Helios Large Display Dual Analog Input Rate/Totalizer Instruction Manual

HELIOS

MeterView Pro
USB Install

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LISTED

Flow Rate/Totalizer

- Large 1.80" Digits
- Dual-Line 6-Digit Display
- Readable from up to 100 Feet (30 Meters) Away
- Superluminous Sunlight Readable Display
- NEMA 4X, IP65 Rated Field Mountable Enclosure
- Operating Temperature Range of -40 to 65°C (-40 to 150°F)
- Dual Analog Inputs with Math Functions
- Rate, Total, and Grand Total for Each Input Channel
- Addition, Difference, Average, Multiplication, Division, Min, Max, Weighted Average, Ratio, Concentration, & More
- 0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and ±10 V Inputs
- Input Power Options Include 85-265 VAC or 12-24 VDC
- Isolated 24 VDC Transmitter Power Supply
- 32-Point, Square Root, or Exponential Linearization
- 2 or 4 Relays + Isolated 4-20 mA Output Options
- Onboard USB & RS-485 Serial Communication Options
- Modbus® RTU Communication Protocol Standard
- Program the Meter from a PC with onboard USB and MeterView Pro

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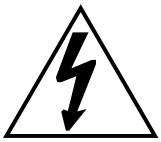
PRECISION DIGITAL

www.predig.com

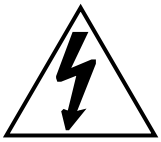
Disclaimer

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.

Caution: *Read complete instructions prior to installation and operation of the meter.*



Warning: ***Risk of electric shock or personal injury.***



Warning!

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

Limited Warranty

Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period under “Specifications” from the date of shipment from the factory. Precision Digital’s liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit.

Registered Trademarks

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Introduction

The Helios PD2-6262 is a multi-purpose, easy to use, large-display dual-input rate/totalizer ideal for flow rate, total, and flow control applications. It features large 1.8 inch superluminous sunlight-readable LED digits, which can be read from up to 100 feet away. It is housed in a water-resistant, field mountable NEMA 4X/IP65 rated enclosure for convenient indoor and outdoor installation.

The meter accepts current and voltage signals (e.g. 4-20 mA, 0-10 V) from an analog output flowmeter. 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. This is in addition to the signal input conditioning functions (linear, square root, programmable exponent, or round horizontal tank calculations).

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 Helios PD2-6262 dual-input rate/totalizer comes with four (4) SPDT relays, a 4-20 mA output, two 24 VDC power supplies, five (5) digital inputs and four (4) digital outputs, and RS485 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 Helios an excellent addition to any system.

Ordering Information

Standard Models

85-265 VAC Model	12-24 VDC Model	Options Installed
PD2-6262-6H0	PD2-6262-7H0	No Options
PD2-6262-6H7	PD2-6262-7H7	4 relays & 4-20 mA output

Accessories

Model	Description
PDA1011	Dual 4-20 mA expansion module
PDA6260	Pipe Mounting Kit
PDA7485-I	RS-232 to RS-422/485 isolated converter
PDA7485-N	RS-232 to RS-422/485 non-isolated converter
PDA8485-I	USB to RS-422/485 isolated converter
PDA8485-N	USB to RS-422/485 non-isolated converter
PDAPLUG2	Plastic Conduit Plug
PDX6901	Suppressor (snubber): 0.01 µF/470 Ω, 250 VAC

Specifications

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

General

Display	Main display: 1.8" (46 mm) high, red LEDs 6 digits per line (-99999 to 999999), with lead zero blanking
Display Intensity	Eight user selectable intensity levels
Display Update Rate	5/second (200 ms)
Display Assignment	The Upper and Lower displays 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 and/or 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 The lower display may also be set to show engineering units or be off, with no display.
Overrange	Display flashes 999999
Underrange	Display flashes -99999
Programming Methods	Four programming buttons, digital inputs, PC and MeterView Pro software, or Modbus registers.
Noise Filter	Programmable from 2 to 199 (0 will disable filter)
Filter Bypass	Programmable from 0.1 to 99.9% of calibrated span
Recalibration	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
Max/Min Display	Max/min readings reached by the process are stored until reset by the user or until power to the meter is turned off.
Password	Three programmable passwords restrict modification of programmed settings. 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.
Power Options	85-265 VAC 50/60 Hz, 90-265 VDC, 20 W max **or** 12-24 VDC ± 10%, 15 W max Powered over USB for configuration only.

Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ± 10%. 12-24 VDC powered models selectable for 24, 10, or 5 VDC supply (internal P+/P- switch). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max, @ 50 mA max for 5 or 10 VDC supply.
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 meters may share one 5 A fuse
Normal Mode Rejection	Greater than 60 dB at 50/60 Hz
Isolation	4 kV input/output-to-power line; 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.
Environmental	**Operating temperature range:** -40 to 150°F (-40 to 65°C) **Storage temperature range:** -40 to 185°F (-40 to 85°C) **Relative humidity:** 0 to 90% non-condensing
Connections	Removable and integrated screw terminal blocks accept 12 to 22 AWG wire.
Enclosure	UL Type 4X, IP65 rated. Polycarbonate & glass blended plastic case, color: gray. Includes four PG11 through-hole conduit openings, with two factory installed PG11, IP68, black nylon threaded hole plugs with backing nuts.
Mounting	**Wall Mounting:** Four (4) mounting holes provided for screwing meter into wall. See Wall Mounting Instructions on page 11 for additional details. **Pipe Mounting:** Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See Pipe Mounting Instructions on page 12 for additional details.
Tightening Torque	**Removable Screw Terminals:** 5 lb-in (0.56 Nm) **Digital I/O and RS485 Terminals:** 2.2 lb-in (0.25 Nm)
Overall Dimensions	10.63" x 12.59" x 4.77" (270 mm x 319.7 mm x 121.2 mm) (W x H x D)
Weight	6.10 lbs (2.76 kg)
Warranty	3 years parts & labor

Dual Process Input

Two Inputs	Two **non-isolated** inputs, each separately field selectable: 0-20, 4-20 mA, ±10 V (0-5, 1-5, 0-10 V), Modbus PV (Slave)
Channels	Channel A, Channel B, Channel C (Math channel)

	Name	Function	Setting
Math Functions	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	mULt
	Division	((A/B)+P)*F	diV dE
	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	wA AVG
	Ratio	(A/B)*F	rAt io
	Ratio 2	(((B-A)/A)+P)*F	rAt io2
	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 t
	G. Tot. Difference	(GtA-GtB+P)*F	diF Gt
	Total Ratio	(tA/tB)*F	trAt io
	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.*

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 the display line 1 and line 2 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
Programmable Constants	**Constant P (Adder):** -99.999 to 999.999, default: 0.000 **Constant F (Factor):** 0.001 to 999.999, default: 1.000
Accuracy	±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy, range: 10-100% of calibrated span

Temperature Drift	0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient
Signal Input Conditioning	Linear, square root, or programmable exponent
Multi-Point Linearization	2 to 32 points for channel A and B
Programmable Exponent	1.0001 to 2.9999
Low-Flow Cutoff	0-999999 (0 disables cutoff function)
Decimal Point	Up to five decimal places or none: d.ddddd, d.dddd, d.ddd, d.dd, d.d, or dddddd
Calibration Range	Input Range / Minimum Span Input 1 & Input 2 4-20 mA / 0.15 mA ±10 V / 0.01 V An error message will appear if the input 1 and input 2 signals are too close together.
Input Impedance	Voltage ranges: greater than 500 kΩ Current ranges: 50 - 100 Ω (depending on resettable fuse impedance)
Input Overload	Current input protected by resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.
F4 Digital Input Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM.
F4 Digital Input Logic Levels	**Logic High:** 3 to 5 VDC **Logic Low:** 0 to 1.25 VDC

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 and ▲ LED is illuminated.
Total Decimal Points	Up to five decimal places or none: d.ddddd, d.dddd, d.ddd, d.dd, d.d, or dddddd Total decimal point is independent of rate decimal point. 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 meter 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.
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. **Caution!** *Once the Grand Totals have been programmed as "non-resettable" the feature **cannot** be disabled.*
Programmable Delay On Release	0.1 and 999.9 seconds; applied to the first relay assigned to total or grand total. If the meter is programmed to reset total to zero automatically when the preset is reached, then a delay will occur before the total is reset.

Relays

Rating	2 or 4 SPDT (Form C) internal and/or 4 SPST (Form A) external; rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads; see page 16 for details.
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/without clear Pump alternation control (2 to 4 relays) Sampling (based on time) Off (disable unused relays and enable Interlock feature) Manual on/off control mode
Relay Reset	User selectable via front panel buttons or digital inputs 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 (latching) *Note: Front panel button 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 meter, relays will reflect the state of the input to the meter.

Isolated 4-20 mA Transmitter Output

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 1-8; 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 Output 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 *Note: Analog output drift is separate from input drift.*
Isolated Transmitter Power Supply	Terminals I+ & R: 24 VDC ± 10%. May be used to power the 4-20 mA output or other devices. Refer to Figure 21 on page 20. All models rated @ 40 mA max.
External Loop Power Supply	35 VDC maximum

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

RS485 Serial Communications Terminal

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

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

Digital Input & Output Terminal

Channels	4 digital inputs & 4 digital outputs
Digital Input Logic High	3 to 5 VDC
Digital Input Logic Low	0 to 1.25 VDC
Digital Output Logic High	3.1 to 3.3 VDC
Digital Output Logic Low	0 to 0.4 VDC
Source Current	10 mA maximum output current
Sink Current	1.5 mA minimum input current
+5 V Terminal	To be used as pull-up for digital inputs only. Connect normally open pushbuttons across +5 V & DI 1-4. **WARNING!** ***DO NOT use +5 V terminal to power external devices.***

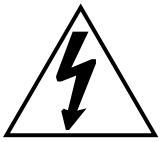
Compliance Information

Safety

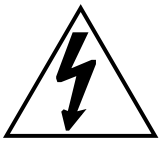
UL & C-UL Listed	USA & Canada UL 508 Industrial Control Equipment (United States), C22.2 No. 142 (Canadian National Standard)
UL File Number	E160849
Front Panel	UL Type 4X, NEMA 4X, IP65
Low Voltage Directive	EN 61010-1:2010 Safety requirements for measurement, control, and laboratory use

Safety Information

Caution: *Read complete instructions prior to installation and operation of the meter.*



Warning: ***Risk of electric shock or personal injury.***



Warning!

Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

Installation

There is no need to open the clear plastic front cover in order to complete the installation, wiring, and setup of the meter. All programming is done through the buttons and switches located under the lower door panel and are accessible by removing the single securing screw. Wires should be run through the knockout holes located on the bottom of the meter.

There are a total of four pre-drilled conduit entry holes located at the bottom of the meter. If the need to drill additional holes arises, make sure you will have the clearance necessary for conduit mounting hardware.

Do not disconnect the RJ45 connector found on the right side of the meter wiring board. Doing so will disable the onboard digital I/O, RS-485 serial communications, and M-Link functionality.

Instructions are provided for changing the transmitter power supply to output 5 or 10 VDC instead of 24 VDC, see page 12.

Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier. If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

Wall Mounting Instructions

The meter can be mounted to any wall using the four provided mounting holes. Note that the bottom mounting holes are located underneath the front door panel. To mount the meter to a wall, follow these instructions.

1. Prepare a section of wall approximately 11” x 13” (280 mm x 330 mm) for meter mounting by marking with a pencil the mounting holes (shown in the image to the right) on the wall.
2. Using a drill bit slightly smaller than the girth of the mounting screws, pre-drill holes at the mounting locations previously marked.
3. Insert mounting screws into the four mounting holes and screw them into the pre-drilled holes. **Do not overtighten** the mounting screws as it is possible that the enclosure could crack and become damaged.

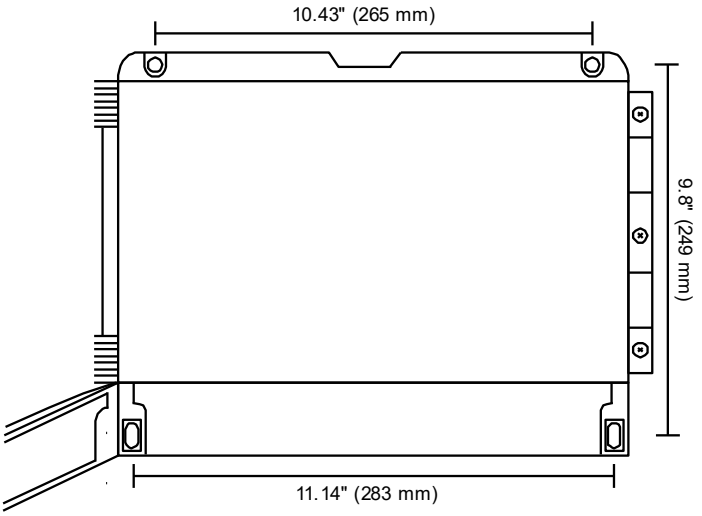


Figure 1. Meter Mounting Holes

Mounting Dimensions

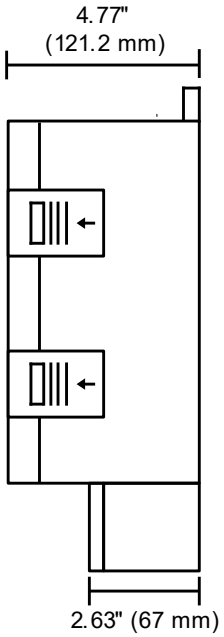


Figure 2. Meter Dimensions - Side View

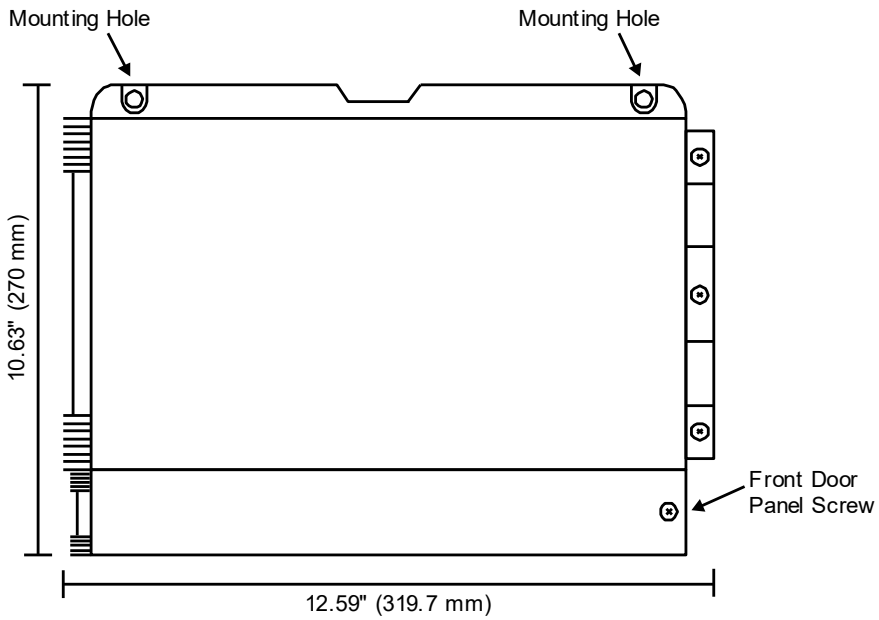


Figure 3. Meter Dimensions – Front View

Pipe Mounting Instructions

The meter can also be mounted to a pipe using the optional pipe mounting kit (PDA6260). This kit includes two mounting plates, two U-bolts, and the necessary nuts and bolts. To mount the meter to a pipe using the pipe mounting kit accessory, follow these instructions.

1. Secure the mounting plates to the top and bottom (for vertical pipes) or left and right (for horizontal pipes) of the reverse side of the meter enclosure using the provided fasteners. **Do not overtighten** the fasteners as it could cause damage to the enclosure.
2. Using the provided nuts and U-bolts, secure the mounting plates to the pipe enough torque such that the meter cannot be moved up or down (or side to side).

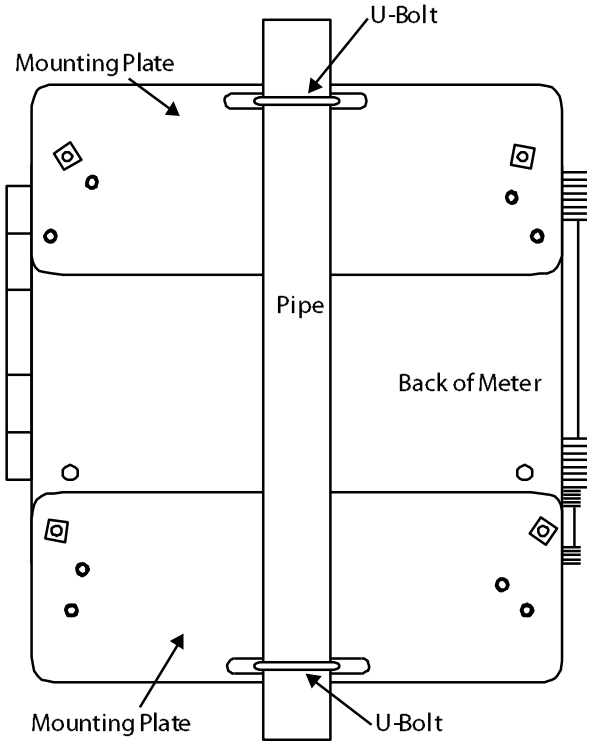


Figure 4. Vertical Pipe Mount Assembly

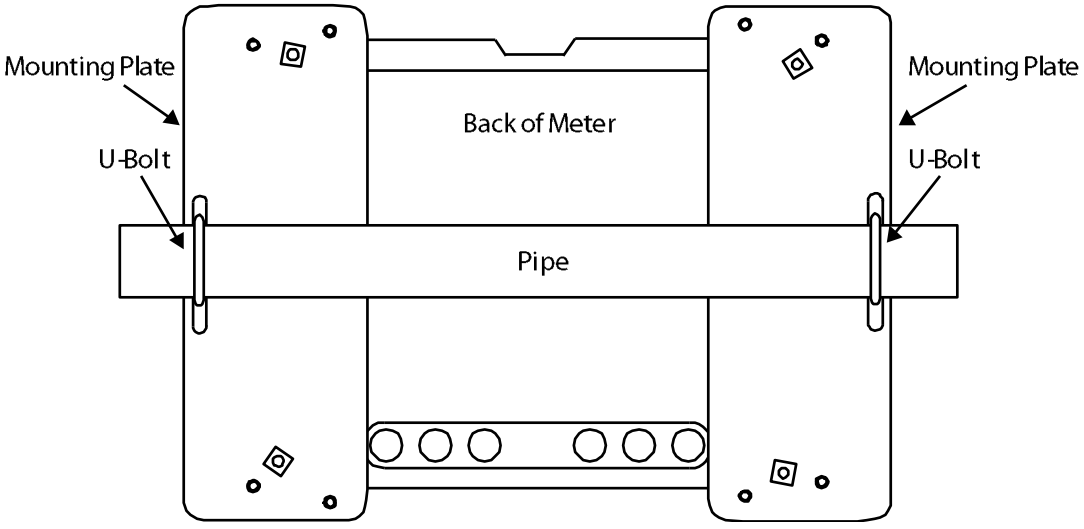


Figure 5. Horizontal Pipe Mount Assembly

Transmitter Supply Voltage Selection (P+, P-)

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

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

To access the voltage selection jumper:

1. Unplug the meter power.
2. Unscrew and open the front door panel.
3. Locate the P+/P- switch located in the center of the connections board (see diagram below).
4. Flip this switch into the appropriate position for the required transmitter excitation.

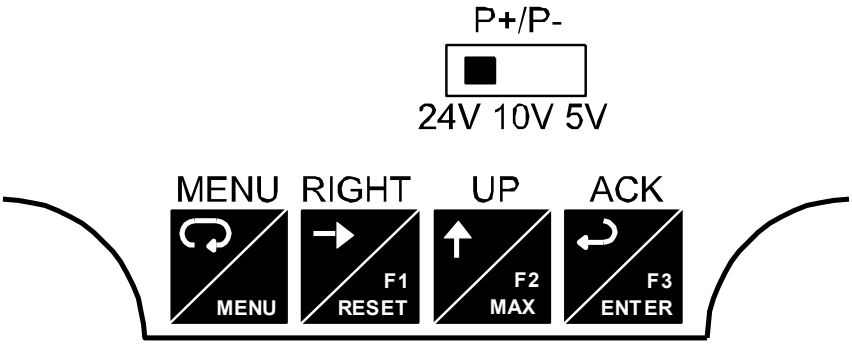


Figure 6. Transmitter Supply Voltage Selection

Connections

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

Caution

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

Connectors Labeling

The connectors' label, affixed to the inside of the lower door panel, shows the location of all connectors available with requested configuration.

Warning!	***Do not connect any equipment other than Precision Digital's expansion modules, cables, or meters to the RJ45 M-LINK connector. Otherwise damage will occur to the equipment and the meter.*** ***Do not disconnect the RJ45 connector located to the left of the power terminal block. Doing so will disable the onboard digital I/O, RS-485 serial communications, and M-Link functionality.***

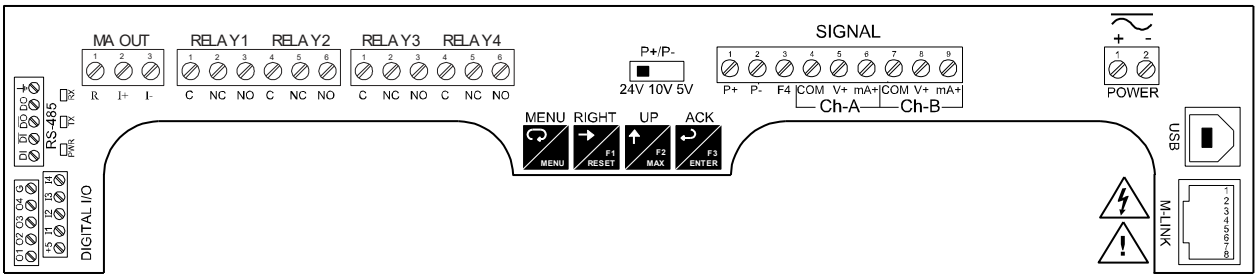


Figure 7. Connector Labeling for Fully Loaded PD2-6262

Power Connections

Power connections are made to a two-terminal connector labeled POWER on Figure 7 on page 14. The meter will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention.

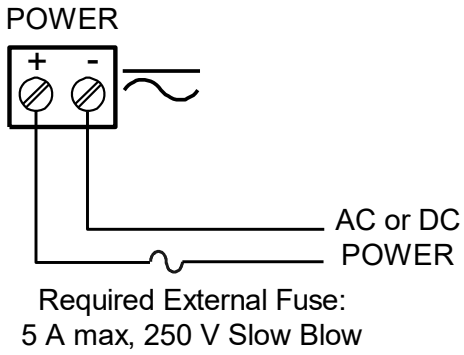


Figure 8. Power Connections

Signal Connections

Signal connections are made to a nine-terminal connector labeled SIGNAL on Figure 7. The COM (common) terminals are the return for the 4-20 mA and the ±10 V input signals. The two COM terminals connect to the same common return, and are not isolated.

Current and Voltage Connections

The following figures show examples of current and voltage connections.

There are no switches or jumpers to set up for current and voltage inputs. Setup and programming is performed through the front panel buttons.

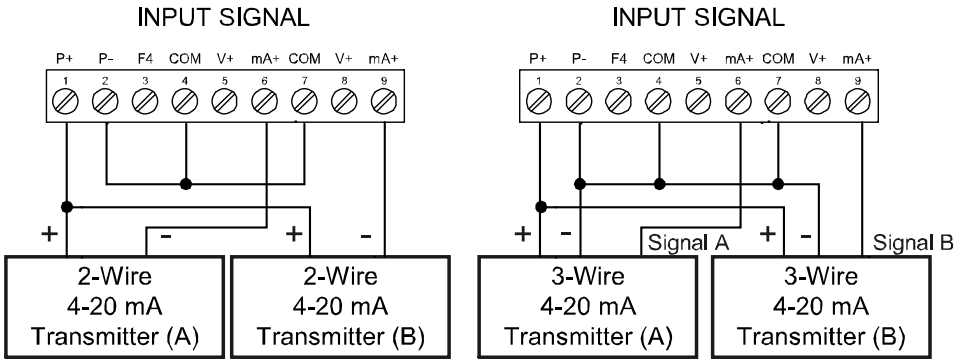


Figure 9. Transmitters Powered by Internal Supply

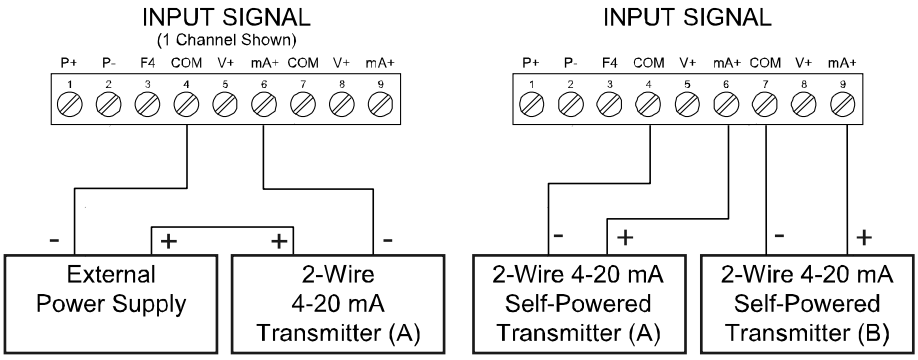


Figure 10. Transmitter Powered by Ext. Supply or Self-Powered

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

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

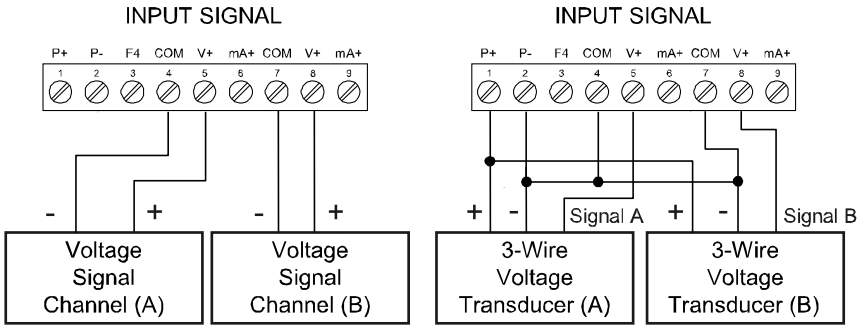


Figure 11. Voltage Input Connections

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

Modbus RTU Serial Communications

Serial communications connection can be made to the onboard RS485 terminal block or USB connector shown in Figure 7. If RS232 is required, an RS485 to RS232 adapter (PDA7485) may be used. See Ordering Information on page 5 for additional information.

Relay Connections

Relay connections are made to two six-terminal connectors labeled RELAY1 – RELAY4 on Figure 7. Each relay's C terminal is common only to the normally open (NO) and normally closed (NC) contacts of the corresponding relay. The relays' C terminals should not be confused with the COM (common) terminal of the INPUT SIGNAL connector.

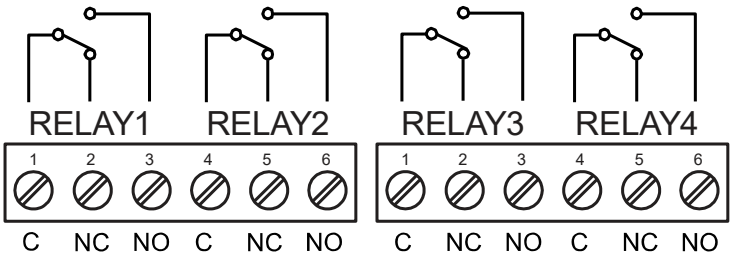


Figure 12. Relay Connections

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:

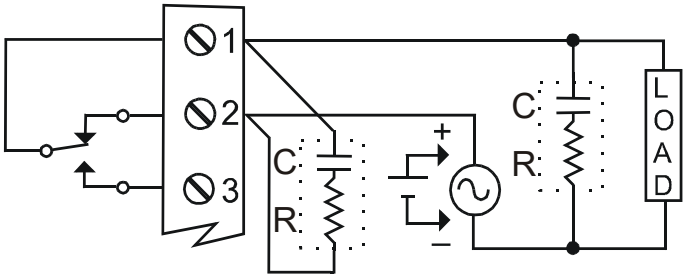
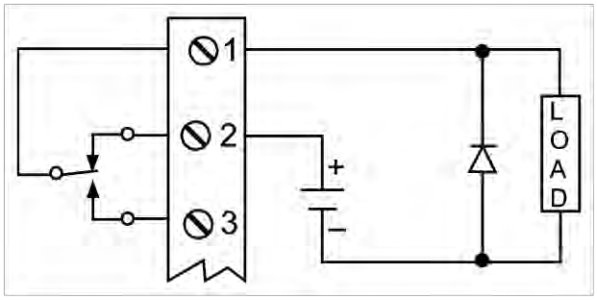


Figure 13. AC and DC Loads Protection

Choose R and C as follows:



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

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

Notes:

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

Figure 14. Low Voltage DC Loads Protection

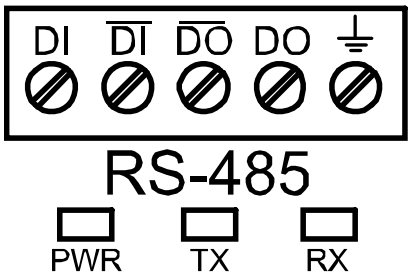
Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

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.

RS485 Output Connections



An RS-485 connector is provided for the use of advanced Modbus® serial communications. This connector converts the serial output of the meter to balanced, full or half-duplex RS-485 signals. It has a removable screw terminal connector for the RS-485 terminals which includes Transmit Data (DO) and (/DO), Receive Data (DI) and (/DI), and Signal Ground. Baud rates are adjustable and handled by the meter (see Modbus RTU Serial Communications on page **53** for more information).

The RS-485 connector has three diagnostic LEDs: a Power (PWR) LED to show when the adapter is powered properly, a Transmit Data (TX) LED to show when the adapter is sending data out from the PC side, and a Receive Data (RX) LED to show when the adapter is receiving data from the meter.

Installation

Figure 15 shows the connection of a meter to a PC using the RS485 output connector and a PDA7485 RS-232 to RS-422/485 converter in an RS-422 network. Figure 16 shows the connection of several meters to a PC using a PDA7485 RS-232 to RS-422/485 converter in an RS-485 network.

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

To change the meter address:

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

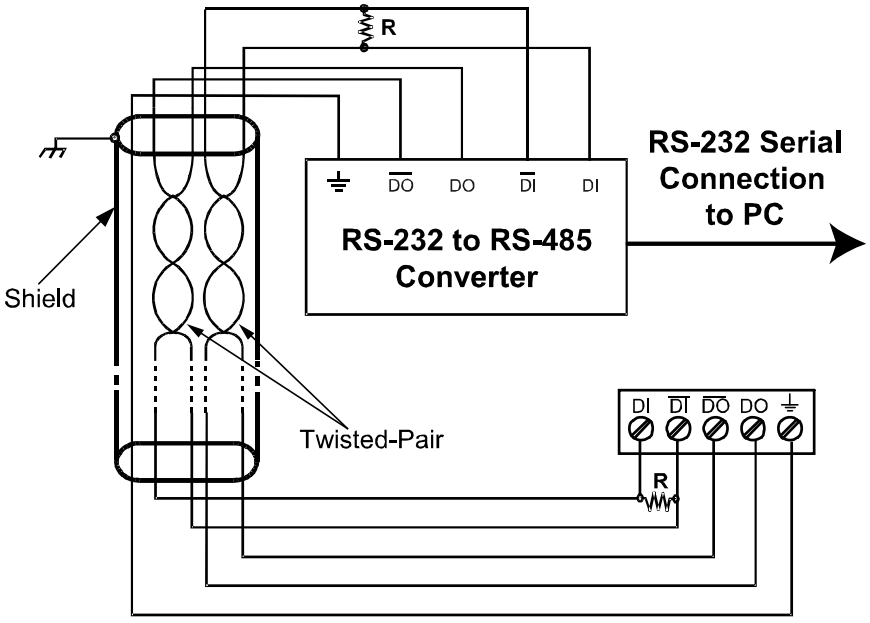


Figure 15. RS-422 or RS-485 Wiring

Notes:

1. Termination resistors are optional and values depend on the cable length and characteristic impedance. Consult the cable manufacturer for recommendations.
2. Refer to RS-232 to RS-422/485 Converter documentation for further details.
3. Use shielded cable, twisted-pairs plus ground. Connect ground shield only at one location.

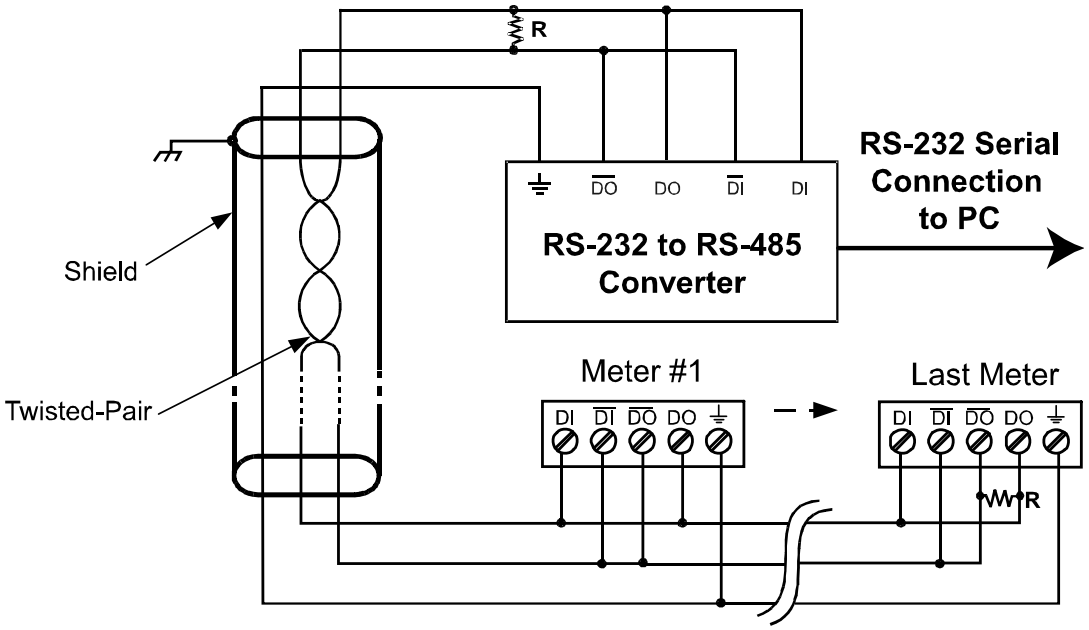


Figure 16. RS-485 Two-Wire Multi-Drop Wiring

Notes:

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

Connections

Figure 17 details the wiring connections from the RS-485 connector to an RS-422/485 serial converter (such as the PDA7485 or PDA8485) for a four-wire network.

RS485 Connector to RS-422/485 Serial Converter Connections	
RS-422/485 Serial Converter	PDA1485 RS-485 Adapter
⏚	⏚
$\overline{DO}$	$\overline{DI}$
DO	DI
$\overline{DI}$	$\overline{DO}$
DI	DO

Figure 17. Connections for RS485 Connector to Serial Converter

Three Wire Connection

In order to wire the 5 pins for use as a 3-wire half-duplex RS-485 connection, it is necessary to create a jumper connection between DI – DO and DI- – DO- as shown below.

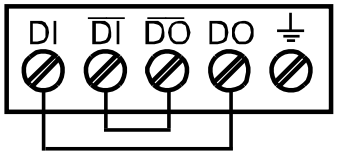


Figure 18. Three-Wire RS485 Connection

Digital I/O Connections

Digital inputs and outputs are provides in order to expand the functionality of the meter. Digital inputs are made via a push button or switch connection to the appropriate digital input connector block and the +5 VDC block. Digital output connections are made by wiring from the appropriate digital output block to the grounding terminal block.

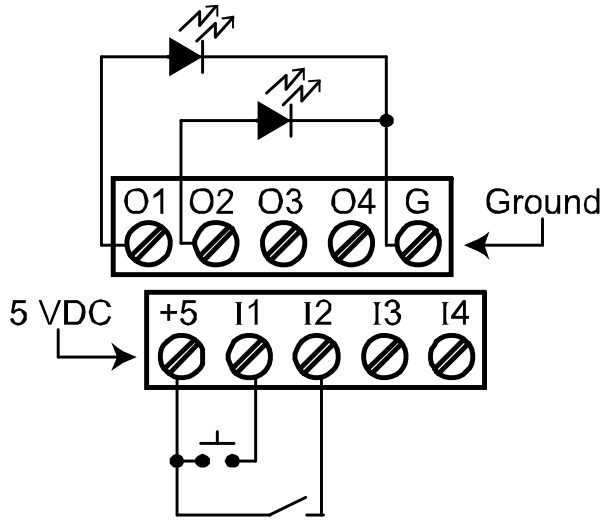


Figure 19. Digital Input and Output Connections

F4 Digital Input Connections

Digital input F4 is also available on the meter. This digital input is connected with a normally open contact across F4 and COM, or with an active low signal applied to F4.

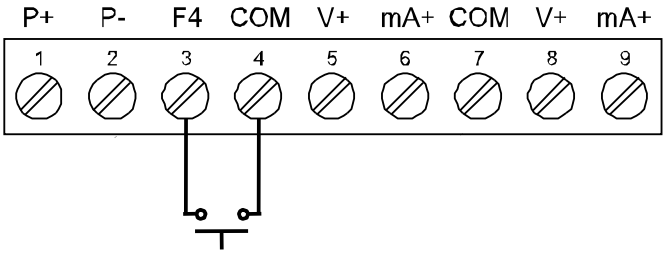


Figure 20. F4 Digital Input Connections

4-20 mA Output Connections

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

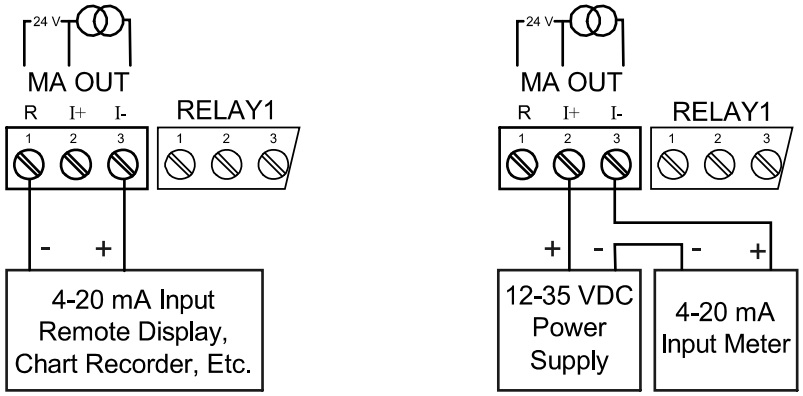


Figure 21. 4-20 mA Output Connections

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.

Interlock Relay Feature

As the name implies, the interlock relay feature reassigns one, or more, alarm/control relays for use as interlock relay(s). Interlock contact(s) are wired to digital input(s) and trigger the interlock relay. This feature is enabled by configuring the relay, and relative digital input(s) (see page 46). In one example, dry interlock contacts are connected in series to one digital input which will be used to force on (energize) the assigned interlock power relay when all interlock contacts are closed (safe). The interlock relay front panel LED flashes when locked out. The interlock relay would be wired in-series with the load (N/O contact). See below.

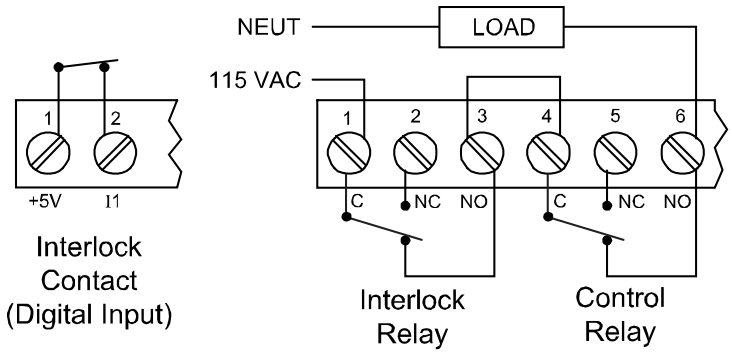


Figure 22. Interlock Connections

External Analog Output Connection

The analog out expansion module PDA1011 is connected to the scanner using a CAT5 cable provided with the module. The two RJ45 connectors on the I/O expansion module are identical and interchangeable; they are used to connect additional modules to the system. See LIM1044, Expansion Module Instruction Manual, for details.

Warning!

Do not connect or disconnect the expansion modules with the power on!
More detailed instructions are provided with each optional expansion module.

Setup and Programming

The meter is factory calibrated prior to shipment to read in milliamps and volts depending on the input selection. The calibration equipment is certified to NIST standards.

Overview

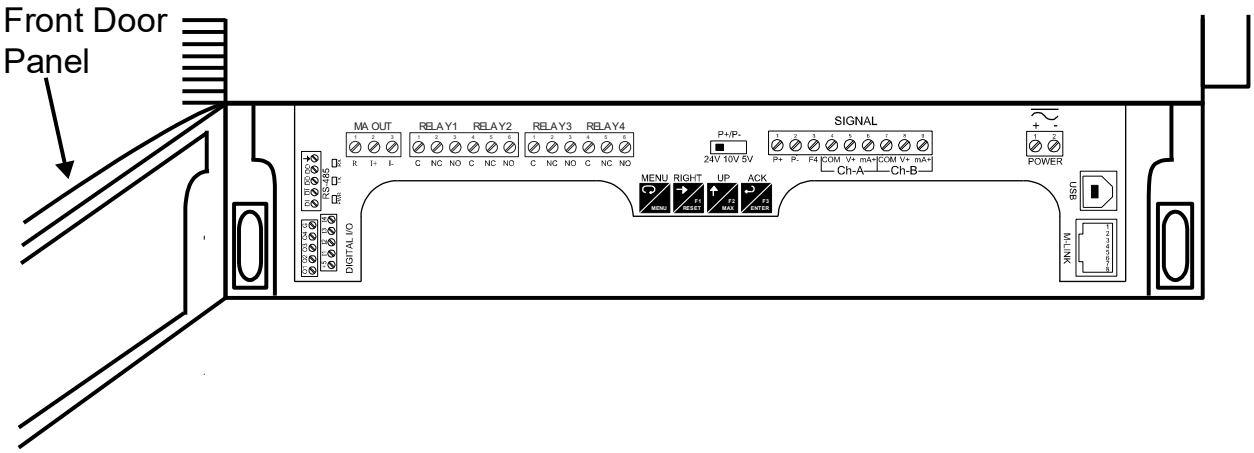
There are no jumpers to set for the meter input selection.

Setup and programming are done through the programming buttons located under the lower door panel.

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

Programming Buttons and Status LED Indicators

The meter can be programmed using the buttons located behind the front door panel. Use the *Menu* button to enter or exit *Programming Mode*, the *Up Arrow* button to cycle through menu options, and the *Enter* button to select the menu item or option you want. The *Right Arrow* button is used during numeric and decimal point programming.



Button Symbol	Description
MENU / MENU	**Menu**
RIGHT / F1 RESET	**Right arrow/F1**
UP / F2 MAX	**Up arrow/F2**
ACK / F3 ENTER	**Acknowledge (Enter)/F3**
Note: *F4 – F8 are digital inputs.*	

LED	Status
1-4	Alarm 1-4 indicator
1-4 M	Flashing: Relay in manual control mode
A B C	Channel displayed
1-4	Flashing: Relay interlock switch open
Note: *LEDs for relays in manual mode flash with the "M" LED every 10 seconds. "M" flashing by itself indicates Aout – manual control is used.*	

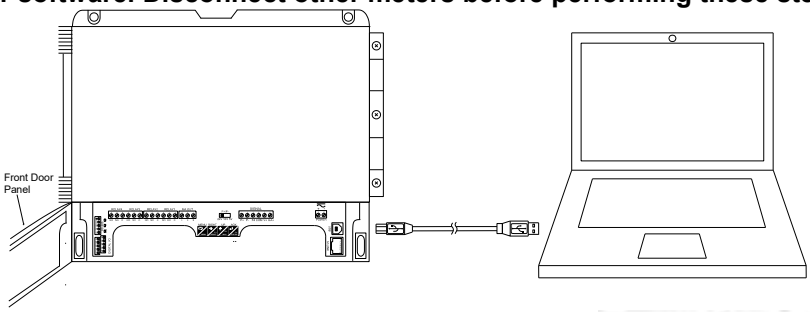
- Press the Menu button to enter or exit the Programming Mode at any time.
- Press the Right arrow button to move to the next digit during digit or decimal point programming.
- Press or hold the Up arrow button to scroll through the menus, decimal point, or to increment the value of a digit.
- Press 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 meter.

MeterView® Pro Software

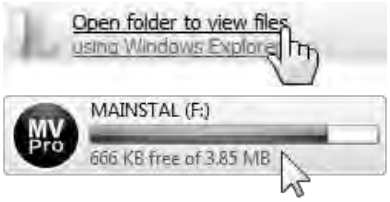
The meter can also be programmed using the PC-based MeterView Pro software included with the meter. This software is can be installed on any Microsoft® Windows® (2000/XP/Vista/7/8/10) computer by connecting the meter's onboard USB. The meter is powered by the USB connection, so there is no need to wire anything prior to programming the meter, though USB is intended only for meter configuration.

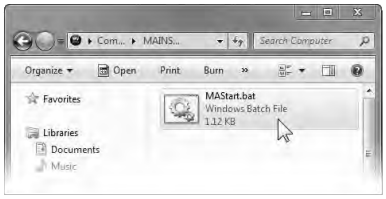
MeterView Pro Installation

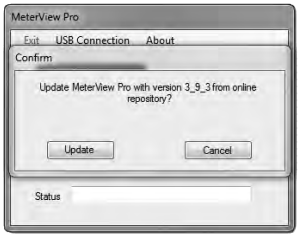
1. Connect one end of the provided USB cable to the meter and the other end to the computer. The computer will automatically install the driver software it needs to talk to the meter.
   Only one meter may be connected at a time. Attaching multiple meters will cause a conflict with the meter software. Disconnect other meters before performing these steps.



2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."
   If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."
3. Double-click on the file named "MAStart." The program will open a few windows and install two programs on your computer. Simply follow the onscreen instructions until you see one of the dialogs below. If you receive a "User Account Control" warning, click "Yes."
4. If there is an update available, click the "Update" button to install the new version. Otherwise, click "Configure" to begin programming your meter.







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

Warning

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

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

Display Functions & Messages

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

Display	Parameter	Action/Setting Description
SEtuP	*Setup*	Enter *Setup* menu
InPut	*Input*	Enter *Input* selection menu
Ch-A*	*Channel A*	Set input type for channel A (*or B)
4-20 A	*4-20 mA*	Set meter for 4-20 mA input
VoLt	*0-10 VDC*	Set meter for ±10 VDC input
totAL	*Total*	Enable/disable totalizer functions
YES	*Yes*	Enable totalizer functions
no	*No*	Disable totalizer functions
Units	*Units*	Select the display units/tags
Ch-A*	*Channel A*	Set unit or tag for channel A (*or B)
Ch-C	*Math channel 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, C)
rAtE*	*Rate*	Set rate decimal point (*channel A and B only)
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*	Set input type for channel A (*or B)
SCAL A*	*Scale 1*	Enter the *Scale* menu for channel A (*or B)
CAL A*	*Calibrate*	Enter the *Calibration* menu for channel A (*or B)
InP 1	*Input 1*	Calibrate input 1 signal or program input 1 value
diS 1	*Display 1*	Program display 1 value
InP 2	*Input 2*	Calibrate input 2 signal or program input 2 value (up to 32 points)
diS 2	*Display 2*	Program display 2 value (up to 32 points)
Error	*Error*	Error, calibration not successful, check signal or programmed value
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	Parameter	Action/Setting Description
t dLY	*Time delay*	Program automatic reset time delay
dSPLAY	*Display*	Enter the *Display* menu
LinE 1	*Display Line 1*	Press Enter to assign the display line 1 parameter (default: PV)
LinE 2	*Display Line 2*	Press Enter to assign the display line 2 parameter (default: engineering units)
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 channel A & B
d AC	*Display AC*	Alternate display of channel A & C
d bC	*Display BC*	Alternate display of channel B & C
d AbC	*Display ABC*	Alternate display of channel 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
d SEt 1*	*Display Set 1**	Displays relay 1(*through 8) 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
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 units A*	Alternate display of channel A total and total units
d tb-u	*Display total B and total units B*	Alternate display of channel B total and total units

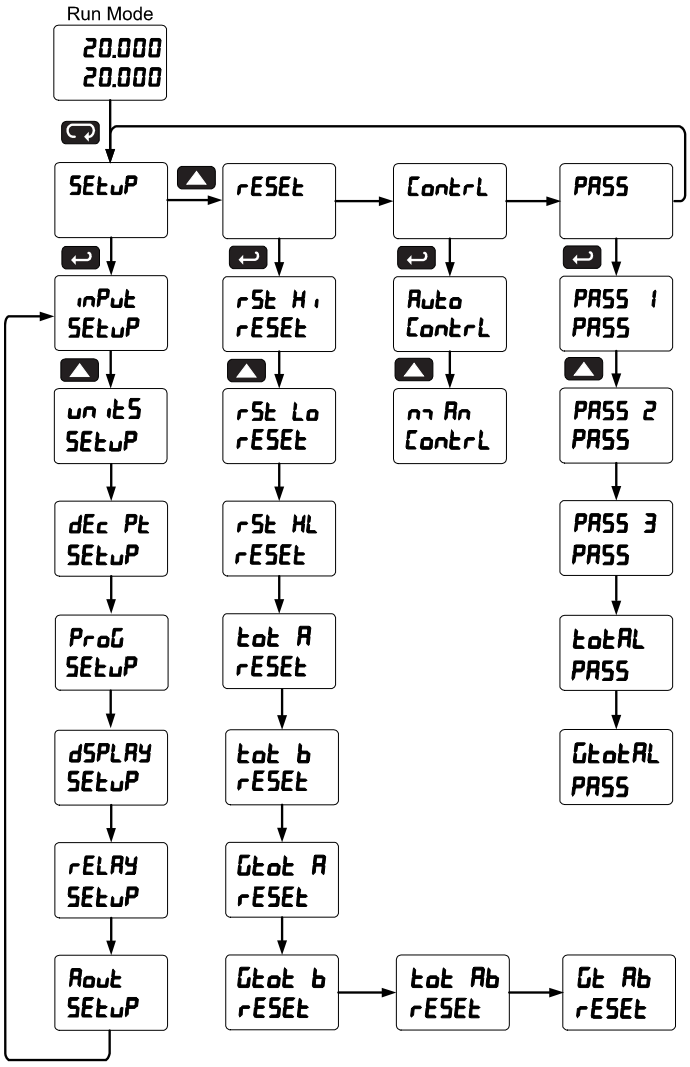
Display	Parameter	Action/Setting Description
d tAb	*Display total A and B*	Alternate display of channel A total and channel B total
d tAbC	*Display total A, B, and math channel C*	Alternate display of channel A total, channel B total, and math result channel C
nn bus	*Display Modbus*	Display Modbus input register
d oFF	*Display off*	Display blank little display
d unit	*Display unit*	Display big display channel units
d- Int	*Display intensity*	Set display intensity level from 1 to 8
rELAY	*Relay*	Enter the *Relay* menu
ASSign	*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, C)
nn bus	*Modbus*	Assign relay to Modbus register
rLY 1	*Relay 1*	Relay 1 setup
Act 1	*Action 1*	Set relay 1 action
Auto	*Automatic*	Set relay for automatic reset
A-nnAn	*Auto-manual*	Set relay for automatic & 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
SAnnPL	*Sampling*	Set relay for sampling operation
OFF	*Off*	Disable relay and front panel status LED (Select Off to enable Interlock feature)
SEt 1	*Set 1*	Program set point 1
rSt 1	*Reset 1*	Program reset point 1
rLY 2	*Relay 2*	Relays 2-4 setup
FAiLSF	*Fail-safe*	Enter *Fail-safe* menu
FLS 1	*Fail-safe 1*	Set relay 1 fail-safe operation
on	*On*	Enable fail-safe operation
oFF	*Off*	Disable fail-safe operation
FLS 2	*Fail-safe 2*	Set relays 2-8 fail-safe operation
dELAY	*Delay*	Enter relay *Time Delay* menu
dLY 1	*Delay 1*	Enter relay 1 time delay setup
On 1	*On 1*	Set relay 1 On time delay
OFF 1	*Off 1*	Set relay 1 Off time delay
dLY 2	*Delay 2*	Enter relays 2-8 time delay setup
brEAK	*Loop break*	Set relay condition if loop break detected
iGnorE	*Ignore*	Ignore loop break condition (Processed as a low signal condition)
On	*On*	Relay goes to alarm condition when loop break is detected
OFF	*Off*	Relay goes to non-alarm condition when loop break is detected
Aout	*Analog output*	Enter the *Analog output* scaling menu
AOut 1*	*Aout channel*	Analog Output source channel (*1 – 3)
d iS 1	*Display 1*	Program display 1 value

Display	Parameter	Action/Setting Description
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
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
ContrL	*Control*	Enter *Control* menu
Auto	*Automatic*	Press Enter to set meter for automatic operation
mn An	*Manual*	Press Enter to manually control relays or analog output operation
PASS	*Password*	Enter the *Password* menu
PASS 1	*Password 1*	Set or enter Password 1
PASS 2	*Password 2*	Set or enter Password 2
PASS 3	*Password 3*	Set or enter Password 3
totAL	*Total reset password*	Set or enter a total reset password
GtotAL	*Grand total password*	Set or enter a grand total reset password
unLoc	*Unlocked*	Program password to lock meter
Locd	*Locked*	Enter password to unlock meter
999999 -99999	*Flashing*	Over/under range condition

Main Menu

The main menu consists of the most commonly used functions: *Setup*, *Reset, Control,* 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/F3.
- The display moves to the next menu every time a setting is accepted by pressing Enter/F3.



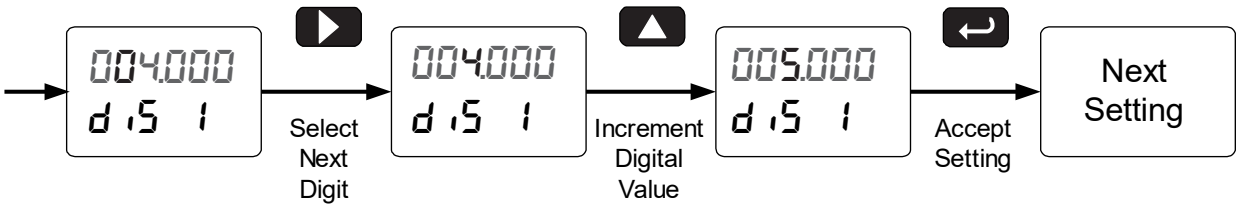
Setting Numeric Values

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

The digit being changed is displayed brighter than the rest.

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

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

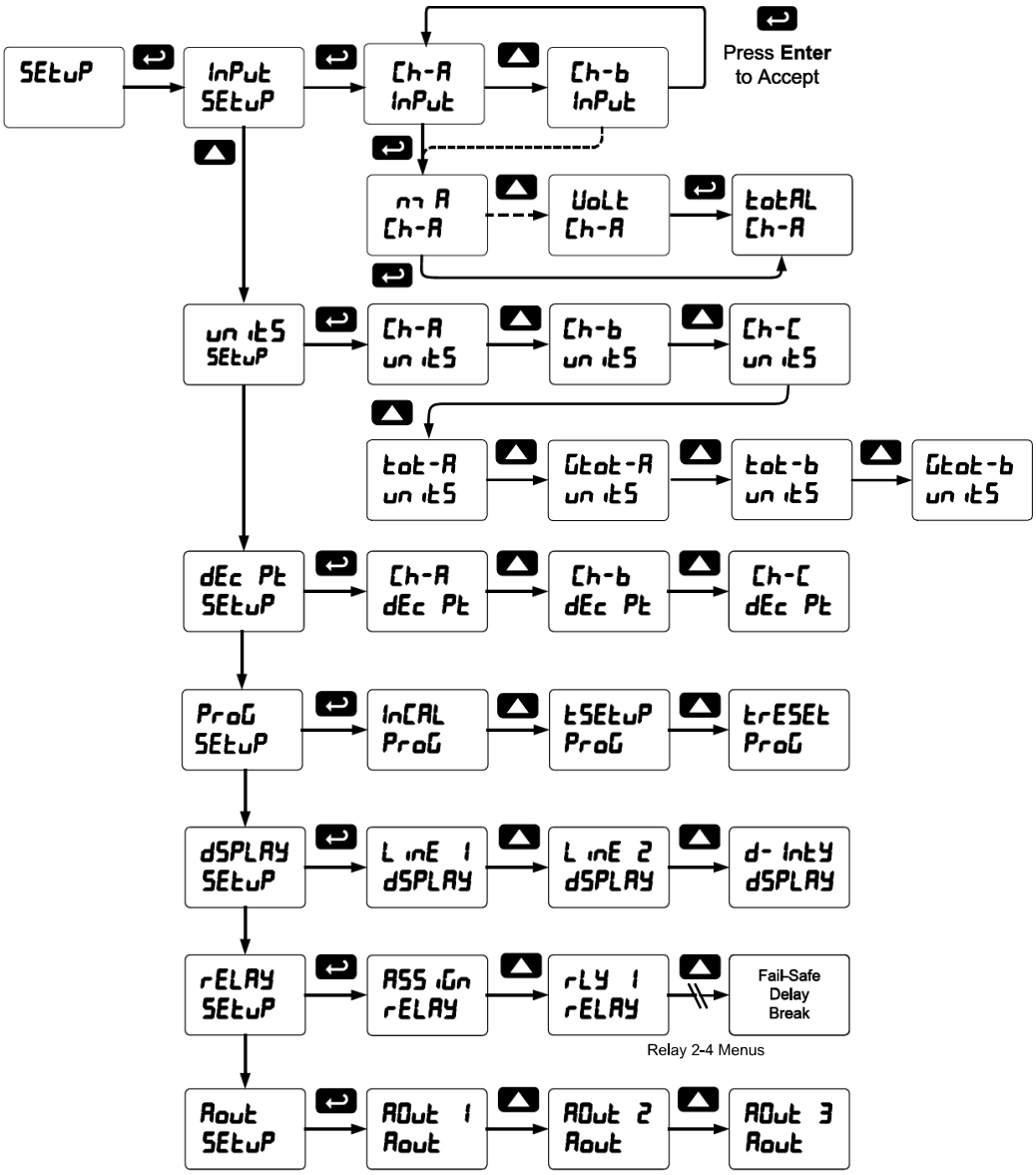


Setting up the Meter (SEtuP)

The *Setup* menu is used to select:

1. Input signal the meter will accept for channel A and channel B
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 meter using the scale, calibrate, & total functions
5. Display parameters and intensity
6. Relay assignments and operation
7. 4-20 mA analog output scaling

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



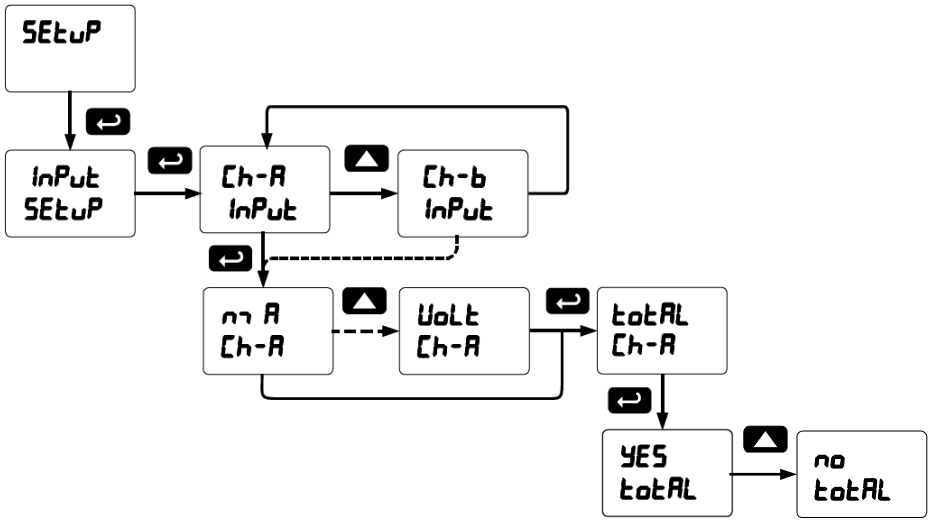
Setting the Input Signal (InPut)

Enter the *Input* menu to set up the meter to display current (mA) or voltage (VoLt) inputs for channel A and channel B.

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

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

Channel C is the Math Function calculation, which is set up in the Advanced Features menu.



Setting the Totalizer Features (totAL)

Enable or disable the totalizer features by selecting "YES" or "no" after the input type has been set up for each channel. If the totalizer features are disabled, all the totalizer features and functions are hidden from the menus. Level and process meter features and functions are added to the menus.

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

If disabling the totAL parameter by selecting no, please refer to the PD2-6060 manual available at www.predig.com for instructions on setting up the meter parameters.

Notes: 1. The totalizer continues working in the background.

2. When selecting "no" for Total for a channel, the meter now functions as a PD2-6060 Dual-Input Process Meter for parameters that affect that channel. *We strongly suggest that you download and use the PD2-6060 instruction manual from our website (www.predig.com) while in this mode of operation.*

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

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 un itS menu, or d un it is selected as the lower display parameter.

See the flow chart on page 29 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 flow chart on page 36 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
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	A
b	b

Display	Character
C	C
c	c
d	d
E	E
F	F
G	G
g	g
H	H
h	h
I	I
i	i
J	J

Display	Character
K	K
L	L
m	m
n	n
O	O
o	o
P	P
q	q
r	r
S	S
t	t
u	u

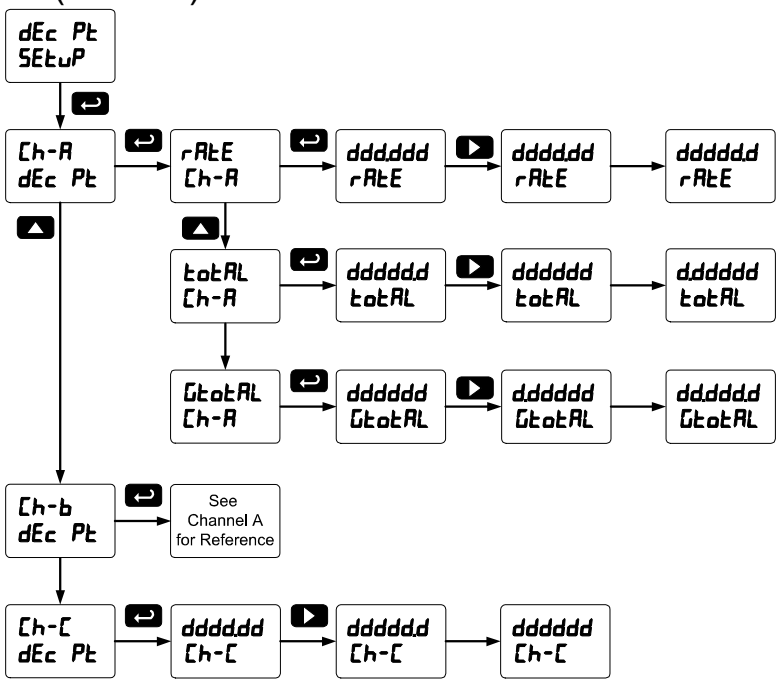
Display	Character
V	V
w	w
X	X
Y	Y
Z	Z
-	-
/	/
]	]
[	[
=	=
°	Degree(<)
	Space

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

Setting the Decimal Point (dEc Pt)

The decimal point 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 meter moves to the *Program* menu.



Programming the Rate/Totalizer (ProG)

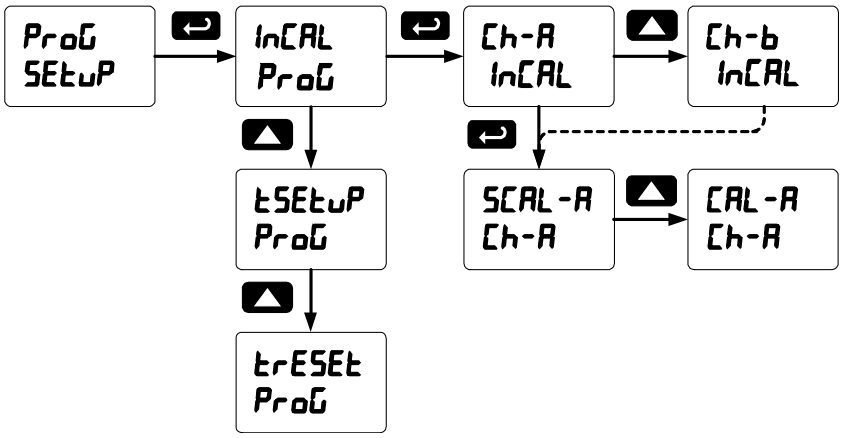
It is **very important** to read the following information, before proceeding to program the meter:

- The meter is factory calibrated prior to shipment to read in milliamps and volts depending on the input selection. The calibration equipment is certified to NIST standards.
- Use the *Scale* menu to scale the process input (e.g. 4-20 mA). A calibrated signal source is not needed to scale the meter.
- Use the *Calibrate* menu to apply a signal from a calibrator or a flowmeter.

The *Program* menu contains the following menus:

1. Scale channel A and B without a signal source
2. Calibrate channel A and B with a calibrated signal source
3. Channel A and B total time base & conversion factors
4. Channel A and B grand total time base & conversion factors
5. Channel A and B reset modes for total & grand total

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



Additional parameters, not needed for most applications, are found in the *Advanced Features* menu; see Advanced Features Menu, page 50.

Input Calibration Method (InCAL)

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

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

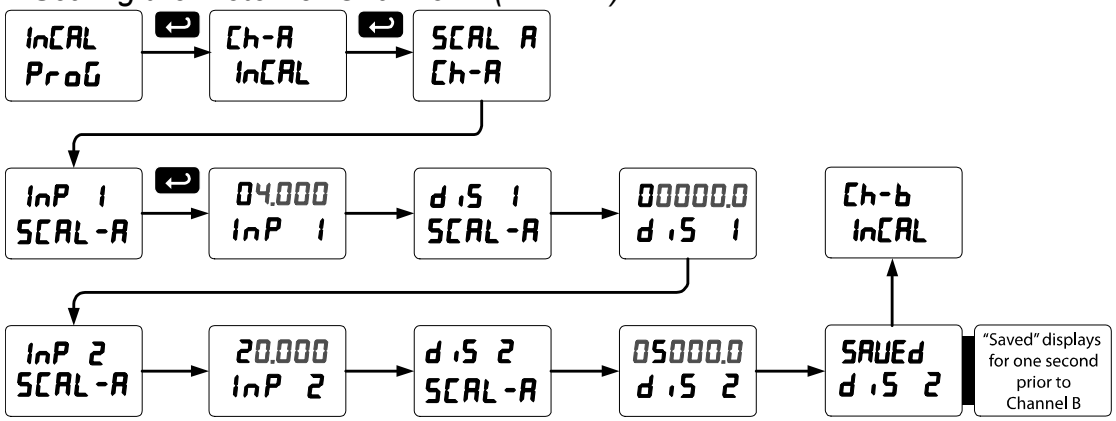
Note: The Scale and Calibrate functions are exclusive of each other. The meter uses the last function programmed. Only one of these methods can be employed at a time. The Scale and Calibrate functions can use up to 32 points (default is 2). The number of points should be set in Scale and Calibrate accordingly under the Number of Points (no PtS) menu selection prior to scaling and calibration of the meter, see page 55 for details.

Scaling the Meter without a Signal Source

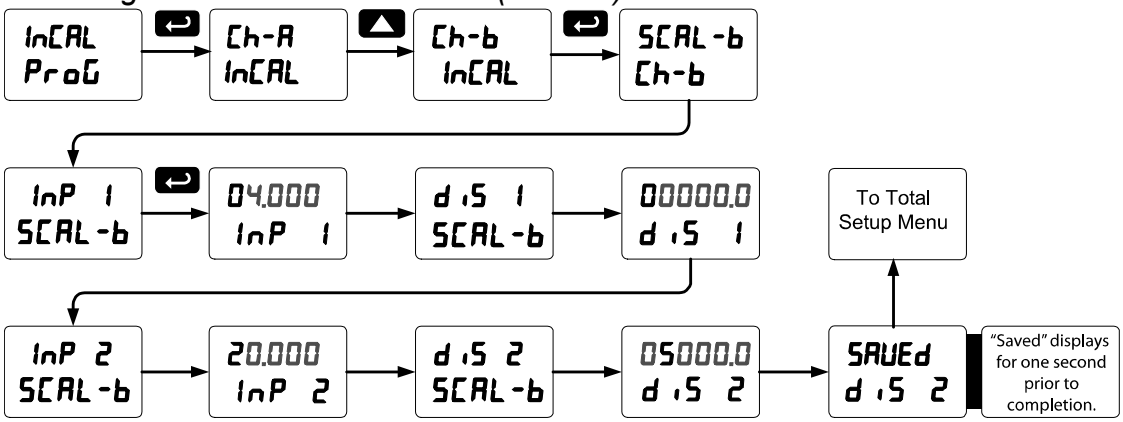
The process inputs (4-20 mA, ±10 VDC) can be scaled to display the process variables in engineering units. A signal source is not needed to scale the meter; simply program the inputs and corresponding display values.

From the InCAL menu, select channel A or B, followed by SCAL-A or SCAL-b, and then set the signal input value and display value for each of the scaling points (default is two).

Scaling the Meter for Channel A (SCAL-A)



Scaling the Meter for Channel B (SCAL-b)



Error Message (Error)

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

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

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

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

Minimum Input Span

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

Input Range	Input 1 & Input 2 Span
4-20 mA	0.15 mA
±10 VDC	0.01 VDC

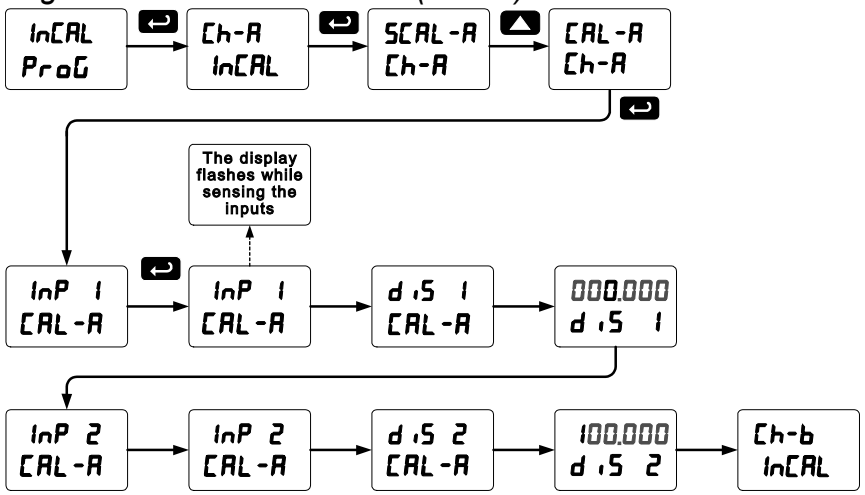
Calibrating the Meter with External Source (CAL)

Note: To scale the meter without a signal source refer to Scaling the Meter without a Signal Source, page 33.
Warm up the meter for at least 15 minutes before performing calibration to ensure specified accuracy.

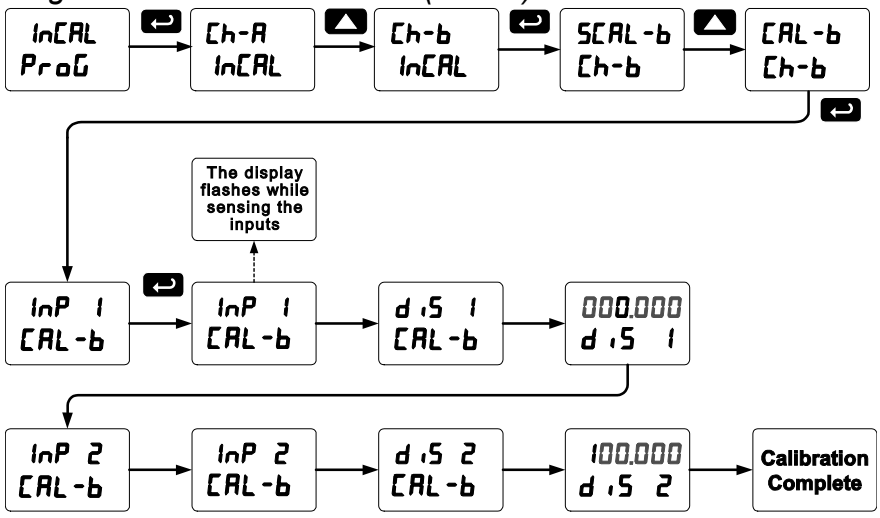
The meter can be calibrated to display the process variable in engineering units by applying the appropriate input signal and following the calibration procedure.

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

Calibrating the Meter for Channel A (CAL -A)

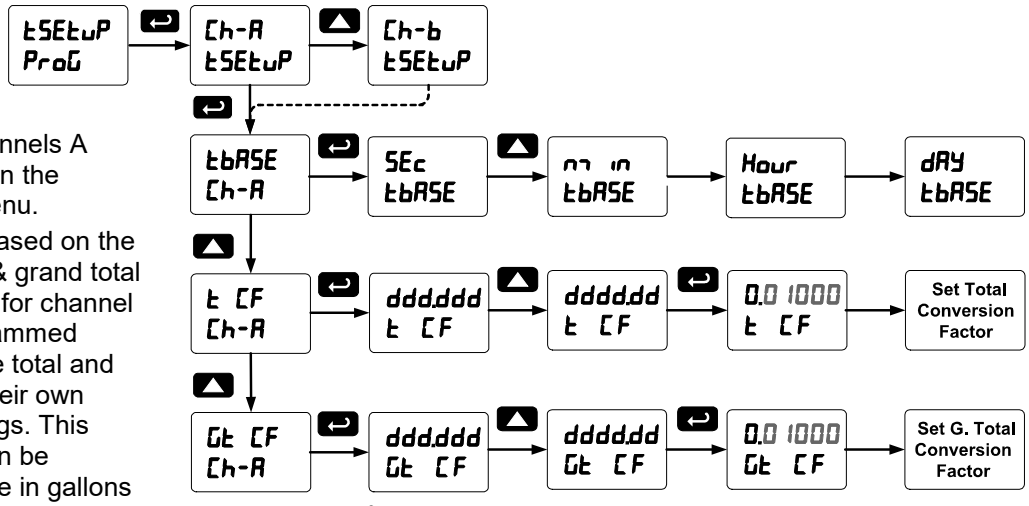


Calibrating the Meter for Channel B (CAL -b)



Total and Grand Total Setup

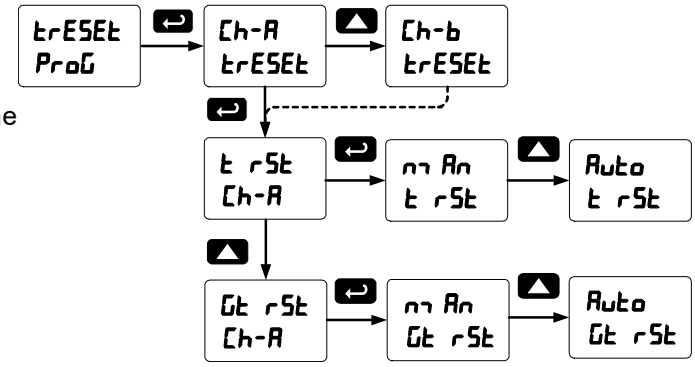
The time base and total conversion factor, and grand total conversion factor for input channels A and B are located in the *Totalizer Setup* menu.



The time base is based on the rate of flow. Total & grand total conversion factors for channel A and B are programmed independently. The total and grand total have their own independent settings. This means that one can be displaying the value in gallons while the other displays in million gallons, liters, m^3, etc.

Total & Grand Total Reset

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.

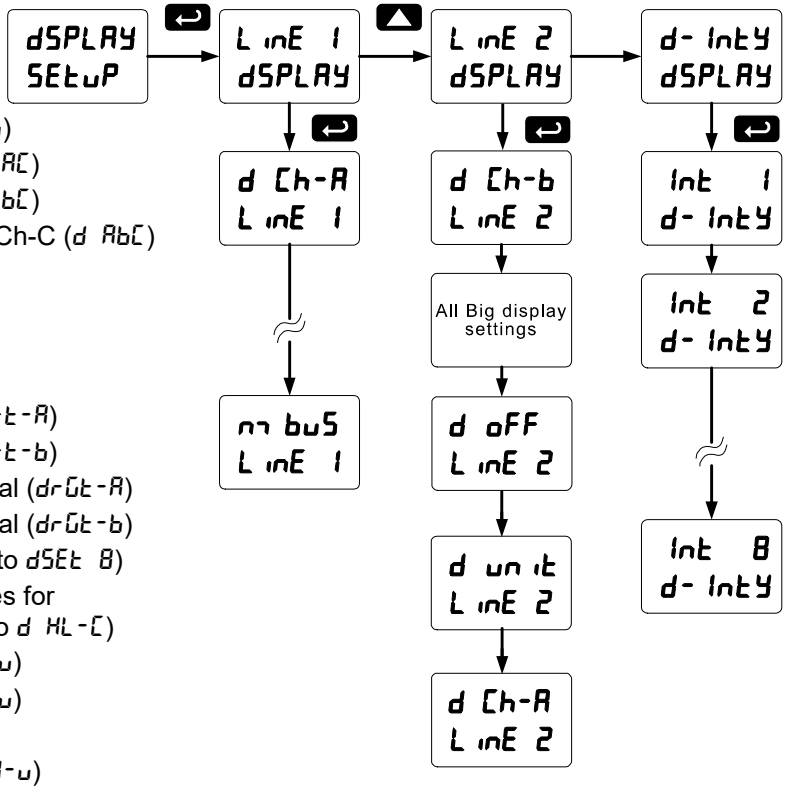


Password Protected and Non-Resettable Total

The total and grand total can be password-protected to prevent unauthorized resets. The grand total can be programmed as a non-resettable total, see page 48 for details.

Setting the Display Parameter & Intensity (dSPLAY)

The main display (L inE 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 (1-8) (dSEt 1 to dSEt 8)
17. Max, min, and max & min values for Ch-A, Ch-B, or Ch-C (d H i-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 and total B (d tAbC).
    Notes: The sum of total A and B for t ABC is independent of channel C programming. Channel C may be used normally by a different display selection even when d tAbC is selected for one of the two displays.
25. Modbus input (no buS)

The small display (L inE 2) can be programmed to display:

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

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

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

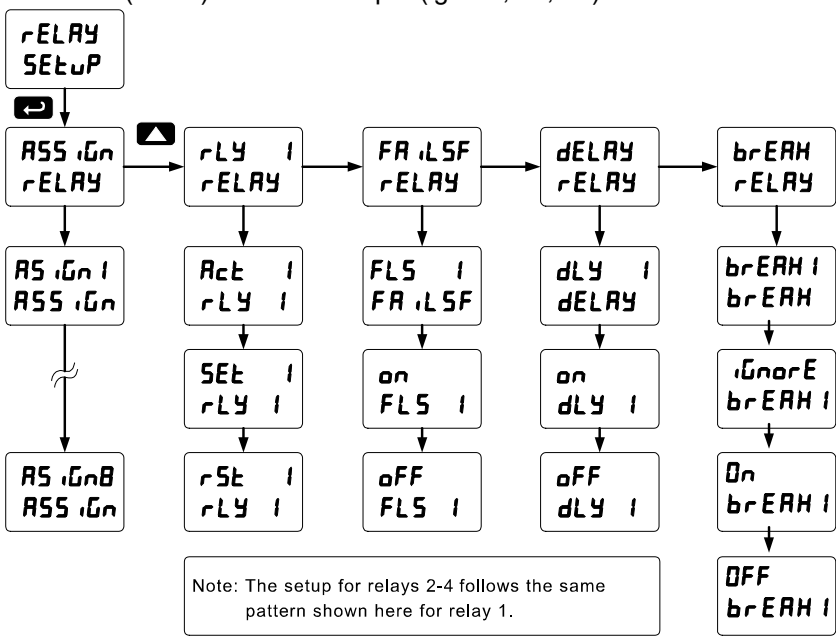
The displays can be set up to read channels A, B, or C, toggle between A & B, B & C, A & C, A & B & C, toggle between channels A, B, or C & units, the max/min of any of the channels, including the math channel (C), set points, gross (without tare) or net (with tare) & gross values of channel A or B, or the Modbus input. In addition to the parameters available on the Upper display, the Lower display can display Engineering units or it could be turned off.

Setting the Relay Operation (rELAY)

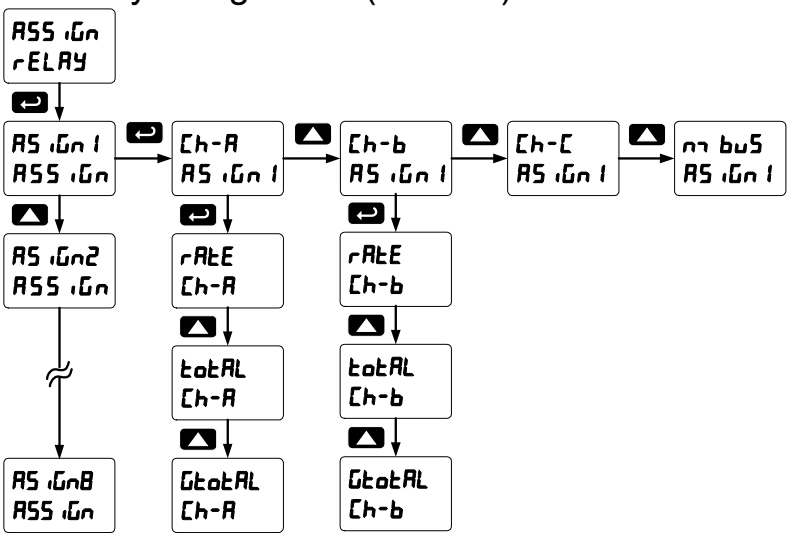
This menu is used to set up the operation of the relays.

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

1. Relay assignment
   a. Channel A
   b. Channel B
   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)
7. Relay action for loss (break) of 4-20 mA input (ignore, on, off)



Setting the Relay Assignment (ASS iGn)

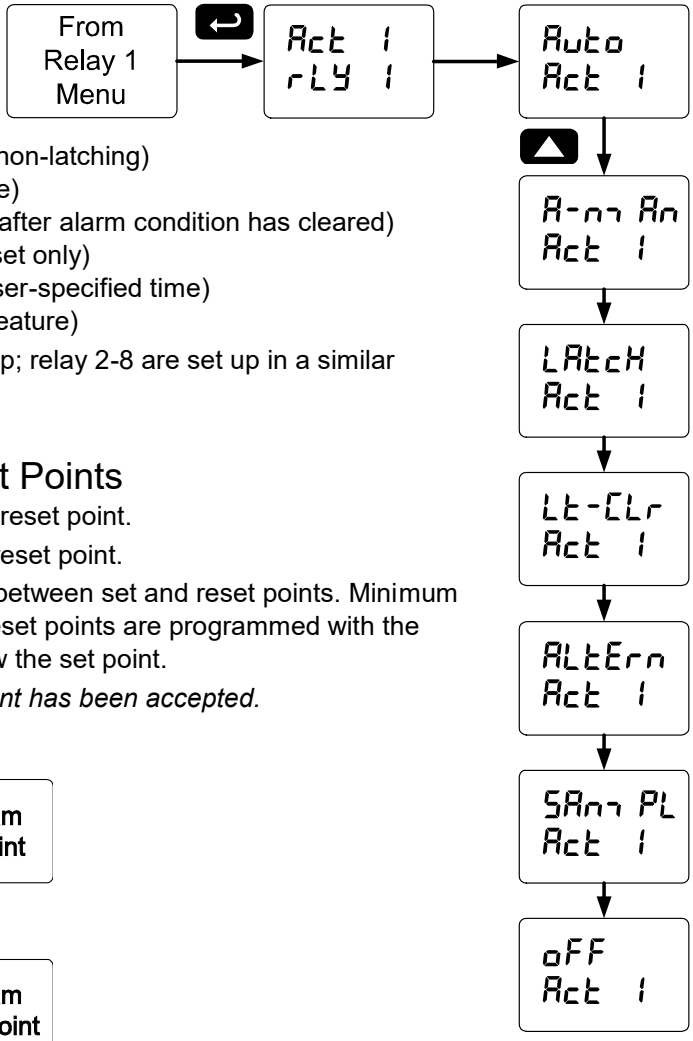


Setting the Relay Action

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

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 2-8 are set up in a similar fashion.



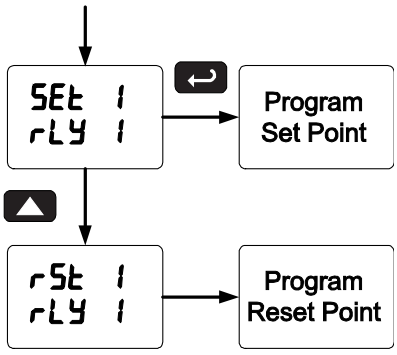
Programming Set and Reset Points

High alarm indication: program set point above reset point.

Low alarm indication: program set point below reset point.

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

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



Setting Fail-Safe Operation

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

Programming Time Delay

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

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

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

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

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

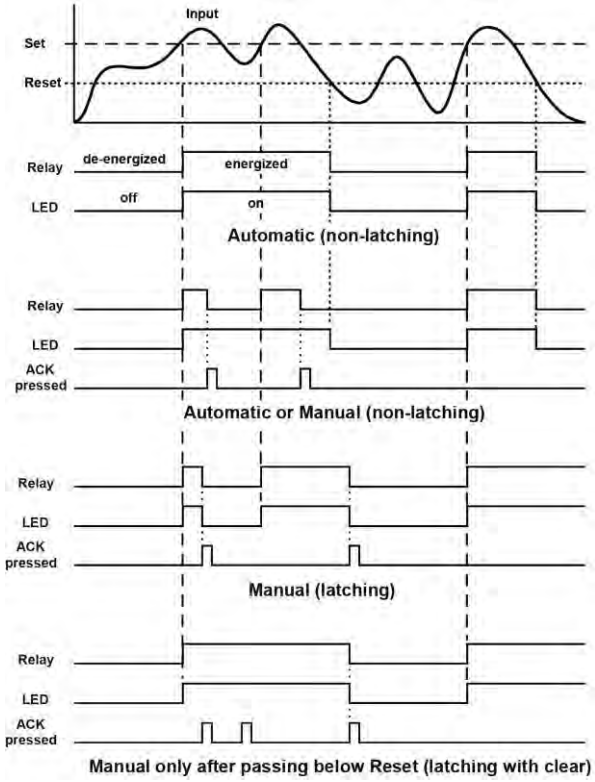
1. Turn *On* (Go to alarm condition)
2. Turn *Off* (Go to non-alarm condition)
3. Ignore (Processed as a low signal condition)

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

Relay and Alarm Operation Diagrams

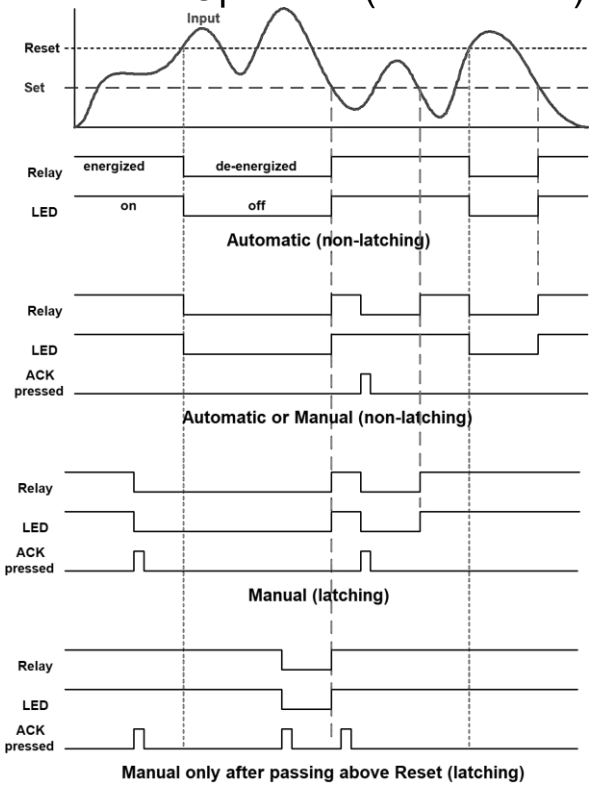
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)



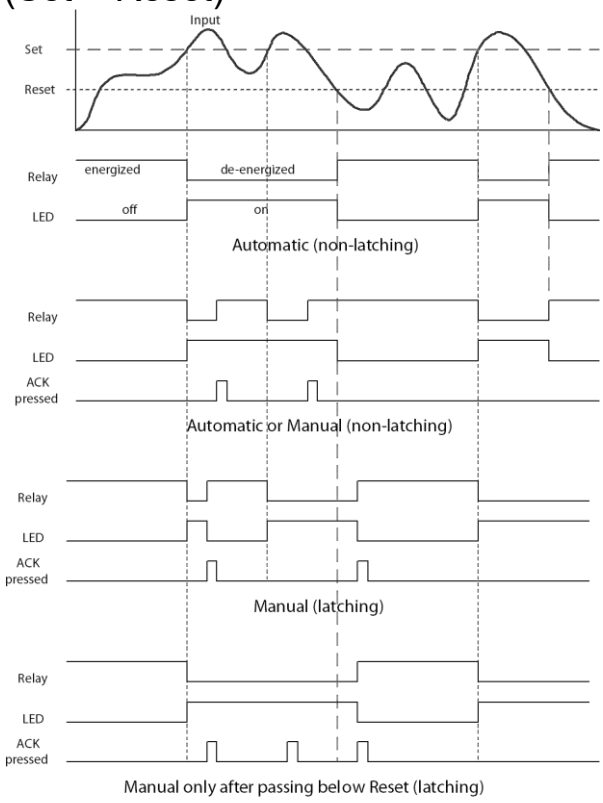
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

Low Alarm Operation (Set < Reset)



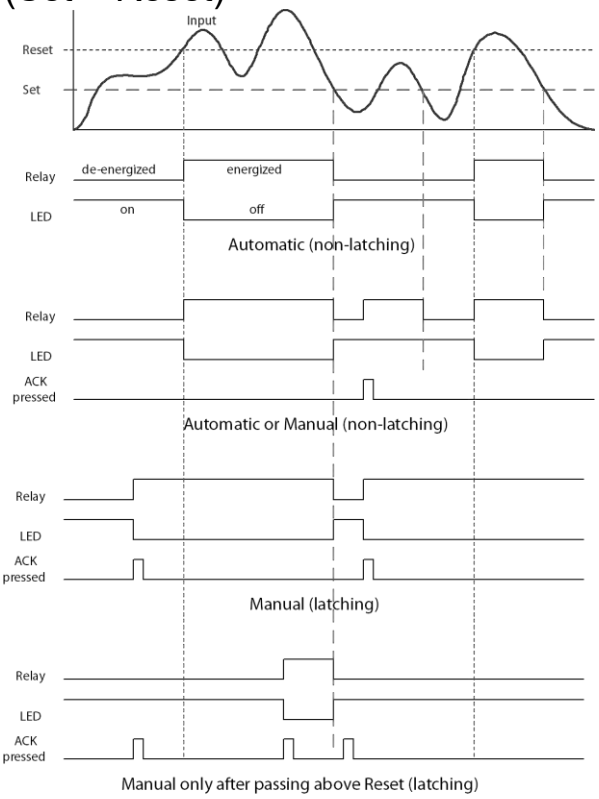
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point and then go below it.

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



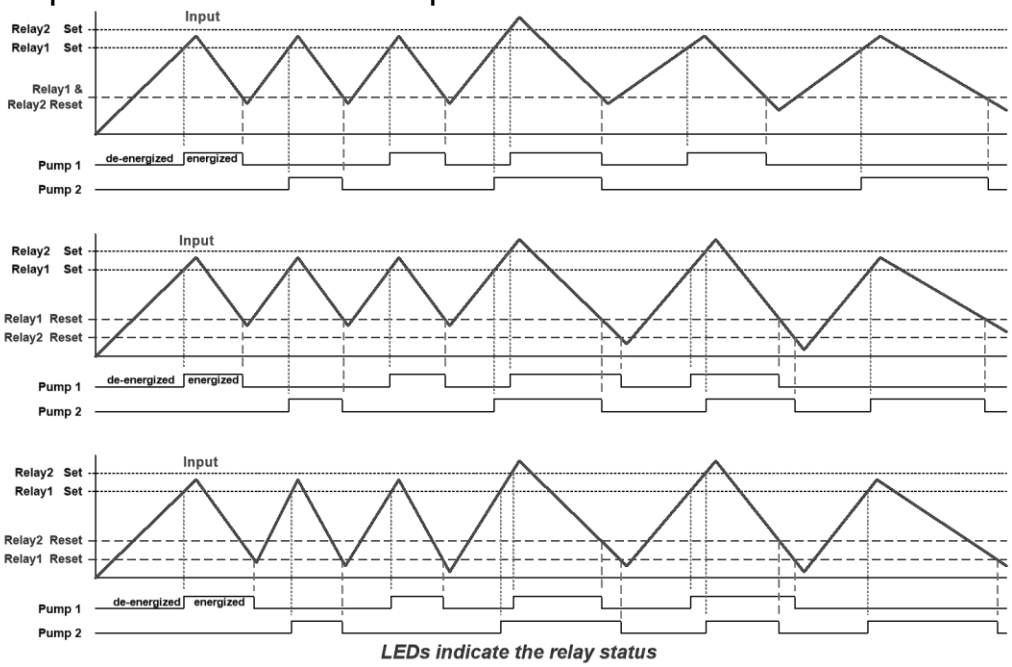
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

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



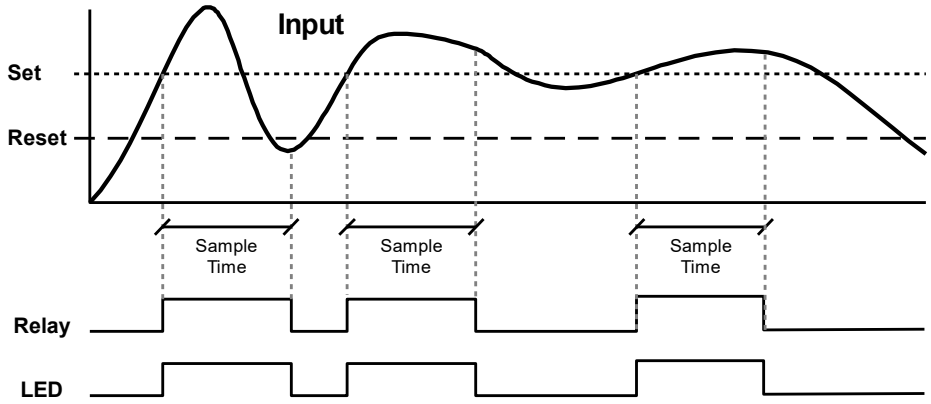
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

Pump Alternation Control Operation



LEDs indicate the relay status

Relay Sampling Operation

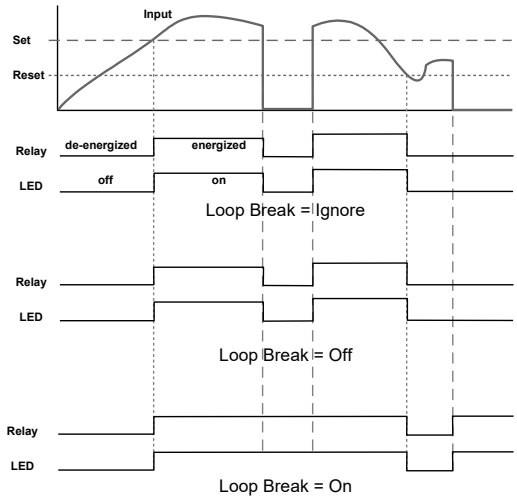


When the signal crosses the set point, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the set point is crossed, going up for high alarms and going down for low alarms.

The sample time can be programmed between 0.1 and 5999.9 seconds.

Signal Loss or Loop Break Relay Operation

The following graph shows the loop break relay operation for a high alarm relay.

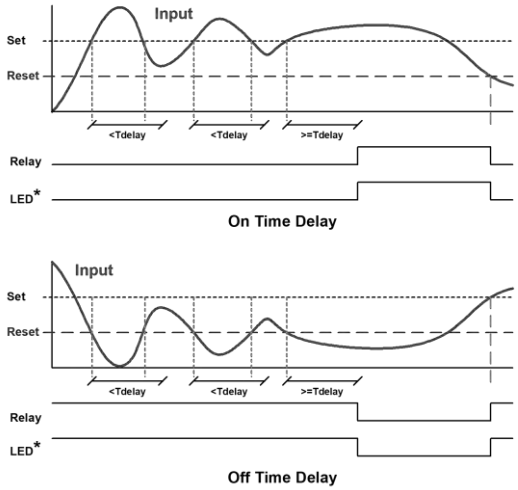


When the meter detects a break in the 4-20 mA loop, the relay will go to one of the following selected actions:

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

Time Delay Operation

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



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

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

Relay Operation Details

Overview

The relay capabilities of the meter expand its usefulness beyond simple indication to provide users with alarm and control functions. These capabilities include front panel alarm status LEDs as well as either 2 or 4 internal relays. Typical applications include high or low temperature, level, pressure or flow alarms, control applications such as simple on/off pump control, and pump alternation control for up to 8 pumps. There are four basic ways the relays can be used:

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

Relays Auto Initialization

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

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

Fail-Safe Operation

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

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

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

Front Panel LEDs

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

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

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

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

For latching relays, the alarm LEDs reflect 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.

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

Relay terminology for following tables

Terminology	Relay Condition
On	Alarm (Tripped)
Off	Normal (Reset)
Ack	Acknowledged

Warning!

In latching relay mode, latched relays will reset (unlatch) when power is cycled.

Non-Latching Relay (AUto)

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

Automatic reset only

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

Non-Latching Relay (A-mn An)

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

The next time an alarm occurs, the operator acknowledges the alarm manually while the alarm condition still exists. This causes the relay to reset, but the LED stays on until the meter returns to the normal condition.

Automatic + manual reset at any time

Condition	LED	Relay
Normal	Off	Off
Alarm	On	On
Normal	Off	Off
Next Alarm	On	On
Ack	On	Off
Normal	Off	Off

Latching Relay (LAtcH)

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

Manual reset any time

Condition	LED	Relay
Normal	Off	Off
Alarm	On	On
Ack	Off	Off

Latching Relay (Lt-CLr)

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

Manual reset only after alarm condition has cleared

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

Acknowledging Relays

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

1. Via the programmable front panel function keys F1-F3 (Default: F3 assigned to ACK).
2. Remotely via a normally open pushbutton wired across one of the digital inputs and the +5 V terminals on the digital I/O terminal, or using the F4 digital input, which is triggered with a contact closure to COM, or with an active low signal (see page 19).

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

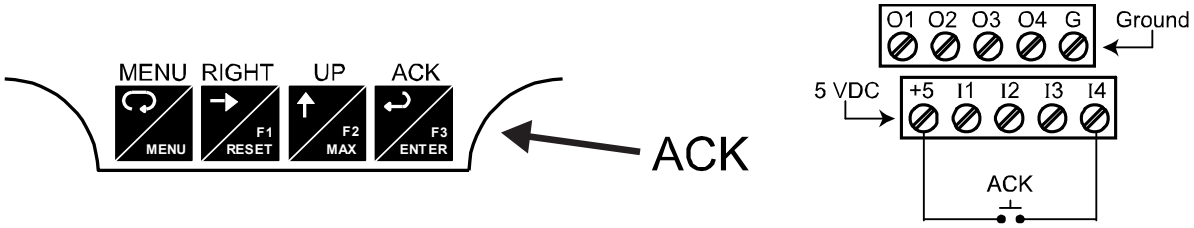


Figure 23. Acknowledge Relays w/Function Key or Digital Input

Pump Alternation Control Applications (ALtErn)

For pump control applications where two or more similar pumps are used to control the level of a tank or a well, it is desirable to have all the pumps operate alternately. This prevents excessive wear and overheating of one pump over the lack of use of the other pumps.

Up to 8 relays can be set up to alternate every time an on/off pump cycle is completed. The set points and reset points can be programmed, so that the first pump on is the first pump off.

Application #1: Pump Alternation Using Relays 1 & 2

1. Relays 1 and 2 are set up for pump alternation.
2. Relays 3 and 4 are set up for low and high alarm indication.

Set and Reset Point Programming

Relay	Set Point	Reset Point	Function
1	30.000	10.000	Controls pump #1
2	35.000	5.000	Controls pump #2
3	4.000	9.000	Controls low alarm
4	40.000	29.000	Controls high alarm

Pump Alternation Operation

1. Pump #1 turns on when level reaches 30.000, when level drops below 10.000, pump #1 turns off.
2. The next time level reaches 30.000, pump #2 turns on, when level drops below 10.000, pump #2 turns off.
3. If the level doesn't reach 35.000, pump #1 and pump #2 will be operating alternately.
4. If pump #1 cannot keep the level below 35.000, pump #2 will turn on at 35.000, then as the level drops to10.000, pump #1 turns off, pump #2 is still running and shuts off below 5.000.
5. Notice that with the set and reset points of pump #2 outside the range of pump #1, the first pump on is the first pump to go off. This is true for up to 8 alternating pumps, if setup accordingly.
6. Relay #3 will go into alarm if the level drops below 4.000 and relay #4 will go into alarm if the level exceeds 40.000.
7. Adding the 4 external relays, expansion module allows using the 4 SPDT internal relays for pump alternation and the 4 SPST external relays for high, high-high, low, and low-low alarm indication.

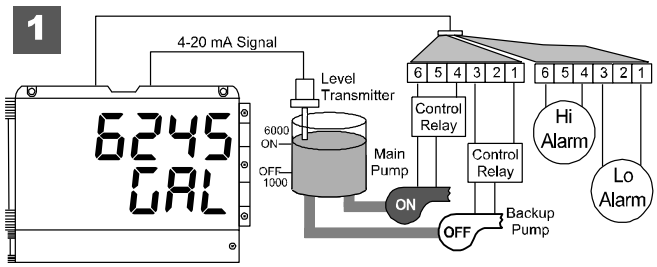
Application #2: Pump Alternation Using Relays 3 & 4

1. Relays 1 and 2 are set up for low and high alarm indication.
2. Relays 3 and 4 are set up for pump alternation.

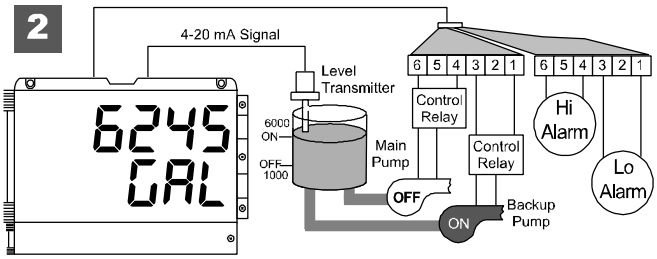
Set and Reset Point Programming			
Relay	**Set Point**	**Reset Point**	**Function**
1	495	750	Controls low alarm
2	7500	6900	Controls high alarm
3	7000	900	Controls backup pump
4	6000	1000	Controls main pump

The following graphics provide a visual representation of a typical pump alternation application with high and low alarm monitoring:

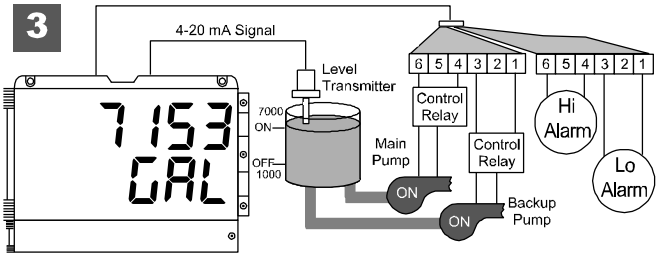
1. Relay #4 turns the main pump on at 6000 gallons and turns it off at 1000 gallons.



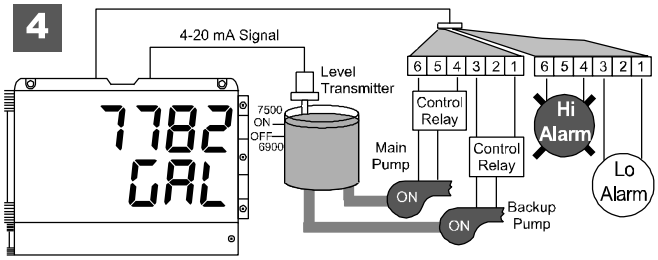
2. With the Pump Alternation feature activated, the next time the level reaches 6000 gallons, relay #3 transfers and starts the backup pump.



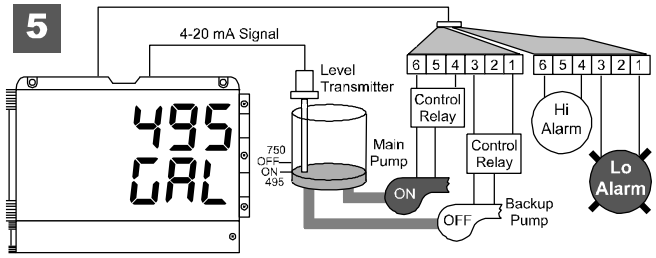
3. If the backup pump is not able to keep up, and the level reaches 7000 gallons, relay #4 transfers and starts the main pump as well.



4. Relay #2 trips the High Level Alarm at 7500 gallons and resets at 6900 gallons.



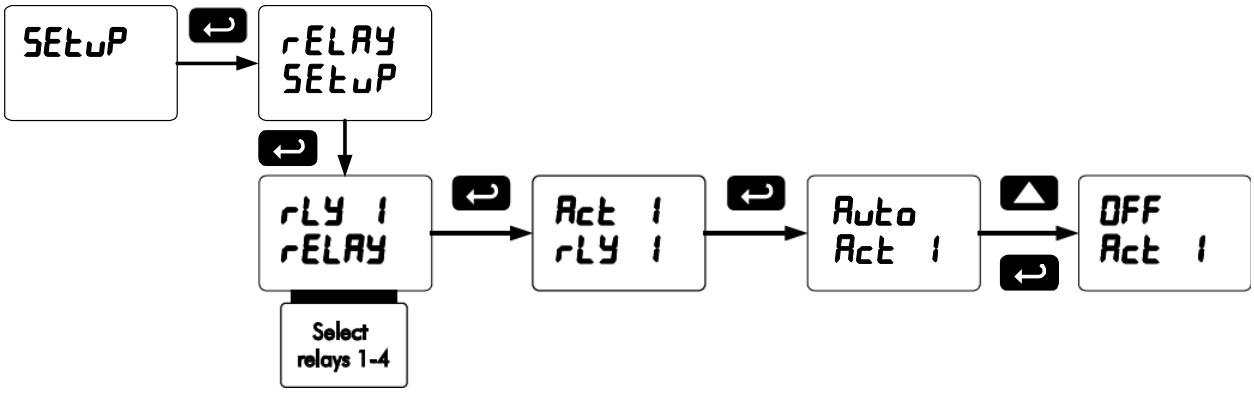
5. Relay #1 trips the Low Level Alarm at 495 gallons and resets at 750 gallons.



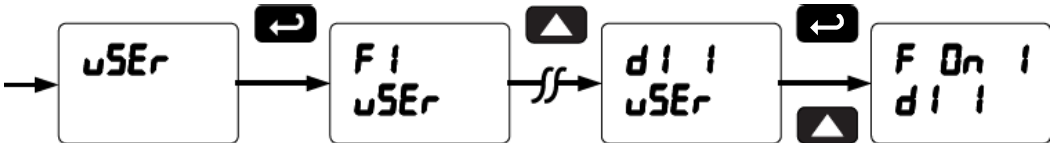
Setting up the Interlock Relay (Force On) Feature

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

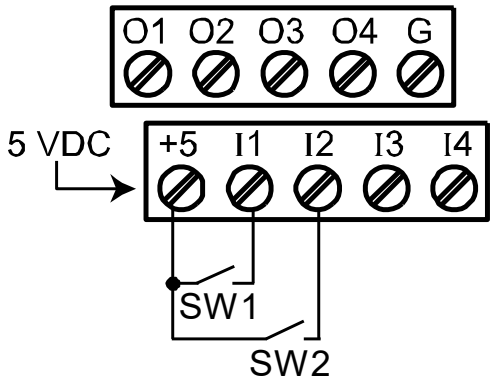
1. Access the *Setup* – *Relay* – *Action* menu and set the action to off.



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

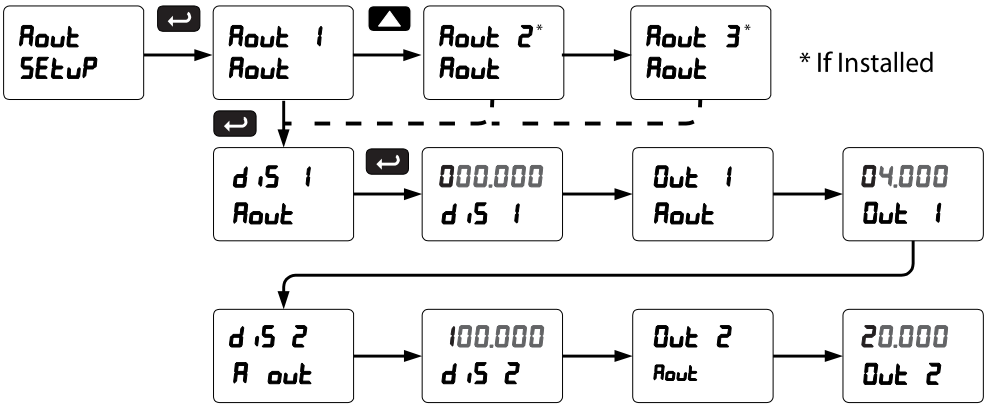
Note: If multiple digital inputs are assigned to the same relay, then the corresponding logic is (AND) – i.e. both switches must be closed to trip the relay.

Scaling the 4-20 mA Analog Output (Aout)

The 4-20 mA analog outputs can be scaled to provide a 4-20 mA signal for any display range selected. To select the channel and source assignments the analog outputs are assigned to, see *Analog Output Source* on page *57*.

No equipment is needed to scale the analog outputs; 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.



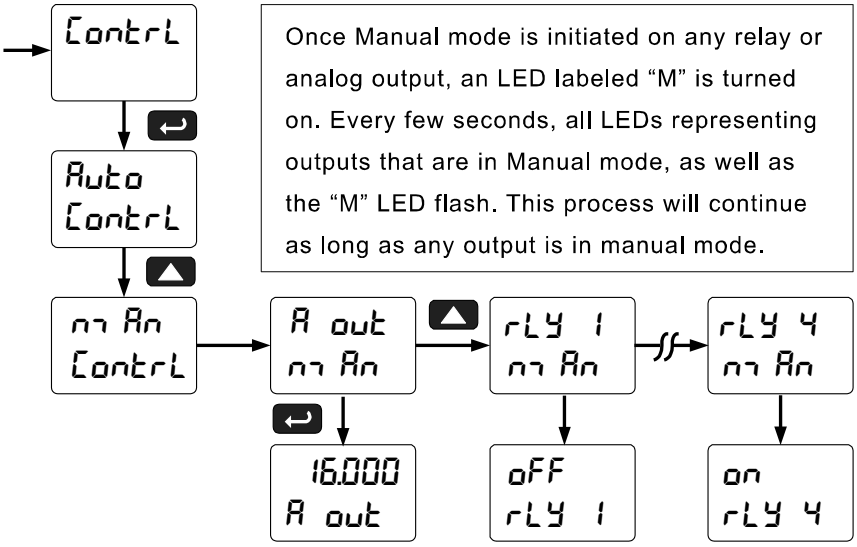
For instructions on how to program numeric values see Setting Numeric Values, page 28.

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).

Control Menu (ContrL)

The *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)

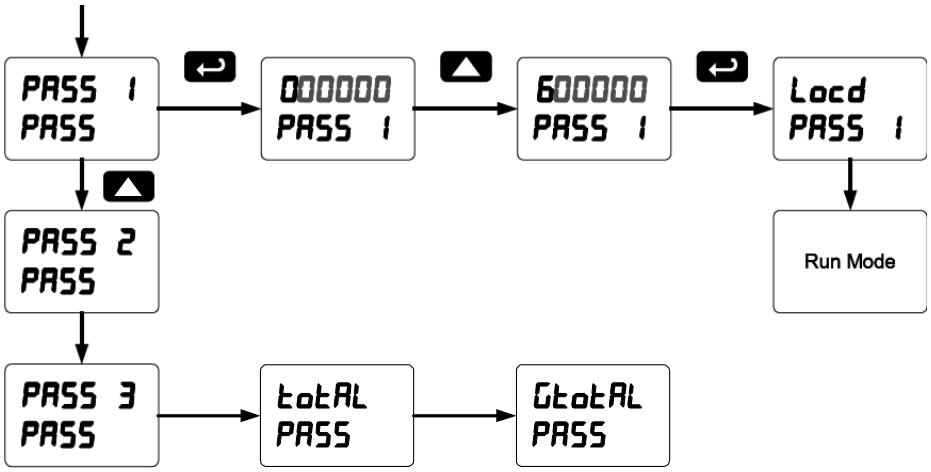
The *Password* menu is used for programming three levels of security to prevent unauthorized changes to the programmed parameter settings.

Pass 1: Allows use of function keys and digital inputs
Pass 2: Allows use of function keys, digital inputs and editing set/reset points
Pass 3: Restricts all programming, function keys, and digital inputs
Total: Prevents resetting the total manually
Gtotal: Prevents resetting the grand total manually.

Protecting or Locking the Meter

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

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



Total Reset Password & Non-Resettable Total

The total and the grand total can be password-protected to prevent unauthorized total resets.
The grand total can be programmed as a non-resettable total by entering the password “050873”.

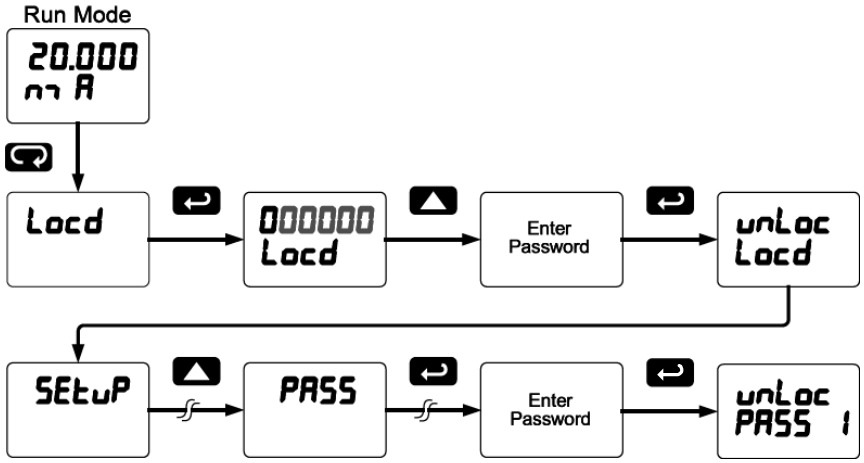
Caution! *Once the Grand Total has been programmed as “non-resettable” the feature **cannot** be disabled.*

Making Changes to a Password Protected Meter

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

Disabling Password Protection

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



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

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

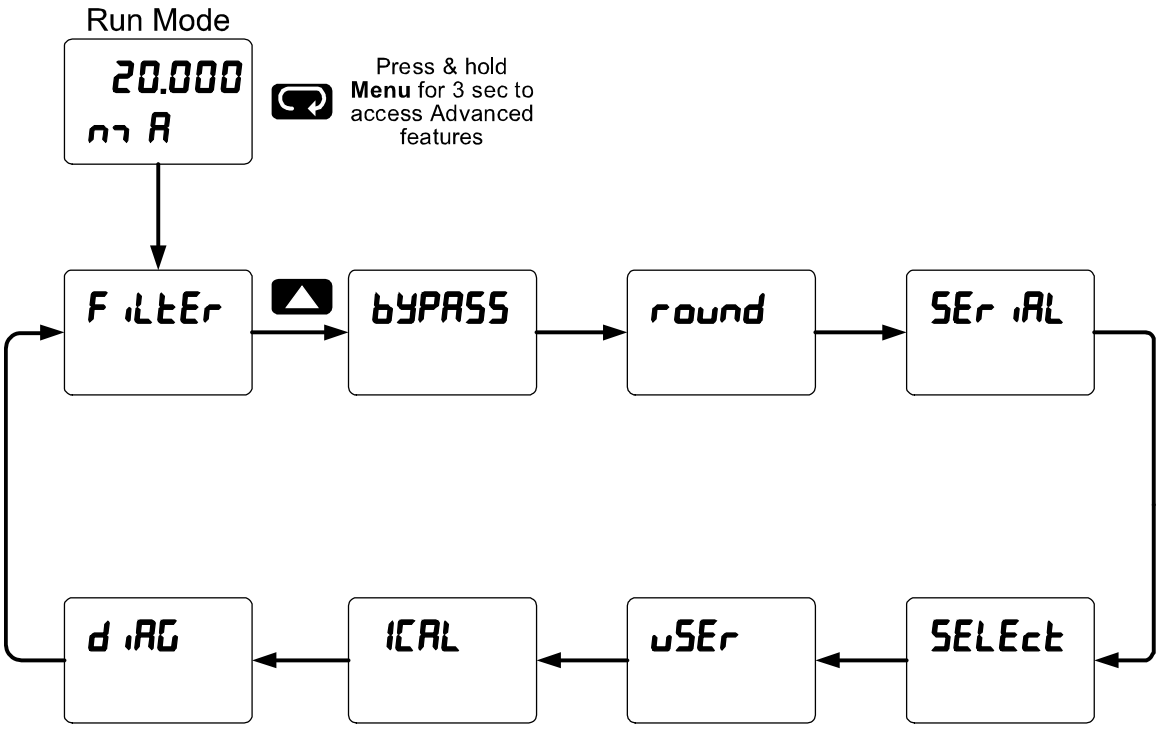
Did you forget the password?

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

Advanced Features Menu

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

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



Advanced Features Menu & Display Messages

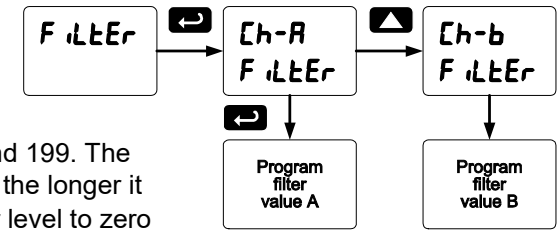
The following table shows the functions and messages of the *Advanced Features* menu in the order they appear in the menu.

Display	Parameter	Action/Setting
FiLtEr	*Filter*	Set noise filter value
Ch-A	*Channel A*	Set filter value for channel A
Ch-b	*Channel B*	Set filter value for channel B
bYPASS	*Bypass*	Set filter bypass value
Ch-A	*Channel A*	Set filter bypass value for channel A
Ch-b	*Channel B*	Set filter bypass value for channel B
round	*Round*	Set the rounding value for display variables
SEr iAL	*Serial*	Set serial communication parameters
SLAVE Id	*Slave ID*	Set slave ID or meter address
bAud	*Baud rate*	Select baud rate
tr dLY	*Transmit delay*	Set transmit delay for serial communication
PAr tY	*Parity*	Select parity: Even, Odd, or None with 1 or 2 stop bits
t-byt	*Time byte*	Set byte-to-byte timeout
SELEct	*Select*	Enter the Select menu (function, cutoff, out)
Functn	*Signal input conditioning*	Select linear, square root, programmable exponent, or round horizontal tank function
Ch-A	*Channel A*	Select menu for channel A
Ch-b	*Channel B*	Select menu for channel B

Display	Parameter	Action/Setting
LinEAr	*Linear*	Set meter for linear function and select number of linearization points
no PtS	*Number of points*	Set the number of linearization points (default: 2)
SqurE	*Square root*	Set meter for square root extraction
Prog E	*Programmable exponent*	Set meter for programmable exponent and enter exponent value
nrAth	*Math*	Enter the setup menu for channel C math functions
Sunr	*Sum*	Channel C = (A+B+P)*F
diF	*Difference*	C = (A-B+P)*F
diFAbS	*Absolute difference*	C = ((Absolute value of (A-B))+P)*F
AUG	*Average*	C = (((A+B)/2)+P)*F
nruLti	*Multiplication*	C = ((A*B)+P)*F
diUidE	*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
drAuJ	*Draw*	C = ((A/B)-1)*F
uJAUG	*Weighted avg.*	C = ((B-A)*F)+A
rAtio	*Ratio*	C = (A/B)*F
rAtio2	*Ratio 2*	C = (((B-A)/A)+P)*F
ConcEn	*Concentration*	C = (A/(A+B))*F
Sunr t	*Sum total*	C = (tA+tB+P)*F
SunrGt	*Sum grand total*	C = (GtA+GtB+P)*F
diF t	*Difference of total*	C = (tA-tB+P)*F
diF Gt	*Diff. of grand total*	C = (GtA-GtB+P)*F
trAtio	*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*	Constant used in channel C math
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	*Grand total count*	Set direction of grand total count
uP	*Count up*	Count up
doUJn	*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 1 (*1-3) parameters

Display	Parameter	Action/Setting
SourcE	*Source*	Select source for the 4-20 mA output
brEAK	*Break*	Set input break condition operation
CAL ib	*Calibrate*	Calibrate 4-20 mA output (internal reference source used for scaling the output)
4 mA	*4 mA output*	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
20 mA	*20 mA output*	Enter mA output value read by milliamp meter with at least 0.001 mA resolution
uSEr	*User I/O*	Assign function keys and digital I/O
F1	*F1 function key*	Assign F1 function key
F2	*F2 function key*	Assign F2 function key
F3	*F3 function key*	Assign F3 function key
F4	*F4 function*	Assign F4 function (digital input)
di 1	*Digital input 1*	Assign digital input 1 – 4, if expansion modules are connected
dO 1	*Digital output 1*	Assign digital output 1 – 4, if expansion modules are connected
iCAL	*Internal source calibration*	Enter internal source calibration (used for scaling the meter without a signal source)
Ch-A	*Channel A*	Perform calibration on channel A
Ch-b	*Channel B*	Perform calibration on channel B
C CAL	*Current calibration*	Calibrate 4-20 mA current input (internal reference source used for scaling the input)
C Lo	*Current low*	Calibrate low current input (e.g. 4 mA)
C Hi	*Current high*	Calibrate high current input (e.g. 20 mA)
U CAL	*Voltage calibration*	Calibrate voltage input
U Lo	*Voltage low*	Calibrate low voltage input (e.g. 0 V)
U Hi	*Voltage high*	Calibrate high voltage input (e.g. 10 V)
diAG	*Diagnostics*	Display parameter settings
LEd t	*LED test*	Test all LEDs
InFo	*Information*	Display software and S/N information
ErASE	*Erase*	Delete the MeterView Pro installation files from the meter

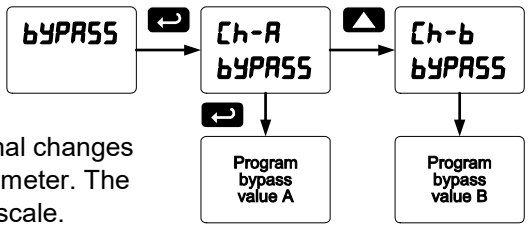
Noise Filter (FiLtEr)



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

Noise Filter Bypass (bYPASS)

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



Rounding Feature (round)

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

Rounding causes the display to round to the nearest value according the rounding selected. See examples below:

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 iAL)

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

The meter may be connected to a PC for initial configuration via the onboard micro USB connection. For ongoing digital communications with a computer or other data terminal equipment, an RS-232, or RS-485 option is required; see *Ordering Information* on page 5 for details.

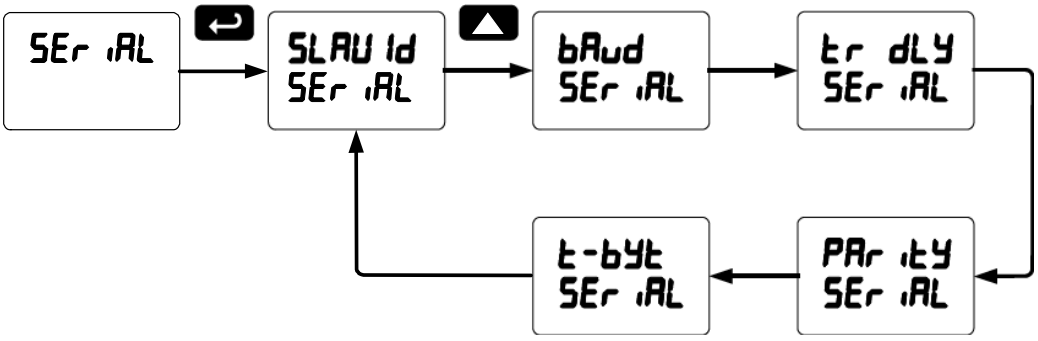
Warning!

Do not connect any equipment other than Precision Digital's expansion modules, cables, or meters to the RJ45 M-LINK connector. Otherwise damage will occur to the equipment and the meter.

Do not disconnect the RJ45 connector located to the left of the power terminal block. Doing so will disable the onboard digital I/O, RS-485 serial communications, and M-Link functionality.

Note: More detailed instructions are provided with each optional serial communications adapter.

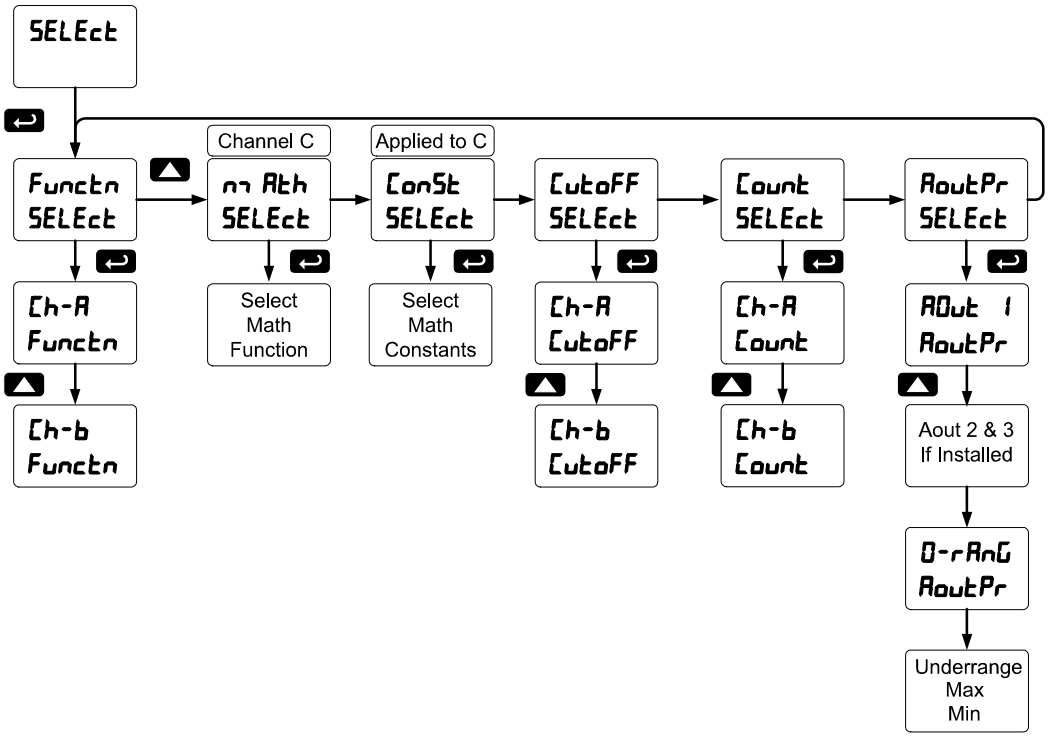
Note: Refer to the Modbus Register Tables located at www.predig.com for details.



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

Select Menu (SELECt)

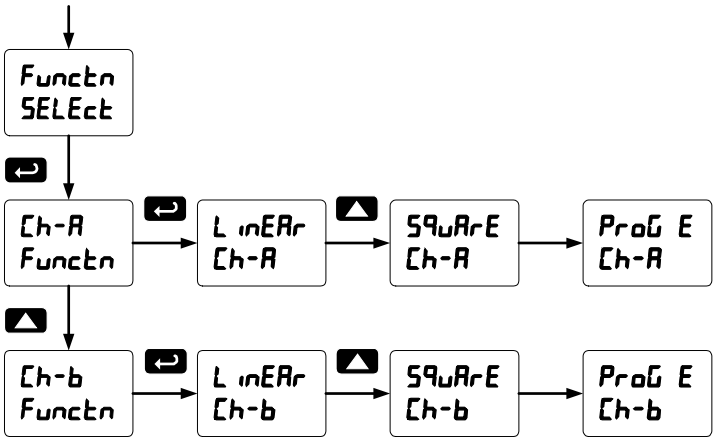
The *Select* menu is used to select the signal input conditioning function applied to the inputs (linear, square root, or programmable exponent), math function for A & B, constants, low-flow cutoff, total count direction (up or down from a preset amount), and analog output programming. Multi-point linearization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



Signal Input Conditioning (Functn)

The *Function* menu is used to select the input-to-output transfer function applied to the input signal: linear, square root, programmable exponent, or round horizontal tank volume calculation. Multi-point linearization is part of the linear function selection.

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



Square Root Linearization (SQuArE)

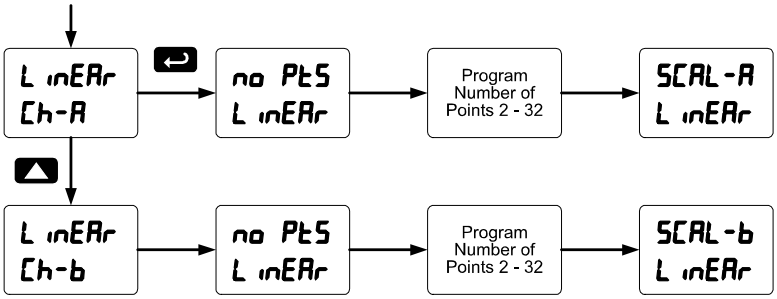
The square root function is used to calculate flow measured with a differential pressure transmitter. The flow rate is proportional to the square root of the differential pressure. Scale the meter so that the low input signal (e.g. 4 mA) is equal to zero flow and the high input signal (e.g. 20 mA) is equal to the maximum flow.

Programmable Exponent Linearization (PrOG E)

The programmable exponent function is used to calculate open-channel flow measured with a level transmitter in weirs and flumes. The flow rate is proportional to the head height. Scale the meter so that the low input signal (e.g. 4 mA) is equal to zero flow and the high input signal (e.g. 20 mA) is equal to the maximum flow. This method works well for all weirs and flumes that have a simple exponent in the flow calculation formula. For weirs and flumes with complex exponents it is necessary to use a strapping table and the 32-point linearization of the meter.

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 meter completes the scaling of the input and display values.

Math Function (mAtH)

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. The following math functions are available.]

SUm	Sum	Channel 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
mULt i	*Multiplication*	C = ((A*B)+P)*F
d iV idE	*Divide*	C = ((A/B)+P)*F
H i-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
UAVG	*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
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

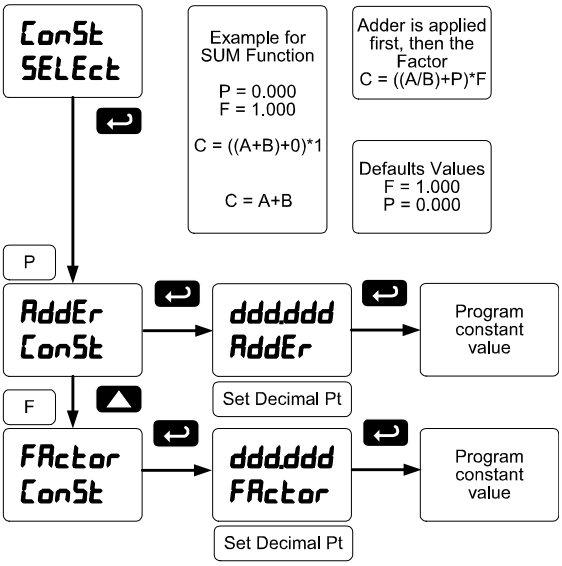
Math Constants (ConSt)

The *Math Constants* menu is used to set the constants used in channel C math. The math functions include input channel A and B, as well as the 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 55 details the math functions that may be selected in the *Math Function* menu.



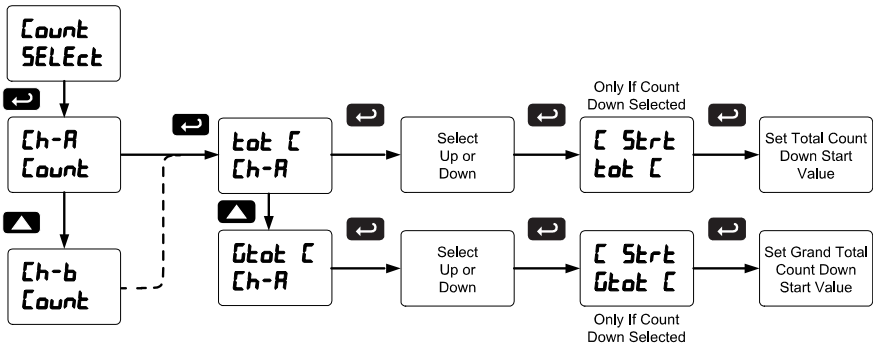
Low-Flow Cutoff (CutoFF)

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

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

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.



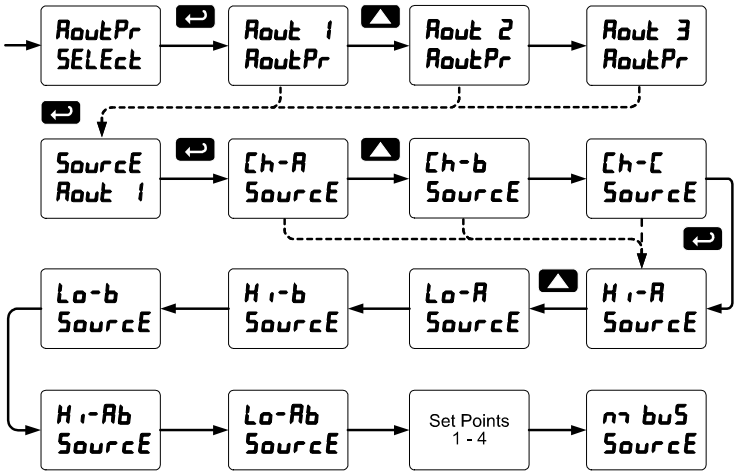
Analog Output Programming (AoutPr)

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

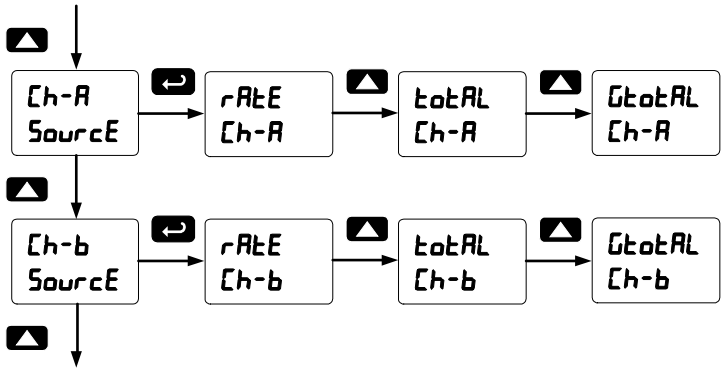
1. Source: Source for generating the 4-20 mA output (e.g. PV)
2. Overrange: Analog output value with display in overrange condition
3. Underrange: Analog output value with display in underrange condition
4. Break: Analog output value when loop break is detected
5. Max: Maximum analog output value allowed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

Analog Output Source

The analog output source can be based on either of the input channels (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), relay set points, or the Modbus input.



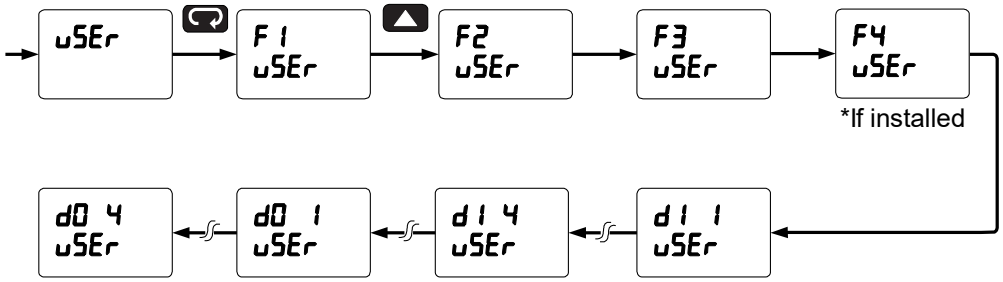
To base an analog output on the rate, total, or grand total of channels A or B, select the channel in the *Analog Output Source* menu. Then select the rate, total, or grand total as the source reference for the output, and program the output scale.



Programmable Function Keys User Menu (u5Er)

The *User* menu allows the user to assign the front panel function keys F1, F2, and F3, the digital input F4 (a digital input located on the signal input connector), and up to eight additional digital inputs to access most of the menus or to activate certain functions immediately (e.g. reset max & min, hold relay states, etc.). This allows the meter to be greatly customized for use in specialized applications.

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



Function Keys & Digital I/O Available Settings

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 8)
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
0 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.
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
LitHLC	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 expansion module to achieve interlock functionality. See page 46 for details about interlock relays.
Contrl	Directly access the control menu
diSAbL	Disable the selected function key or digital I/O
AcK	Acknowledge all active relays that are in a manual operation mode such as auto-manual or latching
rESEt	Directly access the reset menu
rSt t	Reset 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
mnEnu	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)
ALm1 1*	Provide indication when alarm 1 (*through 8) has been triggered (digital outputs only)

* If math functions are displayed, the math function indicator LED “C” will flash when either A or B channel is using a tare value (net value).

Internal Source Calibration (iCAL)

The meter is factory calibrated prior to shipment to read in milliamps and volts depending on the input selection. The calibration equipment is certified to NIST standards.

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

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

Notes:

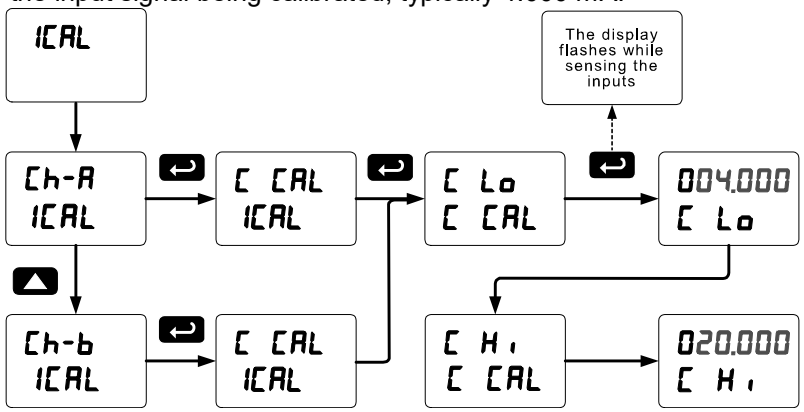
1. *If meter is in operation and it is intended to accept only one input type (e.g. 4-20 mA), recalibration of other input is not necessary.*
2. *Allow the meter to warm up for at least 15 minutes before performing the internal source calibration procedure.*

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

1. Press and hold the Menu button for three seconds to access the advanced features of the meter.
2. Press the Up arrow button to scroll to the *Internal calibration* menu (iCAL) and press Enter.
3. Select channel A (Ch-A) or channel B (Ch-b) and press enter.
4. The meter displays either current calibration (C CAL) or voltage calibration (U CAL), according to the input setup. Press Enter to start the calibration process.

Example of Internal Calibration for current input:

5. The meter displays *low* input current message (C Lo). Apply the low input signal and press Enter. The display flashes for a moment while the meter is accepting the low input signal.
6. After the display stops flashing, a number is displayed with the leftmost digit brighter than the rest. The bright digit is the active digit that can be changed by pressing the Up arrow button. Press the Right arrow button to move to the next digit.
7. Set the display value to correspond to the input signal being calibrated, typically 4.000 mA.
8. The display moves to the *high* input calibration (C Hi). Apply the high input signal and press Enter.
9. Set the display for the high input calibration, in the same way as it was set for the low input calibration, typically 20.000 mA.



The graphic shows the calibration of the current input. The voltage input is calibrated in a similar way.

Tips:

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

Error Message (Error)

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

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

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

Minimum Input Span

Input Range	Input 1 & Input 2 Span
4-20 mA	0.15 mA
±10 VDC	0.01 VDC

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

Meter Operation

The meter is capable of accepting two input channels (A and B) of either current (0-20 mA, 4-20 mA) or voltage signals (0-5 V, 1-5 V, 0-10 V, ± 10 V) and displaying these signals in engineering units from -99999 to 999999 (*e.g.* a 4-20 mA signal could be displayed as -50.000 to 50.000). A totalizer can be programmed to count the scaled engineering units, interpreting it as count per second, minute, hour, or day. The scaled rate and total for each channel can be displayed on the top or bottom displays.

A math function channel (C) is available to perform operations on channel A and B, with adder and factor constants, and display the results. Engineering units or tags may be displayed with these three channels.

The dual-line display can be customized by the user. Typically, the upper display is used to display the math channel C, while the lower display is used to alternate between displaying input channels A and B.

Additionally, the meter can be set up to display any input or math channel on the upper display and a unit or tag on the lower display. The relays and analog output can be programmed to operate based on any input or math channel.

Button Operation

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

Function Key Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu.

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

Digital Input Operation

Five (5) digital inputs, F4-F8, come standard on the meter. These digital inputs are programmed identically to function keys F1, F2, and F3. The inputs are triggered with a contact closure to +5 (COM in the case of F4, see Digital I/O Connections on page 19 for details), or with an active low signal. During operation, digital inputs operate according to the way they are programmed in the *Advanced Features – User* menu.

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 reading by pressing the Up arrow/F2 button and to use the Right arrow/F1 button to access the *Reset* menu.

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

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

Troubleshooting

Due to the many features and functions of the meter, it's possible that the setup of the meter does not agree with what an operator expects to see. If the meter is not working as expected, refer to the *Diagnostics* menu and recommendations below.

Diagnostics Menu (d iAG)

The *Diagnostics* menu is located in the *Advanced Features* menu, to access *Diagnostics* menu see *Advanced Features Menu*, page 50.

It provides an easy way to view the programmed parameter settings for troubleshooting purposes. Press the Enter button to view the settings and the Menu button to exit at any time.

For a description of the diagnostic messages, *see Advanced Features Menu* & Display Messages, page 50.

Determining Software Version

To determine the software version of a meter:

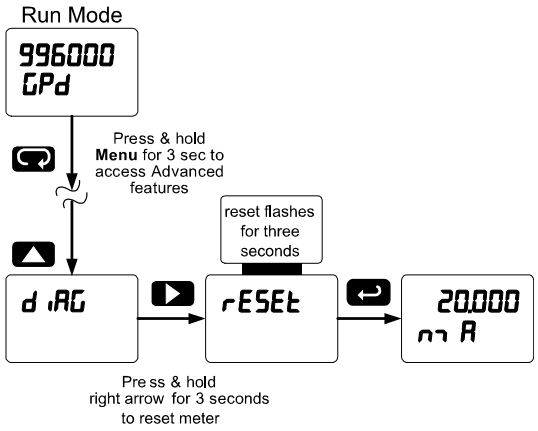
1. Go to the *Diagnostics* menu (d iAG) and press Enter button.
2. Press Up arrow button and scroll to Information menu (InFo).
3. Press Enter to access the software number (SFt) and version (UEr) information. Write down the information as it is displayed. Continue pressing Enter until all the information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

Reset Meter to Factory Defaults

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

Instructions to load factory defaults:

3. Enter the *Advanced Features* menu. See *Advanced Features Menu*, page 50.
4. Press Up arrow to go to *Diagnostics* menu
5. Press and hold Right arrow for three seconds, press Enter when display flashes rESEt.
   Note: If Enter is not pressed within three seconds, the display returns to the *Diagnostics* menu.
6. The meter goes through an initialization sequence (similar as on power-up), and loads the factory default settings.



Note: The dual-scale selection for some level applications (d-SCAL) is not reset to the single scale factory default. This can be changed using the Setup – Input menu.

Factory Defaults & User Settings

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

Parameter	Display	Default Setting
Input type	inPut	
Input type, channel A	Ch-A	4-20 mA
Input type, channel B	Ch-b	4-20 mA
Total, channel A	Ch-A	Yes
Total, channel B	Ch-b	Yes
Units	un iES	
Rate unit, channel A	Ch-A	mA-A
Rate unit, channel B	Ch-b	mA-b
Unit, channel C	Ch-C	mA-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	3
Total, channel A	totAL	1
Grand total, channel A	GtotAL	0
Rate, channel B	rAtE	3

Parameter	Display	Default Setting
Total, channel B	totAL	1
Grand total, channel B	GtotAL	0
Channel C	Ch-C	3
Number of points	no PtS	
Number of points, ch A	Ch-A	2
Number of points, ch B	Ch-b	2
Scaling, (channel A)	ScAL A	
Input 1, channel A	inP 1	4.000 mA
Display 1, channel A	d iS 1	4.000
Input 2, channel A	inP 2	20.000 mA
Display 2, channel A	d iS 2	20.000
Scaling (channel B)	ScAL b	
Input 1, channel B	inP 1	4.000 mA
Display 1, channel B	d iS 1	4.000
Input 2, channel B	inP 2	20.000 mA
Display 2, channel B	d iS 2	20.000
Total setup	tSEtuP	
Time base, channel A	tbASE	Sec

Parameter	Display	Default Setting
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	
Big display	d Ch-A	Channel A
Little display	d Ch-b	Channel B
Display intensity	d- Int	8
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	3.000
Relay 3 reset point	rSt 3	2.500
Relay 4 assignment	Ch-A	Channel A rate
Relay 4 action	Act 4	Automatic
Relay 4 set point	SEt 4	4.000
Relay 4 reset point	rSt 4	3.500
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
Loop break relay 1 to 4	iGnorE	Ignore
Analog output	Aout	
Display 1 analog out	d iS 1	4.000
Output 1 value	Out 1	4.000 mA
Display 2 analog out	d iS 2	20.000
Output 2 value	Out 2	20.000 mA
Source analog output	SourcE	Channel A
Overrange output	O-rAnG	21.000 mA

Parameter	Display	Default Setting
Underrange output	u-rAnG	3.000 mA
Loop break output	brEAK	3.000 mA
Maximum output	mA AH	23.000 mA
Minimum output	mA in	3.000 mA
Filter	FiLtEr	
Filter, channel A	Ch-A	70
Filter, channel B	Ch-b	70
Bypass, channel A	bYPASS	0.2
Bypass, channel B	bYPASS	0.2
Round	round	1
Cutoff	CutoFF	
Cutoff value, channel A	Ch-A	0.000 (disabled)
Cutoff value, channel B	Ch-b	0.000 (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)
Math	mA Ath	
Math, channel C	SumA	Sum
Adder (constant P)	AddEr	0.000
Factor (constant F)	FActor	1.000
User	uSEr	
F1 function key	F1	Reset max & min
F2 function key	F2	Upper 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

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

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

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How to Contact Precision Digital

- For Technical Support, please
  Call: (800) 610-5239 or (508) 655-7300
  Fax: (508) 655-8990
  Email: support@predig.com

- For Sales Support or to place an order, please contact your local distributor or
  Call: (800) 343-1001 or (508) 655-7300
  Fax: (508) 655-8990
  Email: sales@predig.com

- For the latest version of this manual please visit **www.predig.com**

LIM2-6262_C
SFT065 Ver 4.010 & up
08/18