to any system.

CapTouch Buttons

To make it possible to program and operate the ProtEX-MAX in a hazardous area, the programming buttons that are located behind the glass window can be operated without removing the cover by using the CapTouch through-glass buttons. The operator puts their finger on the glass over the button and the button is actuated.

Ordering Information

Aluminum Enclosure

85-265 VAC Models

Model	Standard Features	Options Installed
PD8-6363-6H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD8-6363-6H7		4 relays 4-20 mA output

12-24 VDC Models

Model	Standard Features	Options Installed
PD8-6363-7H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD8-6363-7H7		4 relays 4-20 mA output

Stainless Steel Enclosure

85-265 VAC Models

Model	Standard Features	Options Installed
PD8-6363-6H0-SS	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD8-6363-6H7-SS		4 relays 4-20 mA output

12-24 VDC Models

Model	Standard Features	Options Installed
PD8-6363-7H0-SS	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD8-6363-7H7-SS		4 relays 4-20 mA output

Accessories

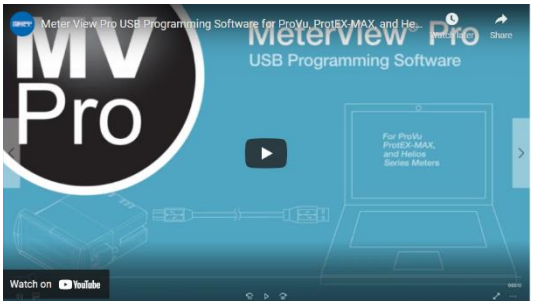
Model	Description
PDAPLUG75	3/4" Metal Conduit/Stopping Plug
PDA-SSTAG	Custom Stainless Steel Tag (see website for convenient ordering form)
PDA6848-SS	2" U-Bolt Kit Stainless Steel
PDA7485-I	RS-232 to RS-485 isolated converter
PDA8485-I	USB to RS-485 isolated converter

Helpful Videos

There are several videos that will help you get a better understating of the features and functionality of the ProtEX-MAX products. Since the ProtEX-MAX meters have the same general features and functionality of the ProVu meters, appropriate videos for the ProVu meter are also included.

MeterView Pro Programming Software

Learn how easy it is to program the ProVu (ProtEX-MAX) process meter using MeterView Pro software.



predig.com/videos/MVPro_SW

MeterView Pro Software Demonstration

Learn how easy it is to program Precision Digital's ProVu (ProtEX-MAX) process meter for a level application using MeterView Pro PC-based programming software.

predig.com/videos/MVPro_Demo

Connect to PC for Programming

Learn how to connect a ProVu (ProtEX-MAX) process meter to your PC and install free MeterView Pro programming software.

predig.com/videos/PC_Connect

Key Features

FRONT

IECEx

Through-Glass Button Programming

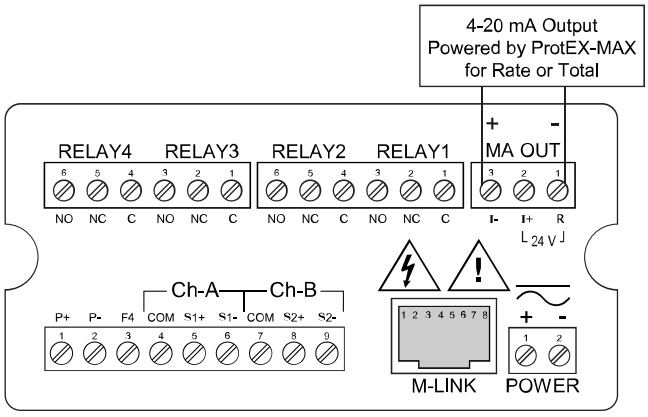
MeterView Pro USB Installation

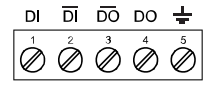
90° Rotatable Display

Sunlight Readable Display

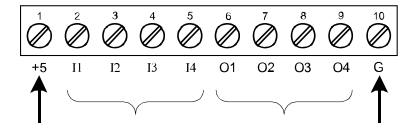
NEMA 4X Enclosure

CONNECTIONS





RS-485 Connections



Digital I/O Connections

- Form C (SPDT) relays
- Two isolated power supplies available even on 12/24 VDC input power models
- Removable terminal blocks
- 4 relays + isolated 4-20 mA output option
- Universal 85-265 VAC or 12/24 VDC input power
- Digital Input (F4)

Connections for PD8-6363-6H7 & PD8-6363-7H7

Physical Features

The ProtEX-MAX is designed for ease-of-use in safe and hazardous area applications, and is housed in a rugged NEMA 4X explosion-proof enclosure, available in either aluminum or stainless steel. The ProtEX-MAX can operate over a wide temperature range (-55 to 65°C / -67 to 149°F), and features through-glass buttons for easy controller operation without the need to remove the cover. All of these features are backed by a 3-year warranty.

Super-Bright LED Display

The ProtEX-MAX features a dual-line 6-digit display with super-bright LEDs, our brightest ever. These allow the display to be read in any lighting condition, even in direct sunlight.

CapTouch Through-Glass Buttons

The ProtEX-MAX is equipped with four capacitive sensors that operate as through-glass buttons so that it can be programmed and operated without removing the cover (and exposing the electronics) in a hazardous area. These buttons can be disabled for security by selecting the DISABLE setting on the NO-CONTACT BUTTONS switch located on the back of the electronics module, inside the enclosure.

Rugged, Heavy-Duty Enclosure

The ProtEX-MAX is housed in a rugged NEMA 4X, 7, & 9, IP68 aluminum or stainless steel enclosure, designed to withstand harsh environments in safe and hazardous areas.

Wide Viewing Angle

Customers can't always look at the display from straight on, so the window and display module have been optimized to provide a wide viewing angle of approximately ±40°; nearly twice that of the competition.

Built-In Mounting Flanges

The ProtEX-MAX is equipped with four slotted flanges for wall mounting or NPS 1½" to 2½" or DN 40 to 65 mm pipe mounting.

Flexible Mounting & Wiring

The ProtEX-MAX features four ¾" NPT threaded conduit openings so that wiring can be routed to the most convenient conduit connection(s).

Rotatable Display

The ProtEX-MAX rotatable display, along with four available conduit connections, provide for numerous installation options. The display can be rotated in 90° increments. Rotate it 90° for horizontal mounting.

Vertical Mounting

Horizontal Mounting

Perfect & Secure Fit Every Time

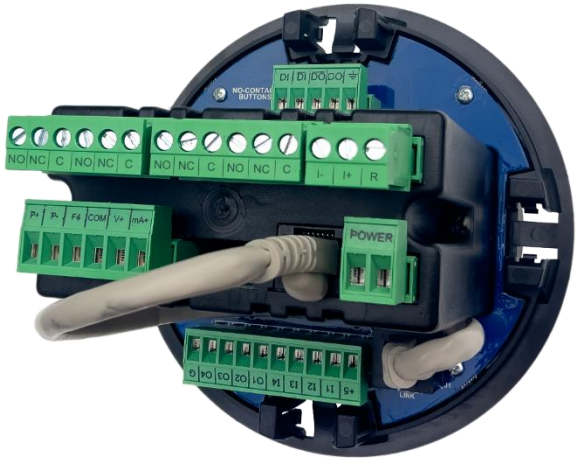
The internal cast rails ensure the ProtEX-MAX assembles together perfectly, quickly and securely; and everything lines up for optimal viewing every time. There are no standoffs to worry about breaking or getting out of alignment. The display module snaps into the built-in rails on the enclosure making assembly a snap, while pressing the display as close to the glass as possible to improve wide angle viewing. No tools are needed to install or remove it.

Stainless Steel Tags

PDA-SSTAG is a laser etched stainless steel tag accessory for any of your Precision Digital meters. The tag features custom text for equipment identification, instruction, or whatever else is needed in your facility. Each tag comes with a stainless steel wire and lead seal for easy mounting wherever you need it.

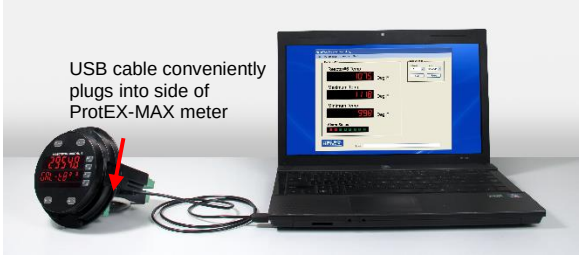
Removable Screw Terminals

Industrial applications require screw terminal connections for easy field wiring, and the ProtEX-MAX goes one step further in convenience by also making them removable.



Note: The above photograph is representative of the back of the PD8-6363 in every regard except for the input signal connector. See *Figure 5* on page *23* for actual input signal connections.

USB Port MeterView Pro



Hazardous Area Approvals

The ProtEX-MAX is certified by CSA as Explosion-Proof / Dust-Ignition-Proof / Flame-Proof and is ATEX and IECEx certified as Dust-Ignition-Proof / Flame-Proof.

Wide Operating Temperature Range

The ProtEX-MAX can operate from -55 to 65°C (-67 to 149°F) meaning it can be installed in a wide variety of indoor and outdoor industrial applications.

Specifications

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

General

Display	Display Line 1: 0.60" (15.2 mm) high, red LEDs Display Line 2: 0.46" (12.0 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 per second; up to 1 per 100 seconds (and is a function of Low Gate setting); Total: 10 per second (fixed)
LED Status Indicators	See *LED Status Indicators* on page *29* for details.
Overrange	Display flashes 999999
Display Assignment	Display lines 1 & 2 may be assigned to show: • One or more rate channels: Channel A (Ch-A), B (Ch-B), or C (Ch-C) • Toggle between rate channels: Ch-A & Ch-B, Ch-A & Ch-C, Ch-B & Ch-C, and Ch-A, Ch-B, & Ch-C • Total or grand total: Ch-A or Ch-B • Rate and total or grand total: Ch-A, Ch-B • Relay set points • Max/min values: Ch-A, Ch-B, or Ch-C • Toggle between any rate channel & units • Total and units: Ch-A or Ch-B • Toggle between totals: Ch-A & Ch-B; Ch-A, Ch-B, and sum of Ch-A and Ch-B • Modbus input Line 2 may also be set to show engineering units, or turned off with no display.
Programming Methods	Four CapTouch through-glass buttons when cover is installed. Mechanical buttons can be used with the cover removed. Free PC based USB MeterView Pro programming software.
Recalibration	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
Max/Min Display	Max/min readings reached by the process are stored until reset by the user or until power to the totalizer is turned off.
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	T6 Class operating temperature range Ta = -55 to 60ºC T5 Class operating temperature range Ta = -55 to 65ºC Storage temperature range: -55 to 85ºC (-67 to 185ºF) Relative humidity: 0 to 90% non-condensing
Max Power Dissipation	Maximum power dissipation limited to 13.73 W
Connections	Power, signal, relays, mA out: Removable screw terminal blocks accept 12 to 22 AWG wire. RS-485: Removable screw terminal block accepts 16 to 30 AWG wire. Digital I/O: Removable screw terminal blocks accept 16 to 30 AWG wire.
Mounting	Wall Mounting: Four (4) mounting holes provided for mounting totalizer to wall. See *Wall Mounting Instructions* on page *19* for additional details. Pipe Mounting: Optional pipe mounting kit (PDA6848) allows for pipe mounting. Sold separately. See *Pipe Mounting Instructions* on page *20* for additional details.
Tightening Torque	Power, signal, relays, mA out terminals: 5 lb-in (0.56 Nm) Digital I/O and RS-485: 2.2 lb-in (0.25 Nm)
Overall Dimensions	6.4" x 8.0" x 8.5" (163 mm x 202 mm x 215 mm) (W x H x D)
Weight	Aluminum: 14.7 lbs (6.7 kg) Stainless Steel: 23.5 lbs (10.7 kg)
Warranty	3 years parts & labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Dual Pulse Inputs

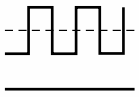
Two Inputs	Field selectable: Pulse or square wave 0-5 V, 0-12 V, or 0-24 V @ 30 kHz; TTL; open collector 4.7 kΩ pull-up to 5 V @ 30 kHz; NPN or PNP transistor, switch contact 4.7 kΩ pull-up to 5 V @ 40 Hz; Modbus PV (Slave)
Isolated Flowmeter Power Supply	Terminals P+ & P-: 24 VDC ±10% Isolated from the input at 500 V and from the power line at 4 kV. All models selectable for 24, 10, or 5 VDC supply (internal jumper J4). All models rated @ 25 mA max. Refer to *Flowmeter Supply Voltage Selection (P+, P-)* on page *22*.
Channels	Channel A, Channel B, Channel C (Math channel)
Programmable Constants	Constant P (Adder): -99.999 to 999.999, default: 0.000 Constant F (Factor): 0.001 to 999.999, default: 1.000

Math Functions

Name	Function	Setting
Addition	(A+B+P)*F	SUM
Difference	(A-B+P)*F	DIF
Absolute diff.	((Abs(A-B))+P)*F	DIFAbS
Average	(((A+B)/2)+P)*F	AVG
Multiplication	((A*B)+P)*F	MULtI
Division	((A/B)+P)*F	DIVIdE
Max of A or B	((AB-Hi)+P)*F	HI-Ab
Min of A or B	((AB-Lo)+P)*F	Lo-Ab
Draw	((A/B)-1)*F	drAw
Weighted avg.	((B-A)*F)+A	w AvG
Ratio	(A/B)*F	rAtIo
Ratio 2	((B-A)/A)+P)*F	rAtIo2
Concentration	(A/(A+B))*F	ConcEn
Total Addition	(tA+tB+P)*F	SUM t
G. Tot. Addition	(GtA+GtB+P)*F	SUMGt
Total Difference	(tA-tB+P)*F	dIF Gt
G. Tot. Difference	(GtA-GtB+P)*F	dIF Gt
Total Ratio	(tA/tB)*F	trAtIo
Total Ratio 2	((tB-tA)/tA)*F	t-rAt2
Total Percent	(tA/(tA+tB))*100	t PCt

Note: The F constant can be any value from 0.001 to 999.999. If the value is less than 1, it will have the same effect as a divider. For example, the average could also be derived by using (A+B)*F, where F = 0.500.

Low Voltage Mag Pickup	Sensitivity: 40 mVp-p to 8Vp-p
Minimum Input Frequency	0.001 Hz Minimum frequency is dependent on high gate setting.
Maximum Input Frequency	30,000 Hz (10,000 for low voltage mag pickup)
Input Impedance	Pulse input: Greater than 300 kΩ @ 1 kHz. Open collector/switch input: 4.7 kΩ pull-up to 5 V.

Input Threshold	Low	High	3.3 V 1.6 V 0 V
	1.6 V	3.3 V	

Sequence of Operations for Input Programming	1. Select Input for A and B 2. Set up the rate, total, and grand total engineering units for channels A & B, and units for math channel C 3. Set up rate, total, and grand total decimal points for channels A & B, and decimal point for math channel C 4. Program channel A & B rate parameters 5. Program channel A & B total and reset parameters 6. Set up display lines 1 & 2 and display intensity 7. Select the transfer function for A & B (e.g. Linear) 8. Select Math function for Channel C 9. Program constants for Factor (F) and Adder (P). 10. Program cutoff values for A and B
Accuracy	±0.03% of calibrated span ±1 count
Temperature Drift	Rate display is not affected by changes in temperature.
Multi-Point Linearization	2 to 32 points for channel A and B
Low-Flow Cutoff	0.1 to 999,999 (0 disables cutoff function). Point below at which the display always shows zero.
Decimal Point	Up to five decimal places or none: d.dddddd, ddddd.d, dddd.dd, ddd.ddd, dd.dd, or dddddd.
Calibration	May be calibrated using K-factor, scaling without a signal source, 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 totalizer; input 2 signal may be set anywhere above or below input 1 setting. Minimum input span between any two inputs is 1.0 Hz for calibration and 0.1 Hz for scaling. An error message will appear if the input span is too small.
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

Dual Rate/Totalizer

Rate Display Indication	-99999 to 999999, lead zero blanking.
Total Display & Total Overflow	0 to 999,999; automatic lead zero blanking. Up to 999,999,999 with total-overflow feature. "oF" is displayed to the left of total overflow.
Total Decimal Points	Up to five decimal places or none: ddddd.d, dddd.dd, ddd.ddd, dd.dddd, or d.ddddd Total decimal point is independent of rate decimal point. Channel A and B decimal points programmed independently.
Dual Totalizer	Calculates total for channels A and B 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. Channel A and B totalizer parameters programmed independently.
Totalizer Rollover	Totalizer rolls over when display exceeds 999,999,999. Relay status reflects display.
Total Overflow Override	Program total A or B total reset for automatic with 0.1 second delay and set point 1 for 999,999
Totalizer Alarm Presets	Up to eight, user selectable under setup menu. Any set point can be assigned to channel A or B total or grand total (or C) and may be programmed anywhere in the range of the totalizer for total alarm indication.
Total & Grand Total Reset	Via front panel button, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications. Channel A and B total and grand total reset parameters programmed independently.
Total Reset Password	Total and grand total passwords may be entered to prevent resetting the totals or grand totals from the front panel.
Programmable Delay On Release	0.1 and 999.9 seconds; applied to the first relay assigned to total or grand total. If the totalizer is programmed to reset total to zero automatically when the preset is reached, then a delay will occur before the total is reset.
Non-Resettable Total	The grand totals can be programmed as non-resettable totals by entering the password "050873". Both channels are set to non-resettable when this password is entered.
Non-Volatile Memory	Total and Grand Total values are stored in non-volatile memory for a minimum of ten years if power is lost.

⚠ CAUTION

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

Relays

Rating	Rating: 4 SPDT (Form C) internal and rated 3 A @ 30 VDC and 125/250 VAC resistive load, Total current: 4 A max (total of all relays), 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads; see *Switching Inductive Loads* on page *26*.
Relay Assignment	Relays may be assigned to channel A or B rate, total, or grand total; channel C; or Modbus control.
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	• Automatic (non-latching) and/or manual reset • Latching (requires manual acknowledge) with or without clear • Pump alternation control (2-4 relays) • Sampling (based on set point and time) • Off (disable unused relays and enable Interlock feature) • Manual on/off control mode
Relay Reset (Acknowledge)	User selectable via front panel button, F4 digital input, external contact closure on digital inputs, or through serial communications. 1. Automatic reset only (non-latching), when the input passes the reset point. 2. Automatic + manual reset at any time (non-latching) 3. Manual reset only, at any time (latching) 4. Manual reset only after alarm condition has cleared (L) **Note:** Front panel button, F4 terminal at back of totalizer or digital input may be assigned to acknowledge relays programmed for manual reset.
Time Delay	0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay
Fail-Safe Operation	Programmable and independent for each relay. **Note:** Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.
Auto Initialization	When power is applied to the totalizer, relays will reflect the state of the input to the totalizer.

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® 10/11
Power	USB port provides power to the totalizer. ***DO NOT*** *apply AC or DC power to the totalizer while the USB port is in use.*

Isolated 4-20 mA Transmitter Output Option

Output Source	Input channels A or B, rate, total, or grand total; channel C; max or min for channel A or B; highest or lowest max or min of A and B; set points 1-4; Modbus input; or manual control mode		
Scaling Range	1.000 to 23.000 mA for any display range		
Calibration	Factory calibrated: 4.000 to 20.000 = 4-20 mA output		
Analog Out Programming	23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break		
Accuracy	± 0.1% of span ± 0.004 mA		
Temperature Drift	0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient		
Isolated Transmitter Power Supply	Terminals I+ & R: 24 VDC ± 10%. May be used to power the 4-20 mA output or other devices. All models rated @ 25 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

RS-485 Serial Communications

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

Modbus® RTU Serial Communications

Slave Id	1 – 247 (Totalizer 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 ProtEX-MAX Modbus Register Tables located at www.predig.com for details.

Digital Input (F4)

Function	Remote operation of front-panel buttons, acknowledge/reset relays, reset totals, reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *59* for a complete list of capabilities.
Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM
Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

Digital Inputs & Outputs

Function	Terminals provided for remote operation of all four programming / operation buttons. Other uses include reset totals, acknowledge/reset relays and reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *59* for a complete list of capabilities.
Channels	5 digital inputs & 4 digital outputs
Digital Input Logic High	3 to 5 VDC
Digital Input Logic Low	0 to 1.25 VDC
Digital Output Logic High	3.1 to 3.3 VDC
Digital Output Logic Low	0 to 0.4 VDC
Source Current	10 mA maximum output current
Sink Current	1.5 mA minimum input current
+5 V Terminal	To be used as pull-up for digital inputs only. Connect normally open push buttons across +5 V & DI 1-4.

⚠ WARNING

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

MeterView Pro Software

Availability	Download directly from totalizer or from www.predig.com/meterviewpro
System Requirements	Microsoft® Windows® 10/11
Communications	USB 2.0 (for programming only) (USB A Male to Micro-B Cable) RS-485 to USB converter (programming, monitoring, and data logging)
Configuration	Configure meters one at a time
Power	USB port provides power to the totalizer. ***DO NOT*** *apply AC or DC power to the totalizer while the USB port is in use.*

Enclosure

Material	AL Models: ASTM A413 LM6 die-cast aluminum, copper-free, enamel coated SS Models: ASTM A743 CF8M investment-cast 316 stainless steel
Gasket	Fluoroelastomer
Rating	NEMA 4X, IP68 Explosion-proof
Color	AL: Blue SS: Silver
Window	Borosilicate glass
Conduits	Four ¾" NPT threaded conduit openings
Conduit Stopping Plugs	Sold separately
Flanges	Two built-in flanges for wall and pipe mounting
Tamper-Proof Seal	Cover may be secured with tamper-proof seal
Overall Dimensions	6.4" x 8.0" x 8.5" (163 mm x 202 mm x 215 mm) (W x H x D)
Weight	AL: 14.7 lbs (6.7 kg) SS: 23.5 lbs (10.7 kg)
ATEX	⟨Ex⟩ II 2 G D Ex db IIC Gb Ex tb IIIC Db IP66/IP68 Tamb: -55°C to +85°C Certificate Number: Sira 19ATEX1252U
IECEx	Ex db IIC Gb Ex tb IIIC Db IP66/IP68 Tamb: -55°C to +85°C Certificate Number: IECEx SIR 19.0075U
CSA	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Group E, F, G Class III Ex db IIC Gb Ex tb IIIC Db Class I, Zone 1, AEx db IIC Gb Zone 21, AEx tb IIIC Db IP66/IP68/TYPE 4X Tamb: -55°C to +85°C Certificate Number: CSA19.80011200U
UL	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III Class I, Zone 1, AEx db IIC Gb Zone 21, AEx tb IIIC Db Ex db IIC Gb Ex tb IIIC Db IP66/IP68/TYPE 4X Tamb: -55°C to +85°C Certificate Number: E518920

Note: The above approvals are for the enclosure only. See next page for approvals on the entire instrument.

General Compliance Information

Electromagnetic Compatibility

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

Note: Testing was conducted on meters with cable shields grounded at the point of entry representing installations designed to optimize EMC performance.

Product Ratings and Approvals

CSA	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1, T5 Class III, Division 1, T6 (Ta max = 60°C) Ex db IIC T5 Ex db IIC T6 (Ta max = 60°C) Ex tb IIIC T90°C Ta = -55°C to +65°C Enclosure: Type 4X & IP66 / IP68 CSA Certificate: CSA 12 2531731
ATEX	II 2 G D Ex db IIC T* Gb Ex tb IIIC T90°C Db IP68 Ta = -55°C to +*°C *T6 = -55°C to +60°C *T5 = -55°C to +65°C Certificate Number: Sira 12ATEX1182X
IECEx	Ex db IIC T* Gb Ex tb IIIC T90°C Db IP68 Ta = -55°C to +*°C *T6 = -55°C to +60°C *T5 = -55°C to +65°C Certificate Number: IECEx SIR 12.0073X

ATEX/IECEx Specific Conditions of Use:

1. The equipment label and epoxy coating may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.
2. Flameproof joints are not intended to be repaired.
3. All entry closure devices shall be suitably certified as “Ex d”, “Ex t” and “IP66/68” as applicable. Suitable thread sealing compound (non-setting, non-insulating, non-corrosive, not solvent based, suitable for the ambient rating) must be used at the NPT conduit entries to achieve the IPx8 rating while maintaining the Ex protection concept.

Year of Construction

This information is contained within the serial number with the first four digits representing the year and month in the YYMM format.

For European Community

The ProtEX-MAX must be installed in accordance with the ATEX directive 2014/34/EU, the product manual, and the product certificate Sira 12ATEX1182X.

EU Declaration of Conformity

For shipments to the EU and UK, a Declaration of Conformity was printed and included with the product. For reference, a Declaration of Conformity is also available on our website www.predig.com/docs.

Safety Information

⚠ CAUTION

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

⚠ WARNINGS

- Risk of electric shock or personal injury.
- Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.
- Service requiring replacement of internal components must be performed at the factory.
- In hazardous areas, conduit and conduit/stopping plugs require the application of non-setting (solvent free) thread sealant. It is critical that all relevant hazardous area guidelines be followed for the installation or replacement of conduit or plugs.

Installation

Install in accordance with applicable local and national regulations (e.g. NEC).

For Installation in USA
The ProtEX-MAX must be installed in accordance with the National Electrical Code (NEC) NFPA 70.

For Installation in Canada
The ProtEX-MAX must be installed in accordance with the Canadian Electrical Code CSA 22.1. All power supplies below 36 V and all signal input circuits must be supplied from a CSA Certified Class 2 source.

For European Community
The ProtEX-MAX must be installed in accordance with the ATEX directive 2014/34/EU, the product manual, and the product certificate Sira 12ATEX1182X.

⚠ WARNINGS

- Disconnect from supply before opening enclosure.
- Keep cover tight while circuits are live.
- Conduit seals must be installed within 18" (450 mm) of the enclosure.
- Use suitably certified and dimensioned cable entry device and/or plug.
- Cable must be suitable for 90°C.

Wiring connectors are accessed by opening the enclosure. To access electrical connectors, remove the electronics module. Connectors are on the rear of the electronics module.

Unpacking

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

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

Cover Jam Screw

The cover jam screw should be properly installed once the totalizer has been wired and tested in a safe environment. The cover jam screw is intended to prevent the removal of the totalizer cover in a hazardous environment without the use of tools. Using a M2 hex wrench, turn the screw clockwise until the screw contacts the totalizer. Turn the screw an additional 1/4 to 1/2 turn to secure the cover.

⚠ CAUTION

- Excess torque may damage the threads, screw head, and wrench.

Mounting

The ProtEX-MAX has two slotted mounting flanges that may be used for pipe mounting or wall mounting. Refer to *Figure 1* and *Figure 2* below.

WARNING

- Do not attempt to loosen or remove flange bolts while the totalizer is in service.

Mounting Dimensions

All units: inches (mm)

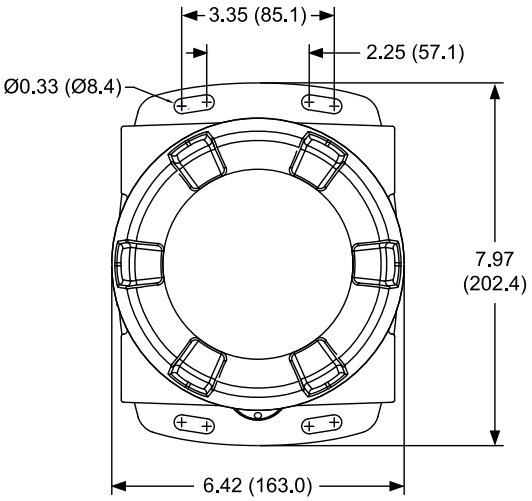


Figure 1. Enclosure Dimensions – Front View

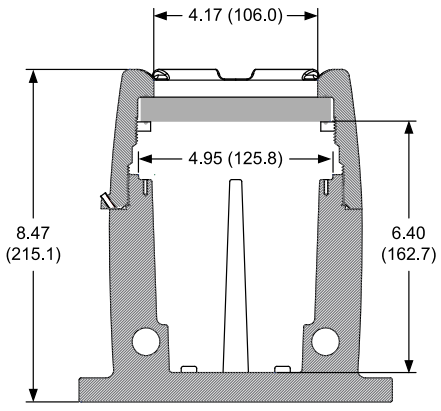


Figure 2. Enclosure Dimensions – Side Cross Section View

Wall Mounting Instructions

The totalizer can be mounted to any wall or flat surface using the four provided mounting holes located in the built-in flanges. In addition, the internal electronic assembly can be rotated to allow the enclosure to be mounted in any position. To mount the totalizer to a wall, follow these instructions:

- Prepare a section of wall approximately 7.0" x 8.5" (178 mm x 216 mm) for totalizer mounting by marking with a pencil the mounting holes (shown in *Figure 1*) on the wall.
- Select the appropriate mounting screws for the mounting surface to be used. The mounting holes diameter is shown on *Figure 1*.

Note: Mounting screws are not included.

- Using a drill bit slightly smaller than the girth of the mounting screws, pre-drill holes at the mounting locations previously marked.
- Insert mounting screws into the four mounting holes and screw them into the pre-drilled holes.

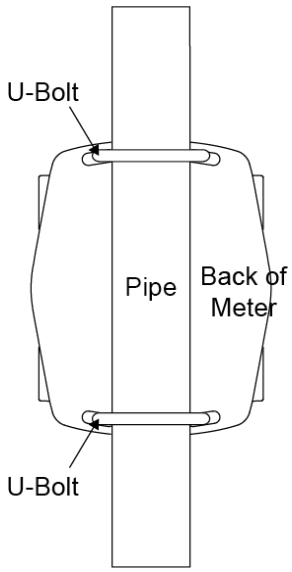
Pipe Mounting Instructions

The totalizer can also be mounted to a pipe using an optional U-Bolt kit. This kit includes two U-bolts, the necessary hardware, and is available in 316 stainless steel (PDA6848-SS).

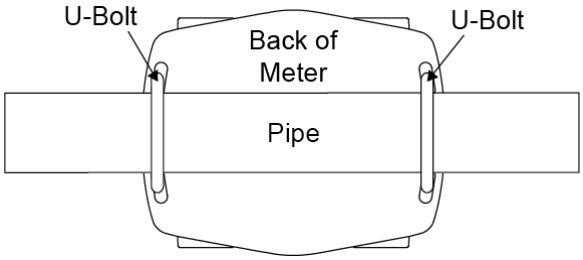
To mount the totalizer using a U-Bolt kit, follow these instructions:

- Orient the groove on the back of the instrument with the pipe and secure it to the pipe with the two U-bolts and hardware provided.

Vertical Pipe Mounting



Horizontal Pipe Mounting



Installation Overview

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

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

MeterView Pro Software

The easiest and quickest way to program your ProtEX-MAX totalizer is to use the FREE MeterView Pro programming software. This software is loaded into the totalizer 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 totalizer out of the box is connect the ProtEX-MAX to your PC with the provided USB cable. **DO NOT** apply AC or DC power to the totalizer while your PC is connected to the totalizer as it will disrupt the USB connection. It is not necessary to apply an input signal.

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

Watch MeterView Pro Software Video at
www.predig.com/meterviewpro

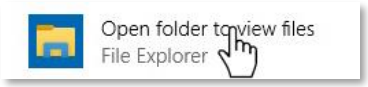
MeterView Pro Installation

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

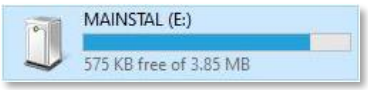
WARNINGS

- Only one totalizer may be connected at a time. Attaching multiple totalizers will cause a conflict with the totalizer software.
- **DO NOT** apply AC or DC power to the totalizer when using the USB *connection.*
- When using the USB connection, the totalizer should only be connected to a computer when both devices are in a non-hazardous area.

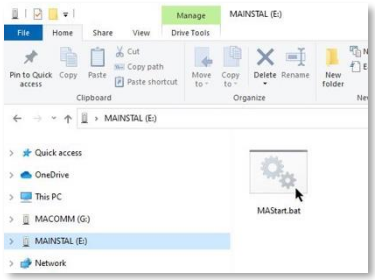
2. Once the driver is installed, an AutoPlay dialog should appear for the drive “MAINSTAL.” Click “Open folder to view files.”



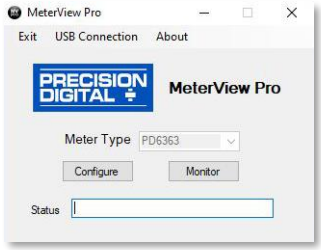
If the computer does not display an AutoPlay dialog for the drive “MAINSTAL,” you should open My Computer and double-click on the drive labeled “MAINSTAL.”



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 totalizer.



Note: If you decide to update your MeterView Pro software, once the installation has completed, you will be asked if you want to update the setup files located on the totalizer itself. This way, you will always have the most current version on the totalizer for future installs.

WARNING

- **DO NOT** unplug the totalizer while the new installation files are being written to it. The totalizer will display `USr rtE` during the process and you will receive an on-screen notification once the process is complete.
- **DO NOT** disconnect and reconnect the totalizer rapidly. Allow at least 10 seconds from disconnection before reconnecting USB to the totalizer.

Flowmeter Supply Voltage Selection (P+, P-)

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

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

To access the voltage selection jumper:

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

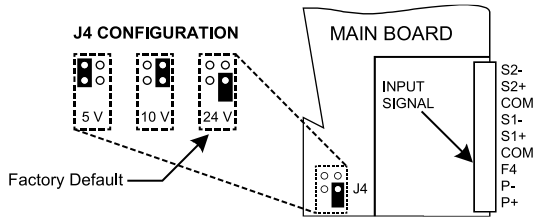


Figure 3. Flowmeter Supply Voltage Selection

Connections

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

⚠ 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 totalizer and ensure personnel safety.

⚠ WARNINGS

- Observe all safety regulations. Electrical wiring should be performed in accordance with all agency requirements and applicable national, state, and local codes to prevent damage to the totalizer and ensure personnel safety.
- Static electricity can damage sensitive components.
- Observe safe handling precautions for static-sensitive components.
- Use proper grounding procedures/codes.
- If the instrument is installed in a high voltage environment and a fault or installation error occurs, high voltage may be present on any lead or terminal.
- Follow all fusing and wiring precautions requirements for the instrument integrated to the PD8 Series model number being connected.

To access the connectors, remove the enclosure cover. The electronics module is snapped into the back of the enclosure and is removed by pulling it straight out. Signal connections are made to de-pluggable connectors on the back of the electronics module.

Some connectors may be provided already connected. These connections are required for proper operation of the ProtEX-MAX, and should not be removed unless instructed to by this manual.

Grounding connections are made to the two ground screws provided on the base – one internal and one external.

After all connections have been completed and verified, apply power to the unit.

Required & Factory Wired Connection

The ProtEX-MAX comes with a pre-wired connection. This connection is detailed below and must be maintained in order for the instrument to function properly.

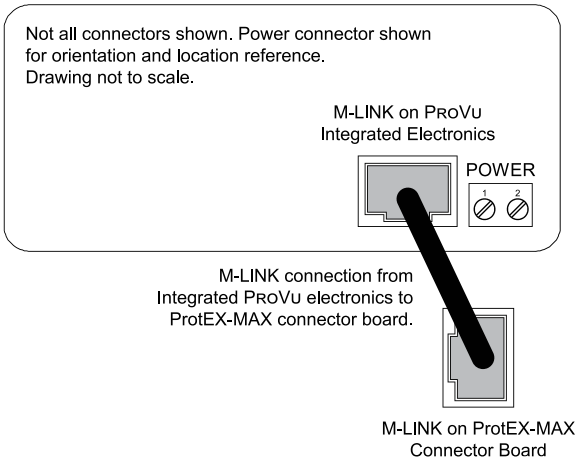
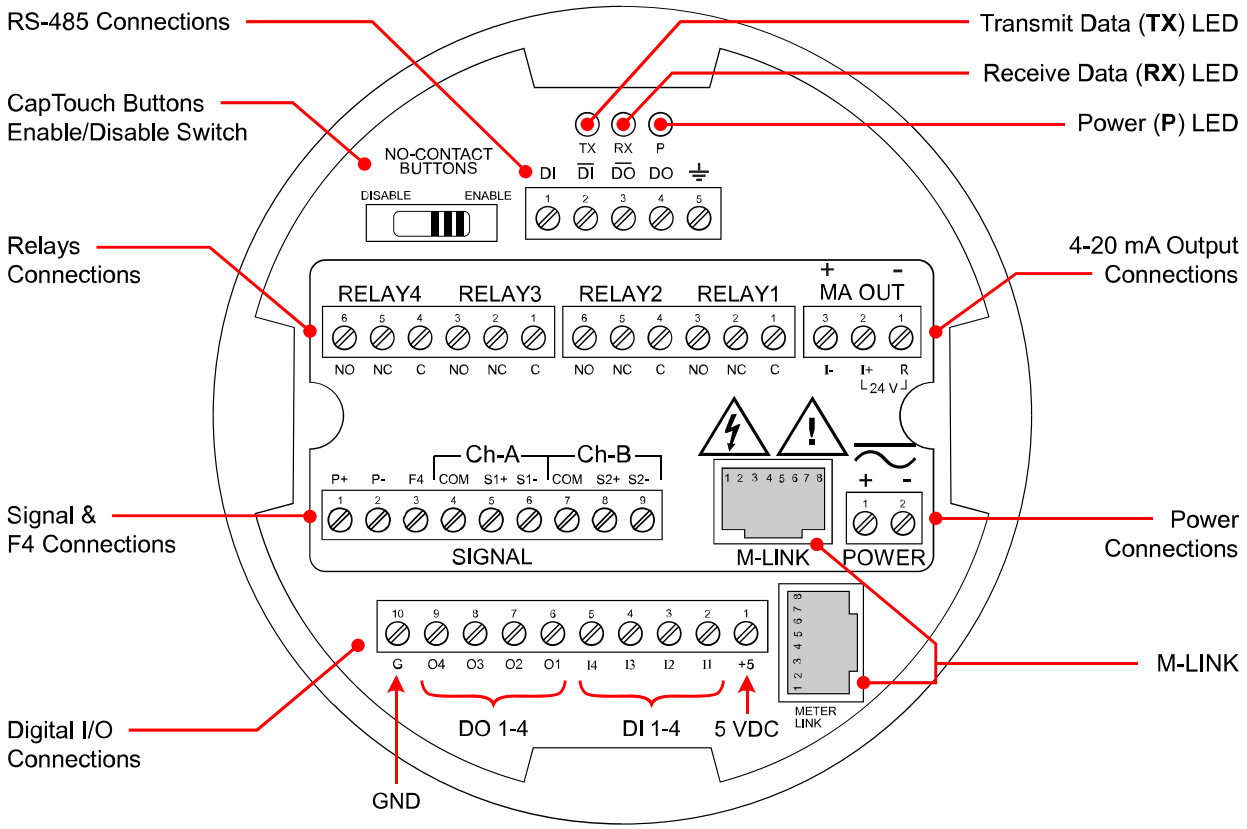


Figure 4. Integrated ProVu Required Connections

PROVU Electronics Module Layout for PD8-6363-6H7 and PD8-6363-7H7*



* For models PD8-6363-6H0 and PD8-6363-7H0, the upper set of connectors (RELAYs & MA OUT) are not present

Figure 5. PROVU Electronics Module Layout

USB Connection

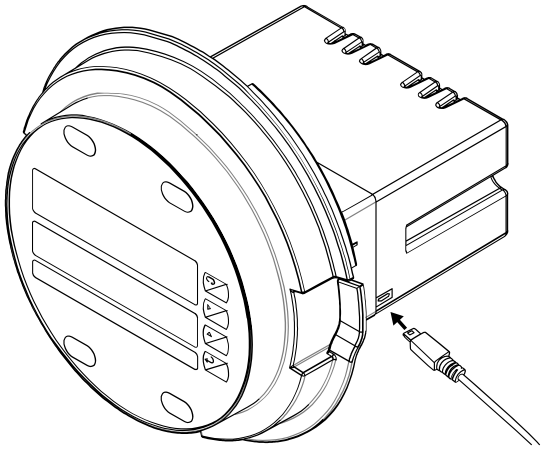


Figure 6. USB Connection

WARNINGS

- **DO NOT** disconnect the RJ45 M-LINK connector cable. Otherwise the instrument will not function properly.
- When using the USB connection, the totalizer should only be connected to a computer when both devices are in a non-hazardous area.

Power Connections

Power connections are made to a two-terminal connector labeled POWER. The totalizer will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention. There are separate models for low voltage and high voltage power. See *Ordering Information* on page *7* for details.

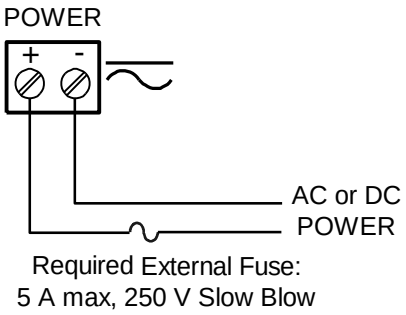


Figure 7. Power Connections

Signal Connections

Signal connections are made to a nine-terminal connector labeled SIGNAL. The COM (common) terminals are the return for certain input signals. The two COM terminals connect to the same common return, and are not isolated.

The following figures show examples of signal connections.

Setup and programming is performed through the programming buttons or MeterView Pro software.

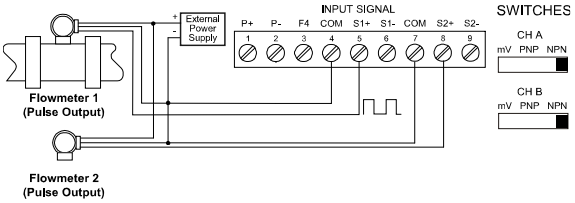


Figure 8. Flowmeters Powered by External Power Supply

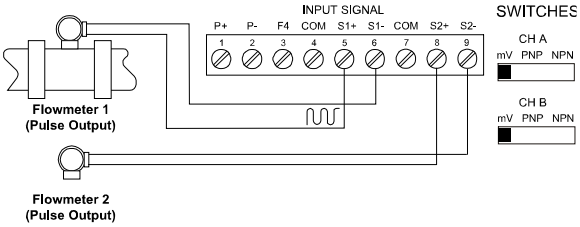


Figure 9. Self-Powered Magnetic Pickup Coil Flowmeter

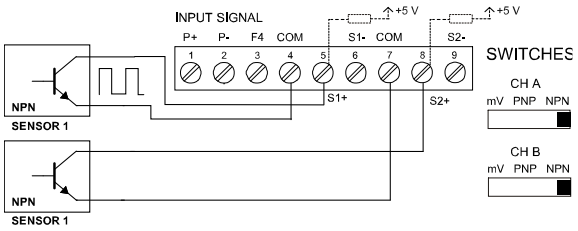


Figure 10. NPN open Collector Input

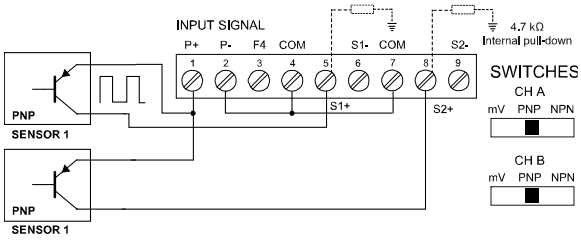


Figure 11. PNP Sensor Powered by Internal Supply

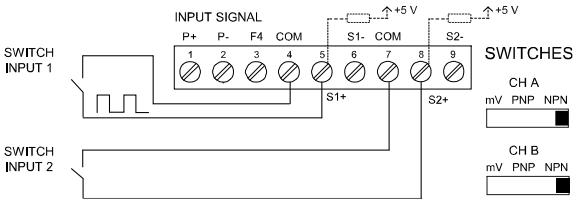


Figure 12. Switch Input Connections

Configure Input Type and Level Switches

Channel A and B each have an internal input type configuration switch. These switches must be set to the correct input type and level. Each switch can be set for mV, PNP, or NPN. For details on what input type to select, see *Signal Connections* starting on page *25*.

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.

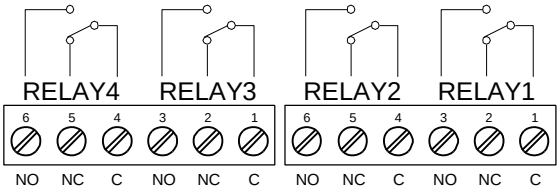


Figure 13. Relay Connections

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 *50*.

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.

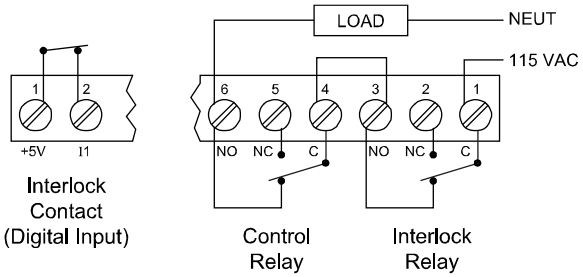


Figure 14. Interlock Connections

Switching Inductive Loads

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

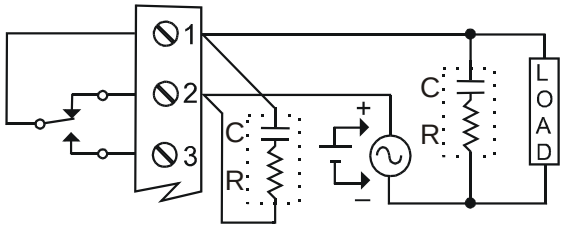


Figure 15. AC and DC Loads Protection

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 totalizer's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.

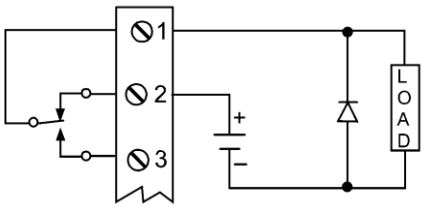


Figure 16. Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

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

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

RS-485 Connections

The RS-485 connections are made to a five terminal connector used for Modbus® RTU serial communications. The RS-485 terminals include Transmit Data (DO) and (/DO), Receive Data (DI) and (/DI), and Signal Ground. See *Modbus RTU Serial Communications* (SEr iRL) on page *55* for more information.

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

Figure 17. RS-485 Connection

RS-485 Multi-Drop Connection

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

To change the totalizer address:

1. Press and hold the Menu button for three seconds to access Advanced Features menu of the totalizer.
2. Press Up arrow until Serial (SEr iRL) menu is displayed and press Enter, AddrES is displayed.
3. Press Enter to change totalizer address using Right and Up arrow buttons. Press Enter to accept.
4. Press Menu button to exit and return to Run Mode.

Three-Wire Connection

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

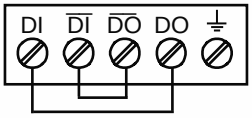


Figure 18. Three-Wire RS-485 Connection

Digital I/O Connections

Digital inputs and outputs are provided in order to expand the functionality of the totalizer. Digital input connections are made via a push button or switch to the appropriate digital input terminal and the +5 VDC terminal. Digital output connections are made by wiring from the appropriate digital output terminal to the ground terminal.

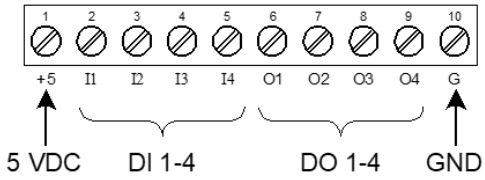


Figure 19. Digital Input and Output Connections

IMPORTANT

The onboard digital inputs (1-4) are configured at the factory to function identically to the front panel pushbuttons (Menu, F1, F2, & F3) in order to work with the CapTouch buttons. Changing the programming of the digital inputs will affect the function of the CapTouch buttons.
If you wish to change the behavior of the digital inputs, re-assign F1-F3 to the desired function, then change the corresponding digital input to match.

WARNING

- **DO NOT** disconnect the RJ45 M-LINK connector cable. Otherwise the instrument will not function properly.

F4 Digital Input Connections

A digital input, F4, is standard on the totalizer. This digital input connected with a normally open closure across F4 and COM, or with an active low signal applied to F4. It can be used for remote operation of front-panel buttons, to acknowledge/reset relays, reset totals, or to reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *59* for a complete list of capabilities.

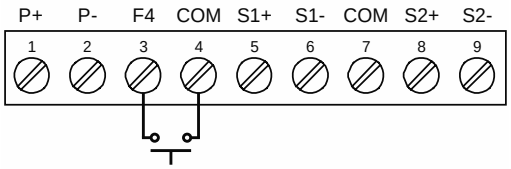


Figure 20. F4 Digital Input Connections

Remote Programming

The totalizer can be operated via the programming buttons or a remote control station with required approvals to be located in a hazardous area using the digital.

4-20 mA Output Connections

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

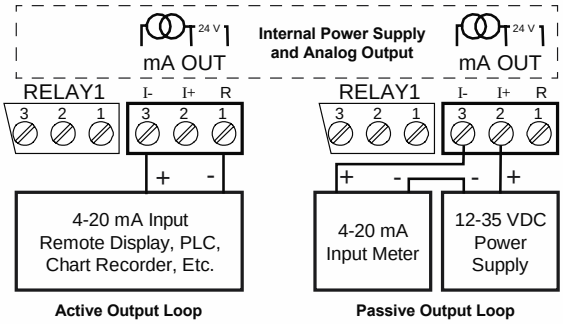


Figure 21. 4-20 mA Output Connections

Analog Output Transmitter Power Supply

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

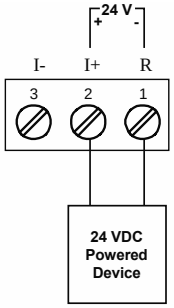


Figure 22. Analog Output Supply Powering Other Devices

Setup and Programming

The totalizer 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 totalizer comes factory calibrated to NIST standards, so for initial setup, it is recommended to use the K-Factor method or (SCALE) function.

Overview

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

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

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

LED Status Indicators

LED	State	Indication
1-4	Steady	Alarm condition based on set and reset points, independent of relay status in certain configurations. (Available on all totalizer configurations, including those without relays installed)
1-4	Flashing	Relay interlock switch open
1-4 & M	Flashing	Relay in manual control mode
T	Steady	Total
T	Flashing	Totalizer in Tare mode
M	Flashing	Analog output in manual control mode
A	Steady	Channel A displayed
B	Steady	Channel B displayed
C	Steady	Channel C displayed

Programming Buttons

Button Symbol	Description
MENU	Press to enter or exit Programming Mode, view settings, or exit max/min readings
F1	Press to reset max/min readings or other parameter/function assigned through the *User* menu
F2	Press to display max/min readings or other parameter/function assigned through the *User* menu
F3	Press to acknowledge relays or other parameters/function assigned through the *User* menu

- Press the Menu button to enter or exit the Programming Mode at any time.
- Press the Right arrow button to move to the next digit during digit or decimal point programming.
- Press or hold the Up arrow button to scroll through the menus, decimal point, or to increment the value of a digit.
- Press the Enter button to access a menu or to accept a setting.
- Press and hold the Menu button for three seconds to access the advanced features of the totalizer.

CapTouch Buttons

The ProtEX-MAX is equipped with four capacitive sensors that operate as through-glass buttons so that they can be operated without removing the cover (and exposing the electronics) in a hazardous area or harsh environment.

CapTouch buttons are designed to protect against false triggering and can be disabled for security by selecting DISABLE on the switch labeled NO-CONTACT BUTTONS located on the connector board.

To actuate a button, press one finger to the window directly over the marked button area. When the cover is removed or replaced, the CapTouch buttons can be used after the meter completes a self-calibrating routine. The sensors are disabled when more than one button is pressed, and they will automatically re-enable after a few seconds. When the cover is removed, the four mechanical buttons located on the right of the faceplate are used.

The CapTouch Buttons are configured by default to duplicate the function of the front panel mechanical pushbuttons associated with the integrated meter.

CapTouch Button Tips:

- Keep the glass window clean.
- Tighten the cover securely.
- Use a password to prevent tampering.

Display Functions & Messages

The totalizer displays various functions and messages during setup, programming, and operation. The following table shows the main menu functions and messages in the order they appear in the menu.

Display Functions & Messages

Display	Parameter	Action/Setting Description
SEtuP	*Setup*	Enter *Setup* menu
InPut	*Input*	Enter *Input* selection menu
Ch-A*	*Input*	Set input operation for channel A (*or B)
totAL	*Total*	Enable/disable totalizer functions
YES	*Yes*	Enable totalizer functions
no	*No*	Disable totalizer functions
nmodE	*Mode*	Select dual-input operation mode
duAL	*Dual*	Set independent dual input mode
ud Ab	*Up/Down AB*	Set channel A total add/subtract based on the state of channel B
ud AI	*Up/Down AI*	Set channel A total add/subtract based on the state of a digital input
ud bI	*Up/Down BI*	Set channel B total add/subtract based on the state of a digital input
ud bI	*Up/Down ABI*	Set channel A & B total add/subtract based on the state of a digital input for each
QuAd 1	*Quadrature 1*	Set type 1 quadrature operation
QuAd 2	*Quadrature 2*	Set type 2 quadrature operation
QuAd 4	*Quadrature 4*	Set type 4 quadrature operation
unitS	*Unit*	Select the display units/tags
Ch-A*	*Rate unit*	Set rate unit or tag for channel A (*or B)
Ch-C	*Math unit*	Set unit or tag for math channel C
tot-A*	*Total unit*	Set total unit or tag for channel A (*or B)
Gtot-A*	*Grand total unit*	Set grand total unit or tag for channel A (*or B)
dEc Pt	*Decimal point*	Set decimal point
Ch-A*	*Decimal point*	Set decimal point for channel A (*or B or C)
rAtE*	*Rate*	Set rate decimal point (*channel A and B only)

Display Functions & Messages

Display	Parameter	Action/Setting Description
totAL*	*Total*	Set total decimal point (*channel A and B only)
GtotAL*	*Grand total*	Set grand total decimal point (*channel A and B only)
ProG	*Program*	Enter the *Program* menu
InCAL	*Input calibration*	Enter the *Input Calibration* menu
Ch-A	*Channel A*	Enter channel A input setup
FAct-A	*K-factor A*	Enter channel A k-factor
SCAL-A	*Scale A*	Enter the *Scale* menu for channel A
CAL-A	*Calibrate A*	Enter the *Calibration* menu for channel A
inP 1	*Input 1*	Calibrate input 1 signal or program input 1 value
d.S 1	*Display 1*	Program display 1 value
inP 2	*Input 2*	Calibrate input 2 signal or program input 2 value (up to 32 points)
d.S 2	*Display 2*	Program display 2 value (up to 32 points)
Error	*Error*	Error, calibration or scaling not successful, check signal or programmed value
Ch-b	*Channel B*	Enter channel B input setup
FAct-b	*K-factor B*	Enter channel B k-factor
SCAL-b	*Scale B*	Enter the *Scale* menu for channel B
CAL-b	*Calibrate B*	Enter the *Calibration* menu for channel B
tSEtuP	*Total setup*	Enter the *Total Setup* menu
Ch-A*	*Channel A*	Setup the total for channel A (*or B)
tbASE	*Time base*	Program total time base
t CF	*Total conversion factor*	Program total conversion factor
Gt CF	*Grand total conversion factor*	Program grand total conversion factor
trESEt	*Total reset*	Program total reset mode: auto or manual
Ch-A*	*Channel A*	Set total reset modes for channel A (*or B)
t rSt	*Total reset*	Program total reset mode: auto or manual
Gt rSt	*Grand total reset*	Program grand total reset mode: auto or manual

Display Functions & Messages

Display	Parameter	Action/Setting Description
t dLY	*Time delay*	Program automatic reset time delay
dSPLAY	*Display*	Enter the *Display* menu
LinE 1	*Display Line 2*	Assign the upper display parameter
LinE 2	*Display Line 2*	Assign the lower display parameter
d Ch-A	*Display Ch-A*	Assign display to channel A
d Ch-b	*Display Ch-B*	Assign display to channel B
d Ch-C	*Display Ch-C*	Assign display to channel C (math)
d Ab	*Display AB*	Alternate display of channels A & B
d AC	*Display AC*	Alternate display of channels A & C
d bC	*Display BC*	Alternate display of channels B & C
d AbC	*Display ABC*	Alternate display of channels A, B, & C
d t-A	*Display total A*	Assign display to channel A total
d t-b	*Display total B*	Assign display to channel B total
d Gt-A	*Display grand total A*	Assign display to channel A grand total
d Gt-b	*Display grand total B*	Assign display to channel B grand total
d rt-A	*Display rate and total A*	Alternate display of channel A rate and total
d rt-b	*Display rate and total B*	Alternate display of channel B rate and total
drGt-A	*Display rate and grand total A*	Alternate display of channel A rate and grand total
drGt-b	*Display rate and grand total B*	Alternate display of channel B rate and grand total
dSEt 1*	*Display Set 1**	Displays relay 1 (*through 4) set point.
d Hi-A	*Display high A*	Display high value of channel A
d Lo-A	*Display low A*	Display low value of channel A
d HL-A	*Display high/low A*	Alternate between high/low value of channel A
d Hi-b	*Display high B*	Display high value of channel B

Display Functions & Messages

Display	Parameter	Action/Setting Description
d Lo-b	*Display low B*	Display low value of channel B
d HL-b	*Display high/low B*	Alternate between high/low value of channel B
d Hi-C	*Display high C*	Display high value of channel C
d Lo-C	*Display low C*	Display low value of channel C
d HL-C	*Display high/low C*	Alternate between high/low value of channel C
d A-u	*Display A and units/tags*	Alternate display of channel A and the unit/tag
d b-u	*Display B and units/tags*	Alternate display of channel B and the unit/tag
d C-u	*Display C and units/tags*	Alternate display of channel C and the unit/tag
d tA-u	*Display total A and total A units*	Alternate display of channel A total and total units
d tb-u	*Display total B and total B units*	Alternate display of channel B total and total units
d tAb	*Display total A and B*	Alternate display of channel A total and channel B total
d tAbC	*Display total A, B, and sum of A and B*	Alternate display of channel A total, channel B total, and sum of totals as channel C
nn bus	*Display Modbus*	Display Modbus input register
d oFF	*Display off*	Display blank line 2
d unit	*Display unit*	Display line 1 channel units
d- Int	*Display intensity*	Set display intensity level from 1 to 8
rELAY	*Relay*	Enter the *Relay* menu
ASS iGn	*Assignment*	Assign relays to channels or Modbus
AS iGn 1*	*Assign 1*	Relay 1 (*through 4) assignment
Ch-A*	*Channel A**	Assign relay to channel A (*or B or C)
rAtE*	*Rate*	Assign relay to rate (*channel A and B only)
totAL*	*Total*	Assign relay to total (*channel A and B only)
GtotAL*	*Grand total*	Assign relay to grand total (*channel A and B only)

Display Functions & Messages

Display	Parameter	Action/Setting Description
on bus	*Modbus*	Assign relay to Modbus register
rly 1*	*Relay 1*	Relay 1 (*through 4) setup
Act 1	*Action 1*	Set relay 1 action
Auto	*Automatic*	Set relay for automatic reset
SEt 1	*Set 1*	Enter relay 1 set point
rSt 1	*Reset 1*	Enter relay 1 reset point
A-man	*Auto-manual*	Set relay for auto or manual reset any time
LAtCH	*Latching*	Set relay for latching operation
Lt-CLr	*Latching-cleared*	Set relay for latching operation with manual reset only after alarm condition has cleared
ALtErn	*Alternate*	Set relay for pump alternation control
SAmPL	*Sample*	Set relay for sample time trigger control
OFF	*Off*	Turn relay off
FAILSF	*Fail-safe*	Enter *Fail-safe* menu
FLS 1*	*Fail-safe 1*	Set relay 1 (*through 4) fail-safe operation
on	*On*	Enable fail-safe operation
oFF	*Off*	Disable fail-safe operation
dELAY	*Delay*	Enter relay *Time Delay* menu
dLY 1*	*Delay 1*	Enter relay 1 (*through 4) time delay setup
On 1	*On 1*	Set relay 1 On time delay
OFF 1	*Off 1*	Set relay 1 Off time delay
Aout	*Analog output*	Enter the *Analog output* scaling menu
Aout 1	*Aout Channel*	Analog Output source channel
dis 1	*Display 1*	Program display 1 value
Out 1	*Output 1*	Program output 1 value (e.g. 4.000 mA)
dis 2	*Display 2*	Program display 2 value
Out 2	*Output 2*	Program output 2 value (e.g. 20.000 mA)
rESEt	*Reset*	Press Enter to access the *Reset* menu
rSt 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

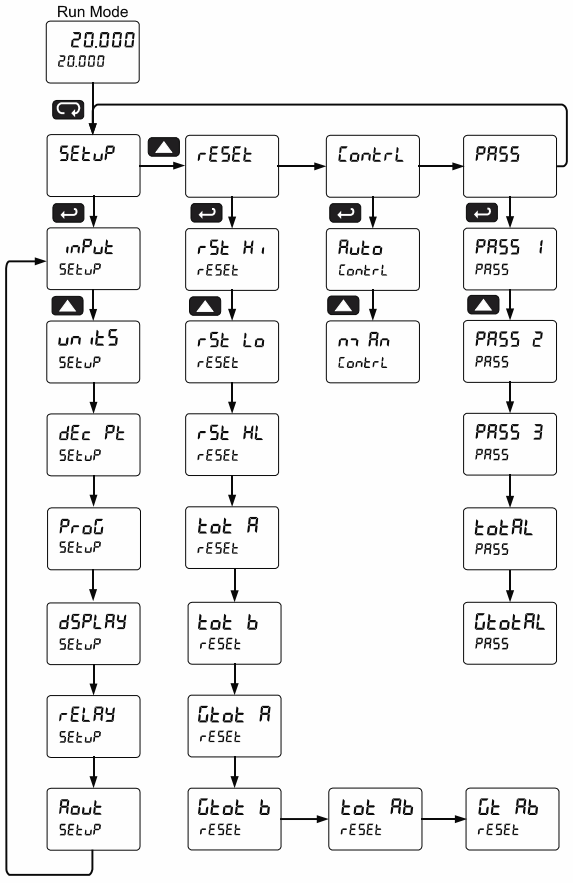
Display Functions & Messages

Display	Parameter	Action/Setting Description
tot A	*Reset total A*	Press Enter to reset channel A total
tot b	*Reset total B*	Press Enter to reset channel B total
Gtot A	*Reset grand total A*	Press Enter to reset channel A grand total
Gtot b	*Reset grand total B*	Press Enter to reset channel B grand total
tot Ab	*Reset totals A and B*	Press Enter to reset channels A and B totals
Gt Ab	*Reset grand totals A and B*	Press Enter to reset channels A and B grand totals
Control	*Control*	Enter *Manual Control* menu
Auto	*Automatic*	Press Enter to set totalizer for automatic operation
man	*Manual*	Press Enter to manually control relays or analog output operation
PASS	*Password*	Enter the *Password* menu
PASS 1	*Password 1*	Set or enter Password 1
unLoc	*Unlocked*	Program password to lock totalizer
Locd	*Locked*	Enter password to unlock totalizer
PASS 2	*Password 2*	Set or enter Password 2
PASS 3	*Password 3*	Set or enter Password 3
totAL	*Total reset password*	Set or enter a total reset password
GtotAL	*Grand total password*	Set or enter a grand total reset password
999999	*Flashing*	Overrange condition

Main Menu

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

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

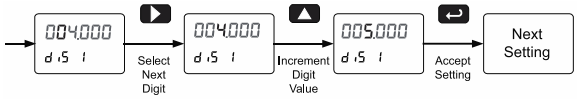


Setting Numeric Values

The numeric values are set using the Right and Up arrow buttons. Press Right arrow to select next digit and Up arrow to increment digit value. The digit being changed is displayed brighter than the rest.

Press and hold Up 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.

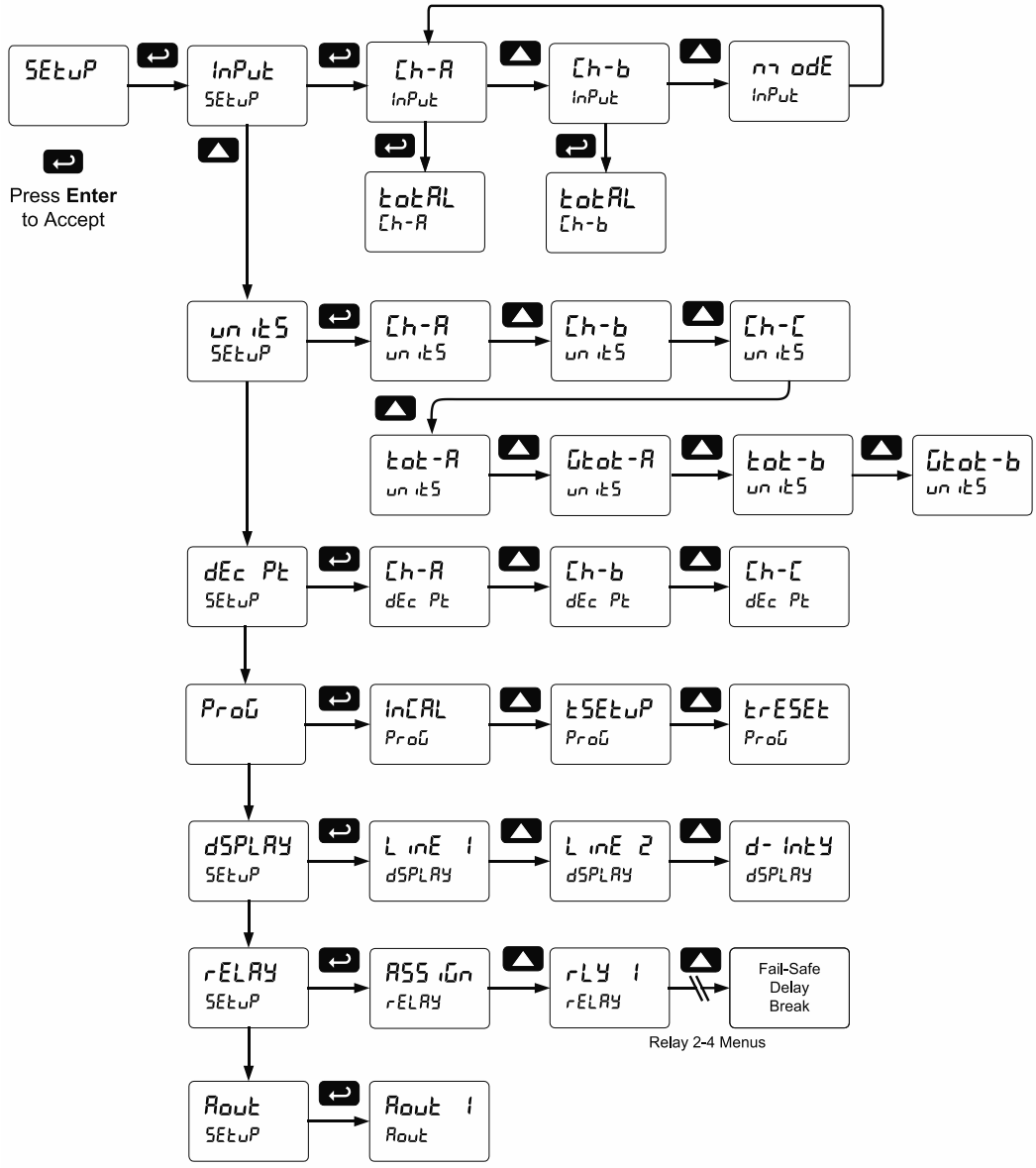


Setting Up the Totalizer (SEtuP)

The *Setup* menu is used to select:

1. Total enable/disable and channel A and B input modes
2. Units for A & B rate, total & grand total, and C
3. Decimal positions for A & B rate, total, and grand total, and C
4. Program the K-factor (or scale or calibrate) & total functions
5. Display parameters and intensity
6. Relay assignments and operation
7. 4-20 mA analog output scaling

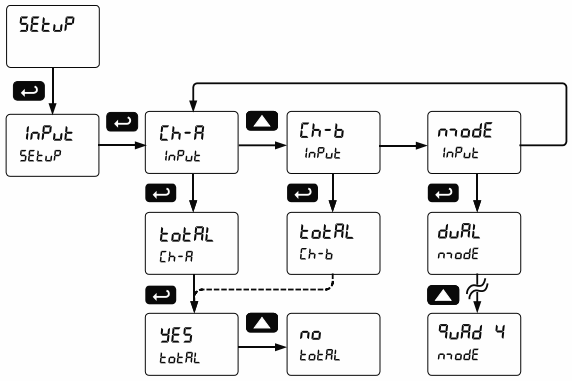
Press the Menu button to exit at any time.



Setting the Input Signal (InPut)

There are two internal slide switches, located inside the rear meter housing to the left of the input connector, which must be configured according to the input levels and types. The rear cover must be removed to access these switches.

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



Setting the Totalizer Features (totAL)

To simply not display the total, select alternative display parameters in the display (dSPLAY) menu.

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 Dual-Input Mode (modE)

The *Mode* menu is used to set the functions of the dual input and total. The inputs may be configured for independent one-directional total operation, bi-directional total count with the use of another input or a digital input, or for quadrature input modes.

Independent Dual Totalizers (dUAL)

Total A and B are one-directional and independent, only counting up *or* down depending on *Count* settings.

Ch-A Totalizer Add/Subtract by Ch-B Input (ud Ab)

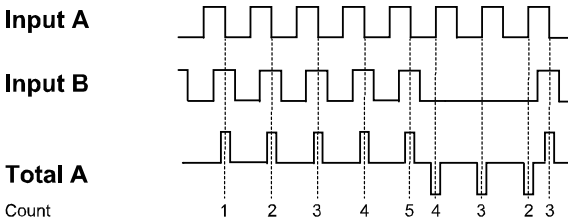


Figure 23. Dual Input Mode (ud Ab)

Total of channel A will add or subtract as determined by the state of input channel B. Channel A total will add at each falling edge if input B is high, and subtract at each rising edge if input B is low.

Ch-A Totalizer Add/Subtract by Digital Input (ud AI)

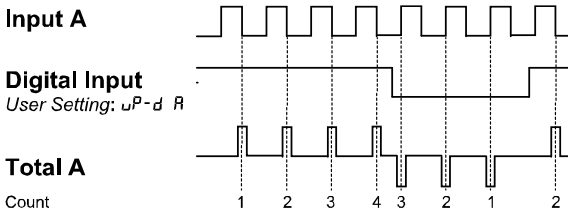


Figure 24. Dual Input Mode (ud AI)

Total of channel A will add or subtract as determined by the state of a digital input. Channel A total will add at each falling edge if an assigned digital input is high, and subtract at each rising edge if an assigned digital input is low.

Ch-B Totalizer Add/Subtract by Digital Input (ud b I)

Total of channel B will add or subtract as determined by the state of a digital input. Channel B total will add at each falling edge if an assigned digital input is high, and subtract at each rising edge if an assigned digital input is low.

Ch-A & Ch-B Totalizer Add/Subtract by Digital Input (ud AB)

Totals of channel A and B will add or subtract as determined by the state of a digital input assigned to each channel. This mode combines the features of ud A I and ud b I.

This setting requires the use of the on-board digital inputs. The F4 digital input will only support one channel.

Quadrature Input Type 1 (quAd 1)

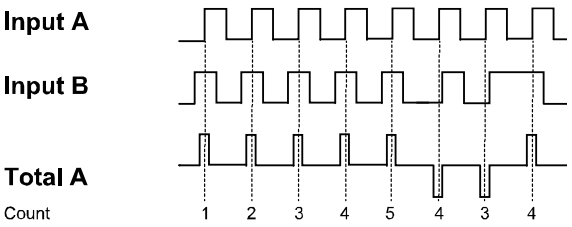


Figure 26. Dual Input Mode (quAd 1)

Quadrature modes are used to accept inputs that are ±90 degrees out of phase, from quadrature output devices. Total of channel A will add or subtract as determined by the state of input channel B. Channel A total will add at each rising edge if channel B is high, and subtract at each rising edge if channel B is low.

Quadrature Input Type 2 (quAd 2)

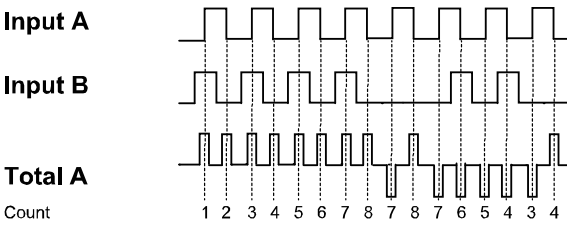


Figure 27. Dual Input Mode (quAd 2)

Quadrature modes are used to accept inputs that are ±90 degrees out of phase, from quadrature output devices. Total of channel A will add or subtract as determined by the state of input channel B. Channel A total will add at each rising edge if channel B is high, and at each falling edge if channel B is low. Channel A total will subtract at each rising edge if channel B is low, and at each falling edge if channel B is high.

Quadrature Input Type 4 (quAd 4)

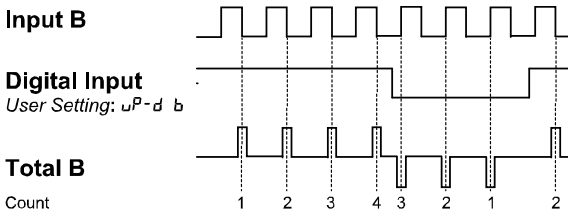


Figure 25. Dual Input Mode (ud b I)

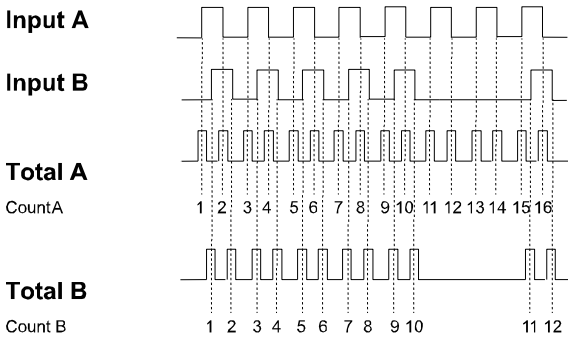


Figure 28. Dual Input Mode (quAd 4)

Quadrature modes are used to accept inputs that are ±90 degrees out of phase, from quadrature output devices. Totals of channel A and B will add at each rising and falling edge of that channel.

Setting the Rate, Total, & Grand Total Units/Tags (unit5)

Enter the channel A and B rate, total, grand total, and math channel C units (or custom tags) that will be displayed if alternating units is selected in the unit5 menu, or d unit is selected as the lower display parameter.

See the *Setting the Display Parameters & Intensity* (d5PLAY) flow chart on page *42* for details on accessing the *Units* menu and parameters. Ch-A and Ch-b set the rate units, tot-A and tot-b the total units, and Gtot-A and Gtot-b the grand total units. Ch-C sets the units for the math channel C.

See the *Setting the Display Parameters & Intensity* (d5PLAY) flow chart on page *42* to access the display menu to show the unit or tag on the lower display.

The engineering units or custom legends can be set using the following 7-segment character set:

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

Notes:

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

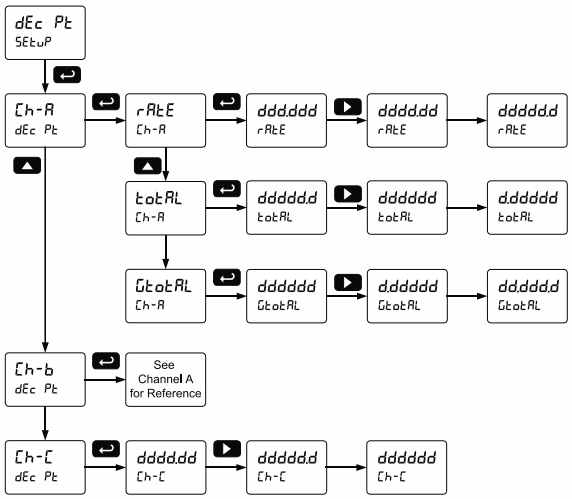
Setting the Decimal Point (dEc Pt)

The decimal point for any channel, rate, total, or grand total, may be set with up to five decimal places or with no decimal point at all.

Pressing the Right arrow moves the decimal point one place to the right until no decimal point is displayed, and then it moves to the leftmost position. Pressing the Up arrow moves the decimal point one place to the left.

There are seven decimal points to set up for three channels: Ch-A rate, total, and grand total; Ch-B rate, total, and grand total; and Ch-C.

After the decimal points are set up, the totalizer moves to the *Program* menu.



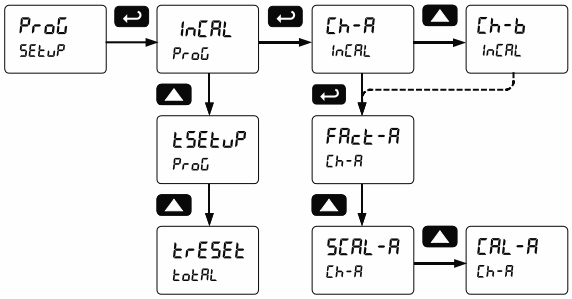
Programming the Rate/Totalizer (PrOG)

The totalizer 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 totalizer 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 for each channel A and B:

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. Reset modes for total & grand total

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



Additional parameters, not needed for most applications, are found in the *Advanced Features* menu; see *Advanced Features Menu*, page 53.

Input Calibration Method (InCAL)

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

- Use the *Factor* menu to enter the k-factor of a flowmeter in units/pulse
- Use the *Scale* menu to enter the scaling without a signal source.
- Use the *Calibrate* menu to apply a signal from a signal source.

⚠ IMPORTANT

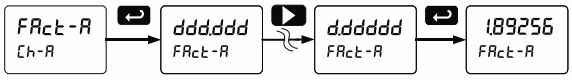
- The Scale, Calibrate, and K-Factor functions are exclusive of each other. The totalizer uses the last function programmed. Only one of these methods can be employed at a time.

Multi-Point Calibration & Scaling

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 under the *Multi-Point Linearization* (L inEAr) menu selection prior to scaling and calibration of the totalizer, see page *56* for details.

K-Factor Calibration (FAct-A, FAct-b)

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



Scaling the Totalizer without a Signal Source (SCAL-A, SCAL-b)

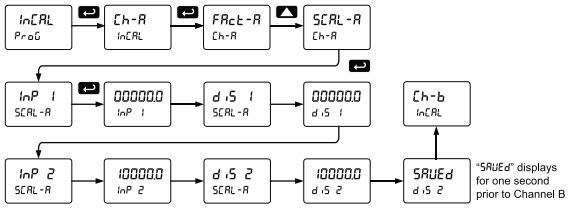
The inputs can be scaled to display the process variables in engineering units.

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

From the InCAL menu, select channel A or B, followed by SCAL-A or SCAL-b, and then set the input signal value and display value for each of the scaling points (default is two). Enter the input signal values in pulses/second (Hz), and the corresponding display values in appropriate engineering units.

Channel B is scaled similarly to Channel A, shown below.

Scaling the Totalizer for Channel A (SCAL-A)



For instructions on how to program numeric values see *Setting Numeric Values*, page *34*.

Note: The display values (dIS 1 and dIS 2) need to be in units of measure per second. For example, if the rate at 1000 Hz is 13.20 gal/min, this must be converted to gal/sec. In this scenario, the numbers input into the SCALE menu would be as follows:

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

Set the time base set to minutes (see *Total & Grand Total Setup* (tSEtuP) on page *41*) and the totalizer will display 13.20 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 totalizer reverts to input 2 during calibration or scaling and to input 1 during internal calibration, allowing the appropriate input signal to be applied or programmed.

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

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

Minimum Input Span

The minimum allowed input span is 1.0 Hz, which is the minimum difference between input 1 and input 2 signals required to complete the calibration using an external signal source, or 0.1 Hz for scaling the totalizer without a signal source.

Calibrating the Totalizer with External Source (CAL-A, CAL-b)

To scale the totalizer without a signal source, refer to *Scaling the Totalizer without a Signal Source* (SCAL-A, SCAL-b), page *39*.

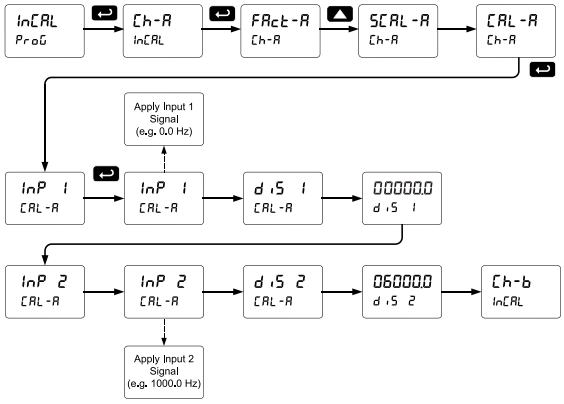
The totalizer can be calibrated to display the process variables in engineering units by applying the appropriate input signal and following the calibration procedure.

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

There is no need to warm up the totalizer before performing calibration of the inputs.

Channel B is calibrated similarly to Channel A, shown below.

Calibrating the Totalizer for Channel A (CAL-A)



Notes:

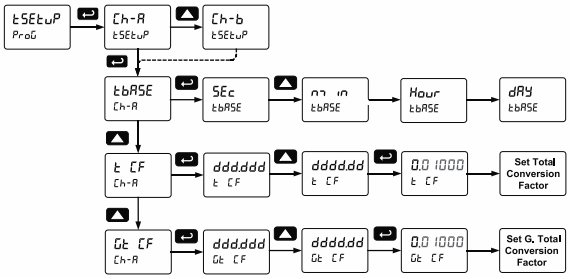
1. The display values (dIS 1 and dIS 2) need to be in units of measure per second.
2. Inputs for the above example are:
   Input 1: 0.0 Hz; Display 1: 0.0 gallons/sec
   Input 2: 1000.0 Hz; Display 2: 6000.0 gallons/sec

Total & Grand Total Setup (tSEtuP)

The time base and total and grand total conversion factors for input channels A and B are located in the *Totalizer Setup* menu.

The time base is determined by the rate programming. Enter the time unit of the programmed rate scale. *For example: A rate display scaled in engineering units of gallons per minute would use a time base of minutes.*

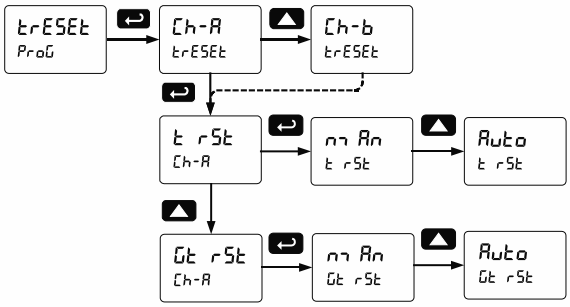
Total & grand total conversion factors for channel A and B are programmed independently. This means that one total or grand total can be displaying the value in gallons while another displays in million gallons, liters, m^3, etc.



Total & Grand Total Reset (trESEt)

Total reset menus are located in the *Program* menu. The totals can be programmed for manual or automatic 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 F4 terminal, digital inputs, or via a Modbus command.



Setting the Display Parameters & Intensity (dSPLAY)

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

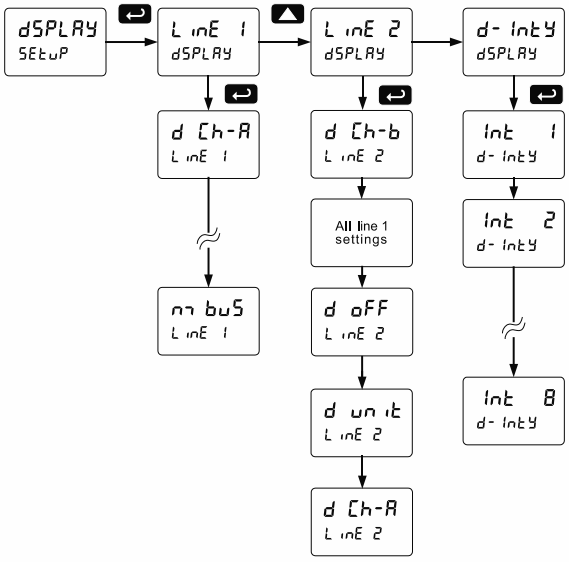
1. Ch-A rate (d Ch-A)
2. Ch-B rate (d Ch-b)
3. Ch-C math channel (d Ch-C)
4. Toggle Ch-A & Ch-B rate (d Ab)
5. Toggle Ch-A rate and Ch-C (d AC)
6. Toggle Ch-B rate and Ch-C (d bC)
7. Toggle Ch-A & Ch-B rate, and Ch-C (d AbC)
8. Ch-A total (d t-A)
9. Ch-B total (d t-b)
10. Ch-A grand total (d Gt-A)
11. Ch-B grand total (d Gt-b)
12. Toggle Ch-A rate and total (d rt-A)
13. Toggle Ch-B rate and total (d rt-b)
14. Toggle Ch-A rate and grand total (drGt-A)
15. Toggle Ch-B rate and grand total (drGt-b)
16. Relay set points (1-4) (dSEt 1 to dSEt 4)
17. Max, min, and max & min values for Ch-A, Ch-B, or Ch-C (d Hi-A to d HL-C)
18. Toggle Ch-A rate & units (d A-u)
19. Toggle Ch-B rate & units (d b-u)
20. Toggle Ch-C & units (d C-u)
21. Toggle Ch-A total & units (d tA-u)
22. Toggle Ch-B total & units (d tb-u)
23. Toggle Ch-A total and Ch-B total (d tAb)
24. Toggle Ch-A total, Ch-B total, and the sum of total A + total B (d tAbC)*
25. Modbus input (nonE bus)

**Note: The (C = sum of total A + total B) displayed with the selection (d tAbC) is different than the math channel C calculated under the Math menu functions. Example: (C = Rate Ch-A + Rate Ch-B).*

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

1. All options for display line 1
2. Off, with no display (d oFF)
3. Engineering units for any single channel, total, or grand total

Display Parameter Menu



After setting up the input and display, press the Menu button to exit programming and skip the rest of the setup menu.

Customizable Displays

The displays can be set up to read input channels (A or B), rate, total, or grand total, math function channel C, toggle between A & B, B & C, A & C, A & B & C, toggle between channels A, B, or C & units, the max/min of any of the channels, including the math channel (C), set points, or the Modbus input. This allows the display to be setup to display whatever variables are most valuable to the application. Here are just a few examples.

Line 1 displays Math Function (C)
Line 2 toggles between Totals A & B

Math Function & Tag

Input Channels A & B Total

Display Intensity (d- Int)

The totalizer 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)

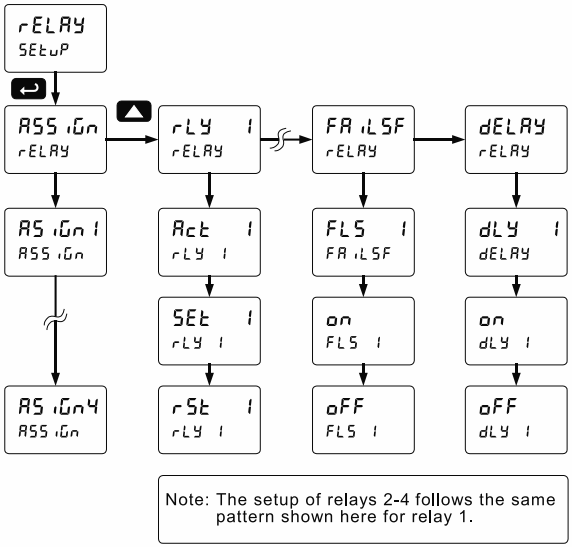
This menu is used to set up the assignment and operation of the relays.

⚠ CAUTION

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

---

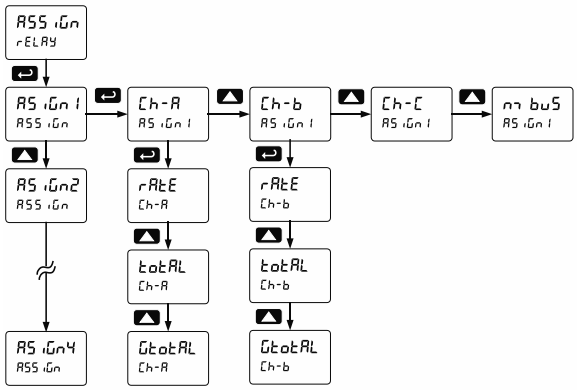
1. Relay assignment
   a. Channel A rate, total, or grand total
   b. Channel B rate, total, or grand total
   c. Channel C (Math channel)
   d. Modbus
2. Relay action
   a. Automatic reset only (non-latching)
   b. Automatic + manual reset at any time (non-latching)
   c. Latching (manual reset only)
   d. Latching with Clear (manual reset only after alarm condition has cleared)
   e. Pump alternation control (automatic reset only)
   f. Sampling (the relay is activated for a user-specified time)
   g. Off (relay state controlled by Interlock feature)
3. Set point
4. Reset point
5. Fail-safe operation
   a. On (enabled)
   b. Off (disabled)
6. Time delay
   a. On delay (0-999.9 seconds)
   b. Off delay (0-999.9 seconds)



Note: The setup of relays 2-4 follows the same pattern shown here for relay 1.

Setting the Relay Assignment (ASS iGn)

Relays may be assigned to Channel A (rate, total, or grand total), Channel B (rate, total, or grand total), Channel C (Math channel), or Modbus input.

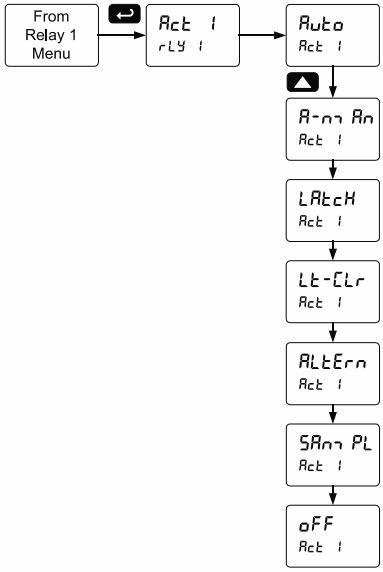


Setting the Relay Action (Act)

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

1. Automatic reset (non-latching)
2. Automatic + manual reset at any time (non-latching)
3. Latching (manual reset only, at any time)
4. Latching with Clear (manual reset only after alarm condition has cleared)
5. Pump alternation control (automatic reset only)
6. Sampling (the relay is activated for a user-specified time)
7. Off (relay state controlled by Interlock feature)

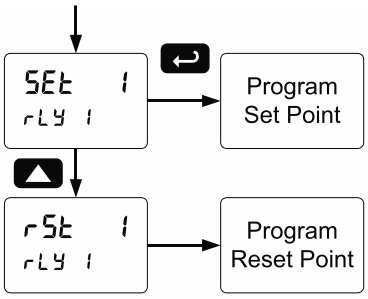
The following graphic shows relay 1 action setup; relay 2-4 are set up in a similar fashion.



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.

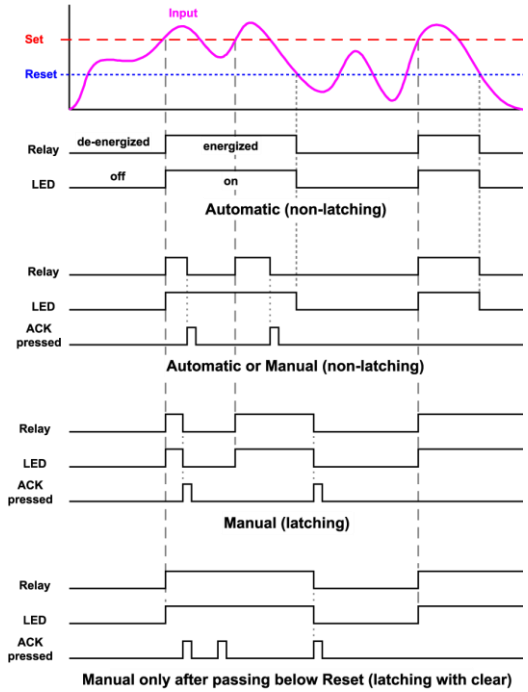
The *On* time delay is associated with the set point.

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

Relay and Alarm Operation Diagrams

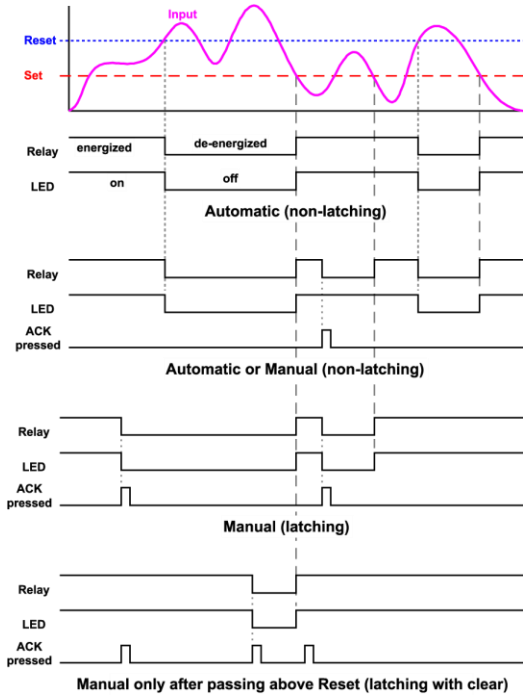
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)



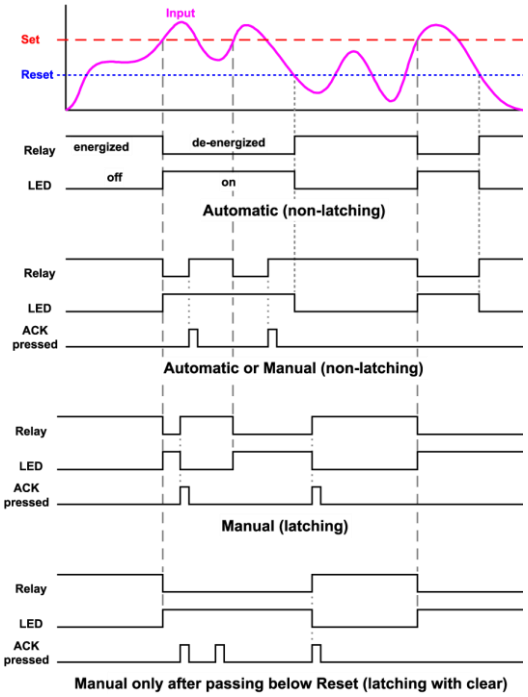
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

Low Alarm Operation (Set < Reset)



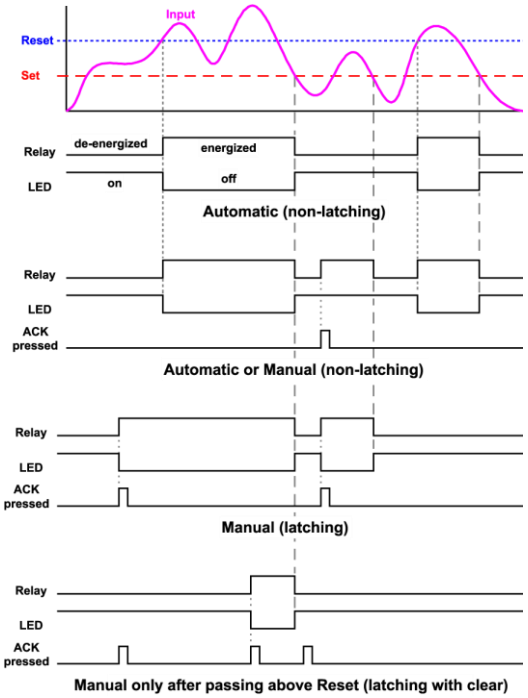
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

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



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

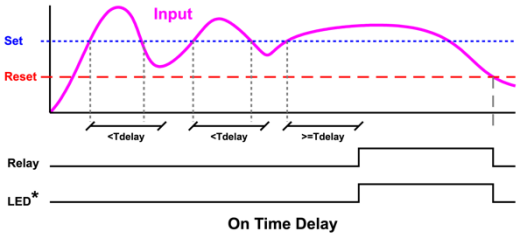
Low Alarm with Fail-Safe Operation (Set < Reset)



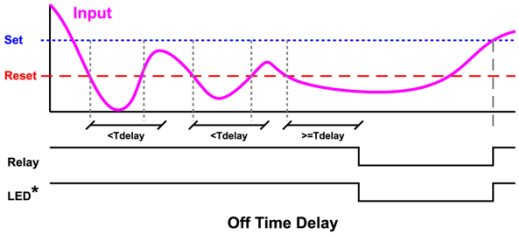
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Time Delay Operation

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



On Time Delay

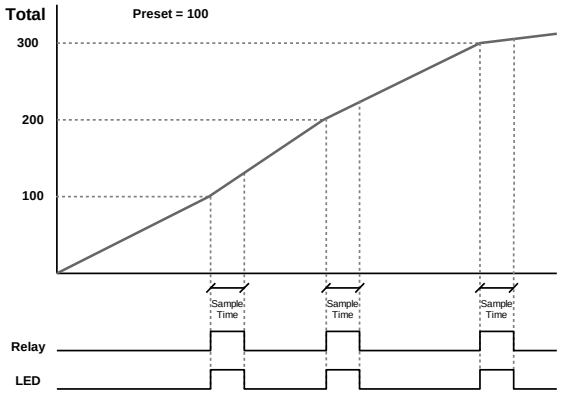


Off Time Delay

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

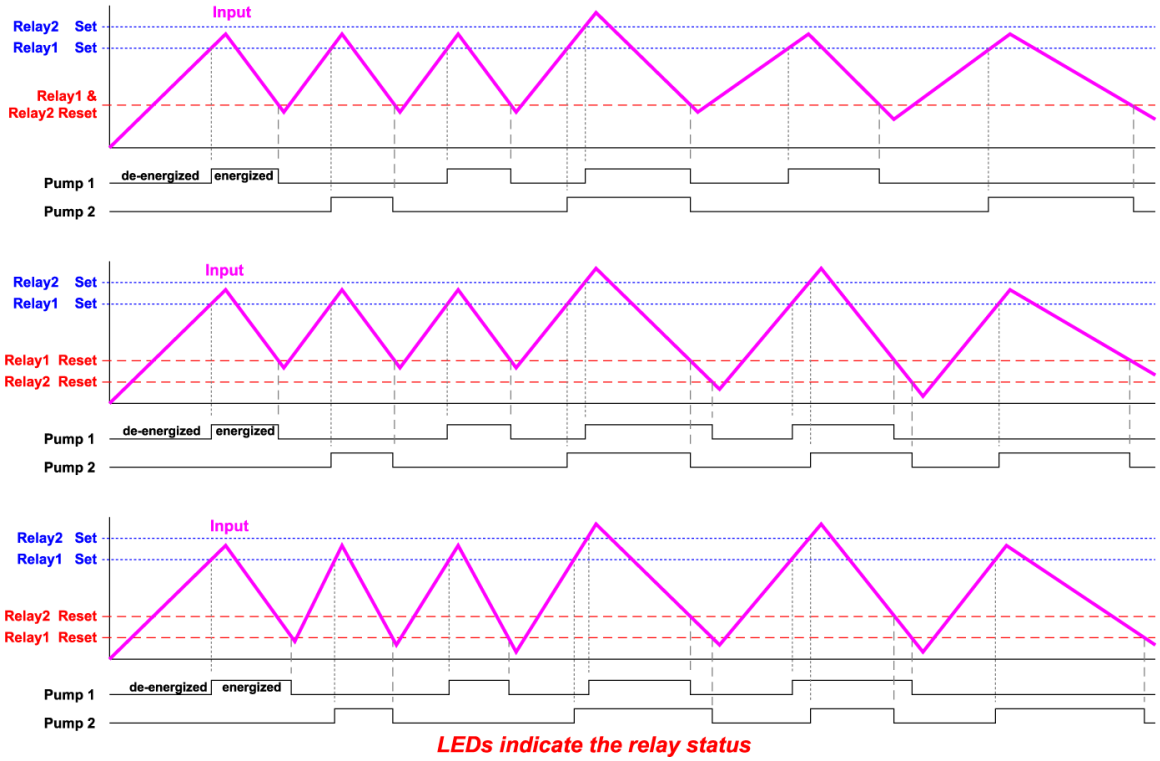
Note: If "Automatic or Manual (ʁ-ɑnʁɑ)" reset mode is selected, the LED follows the reset point and not the relay state when the relay is acknowledged.

Total Relay Sampling Operation



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

Pump Alternation Control Operation



LEDs indicate the relay status

Relay Operation Details

Overview

The four-relays option for the meters expands its usefulness beyond simple indication to provide users with alarm and control functions. Typical applications include high and low temperature, level, pressure or flow alarms, control applications such as simple on/off pump control, and pump alternation control for up to 4 pumps. There are four basic ways the relays can be used:

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

Relays Auto Initialization

When power is applied to the totalizer, the front panel LEDs and alarm relays will reflect the state of the input to the totalizer. 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 totalizer is off.

Front Panel LEDs

The alarm status LEDs on the front panel are available on all meters, even those without relays installed, and provide status indication for the following:

LED	Status
1	Alarm 1
2	Alarm 2
3	Alarm 3
4	Alarm 4

The totalizer 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 responds 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 (Auto)

In this application, the totalizer 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 (A-nAn)

In this application, the totalizer is set up for automatic and manual reset at any time (non-latching relay). The LED and the relay automatically reset when the totalizer 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 totalizer 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 (LAtcH)

In this application, the totalizer 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 (Lt-Clr)

In this application, the totalizer 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 totalizer 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.

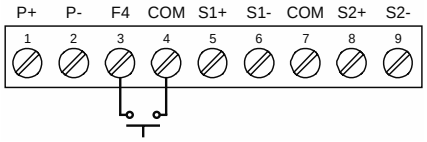
Manual reset only after alarm condition has cleared		
Condition	**LED**	**Relay**
Normal	Off	Off
Alarm	On	On
Ack (No effect)	On	On
Normal	On	On
Ack	Off	Off

Acknowledging Relays

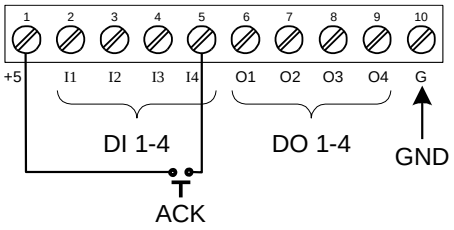
There are three ways to acknowledge relays programmed for manual reset:

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

2. Remotely via a normally open push button wired to the F4 terminal.



3. Remotely via a normally open push button wired to one of the digital inputs and the +5 V terminal on the digital I/O connections.

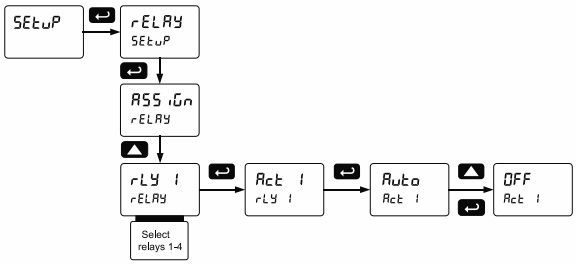


When the ACK button or the assigned digital input is closed, all relays programmed for manual reset are acknowledged.

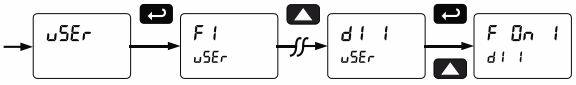
Setting Up the Interlock Relay (Force On) Feature

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

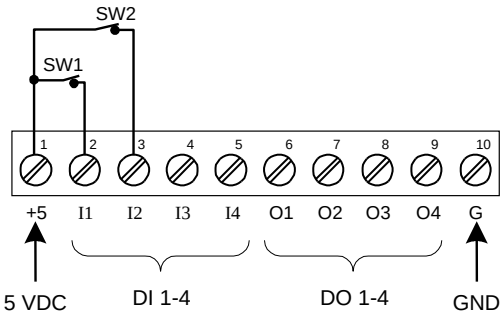
1. Access the *Setup – Relay – Action* menu and set the action to off.



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 trip the relay.

⚠ IMPORTANT

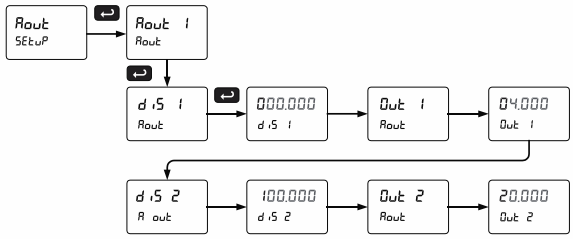
- If the digital inputs are assigned to the *Interlock Function*, then they cannot be used to program the totalizer remotely.

Scaling the 4-20 mA Analog Output (Aout)

The 4-20 mA analog output can be scaled to provide a 4-20 mA signal for any display range selected. To select the channel and source assignments the analog output are assigned to, see *Analog Output Source* on page *58*.

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 outputs based on display values.



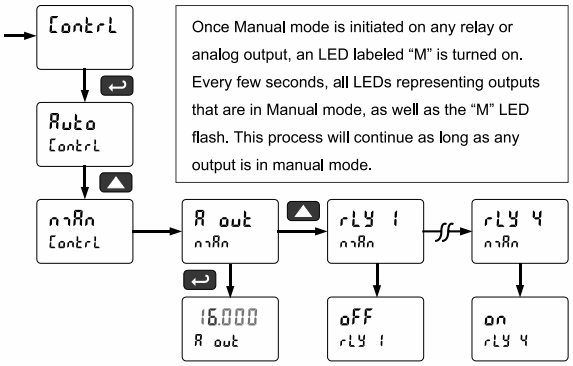
For further details, see *Setting Numeric Values* on page *34*.

Reset Menu (rESEt)

The *Reset* menu is used to reset the maximum (peak) value of Ch-A and Ch-B rate (rSt H.), minimum (valley) reading of Ch-A and Ch-B rate (rSt Lo), both high and low value of Ch-A and Ch-B rate (rSt HL), Ch-A total (tot A) or Ch-B total (tot b), Ch-A grand total (Gtot A) or Ch-B grand total (Gtot b), both Ch-A and Ch-B totals (tot Ab), or both Ch-A and Ch-B grand totals (Gt Ab).

Manual Control Menu (Contrl)

The *Manual Control* menu is used to control the 4-20 mA analog output (Aout 1 only) and the relays manually, ignoring the input. Each relay and analog output can be programmed independently for manual control. Selecting automatic control sets all relays and analog output for automatic operation.



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

Setting Up the Password (PASS)

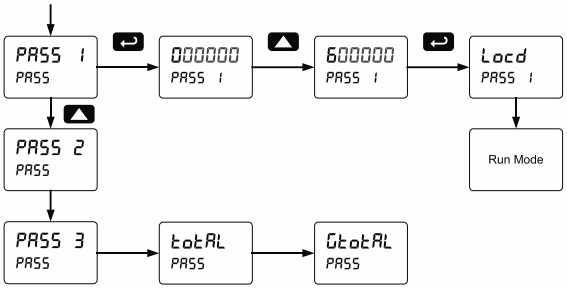
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings, to restrict the ability to reset the totals and grand totals, and to program the non-resettable totalizer.

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 Totalizer Functions

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

For instructions on how to program numeric values see *Setting Numeric Values* on page *34*.



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

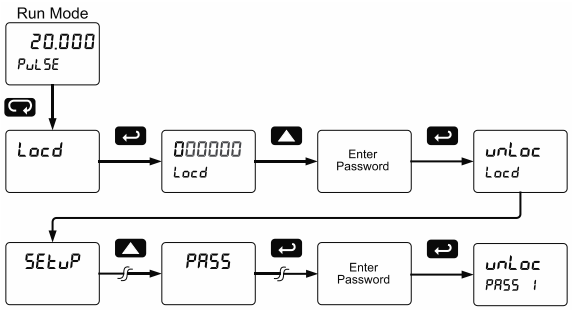
- Once the Grand Total has been programmed as "non-resettable" the feature **CANNOT** be disabled.

Making Changes to a Password Protected Totalizer

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



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

If the password entered is incorrect, the totalizer 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 totalizer.

Advanced Features Menu

To simplify the setup process, functions not needed for most applications are located in the *Advanced Features* menu.

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

Advanced Features Menu & Display Messages

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

Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
GAtE	*Gate*	Enter Gate function menu
Lo G	*Low gate*	Program Low gate value
Hi G	*High gate*	Program High gate value
FiLtEr	*Filter*	Enter the Filter menu
Ch-A	*Channel A*	Set filter speed for channel A
Ch-b	*Channel B*	Set filter speed for channel B
Lo SPd	*Low speed*	Set the contact de-bounce filter value
Hi SPd	*High speed*	Select high speed filter
round	*Round*	Set the rounding value for the display
SEr iAL	*Serial*	Set serial communication parameters
SLAU id	*Slave ID*	Set slave ID or totalizer address
bAud	*Baud rate*	Select baud rate
tr dLY	*Transmit delay*	Set serial communication transmit delay
PAr itY	*Parity*	Select parity Even, Odd, or None with 1 or 2 stop bits
t-byt	*Time byte*	Set byte-to-byte timeout
SELEct	*Select*	Enter the Select menu (function, math, constant, cutoff, count, Aout programming)
Functn	*Input signal conditioning*	Select linear function parameters
Ch-A	*Channel A*	Select menu for channel A
Ch-b	*Channel B*	Select menu for channel B
LinEAr	*Linear*	Set totalizer for linear function and select number of linearization points
no PtS	*Number of points*	Set the number of linearization points (default: 2)
mAtH	*Math*	Select the channel C math function

Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
Sum	*Sum*	C = (A+B+P)*F
diF	*Difference*	C = (A-B+P)*F
diFAbS	*Abs difference*	C = ((Absolute value of (A-B))+P)*F
AvG	*Average*	C = (((A+B)/2)+P)*F
multi	*Multiplication*	C = ((A*B)+P)*F
diV idE	*Divide*	C = ((A/B)+P)*F
Hi-Ab	*Max of A or B*	C = ((High value of channel A or B)+P)*F
Lo-Ab	*Min of A or B*	C = ((Low value of channel A or B)+P)*F
drAu	*Draw*	C = ((A/B)-1)*F
uu AvG	*Weighted avg.*	C = ((B-A)*F)+A
rAt io	*Ratio*	C = (A/B)*F
rAt io2	*Ratio 2*	C = ((B-A)/A)+P)*F
ConcEn	*Concentration*	C = (A/(A+B))*F
Sum t	*Sum total*	C = (tA+tB+P)*F
SumGt	*Sum grand total*	C = (GtA+GtB+P)*F
diF t	*Diff. of total*	C = (tA-tB+P)*F
diF Gt	*Difference of grand total*	C = (GtA-GtB+P)*F
trAt io	*Total ratio*	C = (tA/tB)*F
t-rAt2	*Total ratio 2*	C = ((tB-tA)/tA)*F
t Pct	*Total percent*	C = (tA/(tA+tB))*100
ConSt	*Constant*	Enter math equation constants
AddEr	*Adder*	Addition constant used in channel C math calculations (P)
FActor	*Factor*	Multiplication constant used in channel C math calculations (F)
CutoFF	*Cutoff*	Set low-flow cutoff
Ch-A	*Channel A*	Set low-flow cutoff for Channel A
Ch-b	*Channel B*	Set low-flow cutoff for Channel B
Count	*Count*	Set total count direction
Ch-A	*Channel A*	Set total count direction for Channel A
Ch-b	*Channel B*	Set total count direction for Channel B
tot C	*Total count*	Set direction of total count
Gtot C	*G. total count*	Set direction of grand total count
uP	*Count up*	Count up
doun	*Count down*	Count down
C Strt	*Count start*	Enter count down start value
AoutPr	*Analog output programming*	Program analog output parameters
Aout 1	*Analog output 1*	Program analog output
SourcE	*Source*	Select source for the 4-20 mA output
CAL ib	*Calibrate*	Calibrate 4-20 mA output

Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
4 mA	*4 mA output*	Enter mA output value read by milliamp totalizer with at least 0.001 mA resolution
20 mA	*20 mA output*	Enter mA output value read by milliamp totalizer with at least 0.001 mA resolution
O-rNG	*Overrange*	Program mA output for display overrange
U-rNG	*Underrange*	Program mA output for display underrange
mAX	*Maximum*	Program maximum mA output allowed
mIn	*Minimum*	Program minimum mA output allowed
USEr	*User I/O*	Assign function keys and digital I/O
F1*	*F1* function key*	Assign F1 function key (*F1/F2/F3)
F4	*F4 digital input*	Assign F4 function (digital input)
di 1	*Digital input 1*	Assign digital input 1 – 4
dO 1	*Digital output 1*	Assign digital output 1 – 4
diAG	*Diagnostics*	Display parameter settings
LEd t	*LED test*	Test all LEDs
InFo	*Information*	Display software number and version
ErASE	*Erase*	Erase MeterView Pro software stored in totalizer's memory

Gate Function (GAtE)

The gate function (GAtE) is the first option in the Advanced Features menu. There are two settings for the GAtE, low gate (Lo G) and high gate (Hi G). Channel A and B use the same gate settings.

The gate function is used for displaying slow pulse rates. Using the programmable gate, the totalizer is able to display pulse rates as slow as 1 pulse every 999.9 seconds (0.001 Hz). The gate function can also be used to obtain a steady display reading with a fluctuating input signal.

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 totalizer must display a rate when there is 1 pulse coming into the totalizer every 10 seconds, set the high gate to 11.0 seconds. When the signal is removed from the totalizer, 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 (FiLtEr)

The filter function (FiLtEr) is the second option in the Advanced Features menu. The filter function (FiLtEr) can be used for applications where the totalizer 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. Channel A and B have independent settings.

There are two settings, Hi SPd (high speed) and Lo SPd (low speed). After pressing **ENTER** to select Lo SPd, enter the desired filter setting based on the table below so that there are no extra counts when a contact closure is completed. Selecting Hi SPd does not require a programmable filter value.

Filter Settings

Contact De-Bounce Filter		
1	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.

Rounding Selection	Actual Value	Display Value	Actual Value	Display Value
1	12.022	12.022	12.023	12.023
5	12.022	12.020	12.023	12.025
10	12.024	12.020	12.025	12.030

Modbus RTU Serial Communications (SEr AL)

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

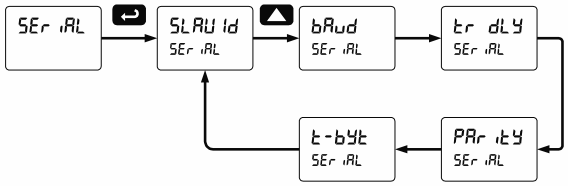
The totalizer may be connected to a PC for initial configuration via the on-board USB connection. For ongoing digital communications with a computer or other data terminal equipment, use the RS-485 connection with the appropriate serial converter; see *Ordering Information* on page 7 for details.

⚠ CAUTION

- **DO NOT** connect any equipment to the RJ45 M-LINK connector. Otherwise damage will occur to the equipment and the totalizer.
- **DO NOT** disconnect the RJ45 connector located to the left of the power terminal block. Doing so will disable the on-board digital I/O, and the RS-485 serial communications.

Notes:

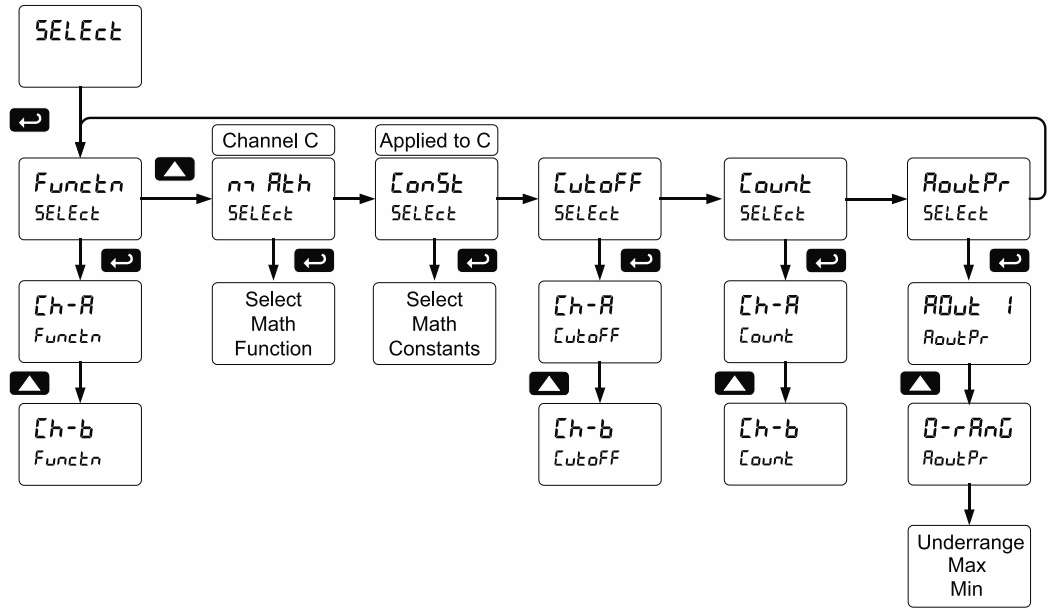
1. More detailed instructions are provided with each optional serial communications adapter.
2. Refer to the ProtEX-MAX Modbus Register Tables located at www.predig.com for details.



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

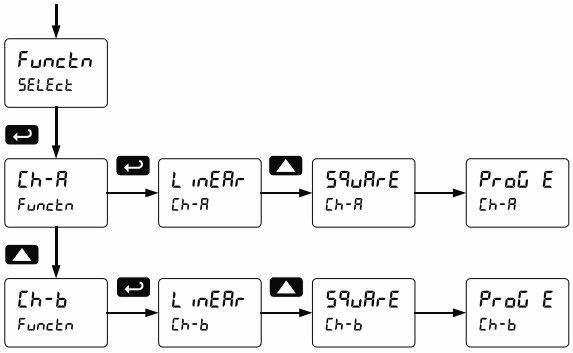
Select Menu (SELEct)

The *Select* menu is used to select the input signal conditioner applied to the inputs, math function for A & B, constants, low-flow cutoff, total count direction (up or down from a preset amount), and analog output programming. Multi-point linearization is part of the linear function selection.



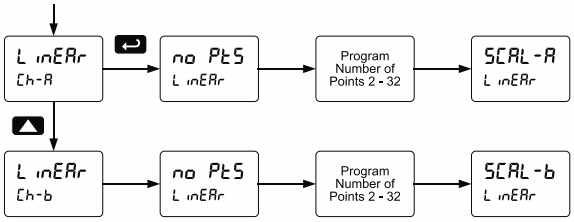
Input Signal Conditioning (Functn)

The *Function* menu is used to condition the linear input signal. Multi-point linearization is part of the linear function selection. Each input channel input signal conditioner is programmed independently.



Multi-Point Linearization (L inEAr)

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



Note: After Scale is displayed continue pressing the Enter button until the totalizer completes the scaling of the input and display values.

Math Function (nrAtH)

The *Math* menu is used to select the math function that will determine the channel C value. These math functions are a combination of input channels A and B, and will display when channel C is selected in the *Display* menu.

A and B refer to the rate of channel A and B. tA and tB refer to the totals of channel A and B. GtA and GtB refer to the grand totals of channel A and B. The following math functions are available.

Function	Display	Description
Sumr	*Sum*	C = (A+B+P)*F
d iF	*Difference*	C = (A-B+P)*F
d iFAbS	*Absolute difference*	C = ((Absolute value of (A-B))+P)*F
AVG	*Average*	C = (((A+B)/2)+P)*F
nrmULt i	*Multiplication*	C = ((A*B)+P)*F
d iV idE	*Divide*	C = ((A/B)+P)*F
Hi-Ab	*Max of A or B*	C = ((High value of channel A or B)+P)*F
Lo-Ab	*Min of A or B*	C = ((Low value of channel A or B)+P)*F
drAw	*Draw*	C = ((A/B)-1)*F
wA AvG	*Weighted avg.*	C = ((B-A)*F)+A
rAt io	*Ratio*	C = (A/B)*F
rAt io2	*Ratio 2*	C = ((B-A)/A)+P*F
ConcEn	*Concentration*	C = (A/(A+B))*F
Sumr t	*Sum total*	C = (tA+tB+P)*F
SumrGt	*Sum grand total*	C = (GtA+GtB+P)*F
d iF t	*Difference of total*	C = (tA-tB+P)*F
d iF Gt	*Diff. of grand total*	C = (GtA-GtB+P)*F
trAt io	*Total ratio*	C = (tA/tB)*F
t-rAt2	*Total ratio 2*	C = ((tB-tA)/tA)*F
t Pct	*Total percent*	C = (tA/(tA+tB))*100

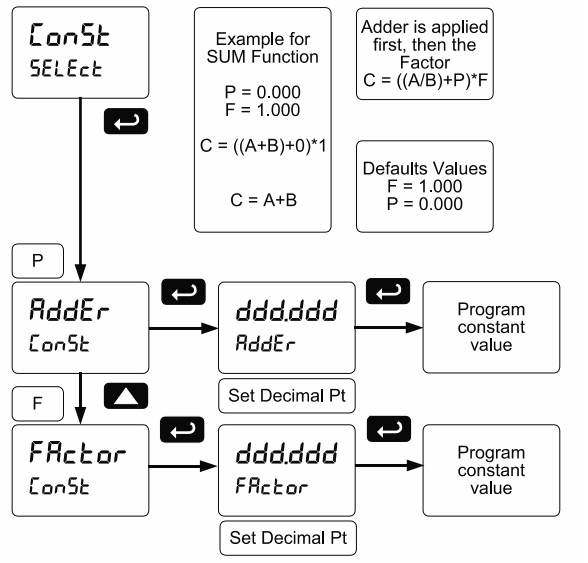
Math Constants (ConSt)

The *Math Constants* menu is used to set the constants used in channel C math. The math functions include adder constant P, and factor constant F.

The *Adder* constant (P) may be set from -99.999 to 999.999.

The *Factor* constant (F) may be set from 0.001 to 999.999.

The chart on page 57 details the math functions that may be selected in the *Math Function* menu.



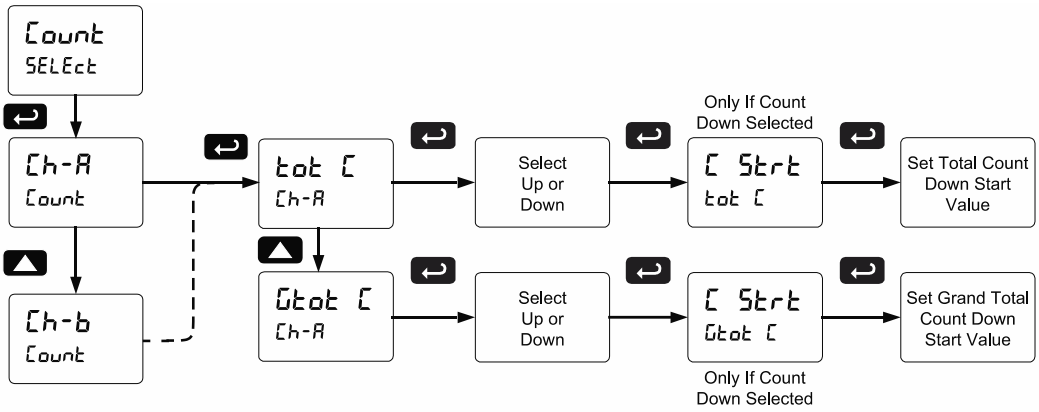
Low-Flow Cutoff (CutoFF)

The low-flow cutoff feature allows the totalizer to be programmed so that the often-unsteady output from a differential pressure transmitter, at low flow rates, always displays zero on the totalizer. The low-flow cutoff for each channel is programmed independently. The cutoff can be disabled to display negative values.

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

Totalizer Count Up/Down (Count)

The totalizer count up/down menu may be used to program the total and grand total to either count up from 0 when reset or count down from a programmed value when reset. Total and grand total may have their countdown numbers programmed individually from 0 to 999999.



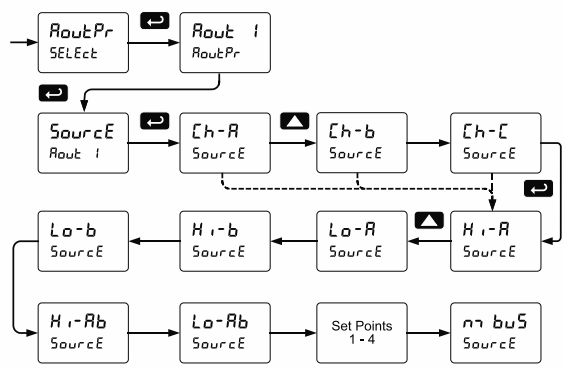
Analog Output Programming (RoutPr)

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

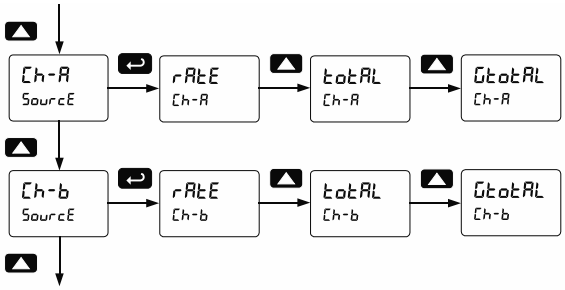
1. Source: Source for generating the 4-20 mA output
2. Overrange: Analog output value with display in overrange condition
3. Underrange: Analog output value with display in underrange condition
4. Max: Maximum analog output value allowed regardless of input
5. Min: Minimum analog output value allowed 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 analog output source can be based on either of the input channel rate, total, or grand totals (Ch-A, Ch-B), the math channel (Ch-C), maximum stored value of either input channel (Hi-A, Hi-B), minimum stored value of either input channel (Lo-A, Lo-B), maximum or minimum of A and B (Hi-AB, Lo-AB), relay set points, or the Modbus input.



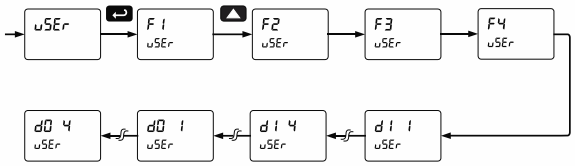
To base an analog output on the rate, total, or grand total of channels A or B, select the channel in the *Analog Output Source* menu. Then select the rate, total, or grand total as the source reference for the output, and program the output scale.



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 (located on the input signal connector), and four digital inputs (located on the digital I/O connector) to access most of the menus or to activate certain functions immediately (e.g. reset totals, reset max & min, hold relay states, etc.). This allows the totalizer to be greatly customized for use in specialized applications.

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



Function Keys & Digital I/O Available Settings

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

Function Keys & Digital I/O Available Settings

Display	Description
rSt H.	Reset the stored maximum display values for all channels
rSt Lo	Reset the stored minimum display values for all channels
rSt HL	Reset the stored maximum & minimum display values for all channels
rELAY	Directly access the relay menu
SEt 1	Directly access the set point menu for relay 1 (*through 4)
rLY d	Disable all relays until a button assigned to *enable relays* (rLY E) is pressed
rLY E	Enable all relays to function as they have been programmed
O HoLd	Hold current relay states and analog output as they are until a button assigned to *enable relays* (rLY E) is pressed
d HoLd	Hold the current display value, relay states, and analog output momentarily while the function key or digital input is active. The process value will continue to be calculated in the background.

Function Keys & Digital I/O Available Settings

Display	Description
d AbC	Scrolls values for A, B & C when activated. Keeps the last value for 10 seconds and then it returns to its assignment. Values are displayed on display line 1 and the corresponding channel and units on display line 2.
d tot	Scrolls through totals for channels A, B, and C (which is the sum of A and B). Values are displayed on display line 1.
d Gtot	Scrolls through grand totals for channels A, B, and C (which is the sum of A and B). Values are displayed on display line 1.
Ln1 H.	Display maximum channel A display value on line 1
Ln1 Lo	Display minimum channel A display value on line 1
Ln1 HL	Display maximum & minimum channel A display values on line 1
Ln2 H.	Display maximum channel B display value on line 2
Ln2 Lo	Display minimum Channel B display value on line 2
Ln2 HL	Display maximum & minimum channel B display values on line 2
Ln2 HC	Display minimum channel C display value on line 2
Ln2 HC	Display maximum & minimum channel C display values on line 2
L.tHLC	Display maximum channel C display value on line 2
F On 1	Force relay 1 (*through 4) into the on state. This function is used in conjunction with a digital input to achieve interlock functionality. See *Setting Up the Interlock Relay (Force On)* Feature on page *50* for details about interlock relays.
Control	Directly access the manual control menu
d.SAbL	Disable the selected function key or digital I/O
uP-d A	Total count mode direction control for channel A
uP-d b	Total count mode direction control for channel B
AcK	Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching
rESEt	Directly access the reset menu
rSt t	Reset totals for all channels
rSt Gt	Reset grand totals for all channels
rSt tA	Reset total for channel A
rSt GA	Reset grand total for channel A
rSt tb	Reset total for channel B
rSt Gb	Reset grand total for channel B

Function Keys & Digital I/O Available Settings	
Display	**Description**
mEnu	Mimic the menu button functionality (digital inputs only)
rIGHt	Mimic the right arrow/F1 button functionality (digital inputs only)
uP	Mimic the up arrow/F2 button functionality (digital inputs only)
EntEr	Mimic the enter/F3 button functionality (digital inputs only)
ALm 1	Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)

Totalizer Operation

When installed, the primary way to operate the totalizer is with the CapTouch through-glass buttons that allow the user to perform various operations without removing the cover and exposing the electronics to the hazardous environment. The user can also operate the totalizer by connecting a suitable control station or switch to one of the digital inputs that can be used to perform various operations on the totalizer based on the Programmable Function Keys. Finally, certain operations can be performed on the totalizer with MeterView Pro software or through Modbus commands.

The two default operations that can be performed with the totalizer's CapTouch buttons are:

1. Display the maximum and minimum readings
2. Acknowledge the relays

In addition, the user can program the CapTouch Buttons to perform a variety of useful operations by reassigning them to other functions per *Function Keys & Digital I/O Available Settings* on page *59*.

Button Operation

The following table shows the default operations for the F1, F2, and F3 CapTouch Buttons, Displaying and resetting the maximum and minimum values and resetting the relays:

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 *User* menu
	Press to display max/min readings or other parameter/function assigned through the *User* menu
	Press to acknowledge relays or other parameters/function assigned through the *User* menu

CapTouch Buttons

The ProtEX-MAX is equipped with four sensors that operate as through-glass buttons so that it can be programmed and operated without removing the cover (and exposing the electronics) in a hazardous area.

These buttons can be disabled for security by selecting DISABLE on the switch labeled NO-CONTACT BUTTONS located on the connector board.

To actuate a button, press one finger to the window directly over the marked button area. When the cover is removed or replaced, the CapTouch buttons can be used after the meter completes a self-calibrating routine. The sensors are disabled when more than one button is pressed, and they will automatically re enable after a few seconds. When the cover is removed, the four mechanical buttons located on the right of the faceplate are used.

The CapTouch Buttons are configured by default to duplicate the function of the front panel mechanical pushbuttons associated with the integrated meter.

CapTouch Button Tips:

- Keep the glass window clean.
- Tighten the cover securely.
- Use a password to prevent tampering.

Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. *See Programmable Function Keys User Menu* (uSEr) on page *59* for details.

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

Digital Inputs Operation

Five (5) digital inputs, F4, DI-1 to DI-4, come standard on the totalizer. These digital inputs are programmed identically to function keys F1, F2, and F3. The inputs are triggered with a contact closure to +5 V in the case of digital inputs 1-4 or with an active high signal, see *Digital I/O Connections* on page *28* for details. The F4 is triggered with a contact closure to COM or with an active low signal. During operation, digital inputs operate according to the way they are programmed in the Advanced Features – User menu. See *Programmable Function Keys User Menu* (uSEr) on page *59* for details.

Maximum/Minimum Readings

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

1. Display briefly by assigning to the F1-F3 function keys 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) and the digital inputs can be programmed to reset the max & min readings. The meters are set at the factory to display the max/min reading by pressing the Up arrow/F2 button and to use the Right arrow/F1 button to reset the max/min.

To display max and min channel A reading using function key with factory defaults:

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

Total Reset Capabilities

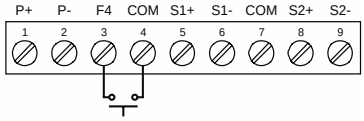
The user may reset the total via a CapTouch button, the F4 terminal at the back of the meter, an external contact closure on the digital inputs, automatically via user selectable preset value and time delay, or through serial communications.

Total Reset via CapTouch Button

The three through-glass CapTouch button function keys can be programmed to reset the total and grand total. This makes it possible for the user to reset either the total or the grand total without opening the enclosure cover and without the need for external devices. Of course, if the total or grand total is password protected, they will not reset when the function key is pressed.

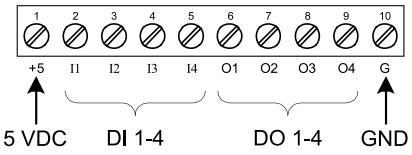
Total Reset via F4 Terminal

The PD8-6363 includes a digital input (referred to as the F4 terminal) located on the back of the electronics module as standard that can be used to reset the total or grand total, among other things. This is the preferred method for externally resetting the total or grand total because it does not interfere with the operation of the CapTouch buttons for programming as described below in the Total Reset via Digital Input section.



Total Reset via Digital Input

In addition to the F4 digital input described above, the PD8-6363 also includes four digital inputs that can be used to reset the total or grand total. However, if a digital input is used to reset the total, or for some other purpose, the corresponding through-glass CapTouch button will function as a programming key.



Total Reset via Preset Value

The total and grand total can be programmed for automatic reset based on a preset value determined by the user. In the automatic reset mode, a programmable time delay is available to reset the total or grand total after the assigned preset is reached.

Total Reset via Serial Communications

The total and grand total can be reset via serial communications such as a Modbus command or MeterView Pro.

Troubleshooting

The rugged design and the user-friendly interface of the totalizer 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 totalizer, it's possible that the setup of the totalizer does not agree with what an operator expects to see.

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

Diagnostics Menu (d iAG)

The *Diagnostics* menu is located in the *Advanced Features* menu. To access the *Diagnostics* menu see *Advanced Features Menu*, page *53*.

For a description of the diagnostic messages, *see Advanced Features Menu &* Display Messages, page *53.*

Testing the Display LEDs

To test all LEDs on the display:

1. Go to the *Diagnostics* menu (d iAG) and press Enter button.
2. Press Up arrow button and scroll to *LED Test* menu (LEd t)
3. Press the Enter button to activate the LED Test. The totalizer will cycle through all digits, decimal points, and relay indicators to enable the operator to check that all LEDs are functioning properly.
4. Press the Enter button again to access the *Information* menu (inFo) or press the Menu button to return to Run Mode.

Determining Software Version

To determine the software version of a totalizer:

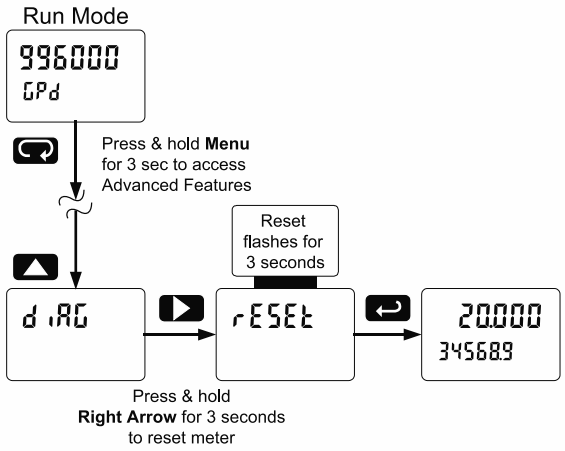
1. Go to the *Diagnostics* menu (d iAG) and press Enter button.
2. Press Up arrow button and scroll to Information menu (inFo).
3. Press Enter to access the software number (SFt) and version (UEr) information. Write down the information as it is displayed. Continue pressing Enter until all the information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

Reset Totalizer 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*, page *53*.
2. Press Up arrow to go to *Diagnostics* menu
3. Press and hold Right arrow for three seconds, press Enter when display flashes rESEt.
   Note: If Enter is not pressed within three seconds, the display returns to Run Mode.
4. The totalizer 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 totalizer.

Factory Defaults & User Settings

Parameter	Display	Default Setting
Input type	inPut	
Total, channel A	Ch-A	Yes
Total, channel B	Ch-b	Yes
Units	unitS	
Rate unit, channel A	Ch-A	HZ-A
Rate unit, channel B	Ch-b	HZ-b
Unit, channel C	Ch-C	HZ-C
Total unit, channel A	tot-A	tot-A
Grand total unit, ch-A	Gtot-A	Gtot-A
Total unit, channel B	tot-b	tot-b
Grand total unit, ch-B	Gtot-b	Gtot-B
Decimal Point	dEc Pt	
Rate, channel A	rAtE	1
Total, channel A	totAL	1
Grand total, channel A	GtotAL	0
Rate, channel B	rAtE	1
Total, channel B	totAL	1
Grand total, channel B	GtotAL	0
Channel C	Ch-C	1
Input Calibration	inCAL	
Number of points	no PtS	
Number of points, ch-A	Ch-A	2
Number of points, ch-B	Ch-b	2
K-Factor, channel A	FAct-A	1.000
K-Factor, channel B	FAct-b	1.000
Total setup	tSEtuP	
Time base, channel A	tbASE	Sec
Total conversion factor, Ch-A	t CF	1.000
Grand total conversion factor, Ch-A	Gt CF	1.000
Time base, channel B	tbASE	Sec
Total conversion factor, Ch-B	t CF	1.000
Grand total conversion factor, Ch-B	Gt CF	1.000
Total reset	trESEt	
Total reset, channel A	t rSt	Manual
Grand total reset, Ch-A	Gt rSt	Manual
Total reset, channel B	t rSt	Manual
Grand total reset, Ch-B	Gt rSt	Manual
Display assignment	dSPLAY	

Factory Defaults & User Settings

Parameter	Display	Default Setting
Display line 1	d Ch-A	Channel A
Display line 2	d Ch-b	Channel B
Display intensity	d- intY	6
Relay	rELAY	
Relay 1 assignment	Ch-A	Channel A total
Relay 1 action	Act 1	Automatic
Relay 1 set point	SEt 1	100.0
Relay 2 assignment	Ch-A	Channel A total
Relay 2 action	Act 2	Automatic
Relay 2 set point	SEt 2	200.0
Relay 3 assignment	Ch-A	Channel A rate
Relay 3 action	Act 3	Automatic
Relay 3 set point	SEt 3	300.0
Relay 3 reset point	rSt 3	250.0
Relay 4 assignment	Ch-A	Channel A rate
Relay 4 action	Act 4	Automatic
Relay 4 set point	SEt 4	400.0
Relay 4 reset point	rSt 4	350.0
Fail-safe relay 1 to 4	FLS 1	Off
On delay relay 1 to 4	On 1	0.0 sec
Off delay relay 1 to 4	OFF 1	0.0 sec
Analog output	Aout	
Display 1 analog out	d.S 1	0.0
Output 1 value	Out 1	4.000 mA
Display 2 analog out	d.S 2	1000.0
Output 2 value	Out 2	20.000 mA
Source analog output	SourcE	Channel A
Overrange output	O-rAnG	21.000 mA
Underrange output	u-rAnG	3.000 mA
Maximum output	n.AH	23.000 mA
Minimum output	n.in	3.000 mA
Filter	FiLtEr	
Filter, channel A	Ch-A	High speed
Filter, channel B	Ch-b	High speed
Round	round	1
Cutoff	CutoFF	
Cutoff value, channel A	Ch-A	0.0 (disabled)
Cutoff value, channel B	Ch-b	0.0 (disabled)
Serial	SEr iAL	
Slave ID (Address)	SLAu id	247
Baud rate	bAud	9600
Transmit delay	tr dLY	50 ms
Parity	PAr itY	Even
Byte-to-byte timeout	t-bYt	010 (0.1 sec)

Factory Defaults & User Settings		
Parameter	**Display**	**Default Setting**
Math	nrAth	
Math, channel C	Sunr	Sum
Adder (constant P)	AddEr	0.000
Factor (constant F)	FActor	1
User	uSEr	
F1 function key	F1	Reset max & min
F2 function key	F2	Line 1 Max & Min
F3 function key	F3	Acknowledge relays
F4 function (digital input)	F4	Acknowledge relays
Digital input 1	di 1	Menu
Digital input 2	di 2	Right arrow
Digital input 3	di 3	Up arrow
Digital input 4	di 4	Enter
Digital output 1	dO 1	Alarm 1
Digital output 2	dO 2	Alarm 2
Digital output 3	dO 3	Alarm 3
Digital output 4	dO 4	Alarm 4
Password	PASS	
Password 1	PASS 1	000000 (unlocked)
Password 2	PASS 2	000000 (unlocked)
Password 3	PASS 3	000000 (unlocked)
Total	totAL	000000 (unlocked)
Grand total	GtotAL	000000 (unlocked)

Troubleshooting Tips

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

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

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, Locd is displayed	Totalizer is password-protected, enter correct six-digit password to unlock
Controller does not respond to input change	Check: 1. The input signal type and make sure it corresponds with the position of the input switch. 2. The input signal voltage level 3. If a *Low-Flow Cutoff* has been programmed, the controller will display zero below that point, regardless of the input.
Controller displays error message during calibration (Error)	Check: 1. Signal connections 2. Input switch position 3. Minimum input span requirements
Controller displays 999999 -99999	Check: 1. The input signal frequency 2. K-Factor value or scaling, time base, and decimal point
Display is unstable	Check: 1. Input signal stability and value 2. Display scaling vs. input signal 3. Increase the gate settings to average more pulses
Display reading is not accurate	Check: 1. K-Factor value provided by the flowmeter manufacturer 2. Time base selected 3. Scaling or calibration
Display response is too slow	Check filter and gate values
Display does not respond to input changes, reading a fixed number	Check display assignment; it might be displaying max, min, or set point.
Display alternates between 1. Hi and a number 2. Lo and a number	Press Menu to exit max/min display readings.
Relay operation is reversed	Check: 1. Fail-safe in *Setup* menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in *Setup* menu 2. Set and reset points
Flashing relay status LEDs	Relays in manual control mode or relay interlock switches opened.
Totalizer not communicating with application programs	Check: 1. Serial adapter and cable 2. Serial settings 3. Totalizer address and baud rate
If the display locks up or the totalizer does not respond at all	Cycle the power to reboot the microprocessor.
CapTouch buttons do not respond	1. Check if slide switch on connector board is in DISABLE position, switch to ENABLE. 2. Be sure to hold the initial CapTouch button for 5 seconds to wake it up.

Troubleshooting Tips

Symptom	Check/Action
Serial Communications Power LED Indicator is off	Check: 1. Modular cable connection 2. Power to the device
If only the TX (or DATA IN) data status LED is flashing when serial communications attempted	Check: 1. Serial cable 2. Instrument address & baud rate 3. Program address & baud rate
If both data status LEDs (TX and RX) are off when trying to communicate	Remove all unnecessary cables and instruments from the bus. Try getting the system to work with only one device (to ease troubleshooting) and then expand the system one device at a time.
Communications slow	Increase the baud rate
Random communication errors	1. Increase the TX delay time 2. Decrease the baud rate
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 totalizer to factory defaults, see *Reset Totalizer to Factory Defaults* on page *63*. In addition, for best results, we recommend using the free MeterView Pro software for all programming needs.

NOTES

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