Helios PD2-6080/PD2-6081 Modbus® Scanners

Instruction Manual

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ScanView

USB Install

- Large Display NEMA 4X, IP65 Wall Mounted Modbus Scanners
- Modbus RS-485 RTU Scanner as Master, Slave, or Snooper
- Dual Analog Inputs (0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and ±10 V)
- On-Board USB & RS-485 Serial Communication Standard
- Decimal or Feet & Inches (with Eighths & Sixteenths) Display Options
- Poll and Display up to 16 Process Variables
- Add, Diff, Avg, Multi, Div, Min, Max, Weighted Avg, Ratio, Concentration, & More
- Large Dual-Line 6-Digit Display, 1.8" (46 mm) Digits Readable up to 100 Feet (30 Meters) Away
- 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Option
- Free PC-Based, On-Board, ScanView USB Programming Software
- SunBright Display Standard Feature; Great for Outdoor Applications
- Operating Temperature Range of -40 to 65°C (-40 to 149°F)
- Conformal Coated PCBs for Dust and Humidity Protection
- UL & C-UL Listed. E160849; 508 Industrial Control Equipment
- Input Power Options: 85-265 VAC / 90-265 VDC or 12-24 VDC / 12-24 VAC
- Multi-Pump Alternation Control
- 32-Point, Square Root, or Exponential Linearization
- External 4-Relay & Dual 4-20 mA Output Expansion Modules
- 5 Digital Inputs & 4 Digital Outputs Standard
- Password Protection
- Light / Horn & Button Accessory
- Control Station Accessory for Remote Operation
- 3-Year Warranty

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Disclaimer

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

⚠ CAUTION

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

⚠ WARNINGS

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

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

Limited Warranty

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

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FREE ScanView Programming Software

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

The easiest and quickest way to program your Helios Modbus scanner is to use the FREE ScanView programming software. This software is loaded into the scanner and connects and installs directly to your PC with a USB cable. We recommend that the first thing you do after taking the Modbus scanner out of the box is connect it to your PC with the provided USB cable – do not use a different cable. **DO NOT** apply AC or DC power to the scanner while your PC is connected to the scanner as it will disrupt the USB connection.

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

For more information on ScanView visit www.predig.com/ScanView

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

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

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

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Introduction

The Helios PD2-6080 and PD2-6081 Large Display Modbus® Scanners are multi-purpose, easy to use, digital scanners that can be programmed as a Modbus RTU Master, Slave, or Snooper. They feature large 1.8 inch superluminous LED digits, which can be read in direct sunlight from up to 100 feet away, and are capable of scanning up to 16 variables generated by any Modbus device. The PD2-6080 displays in decimal format, while the PD2-6081 has a feet & inches display. They are housed in a water-resistant, field mountable NEMA 4X/IP65 rated enclosure for convenient indoor or outdoor installation.

The programming buttons are located behind the lower panel door and are not generally accessible during operation. For that reason, we recommend the use of the PDA2364-MRUE remote control station which has four buttons to mimic the buttons behind the panel.

In master mode, the Helios reads up to 16 slave devices, scales the data from each, displays the result, and operates the internal relays and 4-20 mA output. The scanners are capable of polling up to 16 process variables (PVs) and displaying them in sequence at a user programmable scan rate. They also allow other Helios Modbus Scanners in snooper mode to read any of the variables being polled by the master. As a snooper, the scanners listen to the Modbus traffic and pick up a specific register or registers being polled by a master device from a specific slave device and process the data being read. In slave mode, they are controlled by a master device. The data sent to them by the master is scaled, displayed, and used to operate the relays and 4-20 mA output.

The Helios PD2-6080 and PD2-6081 come equipped with dual analog input channels (4-20 mA and/or 0-10 VDC) for use in Master mode. These can be assigned to mA or volts by mapping a PV to the internal scanner addresses 256-259, depending on the desired function.

Various math functions may be applied to the Modbus and analog inputs including addition, difference, absolute difference, average, weighted average, multiplication, division, minimum, maximum, draw, ratio, and concentration. This is in addition to the input signal conditioning functions (linear, square root, programmable exponent, or round horizontal tank calculations). The displays, relays, and the analog outputs may be assigned to PVs or to math channels C1, C2, C3, or C4. The digital inputs/outputs can be custom-programmed for specific operations.

A fully loaded Helios PD2-6080 or PD2-6081 scanner comes with four SPDT relays, a 4-20 mA output, two 24 VDC power supplies, five digital inputs and four digital outputs, and RS-485 serial communications.

Free ScanView software allows the Helios Modbus Scanner to be accessed via a computer. Configure multiple scanners, conveniently monitor critical information, and data log right from a PC with ease, further increasing plant efficiency.

Ordering Information

85-265 VAC Models

Model	Standard Features	Options Installed
Decimal Display		
PD2-6080-6H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6080-6H7		4 relays 4-20 mA output
Feet & Inches Display		
PD2-6081-6H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6081-6H7		4 relays 4-20 mA output

12-24 VDC Models

Model	Standard Features	Options Installed
Decimal Display		
PD2-6080-7H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6080-7H7		4 relays 4-20 mA output
Feet & Inches Display		
PD2-6081-7H0	5 Digital Inputs, 4 Digital Outputs, RS-485 Communications	No options
PD2-6081-7H7		4 relays 4-20 mA output

Accessories

Model	Description
PDA0004	Cable Gland
PDA7485-I	RS-232 to RS-485 isolated converter
PDA8485-I	USB to RS-485 isolated converter
PDAPLUG2	Plastic Conduit Plug
PDX6901	Snubber: 0.01 µF/470 Ω, 250 VAC

PDA2360 Control Stations

Model	Description
PDA2360-E	Emergency button
PDA2361-A	Ack button
PDA2361-B	Blank button
PDA2361-R	Reset button
PDA2361-T	Tare button
PDA2361-S	Stop button
PDA2361-Q	Silence button
PDA2362-AR	Ack and Reset buttons
PDA2362-BB	Two blank buttons
PDA2364-MRUE	Menu, right, up, enter buttons

Note: Control stations can be connected directly to the Helios scanner's on-board digital inputs. See *Remote Operation of Scanner* on page *22* for details.

Light / Horn Accessories

Helios Scanner Shown with MOD-PD2LHRB1 Red Light / Horn and Button. Scanner Sold Separately.

Model	Description
MOD-PD2LHRB1	Red Light / Horn and Button Mounted and Wired to Helios(1)
MOD-PD2LHGB1	Green Light / Horn and Button Mounted and Wired to Helios(1)
MOD-PD2LHYB1	Yellow Light / Horn and Button Mounted and Wired to Helios(1)
MOD-PD2LHBB1	Blue Light / Horn and Button Mounted and Wired to Helios(1)
MOD-PD2LHWB1	White Light / Horn and Button Mounted and Wired to Helios(1)
MOD-PD2LH5CB1	Light / Horn with User Choice of Red, Green, Yellow, Blue or White Light, Button, Mounted and Wired to Helios(1)
MOD-PD2LH3CB1-RYG	Light / Horn with Red, Yellow, Green Light Layers, Button, Mounted and Wired to Helios(1)

Note:

1. Specify MOD-PD2LH model as a separate item on the order for the Helios to order the Light / Horn & Button accessory installed and wired. Scanner is sold separately.

9 labels are provided for the button.

Pipe Mounting Kit

Helios Scanner Shown mounted to pipe using PDA6260 pipe mounting kit. See *Pipe Mounting Instructions* on page *15* for details.

Model	Description
PDA6260	2" Pipe Mounting Kit for PD2

Signal Splitter & Conditioner Accessories

Model	Description
PD659-1MA-1MA	Signal Isolator with One 4-20 mA Input and One 4-20 mA Output
PD659-1MA-2MA	Signal Splitter with One 4-20 mA Input and Two 4-20 mA Outputs
PD659-1V-1MA	Signal Conditioner with One 0-10 VDC Input and One 4-20 mA Output
PD659-1MA-1V	Signal Conditioner with One 4-20 mA Input and One 0-10 VDC Output

Specifications

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

Operating Modes

Master	Processes data read from Modbus RTU slave devices. It polls up to 16 process variables from 1 to 16 slave devices. The Master is capable of scanning the selected PVs, scaling the data, triggering relays, performing math operations, and driving the analog outputs.
Snooper	Listens to the Modbus traffic and picks up a specific register or registers being polled by a master device from a specific slave device and processes the data being read. The Snooper mode handles the data the same way as the Master.
Slave	Processes data sent to it from a Modbus RTU master device.
Note: The relays and the 4-20 mA outputs are functional in all modes.	

Master & Snooper Settings

PV Number	PV1–PV16 Enable or disable the process variables to be polled by the Master.
Slave Id	Assign the slave ID or address (1-247, 256-259 for mA or volts inputs) containing the process variables to be displayed by the selected PV.
Function Code	Select which Modbus function code (03, 04, or 65) to use in reading the slave device.
Register Number	5 digit: 30001-39999, 40001-49999, or 1-65,536 6 digit: 300001-365536 or 400001-465536 (Function Code 65 N/A here) Specifies which register(s) to read in the slave device. Range is dependent on Function Code selection (65, 04, or 03) and digits selection (5 or 6).
Data Type	Select the data format that the slave device uses. Select between Short integer (2 byte), Long integer (4 byte), or floating point (4 byte), Signed or Unsigned (integer only) and byte order: 1234, 4321, 2143, or 3412 (big-endian vs. little-endian, or swapped).
Poll Time	1.0 to 99.9 sec. Time between read-commands (Master mode).
Slave Response Timeout	0.0 to 99.9 seconds: Time allowed for the slave to respond before the scanner generates a communication break condition. The master polls the slave 3 times before starting the response timeout timer. Slave/Snooper mode: Time the scanner will wait for new data before going into break condition. Slave mode: Programming 0 disables the timeout; the last value received will be displayed indefinitely.
Communication Break	Displays brERR after the Master has polled the slave device 3 times and the response timeout has elapsed. The Snooper and Slave modes go into break condition after no new data is received within the response timeout window. Relays can be programmed to go on, off, or ignore the break condition. The analog outputs can be setup to generate a fixed mA current when a break condition is detected.

PV Settings

Tag & Units	6-character, independent tag and units for each PV and math channel
PV Format	PD2-6080 default: Decimal format PD2-6081 default: FT & IN, 1/8th or 1/16th; decimal format may be selected for line 2 indication.
Display Decimal Point	Up to five decimal places or none: d.dddd, dd.dddd, ddd.ddd, dddd.dd, ddddd.d, or ddddd
Float Decimal Point	Select the number of decimals to use for the floating point data expected from the slave or master device (this is independent from the display decimal point selection).
PV & Math Scaling	All PVs and math channels may be scaled to represent the input data in any engineering unit. Example: Level transmitter = 999.999 inches; to display in Ft-In-1/16th scale input 2 to display 83 Ft – 4 In – 0/16th.

Display Settings

Scan Mode	Automatic: 1.0 to 99.9 sec Manual: Front panel or digital inputs Go on alarm: Continues scanning after an alarm is detected Stop on alarm: Goes to the alarmed PV and stops scanning; press Scan to resume scanning.
Display Scan Rate	Master/Snooper: 1 PV/second to 1 PV every 99.9 seconds Slave: Dependent on master device (e.g. PLC) *Note: The display scan rate is independent of the poll time.*
Display Assignment	Display line 1: PV, Ch-C (math channel), PV & units, tag & PV, tag-PV-units, Ch-C & units, tag-Ch-C-unit, set points, max/min PV, max/min Ch-C. Display line 2: Same as Display Line 1; plus units, tag or turned off. The tag and units are displayed alternately for 2 seconds max, when selected. Different tags & PVs may be selected to display on line 1 & 2 at the same time.

Math Functions

Name	Math Operation (Examples) (P = Adder, F = Factor)	Setting
Addition	(PV1+PV2+P)*F	Sum1
Difference	(PV1-PV2+P)*F	diF
Absolute difference	((Abs(PV1- PV2)+P)*F	diFAbS
Average	(((PV1+PV2)/2)+P)*F	AvG
Multiplication	((PV1*PV2)+P)*F	multi
Division	((PV1/PV2)+P)*F	div idE
Max PV	Max value of all selected PVs	Hi-Pu
Min PV	Min value of all selected PVs	Lo-Pu
Draw	((PV1/PV2)-1)*F	drAu
Weighted average	((PV2-PV1)*F)+PV1	uAvG
Ratio	(PV1/PV2)*F	rAt io
Concentration	(PV1/(PV1+PV2))*F	Conc En
Math 2	Math on other math channels	m1At h2
Programmable Constants	Constant P (Adder): -99.999 to 999.999, default: 0.000 Constant F (Factor): 0.001 to 999.999, default: 1.000	

General

Input/output	Modbus RTU over RS-485 Two analog inputs (4-20 mA, ±10 V)
Display	Dual-line: 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. Default value is six.
LED Status Indicators	See *LED Status Indicators* on page *23* for details.
Overrange	Display flashes 999999
Underrange	Display flashes -99999
Programming Methods	Four programming buttons, digital inputs, PC and ScanView software, or Modbus registers.
Max/Min Display	Max/min readings are stored until reset by the user or when power to the scanner is turned off. User can reset by front panel pushbuttons, digital input, or via Modbus registers.
Rounding	Select 1, 2, 5, 10, 20, 50, or 100 (e.g. rounding = 10, value = 123.45, display = 123.50).
Password	Three programmable passwords restrict modification of programmed settings. 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.
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years, with or without power.
Power Options	85-265 VAC 50/60 Hz; 90-265 VDC, 20 W max; 12-24 VDC, 12-24 VAC, 15 W max. Powered over USB for configuration only.
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 scanners may share one 5 A fuse.
Isolation	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.
Environmental	Operating temperature range: -40 to 65°C (-40 to 149°F) Storage temperature range: -40 to 85°C (-40 to 185°F) Relative humidity: 0 to 90% non-condensing *Note: Printed circuit boards are conformally coated.*
Connections	Power, signal, relays, mA out: Removable screw terminal blocks accept 12 to 22 AWG wire. RS-485: Removable screw terminal block accepts 16 to 30 AWG wire. Digital I/O: Non-removable screw terminal blocks accept 16 to 30 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 mounting scanner to wall. See *Wall Mounting Instructions* on page *14* for additional details. Pipe Mounting: Optional pipe mounting kit (PDA6260) allows for pipe mounting. Sold separately. See *Pipe Mounting Instructions* on page *15* for additional details.
Tightening Torque	Power, signal, relays, mA out terminals: 5 lb-in (0.56 Nm) Digital I/O and RS-485: 2.2 lb-in (0.25 Nm)
Overall Dimensions	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. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Serial Communications

Compatibility	EIA-485
Connectors	Removable screw terminal connector
Max Distance	3,937' (1,200 m) max
Status Indication	Separate LEDs for Power (P), Transmit (TX), and Receive (RX)
Scanner ID	1 – 247 (Scanner Modbus address)
Baud Rate	300 – 19,200 bps
Transmit Time Delay	Programmable 0 to 4999 ms This is the time the scanner will wait for a slave to respond before sending another request on the bus. This value should be greater than 100 ms to avoid collisions on the bus.
Data	8 bits (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 Helios Scanner Modbus Register Tables located at www.predig.com for details.

Dual Process Input

Two Inputs	Two non-isolated analog inputs, independent field selectable: 0-20 mA, 4-20 mA; ±10 V (0-5, 1-5, 0-10 V)
Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ±10%. All models selectable for 24, 10, or 5 VDC supply (Switch labeled P+/P-). 85-265 VAC models rated @ 200 mA max, 12-24 VDC powered models rated @ 100 mA max. 5 & 10 VDC supply rated @ 50 mA max. Refer to *Transmitter Supply Voltage Selection (P+, P-)* on page *17*.
PV Analog Channel ID	Ch-A mA: Assign PV to ID 256 or Ch-A volt: 257; Ch-B mA: Assign PV to ID 258 or Ch-B volt: 259
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
Input Signal Conditioning	Linear, square root, programmable exponent, or round horizontal tank volume calculation
Multi-Point Linearization	2 to 32 points for PV1 and PV2
Programmable Exponent	User selectable from 1.0001 to 2.9999 for open channel flow
Round Horizontal Tank	Diameter & Length: 999.999 inch or cm calculates volume in gallons or liters respectively.
Low-Flow Cutoff	0.1 to 999,999 (0 disables cutoff function) for PV1 and PV2. Point below at which display always shows zero.
Calibration Range	Input Range: Minimum Span Input 1 & Input 2 4-20 mA: 0.15 mA ±10 V: 0.10 V An error message will appear if the input 1 & input 2 signals are too close together.
Input Impedance	Voltage ranges: greater than 500 kΩ Current ranges: 50 - 100 Ω (depending on internal resettable fuse impedance)
Input Overload	Current input protected by an internal resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.
HART Transparency	The scanner can support ONLY one HART loop on either of the inputs. A signal isolator, such as the PD659 is required if two HART loops are being connected. Under the described conditions, the scanner does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption. The scanner is not affected if a HART communicator is connected to the loop. The scanner does not display secondary HART variables.

Relays

Rating	4 SPDT (Form C) internal and 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 to prevent disruption to the microprocessor's operation. Recommended suppressor value: 0.01 µF/470 Ω, 250 VAC (PDX6901). See *Switching Inductive* Loads on page *20* 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 or without clear • Pump alternation control (2-4 relays) • Sampling (based on set point and time) • Off (disable unused relays and enable Interlock feature) • Manual on/off control mode
Relay Reset (Acknowledge)	User selectable via front panel button, F4 digital input, external contact closure on digital inputs, or through serial communications.
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 scanner, relays will reflect the state of the input to the scanner.

Isolated 4-20 mA Transmitter Output

Output Source	PV1-16, math channels C1-4, set points 1-4, or manual control mode		
Scaling Range	1.000 to 23.000 mA for any display range		
Calibration	Factory calibrated: 4.000 to 20.000 = 4-20 mA output		
Analog Out Programming	23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break		
Communica-tions Break	Programmable mA output when a slave device does not reply within the response timeout.		
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. 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
0-10 VDC Output	The PD659-1MA-1V can convert the optional 4-20 mA output to a 0-10 VDC output		

USB Connection

Function	Programming only
Connector Type	Type B receptacle
Cable	USB Type A-B cable
Driver	Microsoft® Windows® XP/Vista/7/8/10
Power	USB port provides power to the scanner. ***DO NOT*** *apply AC or DC power to the scanner while the USB port is in use.*

Digital Input (F4)

Function	Remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *68* for a complete list of capabilities.
Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM
Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

Digital Inputs & Outputs

Function	Terminals provided for remote operation of all four programming / operation buttons (use PDA2364-MRUE control station). Other uses include acknowledge/reset relays and reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *68* for a complete list of capabilities.
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 push buttons across +5 V & DI 1-4.

WARNING

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

ScanView Software

Availability	Download directly from scanner or from www.predig.com/download_software
System Requirements	Microsoft® Windows® XP/Vista/7/8/10
Communications	USB 2.0 (for programming only) (Standard USB A to USB Type B) RS-485 to USB converter (programming, monitoring, and data logging)
Configuration	Configure scanners one at a time
Power	USB port provides power to the scanner. ***DO NOT*** *apply AC or DC power to the scanner while the USB port is in use.*

Compliance Information

Safety

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

Safety Information

⚠ CAUTION

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

⚠ WARNINGS

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

Installation

There is no need to open the clear plastic front cover in order to complete the installation, wiring, and setup of the scanner. All programming is done using MeterView Pro software or 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 scanner, see *Figure 5. Conduit Holes Location – Bottom View* on page *14* for details.

There are a total of four pre-drilled conduit entry holes located at the bottom of the scanner. 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 scanner wiring board. Doing so will disable the on-board 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 *Figure 8. Transmitter Supply Voltage Selection* on page *17*.

Unpacking

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

Wall Mounting Instructions

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

- Prepare a section of wall approximately 11" x 13" (280 mm x 330 mm) for scanner mounting by marking with a pencil the mounting holes (shown in *Figure 1*) on the wall.
- Select the appropriate mounting screws for the mounting surface to be used. The mounting holes diameter is shown on *Figure 2*.
  Note: Mounting screws are not included.
- Using a drill bit slightly smaller than the girth of the mounting screws, pre-drill holes at the mounting locations previously marked.
- Insert mounting screws into the four mounting holes and screw them into the pre-drilled holes. **DO NOT** overtighten the mounting screws as it is possible that the enclosure could crack and become damaged.

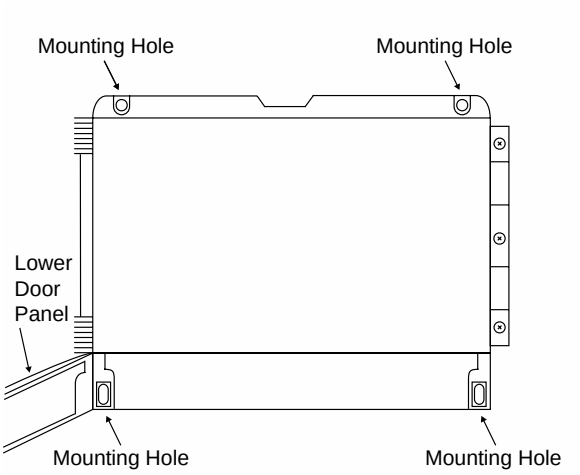


Figure 1. Scanner Mounting Holes Location

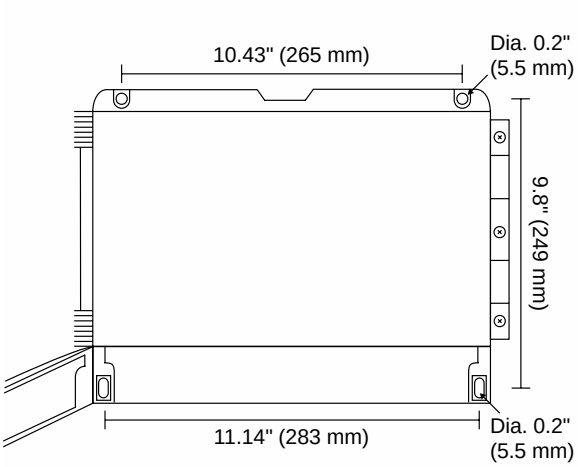


Figure 2. Scanner Mounting Holes Dimensions

Mounting Dimensions

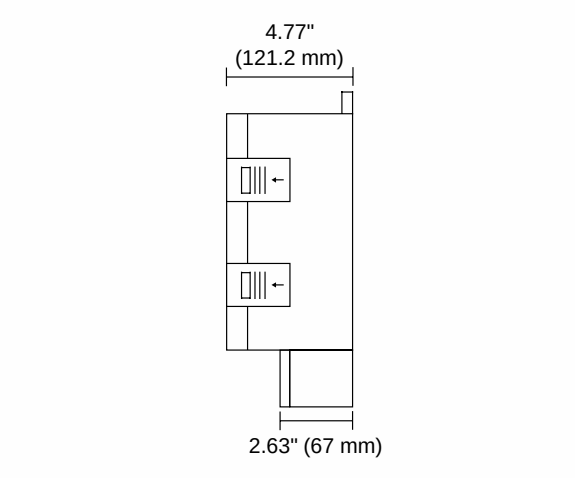


Figure 3. Scanner Dimensions – Side View

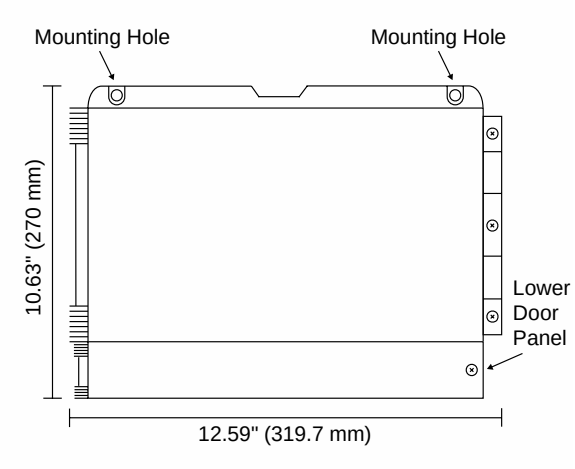


Figure 4. Scanner Dimensions - Front View

Conduit Holes Location

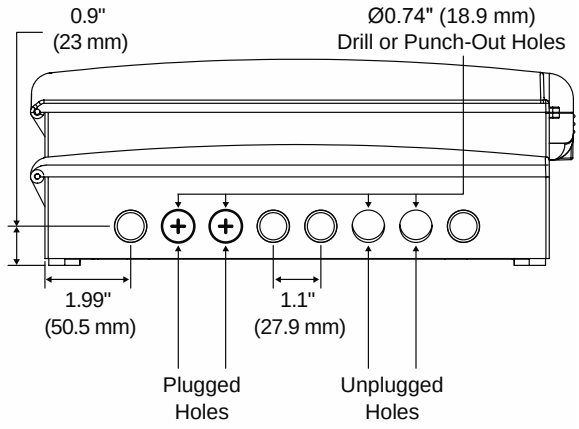


Figure 5. Conduit Holes Location – Bottom View

Pipe Mounting Instructions

The scanner 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 scanner to a pipe using the pipe mounting kit accessory, follow these instructions.

- 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 scanner enclosure using the provided fasteners. **DO NOT** overtighten the fasteners as it could cause damage to the enclosure.
- Using the provided nuts and U-bolts, secure the mounting plates to the pipe applying enough torque such that the scanner cannot be moved up or down (or side to side).

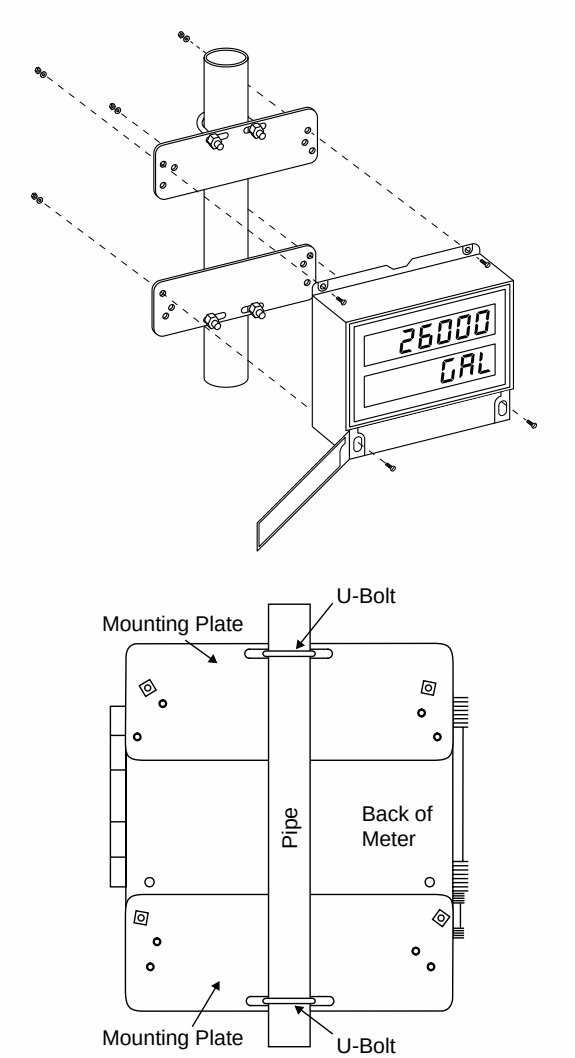


Figure 6. Vertical Pipe Mount Assembly

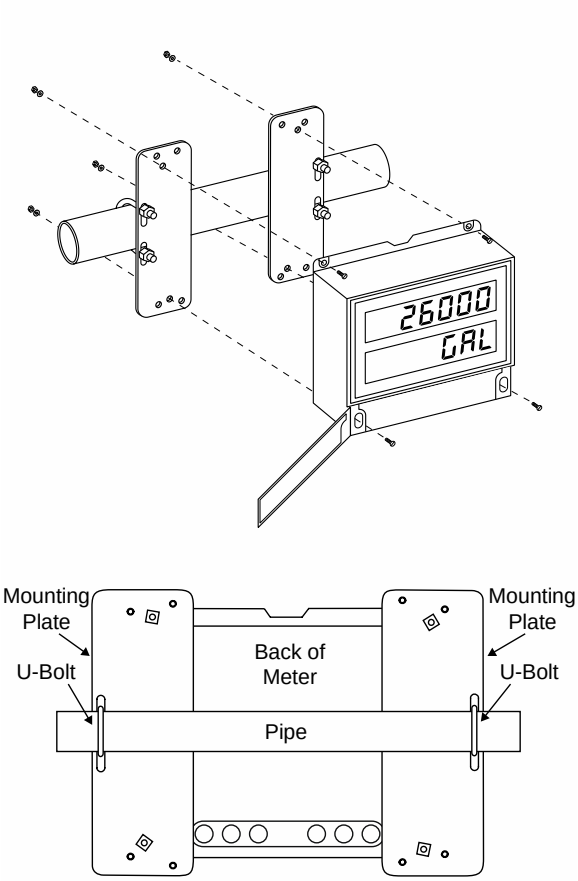


Figure 7. Horizontal Pipe Mount Assembly

Installation Overview

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

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

ScanView Software

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

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

For more information on ScanView visit
www.predig.com/ScanView

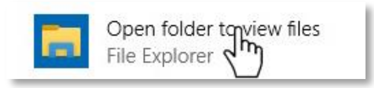
ScanView Installation

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

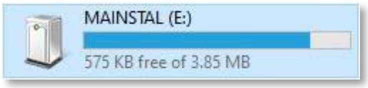
WARNINGS

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

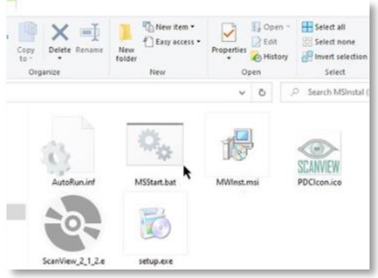
2. Once the driver is installed, an AutoPlay dialog should appear for the drive "MAINSTAL." Click "Open folder to view files."



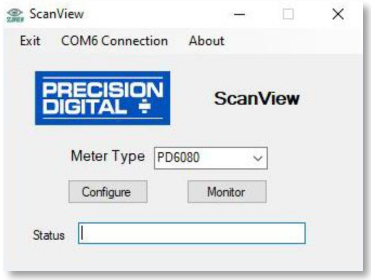
If the computer does not display an AutoPlay dialog for the drive "MAINSTAL," you should open My Computer and double-click on the drive labeled "MAINSTAL."



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



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



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

WARNING

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

ScanView Monitoring

Once the scanner has been configured, the user chooses Monitor from the top menu bar. The Monitor window will appear; the enabled PVs and all associated values will take a few seconds to display.

The PVs will display as configured - either in Decimal or Feet & Inches format. Data Logging, Scanning, and Alarm Status can all be viewed at the bottom of the Monitor window.

ScanView Data Logging

ScanView software allows the user to log data and generate reports.

1. Select Monitor - Stop Scan from the top menu bar.
2. Select the Data Log drop-down menu from the top menu bar. Parameters for Data Logging are: Interval, Units, Log File Name, and Start/Pause. For Interval the choices are: 1-60, and for Unit choices for logging data are: Seconds, Minutes, and Hours.
3. Save the Data Log File. It is recommended to name the file using a unique name and the date, such as: **"ScanView_1.00_Log_X_100813".**
4. Select Monitor - Start Scan from the top menu bar, then select Data Log - Start from the top menu bar. The log file can be retrieved at any time by following the path: **(C:) - Program Files (x86) - PDC - ScanView 1.00 - Data Log.**

⚠ IMPORTANT

- Once Data Logging has begun, the Configure, Customize, and Connection screens cannot be accessed until the user has paused Data Logging.

Data Log files are saved in the Data Log folder as ".CSV" files. To view Data Log files, the user must first pause both Scanning and Data Logging. Data Logging & Scan Status can be seen at the bottom of the Monitor window.

Transmitter Supply Voltage Selection (P+, P-)

All scanners, 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 switch:

1. Turn off the power to the meter.
2. Unscrew and open the lower 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.

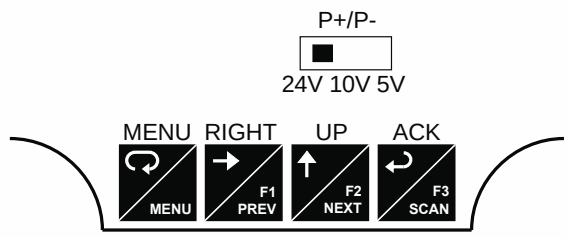


Figure 8. Transmitter Supply Voltage Selection

Connections

All connections are made to screw terminal connectors located under the lower 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 the ordered configuration.

⚠ WARNINGS

- **DO NOT** connect any equipment 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 on-board digital I/O, and the RS-485 serial communications.

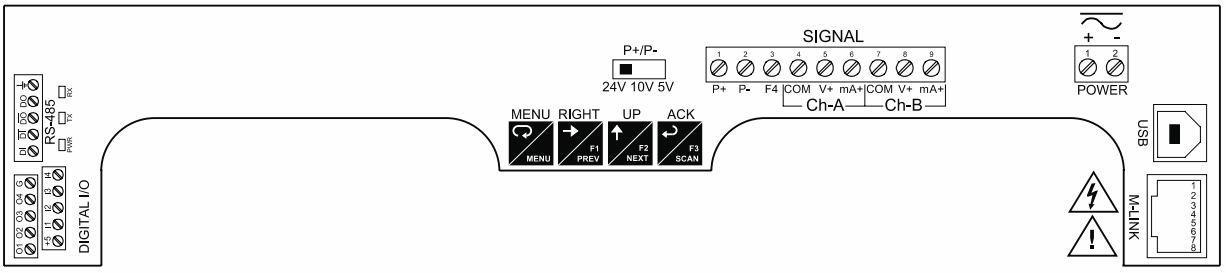


Figure 9. PD2-6080/1-6H0 / 7H0 Connectors Label

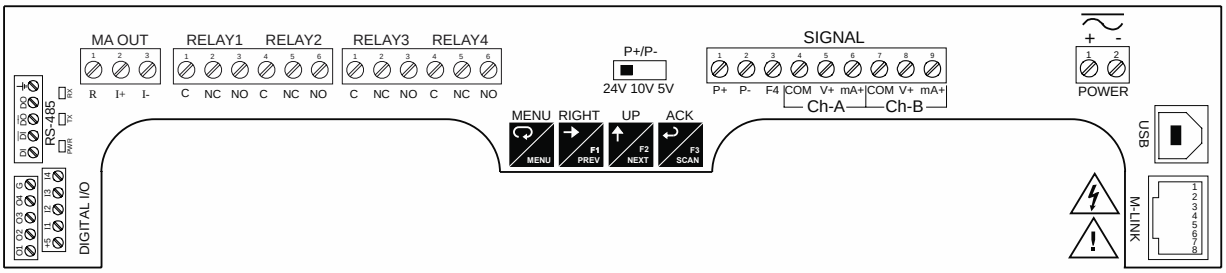


Figure 10. PD2-6080/1-6H7 / 7H7 Connectors Label

Power Connections

Power connections are made to a two-terminal connector labeled POWER on the back of the scanner. The scanner will operate regardless of DC polarity connection. The + and - symbols are only a suggested wiring convention. There are separate models for low voltage and high voltage power. See *Ordering Information* on page *6* for details.

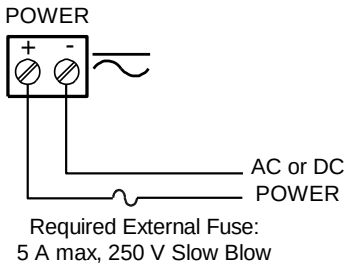


Figure 11. Power Connections

RS-485 Connections

The RS-485 connections are made to a five terminal connector used for Modbus® RTU serial communications. The RS-485 terminals include Transmit Data (DO) and (/DO), Receive Data (DI) and (/DI), and Signal Ground. See *Serial Communications* (SEr iAL) on page *30* for more information.

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

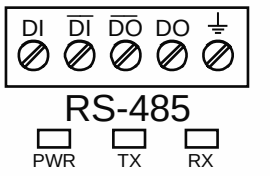


Figure 12. RS-485 Connection

RS-485 Multi-Drop Connection

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) can be programmed between 1 and 247. The transmit delay can be set between 0 and 199 ms. The parity can be set to even, odd, or none with 1 or 2 stop bits.

To change the 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, AddrES 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.

RS-485 Serial Converters

To convert the RS-485 to RS-232, use the PDA7485-I converter. To convert the RS-485 to USB, use the PDA8485-I converter. See *Ordering Information* on page *6* for additional information.

RS-485 Connection Examples

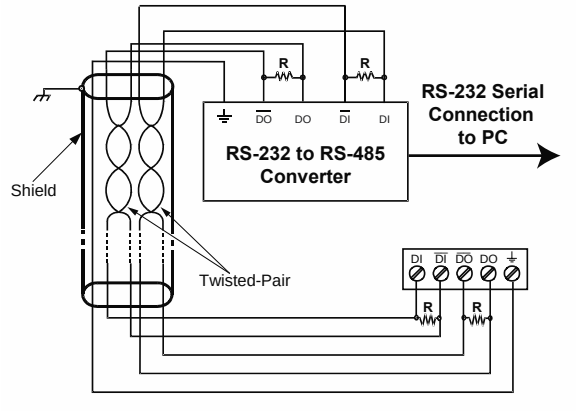


Figure 13. Five-Wire RS-485 Connections

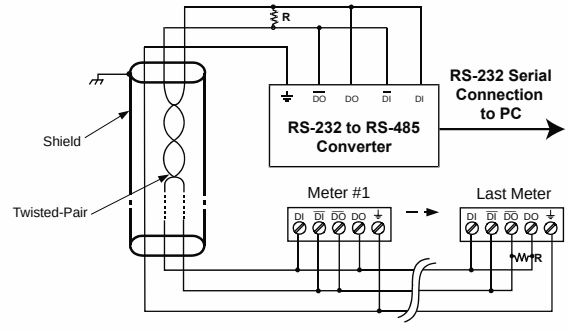


Figure 14. Three-Wire RS-485 Multi-Drop Connections

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*

RS-485 Converter Connections

Figure 15 below details the wiring connections from the RS-485 connector to an RS-485 serial converter (such as the PDA7485-I or PDA8485-I) for a five-wire network.

RS-485 Connector to RS-485 Serial Converter Connections	
RS-485 Connector	RS-485 to USB or RS-232 Converter
⏚	⏚
$\overline{DO}$	$\overline{DI}$
DO	DI
$\overline{DI}$	$\overline{DO}$
DI	DO

Figure 15. Connections for RS-485 Connector to Serial Converter

Three-Wire Connection

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

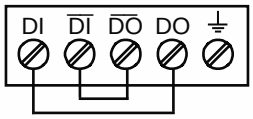


Figure 16. Three-Wire RS-485 Connection

Digital I/O Connections

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

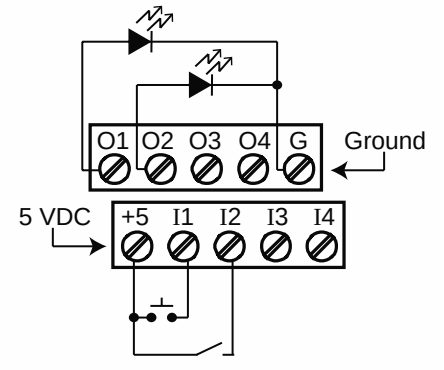


Figure 17. Digital Input and Output Connections

F4 Digital Input Connections

A digital input, F4, is standard on the scanner. This digital input connected with a normally open contact across F4 and COM, or with an active low signal applied to F4. It can be used for remote operation of front-panel buttons, to acknowledge/reset relays, or to reset max/min values. See *Function Keys & Digital I/O Available Settings* on page *68* for a complete list of capabilities.

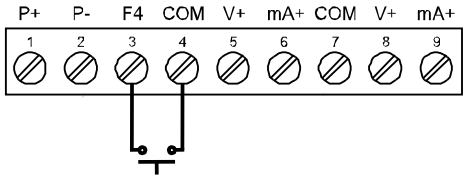


Figure 18. F4 Digital Input Connections

Relay Connections

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

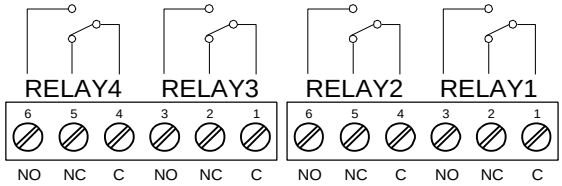


Figure 19. Relay Connections

Switching Inductive Loads

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

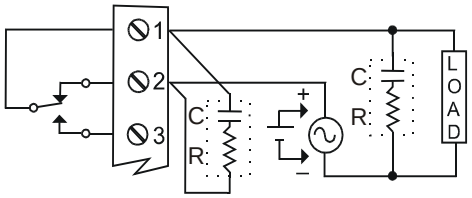


Figure 20. AC and DC Loads Protection

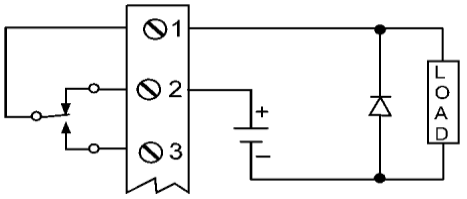
Choose R and C as follows:

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



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

Figure 21. Low Voltage DC Loads Protection

RC Networks (Snubbers) 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 1/14 HP (50 watts) with an inductive load.

4-20 mA Output Connections

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

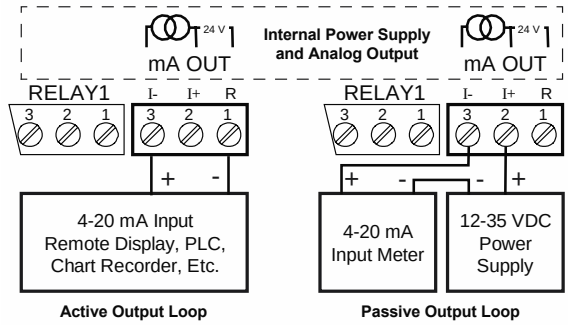


Figure 22. 4-20 mA Output Connections

Analog Output Power Supply

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

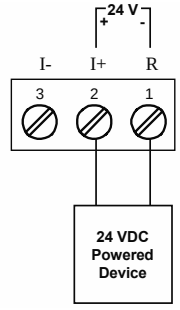


Figure 23. Analog Output Supply Powering Other Devices

Remote Operation of Scanner

The scanner can be operated via the programming buttons or a PDA2364-MRUE remote control station using the digital inputs and outputs connections as illustrated in *Figure 24. Meter to PDA2364-MRUE Control Station Connection.*

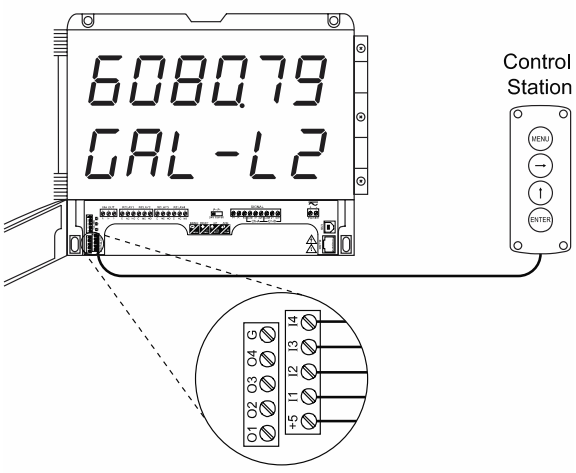


Figure 24. Meter to PDA2364-MRUE Control Station Connection

Interlock Relay Feature

As the name implies, the interlock relay feature reassigns one, or more, alarm/control relays for use as interlock relay(s). Interlock contact(s) are wired to digital input(s) and trigger the interlock relay. This feature is enabled by configuring the relay, and the corresponding digital input(s). See *Setting Up the Interlock Relay (Force On) Feature* on page *52*.

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

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

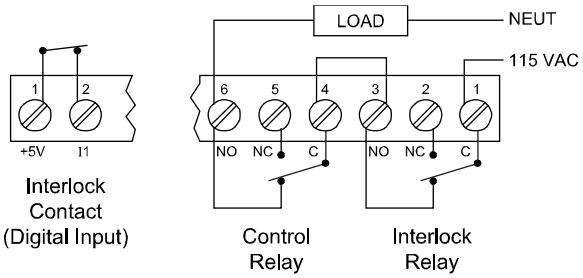


Figure 25. Interlock Connections

Analog Input Signal Connections

Analog input signal connections are made to a nine-terminal connector labeled SIGNAL. 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 programming buttons or using ScanView software.

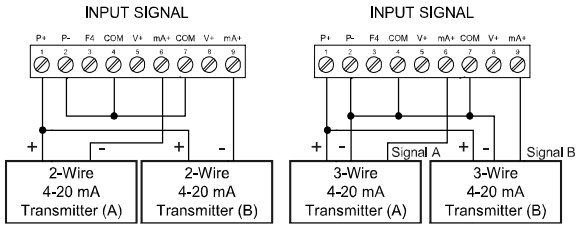


Figure 26. Transmitters Powered by Internal Supply

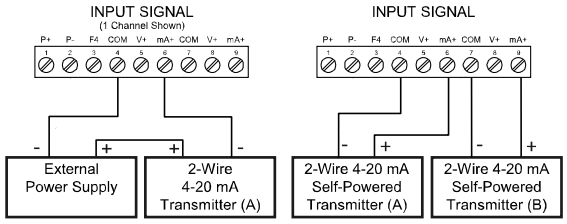


Figure 27. Transmitter Powered by Ext. Supply or Self-Powered

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.

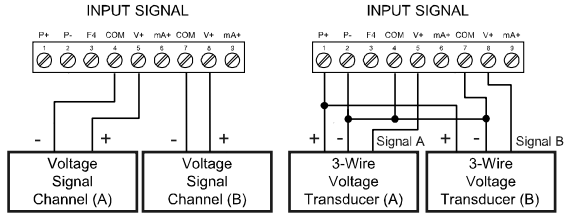


Figure 28. Voltage Input Connections

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

Setup and Programming

> There is **no need to recalibrate** the scanner when first received from the factory. The scanner is **factory calibrated** prior to shipment for milliamps and volts with calibration equipment that is certified to NIST standards.

Overview

There are no jumpers involved in the scanner setup procedure.

Setup and programming is done using ScanView software or through the programming buttons.

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

LED Status Indicators

PD2-6080

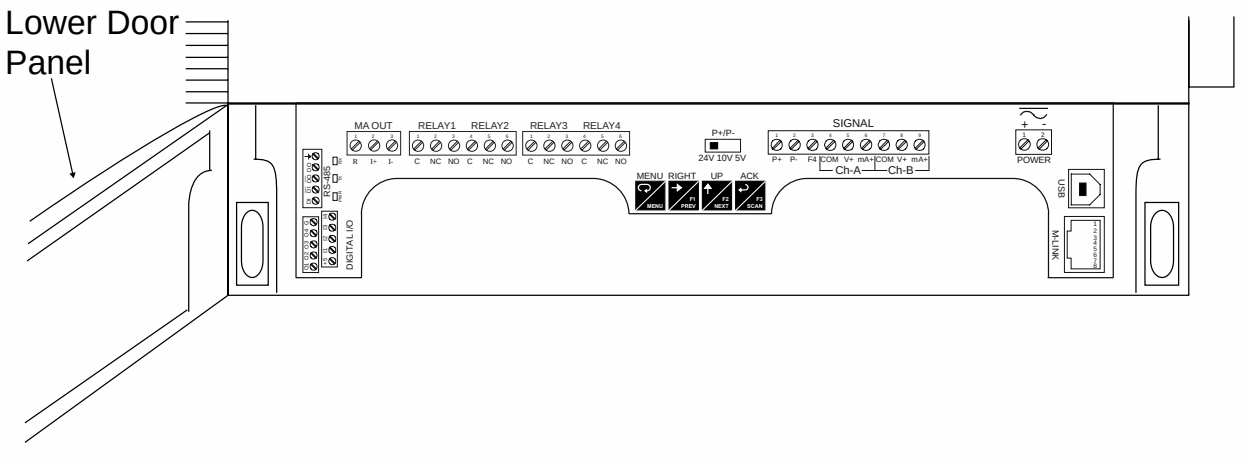
LED	State	Indication
1-4	Steady	Alarm condition based on set and reset points, independent of relay status in certain configurations. (Available on all meter configurations, including those without relays installed)
1-4	Flashing	Relay interlock switch open
1-4 & M	Flashing	Relay in manual control mode
F	Flashing	Communications fault condition
⏸	Flashing	Press SCAN to pause scanning
⏵	Steady	Press SCAN to resume scanning
■	Flashing	Stop scan on alarm
M	Flashing	Analog output in manual control mode

PD2-6081

LED	State	Indication
1-4	Steady	Alarm condition based on set and reset points, independent of relay status in certain configurations. (Available on all meter configurations, including those without relays installed)
1-4	Flashing	Relay interlock switch open
1-4 & M	Flashing	Relay in manual control mode
$\overline{8}$	Steady	Eighths of an inch
$\overline{16}$	Steady	Sixteenths of an inch
F	Flashing	Communications fault condition
⏸	Flashing	Press SCAN to pause scanning
⏵	Steady	Press SCAN to resume scanning
■	Flashing	Stop scan on alarm
M	Flashing	Analog output in manual control mode

Symbol	Description
FT	Feet value
IN	Inches value
- -	Designation separators

Programming Buttons



Button	Description
MENU 	**Menu**
RIGHT 	**Previous** **Right Arrow/F1**

Button	Description
UP 	**Next** **Up Arrow/F2**
ACK 	**Scan** **Acknowledge (Enter)/F3**

- 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 the Up arrow button to scroll through the menus, decimal point, or to increment 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 scanner.
- Press the SCAN/Enter button once to pause scanning (Pause LED flashes), then press the SCAN/Enter button again to resume scanning (Play LED turns on).
- Press NEXT to go to the next PV; auto scan resumes after 10 seconds of inactivity.
- Press PREV to go to the previous PV; auto scan resumes after 10 seconds of inactivity.

Remote Buttons

The meter can be operated via a remote control station (PDA2364-MRUE) using the digital input connections. The PDA2364-MRUE mimics the Helios's four programming buttons: Menu, Right Arrow, Up Arrow, and Enter.

See *Remote Operation of Scanner* on page *22* for details.

Display Functions & Messages

The following table shows the main menu functions and messages in the order they appear in the menu.

Display Functions & Messages

Display	Parameter	Action/Setting Description
mode	*Mode*	Enter *Mode* menu
mASter	*Master*	Enter *Master* Mode
PUnbr	*PV Number*	Select PV
PU 1	*PV*	Select PV 1-16
EnAbLE	*Enable*	Enable PV
d iSAbL	*Disable*	Disable PV
SLAU.id	*Slave ID*	Enter the unique Slave ID for each PV
FunCod	*Function Code*	Enter the Function Code for each PV
Fun 03	*Function Code 03*	Use Function Code 03 to read slave device
Fun 04	*Function Code 04*	Use Function Code 04 to read slave device
Fun 65	*Function Code 65*	Use Function Code 65 to read slave device
rEGnbr	*Register Number*	Enter the Register Number for each PV
5 d iG 6 d iG	*Register Number Digits*	Select either 5 (x0001-x9999) or 6 (x00001-x65536) digits
dAtA	*Data Type*	Enter the Data Type for each PV
FLoAt	*Floating Point Data Type*	Floating Point Data Type. Select *Floating Point* as the data type to be read from the slave device.
Short	*Short Integer Data Type*	Short Integer Data Type. Select *Short Integer* as the data type to be read from the slave device.
LonG	*Long Integer Data Type*	Long Integer Data Type. Select *Long Integer* as the data type to be read from the slave device.
binAry	*Binary*	Binary Data format. Select *Binary* format for Short or Long integers.
bcd	*BCD*	BCD Data format. Select *BCD* format for Short or Long integers.
SiGnEd	*Signed*	Signed Data. Select *Signed* Binary format for Short or Long integers.
unSiGd	*Unsigned*	Unsigned Data. Select *Unsigned* Binary format for Short or Long integers.
1234	*Byte Order*	Select big-endian byte order.
4321	*Byte Order*	Select little-endian byte order.
2143	*Byte Order*	Select byte-swapped big-endian byte order. Not available for Short integer.
3412	*Byte Order*	Select byte-swapped little-endian byte order. Not available for Short integer.
t-PoLL	*Polling Time*	Enter Polling Time (the time between read commands). In other words, how often the display is updated in Master mode.
t-rESP	*Response Time*	Enter the time allowed for a slave device to respond to a command.
SnooPEr	*Snooper*	Enter *Snooper* Mode
Punbr	*PV Number*	Select PV
PU 1	*PV*	Select PV 1-16
EnAbLE	*Enable*	Enable PV
d iSAbL	*Disable*	Disable PV
SLAu.id	*Slave ID*	Enter the unique Slave ID of the device to be polled by Master
FunCod	*Function Code*	Enter the Function Code for each PV
Fun 03	*Function Code 03*	Use Function Code 03 to read slave device
Fun 04	*Function Code 04*	Use Function Code 04 to read slave device
Fun 65	*Function Code 65*	Use Function Code 65 to read slave device
rEGnbr	*Register Number*	Enter the Register Number for each PV
5 d iG 6 d iG	*Register Number Digits*	Select either 5 (x0001-x9999) or 6 (x00001-x65536) digits
dAtA	*Data Type*	Enter the Data Type for each PV
FLoAt	*Floating Point Data Type*	Floating Point Data Type. Select *Floating Point* as the data type to be read from the slave device.
Short	*Short Integer Data Type*	Short Integer Data Type. Select *Short Integer* as the data type to be read from the slave device.
LonG	*Long Integer Data Type*	Long Integer Data Type. Select *Long Integer* as the data type to be read from the slave device.
binAry	*Binary*	Binary Data. Select *Binary* format for Short or Long integers.
bcd	*BCD*	BCD Data. Select *BCD* format for Short or Long integers.
SiGnEd	*Signed*	Signed Data. Select *Signed* Binary format for Short or Long integers.
unSiGd	*Unsigned*	Unsigned Data. Select *Unsigned* Binary format for Short or Long integers.

Display Functions & Messages

Display	Parameter	Action/Setting Description
1234	*Byte Order*	Select big-endian byte order.
4321	*Byte Order*	Select little-endian byte order.
2143	*Byte Order*	Select byte-swapped big-endian byte order. Not available for Short.
3412	*Byte Order*	Select byte-swapped little-endian byte order. Not available for Short.
t-rESP	*Response Time*	Enter the time allowed for a slave device to respond to a command.
SLAVE	*Slave*	Enter *Slave* Mode
dAtA	*Data Type*	Enter the Data Type for each PV
FLoAt	*Floating Point Data Type*	Floating Point Data Type. Select *Floating Point* as the data type to be read from the slave device.
Short	*Short Integer Data Type*	Short Integer Data Type. Select *Short Integer* as the data type to be read from the slave device.
LonG	*Long Integer Data Type*	Long Integer Data Type. Select *Long Integer* as the data type to be read from the slave device.
binAry	*Binary*	Binary Data. Select *Binary* format for Short or Long integers.
bcd	*BCD*	BCD Data. Select *BCD* format for Short or Long integers.
SignEd	*Signed*	Signed Data. Select *Signed* Binary format for Short or Long integers.
unSignEd	*Unsigned*	Unsigned Data. Select *Unsigned* Binary format for Short or Long integers.
1234	*Byte Order*	Select big-endian byte order.
4321	*Byte Order*	Select little-endian byte order.
2143	*Byte Order*	Select byte-swapped big-endian byte order. Not available for Short integer.
3412	*Byte Order*	Select byte-swapped little-endian byte order. Not available for Short integer.
t-rESP	*Response Time*	Enter the time allowed for a slave device to respond to a command.
SEtuP	*Setup*	Enter *Setup* menu
PU	*Process Variable*	Enter *PV Setup* menu
PU 1	*PV*	Select PV 1-16
tAG	*Tag*	Tag
unitS	*Units*	Units

Display Functions & Messages

Display	Parameter	Action/Setting Description
Format	*Format*	Format (Decimal, Eighths, or Sixteenths of an Inch)
dEc	*Decimal*	Decimal Format
Ft In 8	*Eighths*	Eighth Inch Format
Ft In 16	*Sixteenths*	Sixteenth Inch Format
dEcPt	*Decimal Point*	Decimal Point menu
diSPdP	*Display Decimal Point*	Set the decimal point position for the display. This is independent from float decimal point.
FLotdP	*Floating Decimal Point*	Floating Decimal Point. Select the decimal point for the expected floating point data.
SCALE	*Scale PV*	Scale PV
inP 1	*Input 1*	Scale input 1 signal or program input 1 value
di5 1	*Display 1*	Program display 1 value
inP 2	*Input 2*	Scale input 2 signal or program input 2 value (up to 32 points)
di5 2	*Display 2*	Program display 2 value (up to 32 points)
dSPLAY	*Display*	Enter *Display Setup* menu
Line 1	*Display Line 1*	Top Display
d PU	*Display PV*	Display PVs 1-16
d Ch-C	*Display C Channel*	Display Math Channels C1-C4
PUnit	*Display PV & Units*	Display PV & Units
tGPUn	*Display Tag, PV Number*	Display Tag & PV Number selected
tGPUnu	*Display Tag, PV# & Units*	Display Tag, PV Number selected, & Units
Cunit	*Display C & Units*	Display C1-C4 & Units
tG. C. u	*Display Tag, C, & Units*	Display Tag, C1-C4 & Units
dSEt 1	*Display Set Points 1-4*	Display Set Points 1-4
Hi-PU	*Display Max PV 1-16*	Display Maximum value for each enabled PV1-16
Lo-PU	*Display Min PV 1-16*	Display Minimum value for each enabled PV1-16
Hi-C	*Display Max Ch C1-C4*	Display Maximum for math channels C1-C4
Lo-C	*Display Min Ch C1-C4*	Display Minimum for math channels C1-C4
Line 2	*Display Line 2*	Bottom Display
d tAG	*Display Tag*	Display Tag
d tAGu	*Display Tag & Units*	Display Tag & Units
d oFF	*Display off*	Display Off

Display Functions & Messages

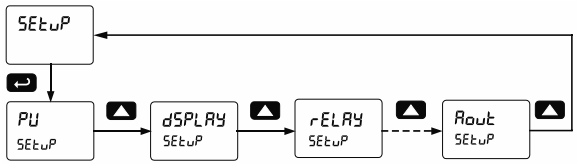
Display	Parameter	Action/Setting Description
d- InEY	*Display Intensity*	Display Intensity
rELAY	*Relay Setup*	Enter *Relay Setup* menu
ASS iGn	*Assign Relay*	Assign Relay menu
rELAY 1	*Relay 1-4*	Assign Relay 1-4
PU 1	*PV 1-16*	Map Relay to PV 1-16
nn-PU	*Multiple PVs*	Map Relay to Multiple PVs
rLY 1	*Relay 1-4*	Relay 1-4
Act 1	*Relay Action 1-4*	Assign Relay Action for relays 1-4
Auto	*Automatic*	Set relay for automatic reset
A-nnAn	*Auto-manual*	Set relay for auto or manual reset any time
LAtCH	*Latching*	Set relay for latching operation
Lt-CLr	*Latching-cleared*	Set relay for latching operation with manual reset only after alarm condition has cleared
ALtErn	*Alternate*	Set relay for pump alternation control
SAnnPL	*Sample*	Set relay for sample time trigger control
OFF	*Off*	Turn relay off
FA iLSF	*Fail-safe*	Enter *Fail-safe* menu
FLS 1	*Fail-safe 1*	Set relay 1-4 fail-safe operation
on	*On*	Enable fail-safe operation
oFF	*Off*	Disable fail-safe operation
dELAY	*Delay*	Enter relay *Time Delay* menu
dLY 1	*Delay 1**	*Enter relay 1-4 time delay setup
On 1	*On 1*	Set relay 1 On time delay
OFF 1	*Off 1*	Set relay 1 Off time delay
brEAK	*Break*	Set relay condition if communication break detected
no Act	*No action*	Ignore break condition. *No* change in relay state when Communications Break detected.
On	*On*	Relay goes to alarm condition when break detected. Relay turns *on* when Communications Break detected.
OFF	*Off*	Relay goes to non-alarm condition when break detected. Relay turns *off* when Communications Break detected.

Display Functions & Messages

Display	Parameter	Action/Setting Description
Aout	*Analog output*	Enter the *Analog Output* scaling menu
AOut 1	*Aout channel*	Analog Output source channel
d.S 1	*Display 1*	Program the first *Display* value for the Analog Output.
Out 1	*Output 1*	Program the first *Output* value that corresponds to the Display *1* value for the Analog Output. (e.g. 4.000 mA).
d.S 2	*Display 2*	Program the second *Display* value for the Analog Output.
Out 2	*Output 2*	Program the second *Output* value that corresponds to the Display *2* value for the Analog Output. (e.g. 4.000 mA). (e.g. 20.000 mA)
SEr iAL	*Serial*	Enter *Serial* menu
SCAn.Id	*Scan ID*	Enter *Scan ID* of the meter being polled (1-247)
bAud	*Baud Rate*	Select *Baud Rate (Choices: 300/600/1200/2400/4800/9600/19,200)* *(Must match that of other devices)*
tr dLY	*Transmit Delay*	Enter *Transmit Delay (Master's delay must be greater than Snooper or slave devices)*
PAr itY	*Parity*	Select *Parity (Even, Odd, None 1-Stop, or None 2-Stop)* *(Must match that of other devices)*
t-byt	*Byte-to-byte Timeout*	Enter the timeout value allowed between received *bytes*. *(This is used to fix communication problems with slow devices).*
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
unLoc	*Unlocked*	Program password to lock scanner
Locd	*Locked*	Enter password to unlock scanner
999999 -99999	*Flashing*	Over/under range condition

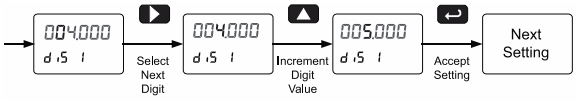
Menu Navigation Tip

- The Up arrow scrolls through the sub-menus within a menu, after the last item it returns to the top menu. Press Enter to step into the menu again or press Up arrow to move to the next menu.
  Note: There are some exceptions (e.g. PV - Enable - - Data type ▲ Next PV).
- Press Menu to exit programming at any time.



Setting Numeric Values

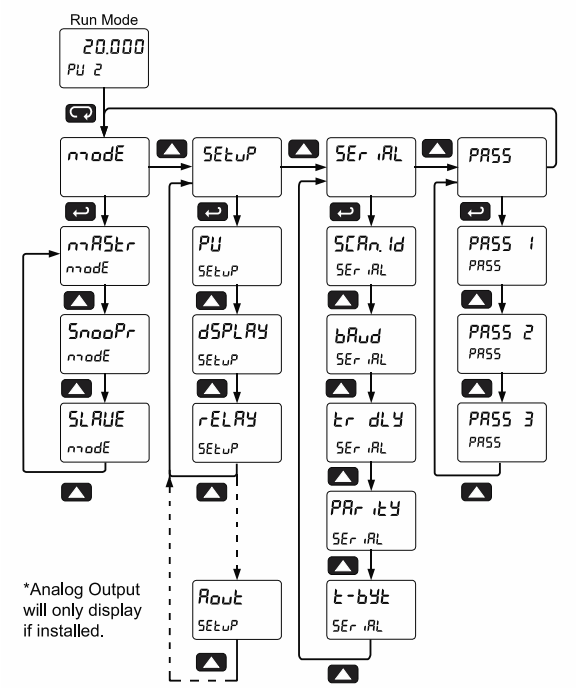
The numeric values are set using the Right and Up arrow buttons. Press the Right arrow to select the next digit and the Up arrow to increment the digit's value. The digit being changed is displayed brighter than the rest. Press and hold the Up arrow to auto-increment the display value. Press the Enter button, at any time, to accept a setting or the Menu button to exit without saving changes.



Main Menu

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

- Press Menu button to enter Scanner Programming
- Press Up arrow button to scroll through the menus
- Press Menu, at any time, to exit and return to Run Mode
- Changes to the settings are saved to memory only after pressing Enter
- The display moves to the next menu every time a setting is accepted by pressing Enter



Serial Communications (SEr iAL)

The scanner is equipped with RS-485 Modbus RTU serial communications.

The *Serial* menu is used for programming the Scanner ID, Baud Rate, Transmit Delay, Parity, and Byte-to-Byte Timeout parameters.

The scanner may be connected to a PC for initial configuration via the on-board USB connection. For ongoing digital communications with a computer or other data terminal equipment, use the RS-485 connection with the appropriate serial converter; see *Ordering Information* on page *6* for details.

WARNING

- **DO NOT** connect any equipment 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 on-board digital I/O, and the RS-485 serial communications.

When using more than one scanner in a multi-drop mode, each scanner must be provided with its own unique address. The scanner address (Scan ID) may be programmed between 1 and 247.

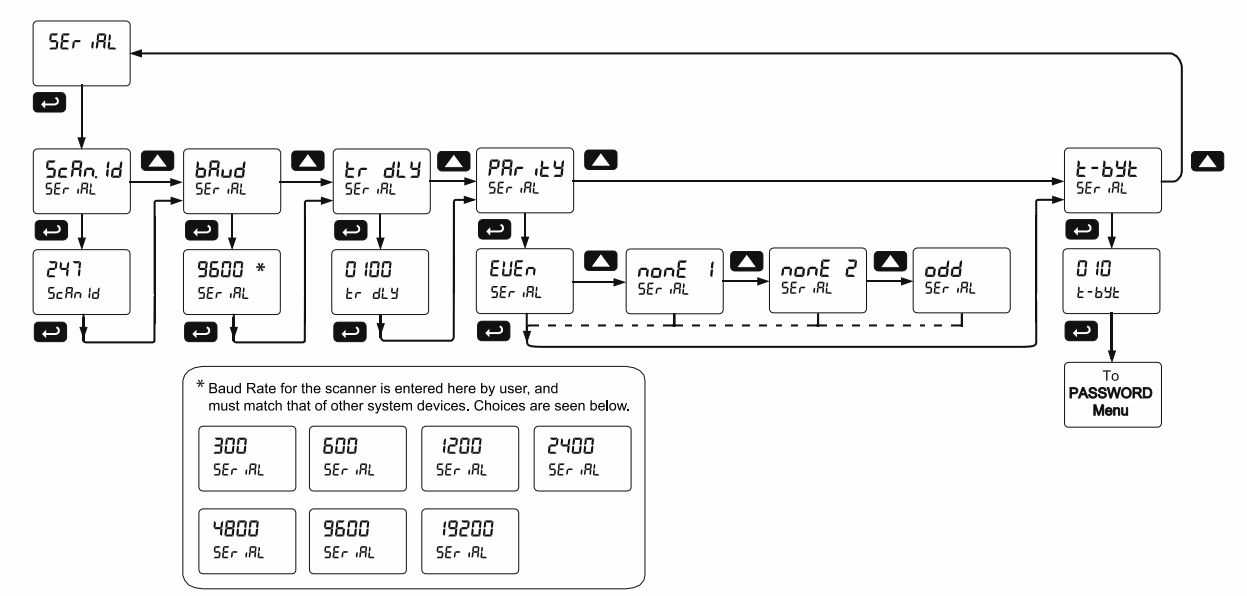
The transmit delay may be set between 0 and 4999 ms; this value must be less than (Poll Time/# of PVs).

The parity can be set to even, odd, or none with 1 or 2 stop bits.

When setting up the scanner to run on a Modbus system, the devices must be programmed with matching Baud Rate and Parity. Failure to match up the network devices' parameters may result in communication breaks.

Notes:

1. *The byte-to-byte timeout setting may be adjusted to fix communication errors with slow devices.*
2. *The Transmit Delay of the Master must be greater than the Snooper or the slave devices being polled.*



Scanner Mode Selection

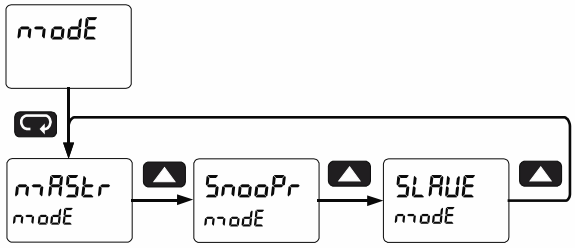
Operating Modes (mode)

The *Mode* menu is used to select how the scanner is to function:

1. Master: Reads a slave device, scales the data from it, displays the result, and operates the relays and 4-20 mA output. The Master polls from 1 to 16 process variables from 1 to 16 slave devices. The Master processes and displays PV1 through PV16 and alternately displays the variables being polled.
2. Snooper: Listens to the Modbus traffic and picks up a specific register or registers being polled by a Master device from a specific slave device and processes the data being read.
3. Slave: Read and controlled by a master device (PLC, DCS, etc). The data sent to it by the master is scaled, displayed, and used to operate the relays and 4-20 mA output.

The Master mode requires additional parameter selection to specify how the slave device is to be read and how to interpret the data.

Press **Menu** to enter Scanner Programming. 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 and return to Run mode.



How to Enable Process Variables (PVs)

In Master or Snooper Mode, navigate to the *PV Number* menu and press ENTER. From there, the user can scroll through all of the sixteen available PVs. In order to enable a specific PV, simply press ENTER to access the desired PV, then scroll to ENABLE and press ENTER (Follow the same course of action for disabling PVs).

Enter the Slave ID of the device being polled by the Master, followed by the Function Code, Register Number, Data Type, and Byte Order. Analog input channels must be assigned a Slave ID corresponding to the input to be read as indicated here:

- Ch A = 256 (mA) or 257 (V)
- Ch B = 258 (mA) or 259 (V)

Once the desired PVs are enabled, navigate to the *Setup* menu and enter the PV Setup in order to select the PV tag, units, format, and decimal point parameters, as well as to scale the PVs.

Once the user has scaled the final PV, the scanner automatically goes to the *Display Setup* menu to access line 1 and 2 display assignments.

By default, display line 1 is assigned to *Display PV* (d PU) and line 2 to display the *Tag* (d tAG) for the corresponding PV.

It is possible to display PVs & Tags on line 1 and 2 simultaneously by selecting *Tag & PV Number* (tAGPUn). Display line 1 is setup by default to display PV & tag for PV1, 3, 5, 7; while line 2 is setup by default to display PV & tag 2, 4, 6, 8. These can be changed by the user to display any or all PVs. Program either display line 1 or 2 to show the desired parameters and press ENTER. See *Setting Up the Displays* (dSPLAY SEtuP) on page 38 for details.

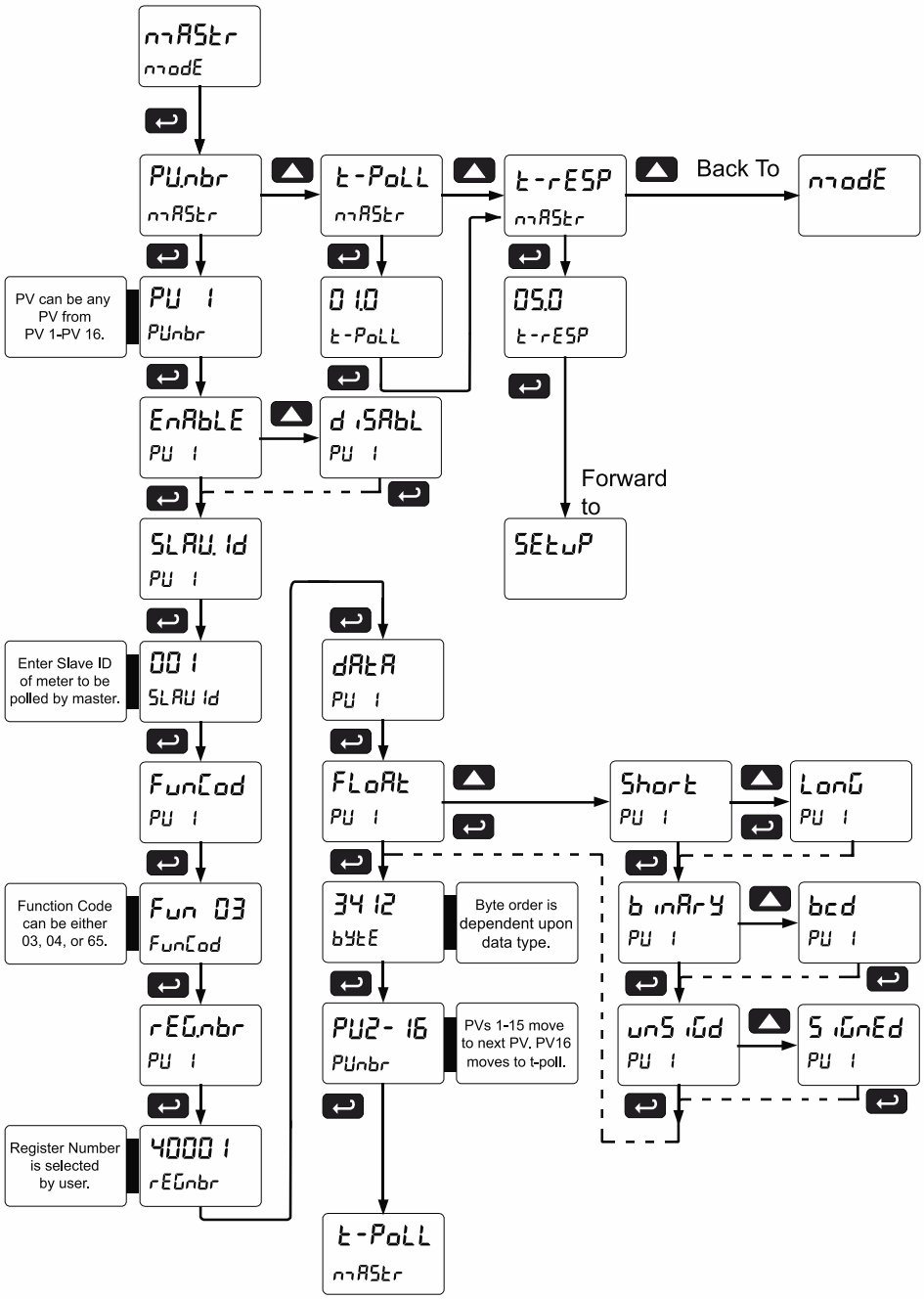
Master Mode (mASTr)

The Master mode contains the *PV Number, Poll Time, and Response Timeout* menus.

PV Number: Enable/disable PVs, select slave ID, function code, register number, data type & byte order.

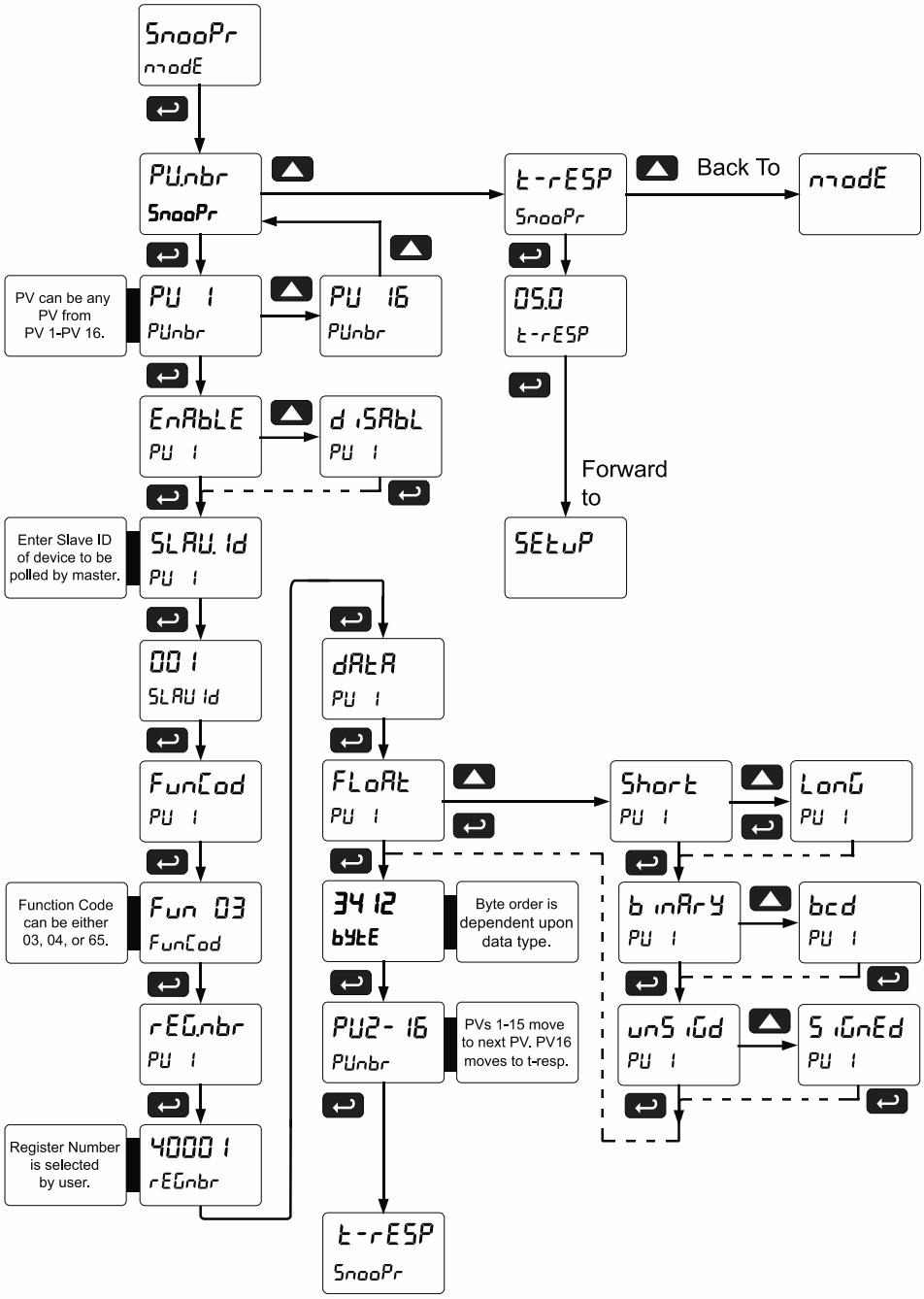
Poll Time: Enter the time interval to poll the slave devices selected.

Response timeout: Enter the time interval to wait after three polls before reporting it as a Communications Break.



Snooper Mode (SnooPr)

The Snooper mode is used to listen to data being transmitted on the bus. Multiple Snoopers can be connected to the RS-485 bus and display any process variable. The same process variable can be displayed in multiple locations. Use the menu below to configure Snooper Mode parameters.



Notes:

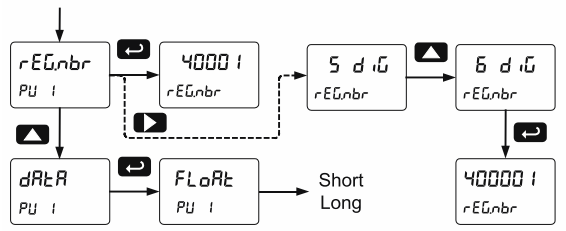
1. *To minimize the possibility of communication errors and communication break conditions, use a poll time of 5 seconds or more with slow baud rates (e.g. 4800 bps or less).*
2. *The response time for scanners set up for Snooper mode must be greater than the Master's poll time. This setting corresponds to the time window during which the Snooper listens to the bus for a reply by the slave device being polled by the master device. As soon as the Snooper detects a new reply on the bus, the display is updated. If there is no reply within the response time setting, the Snooper goes into communications break condition.*

How to Select 5 or 6-Digit Registers

In Master or Snooper Mode, it is possible to select either a five-digit or a six-digit Register Number. Once the operator has enabled a PV, entered a Slave ID, and chosen a Function Code, the scanner will arrive at the Register Number menu (rEGnbr). Press the Right arrow to display the number of digits being used and then the Up arrow to change the setting for the number of digits to be used for that register (5 dIG or 6 dIG), then press ENTER.

Notes:

1. *If Function Code 03 is selected, the Register Number defaults to 40001; if Function Code 04 is selected, the Register Number defaults to 30001.*
2. *Default Data Type is Float*
3. *Default Slave ID for PV1=001, for PV2=002, for PV3=003, etc.*



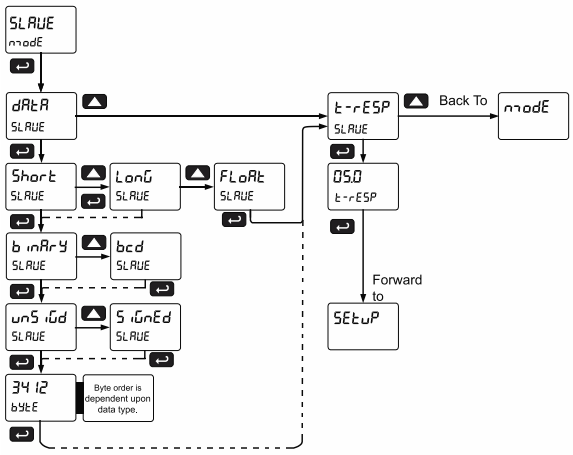
The Master ignores the decimal point setting for slave devices that specify a Short or Long integer. For example, a slave that is displaying 12.34 is read as 1,234. Floating point data may or may not utilize the decimal point. Refer to the slave's operating manual to make sure.

The Register Number range is based on the Function Code and the number of digits selected. See the following table:

Function Code	5 Digit	6 Digit
03	40001 – 49999	400001 – 465536
04	30001 – 39999	300001 – 365536
65	65001-65999	N/A

Slave Mode (SLAVE)

The Slave mode is capable of accepting Short, Long, and Float data types. Refer to the Modbus Register Tables at www.predig.com for details of all the predefined parameters. Follow the menu below to navigate and set all parameters for Slave Mode.

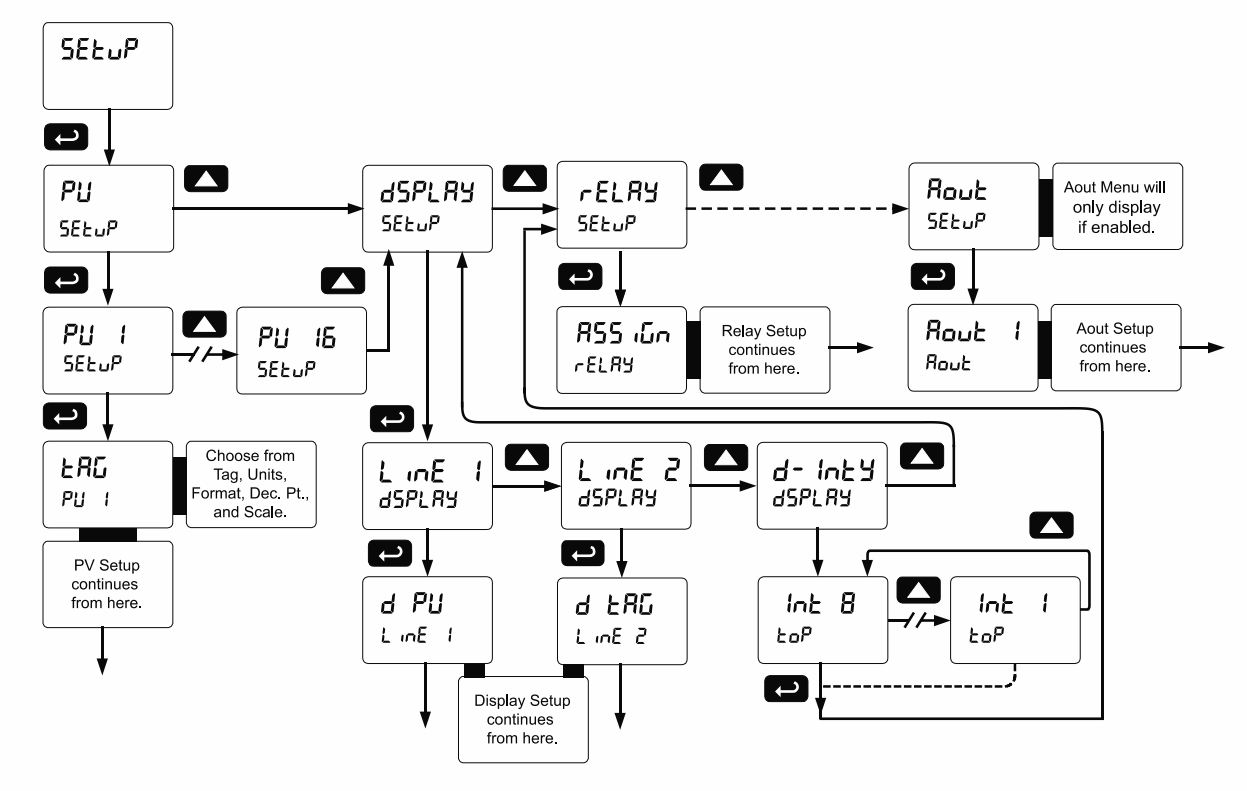


Setting Up the Scanner (SEtuP)

The *Setup* menu is used to select:

1. PV Setup
    a. PV Tags
    b. PV Units
    c. Format: Decimal point or Feet & Inches
    d. Decimal Point
    e. Scale input data
2. Display assignment & Intensity
3. Relay assignment and operation
4. 4-20 mA analog output scaling

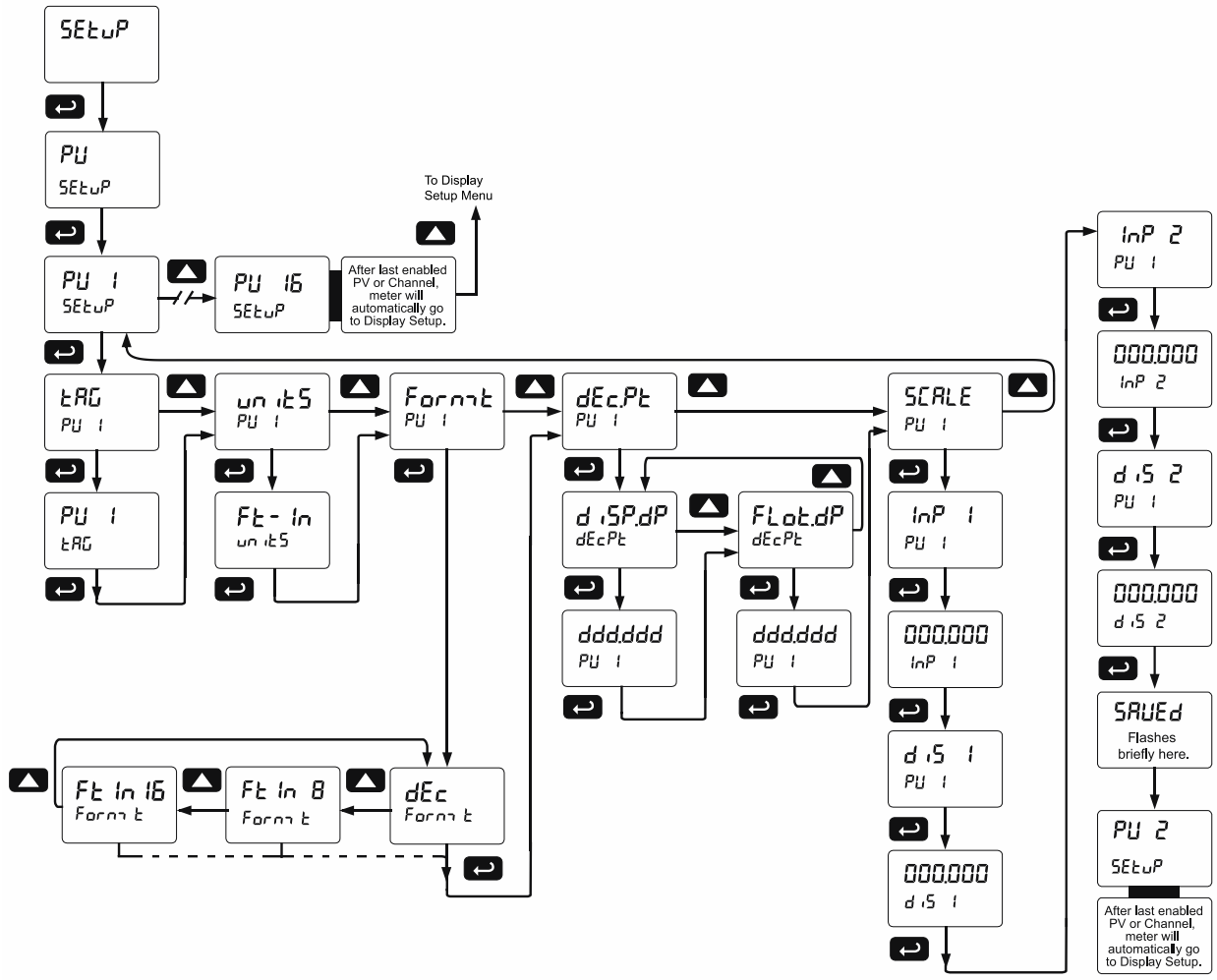
Press the Menu button to exit at any time.



Setting Up the Process Variables (PVs) (PU SEtuP)

Enter the *PV Setup* menu to set up all the criteria associated with each enabled PV. Once you have selected the desired PV, you can select parameters for each. These include tag, units, format, display decimal point, float decimal point (resolution), and scaling of the input data.

Note: PV1 and PV2 can have multiple points for linearization. Only two points are available for all other PVs and for either the Square Root or Programmable Exponent functions.



Setting the Display Decimal Point (d.SPdP)

Decimal point may be set one to five decimal places or with no decimal point at all. Pressing the **Up** arrow moves the decimal point one place to the right until no decimal point is displayed, and then it moves to the leftmost position. The decimal point is programmable only for the Display Value.

Setting the Float Decimal Point (FLotdP)

If floating point data type is selected, select the number of decimals to correspond to the expected floating point data; the numbers to right of the LSD will be ignored by the scanner.

Example:

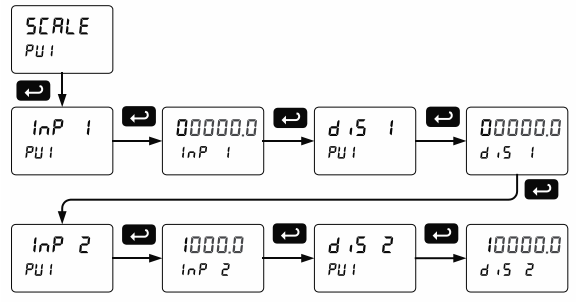
If you have a number such as *12.3456*, you have to tell the scanner how many digits to the right are of interest to you. In this case selecting 4 places will make use of all the digits. For most applications the display decimal point will be set accordingly (*i.e.* 4 places).

If 2 decimal places are selected, the number 12.3456 is displayed as 12.35; notice that the number is rounded up.

Scaling the PV Display Values (SCALE)

The data that the scanner receives can be scaled to display in engineering units. Input 1 must be less than Input 2, Input 2 must be less than Input 3, etc. (known as monotonic values). Press **Enter** to save the changes or **Menu** to exit without saving. When the Linear function is selected for PV1 & PV2, up to 32 points may be programmed to handle non-linear data. Only two points are available for all other PVs and for either the Square Root or Programmable Exponent functions. Round Horizontal Tanks are scaled using the length and diameter of the tank.

Scale Menu



The display will show Error if the scaling or calibration process is unsuccessful. Undesired operation may occur if the error is not corrected. Correct the error by either changing one of the inputs in question or changing the number of points to exclude an erroneous input point.

Notes:

1. *For Feet & Inches Display format, the display values will be in the format* 99 FT 11 IN 15 /16th or 8th. *Make the left digit for inches and 16th blank if the value is less than 10. Example:* 50 Feet, 9 Inches, and 8/16 *will be displayed as* 50 FT _9 IN _8 16th *instead of* 50 FT 09 IN 08 /16th.
2. *Scaling Short and Long input values (input 1, input 2, etc.) should be done without the decimal point.*

Multi-Point Linearization (L inEAr)

The scanner is set up at the factory for 2-point linear scaling. Up to 32 linearization points may be selected for PV1 and PV2. All other PVs have two linearization points available. See *Linear Function Menu* (L inEAr) on page *59* for details.

Setting Up the Displays (dSPLAY SEtuP)

Display Line 1 Parameters (L inE 1 dSPLAY)

The top display (L inE 1) can be programmed to display any of the following:

Display	Parameter	Setting Description
d PU	*Display PV*	Display PVs 1-16
d Ch-C	*Display C Channel*	Display Math Channels C1-C4
PUun it	*Display PV & Units*	Display PV & Units
tGPUn	*Display Tag, PV Number*	Display Tag & PV Number selected
tGPUnu	*Display Tag, PV# & Units*	Display Tag, PV Number selected, & Units
Cun it	*Display C & Units*	Display C1-C4 & Units
tG. C. u	*Display Tag, C, & Units*	Display Tag, C1-C4 & Units
dSEt 1	*Display Set Points 1-4*	Display Set Points 1-4
Hi-PU	*Display Max PV 1-16*	Display Maximum value for each enabled PV1-16
Lo-PU	*Display Min PV 1-16*	Display Minimum value for each enabled PV1-16
Hi-C	*Display Max Ch C1-C4*	Display Maximum for math channels C1-C4
Lo-C	*Display Min Ch C1-C4*	Display Minimum for math channels C1-C4

Display Line 2 Parameters (L inE 2 dSPLAY)

The bottom display (L inE 2) can be programmed to display any of the following:

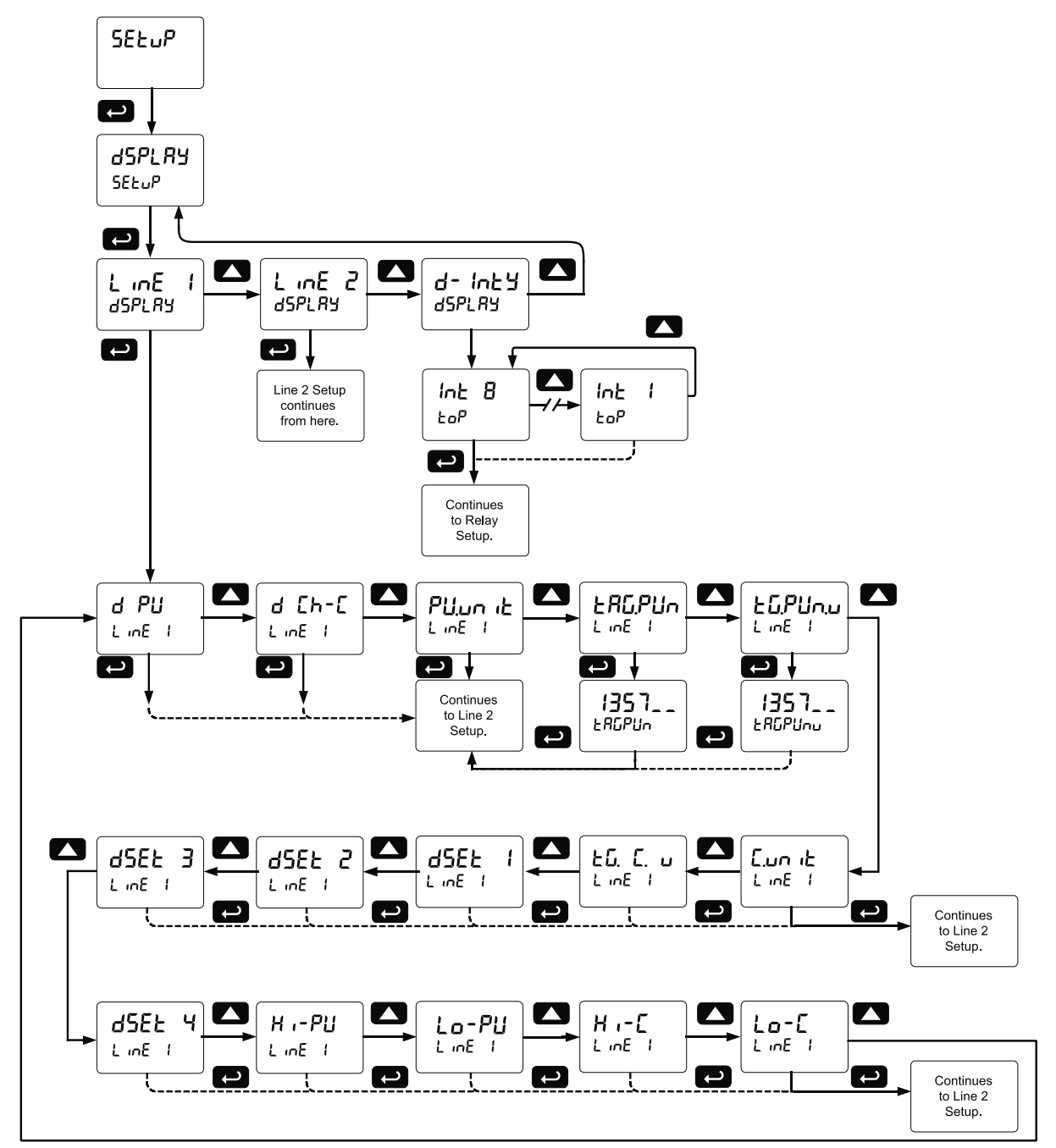
Display	Parameter	Setting Description
d PU	*Display PV*	Display PVs 1-16
d Ch-C	*Display C Channel*	Display Math Channels C1-C4
PUun it	*Display PV & Units*	Display PV & Units
tGPUn	*Display Tag, PV Number*	Display Tag & PV Number selected
tGPUnu	*Display Tag, PV# & Units*	Display Tag, PV Number selected, & Units
Cun it	*Display C & Units*	Display C1-C4 & Units
tG. C. u	*Display Tag, C, & Units*	Display Tag, C1-C4 & Units
dSEt 1	*Display Set Points 1-4*	Display Set Points 1-4
Hi-PU	*Display Max PV 1-16*	Display Maximum value for each enabled PV1-16
Lo-PU	*Display Min PV 1-16*	Display Minimum value for each enabled PV1-16
Hi-C	*Display Max Ch C1-C4*	Display Maximum for math channels C1-C4
Lo-C	*Display Min Ch C1-C4*	Display Minimum for math channels C1-C4
d tAG	*Display Tag*	Display Tag (Line 2 only)
d tAGu	*Display Tag & Units*	Display Tag & Units (Line 2 only)
d oFF	*Display off*	Display Off (Line 2 only)

Note: Toggling displays use the Scan Time for the value and 2 seconds for Tag and Units.

Display Intensity (d- Int Y)

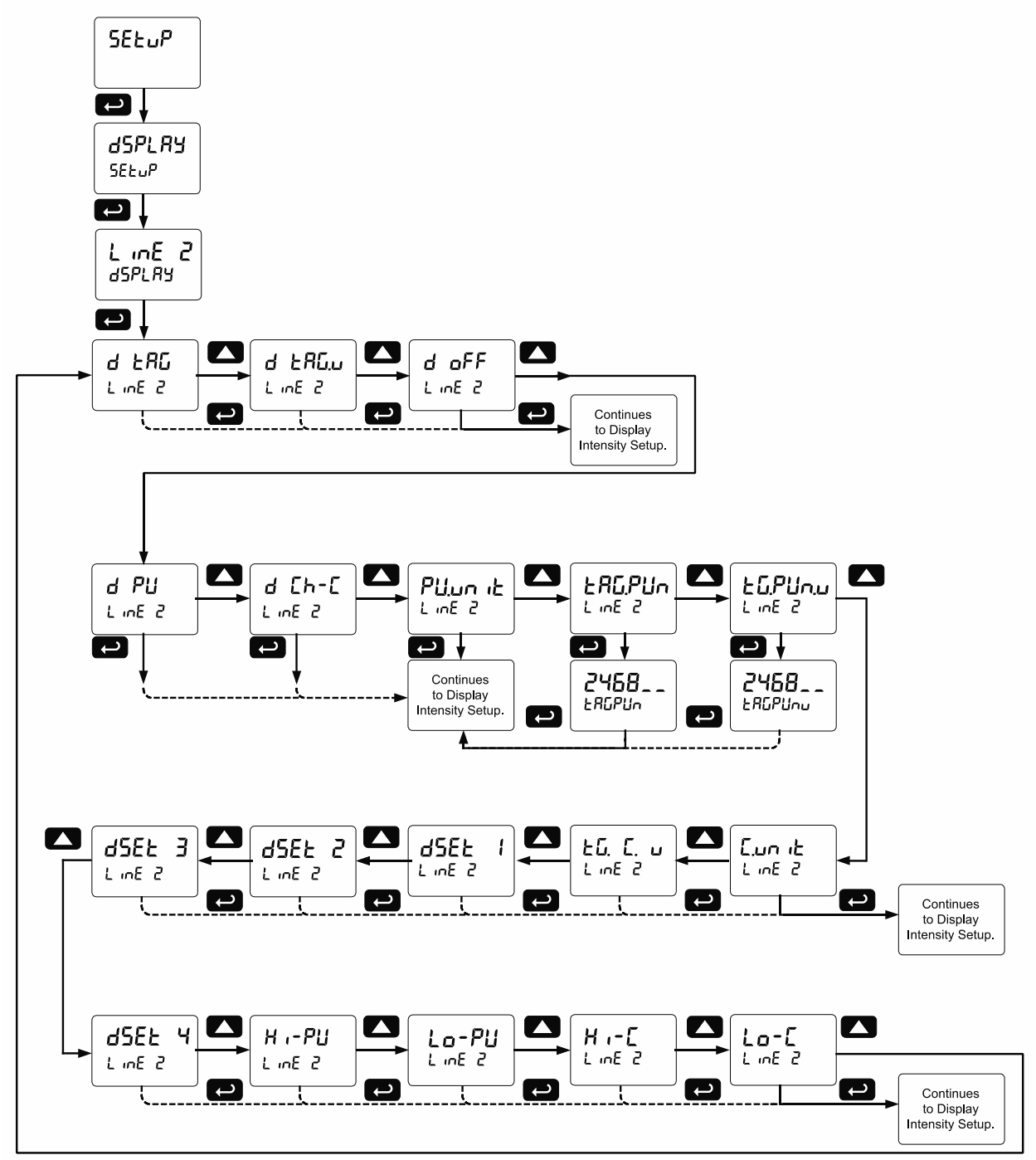
The scanner has eight display intensity levels to give the best performance under various lighting conditions. Select intensity 8 for outdoor applications. The default intensity setting is 6.

Display Line 1 Menu (LINE 1 DSPLAY)



Note: For Tag-PVn and Tag-PVn-U, the default settings for PVs are 1,3,5, & 7, followed by two underscores, which represent empty PVs. These all can be changed to any enabled PVs.

Display Line 2 Menu (LinE 2 dSPLAY)



Note: For Tag-PVn and Tag-PVn-U, the default settings for PVs are 2,4,6,& 8, followed by two underscores, which represent empty PVs. These all can be changed to any enabled PVs.

Setting the Tags (tAG) & Units (Un it5)

Each PV can be setup with its own tag and units. See the flow charts on the previous pages to access the display menu to show the tag or toggling tag & units. The engineering units and custom tags can be set using the following 7-segment character set:

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

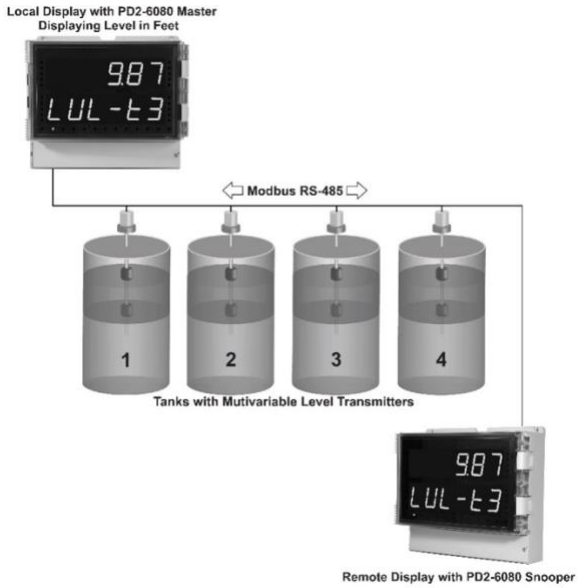
Notes:

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

Application Example 1

In this application we have a system consisting of (4) multivariable tank level gauges connected to (2) PD2-6080 Mobus scanners displaying Product Level, Interface Level, and Average Temperature.

One of the Modbus Scanners is located next to the tanks and the other is located in the control room.



Register Numbers & Process Variables

30001 - Product Level

30003 - Interface Level

30017 - Average Temperature

The following table shows the system setup for a typical multivariable level gauge, one PD2-6080 Master, and one PD2-6080 Snooper:

Parameter	PD2-6080 Master	PD2-6080 Snooper	Description/ Comment
Mode	Master	Snooper	
PV1 Slave ID	1	1	
Function Code	04	04	
Register PV1	30001	30001	Tank 1 Product Level
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV2 Slave ID	1	1	
Function Code	04	04	
Register PV2	30003	30003	Tank 1 Interface

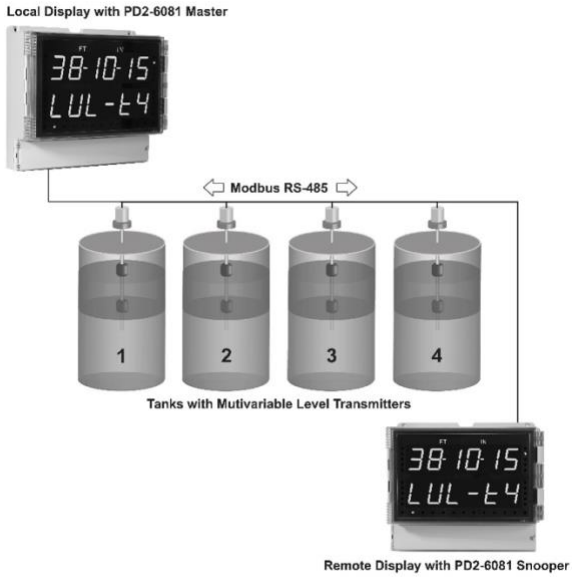
Parameter	PD2-6080 Master	PD2-6080 Snooper	Description/ Comment
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV3 Slave ID	1	1	
Function Code	04	04	
Register PV3	30017	30017	Tank 1 Average Temperature
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV4 Slave ID	2	2	
Function Code	04	04	
Register PV4	30001	30001	Tank 2 Product Level
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV5 Slave ID	2	2	
Function Code	04	04	
Register PV5	30003	30003	Tank 2 Interface
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV6 Slave ID	2	2	
Function Code	04	04	
Register PV6	30017	30017	Tank 2 Average Temperature
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV7 Slave ID	3	3	
Function Code	04	04	
Register PV7	30001	30001	Tank 3 Product Level
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV8 Slave ID	3	3	
Function Code	04	04	
Register PV8	30003	30003	Tank 3 Interface
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV9 Slave ID	3	3	
Function Code	04	04	
Register PV9	30017	30017	Tank 3 Average Temperature
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV10 Slave ID	4	4	
Function Code	04	04	
Register PV10	30001	30001	Tank 4 Product Level
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV11 Slave ID	4	4	
Function Code	04	04	
Register PV11	30003	30003	Tank 4 Interface
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
PV12 Slave ID	4	4	

Parameter	PD2-6080 Master	PD2-6080 Snooper	Description/ Comment
Function Code	04	04	
Register PV12	30017	30017	Tank 4 Average Temperature
Data Type	Long integer Binary, Signed	Long	
Byte Order	1234	1234	
Scanner ID	246	245	
Polling Time	5.0 sec	N/A	
Slave Response Timeout	10.0 sec	10.0 sec	
Baud	4800	4800	
Parity	None 1	None 1	1 stop bit
Byte-to-Byte Timeout	0.01 sec	0.01 sec	
Decimal point	3 places	3 places	
Input 1	000000	000000	Scaling for Level & Interface
Display 1	000000	000000	
Input 2	999999	999999	0.001 inch resolution
Display 2	83.333	83.333	Feet

Application Example 2

In this application we have a system consisting of (4) multivariable tank level gauges connected to (2) PD2-6081s displaying Product Level, Interface Level, and Average Temperature.

One of the Modbus Scanners is located next to the tanks and the other is located in the control room. The display readout is shown in sixteenths of an inch.



Register Numbers & Process Variables

30001 - Product Level

30003 - Interface Level

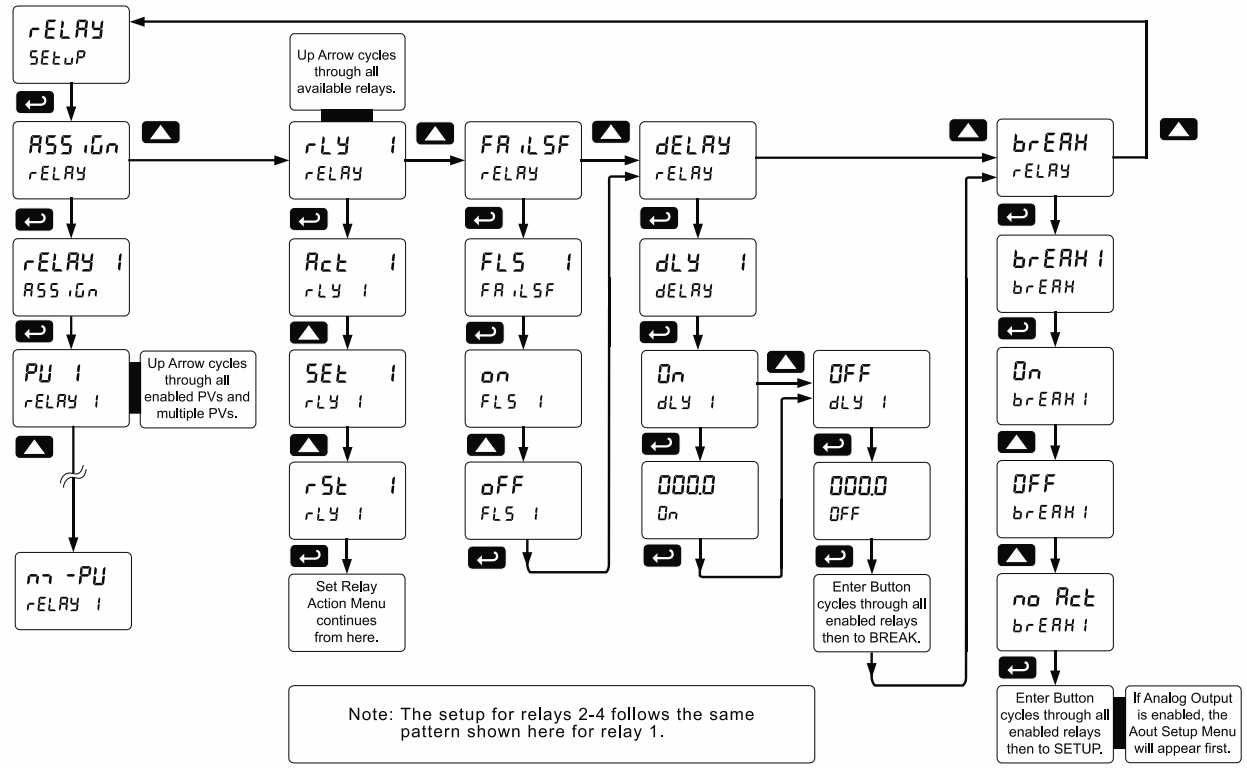
30017 - Average Temperature

Note: The example above shows the PD2-6081. The setup of the scanner is the same as the first example. The PD2-6081's Feet & Inches display is clearly visible.

Setting the Relay Operation (rELAY)

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

Relay Setup Menu (rELAY SEtuP)



⚠ CAUTION

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

---

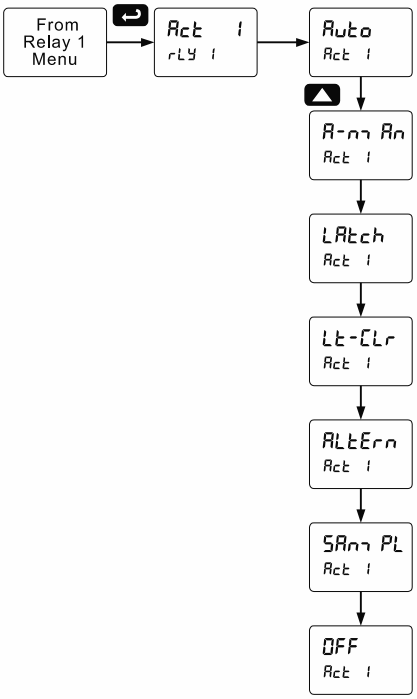
1. ASS iGn Relay assignment
   a. Assign relay to PV
   b. Assign relay to Math channel
   c. Assign relay to multiple PVs (2 to 16 PVs)
2. Act 1 Relay action
   a. Automatic reset only (non-latching)
   b. Automatic + manual reset at any time (non-latching)
   c. Latching (manual reset only)
   d. Latching 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 1 Set point & rSt 1 Reset point
4. FA iLSF Fail-safe operation
   a. On (enabled)
   b. Off (disabled)
5. dELAY Time delay
   a. On delay (0-999.9 seconds)
   b. Off delay (0-999.9 seconds)
6. brEAK Relay action for communications break or loss of 4-20 mA input

Setting the Relay Action (Act 1)

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

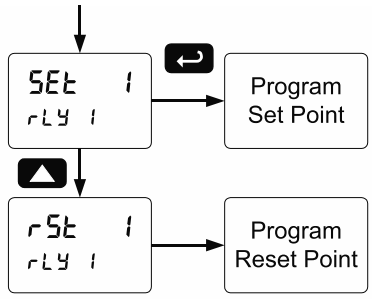
1. Automatic reset (non-latching)
2. Automatic + manual reset at any time (non-latching)
3. Latching (manual reset only, at any time)
4. Latching with Clear (manual reset only after alarm condition has cleared)
5. Pump alternation control (automatic reset only)
6. Sampling (the relay is activated for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

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



Programming Set and Reset Points

High alarm indication: program set point above reset point.
Low alarm indication: program set point below reset point.
The deadband is defined as 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 (FAiLSF)

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 (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 Communications Break (brEAK)

The Scanner will poll the slave device three times before reporting a communications break condition. After the third failure, the Response Timeout timer starts and will determine the actual time to report a PV in break condition.

1. Turn *On* (Go to alarm condition)
2. Turn *Off* (Go to non-alarm condition)
3. No Action (The relays will maintain the last condition)

Refer to *Relay Operation After Communications Break* on page *48* for details.

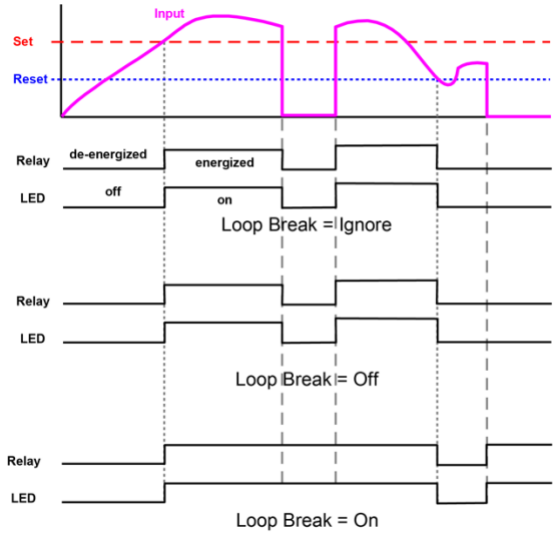
Relay Action for Loss of 4-20 mA Input (Loop Break)

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

Notes:

1. *This is not dependent on the Communications Break or Response Timeout setting.*
2. *This is not a true loop break condition; if the signal drops below 0.005 mA, it is interpreted as a "loop break" condition.*

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

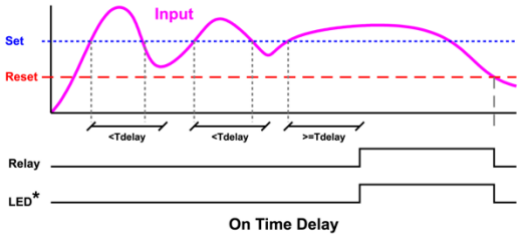


When the scanner detects a break in the 4-20 mA loop, the relay will go to one of the following selected actions:

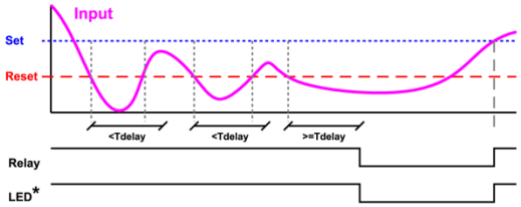
1. Turn *On* (Go to alarm condition)
2. Turn *Off* (Go to non-alarm condition)
3. Ignore (Processed as a low signal condition)
   Note: Select no Action

Time Delay Operation

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



On Time Delay

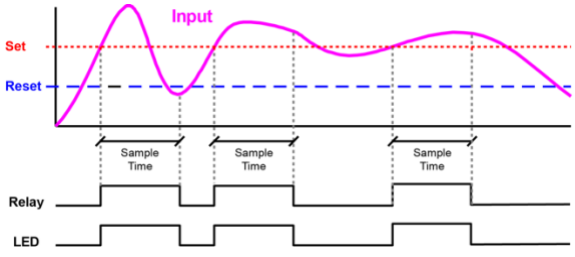


Off Time Delay

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

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

Relay Sampling Operation



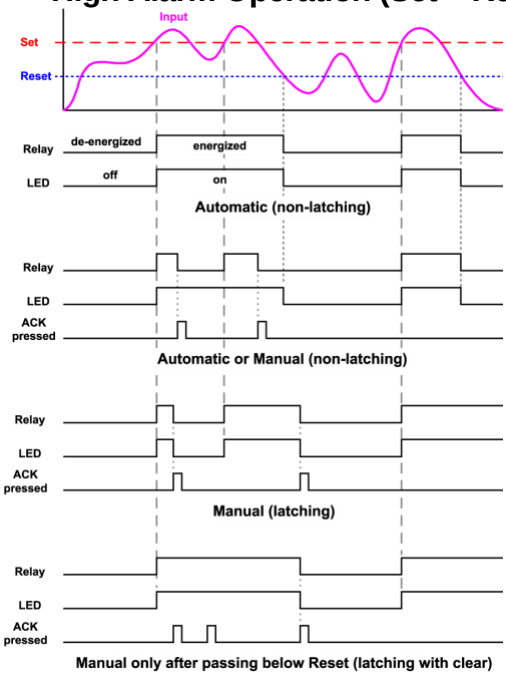
When the signal crosses the set point, the relay trips and the sample time starts. After the sample time has elapsed, the relay resets. The cycle repeats every time the set point is crossed, going up for high alarms and going down for low alarms.

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

Relay and Alarm Operation Diagrams

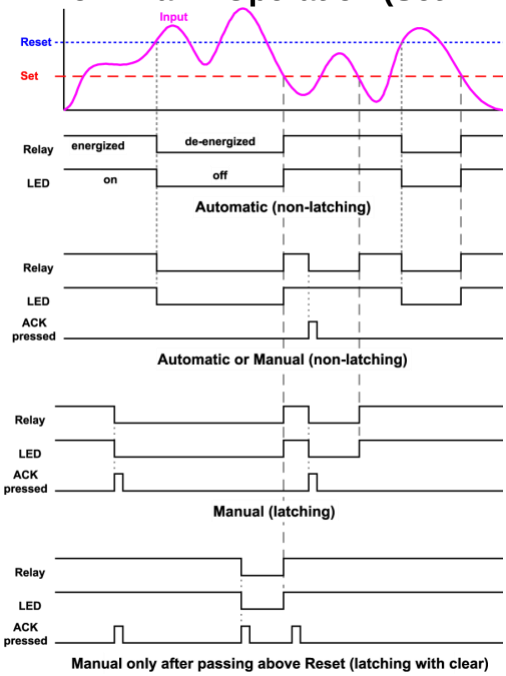
The following graphs illustrate the operation of the relays, status LEDs, and ACK button.

High Alarm Operation (Set > Reset)



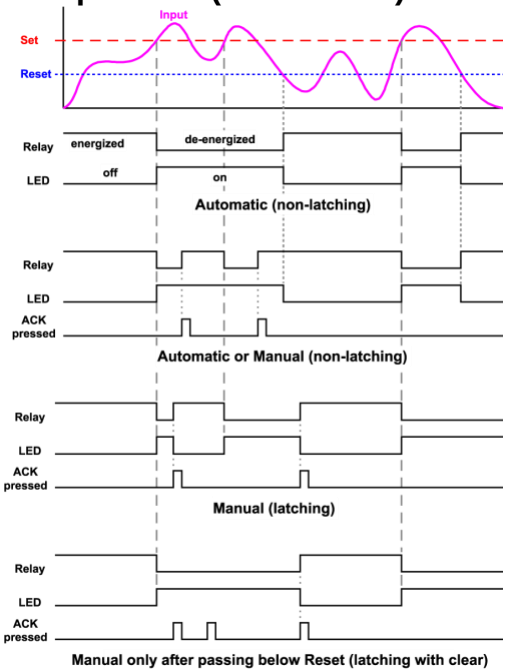
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. To detect a new alarm condition, the signal must go below the set point, and then go above it.

Low Alarm Operation (Set < Reset)



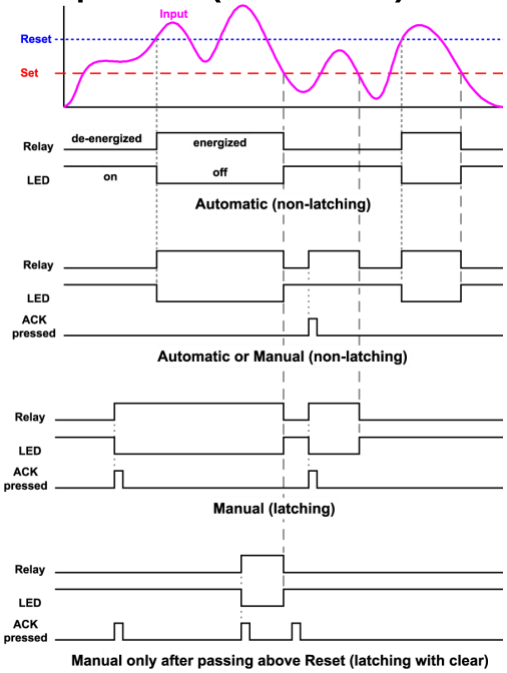
For Manual reset mode, ACK can be pressed anytime to turn "off" relay. For relay to turn back "on", signal must go above set point and then go below it.

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



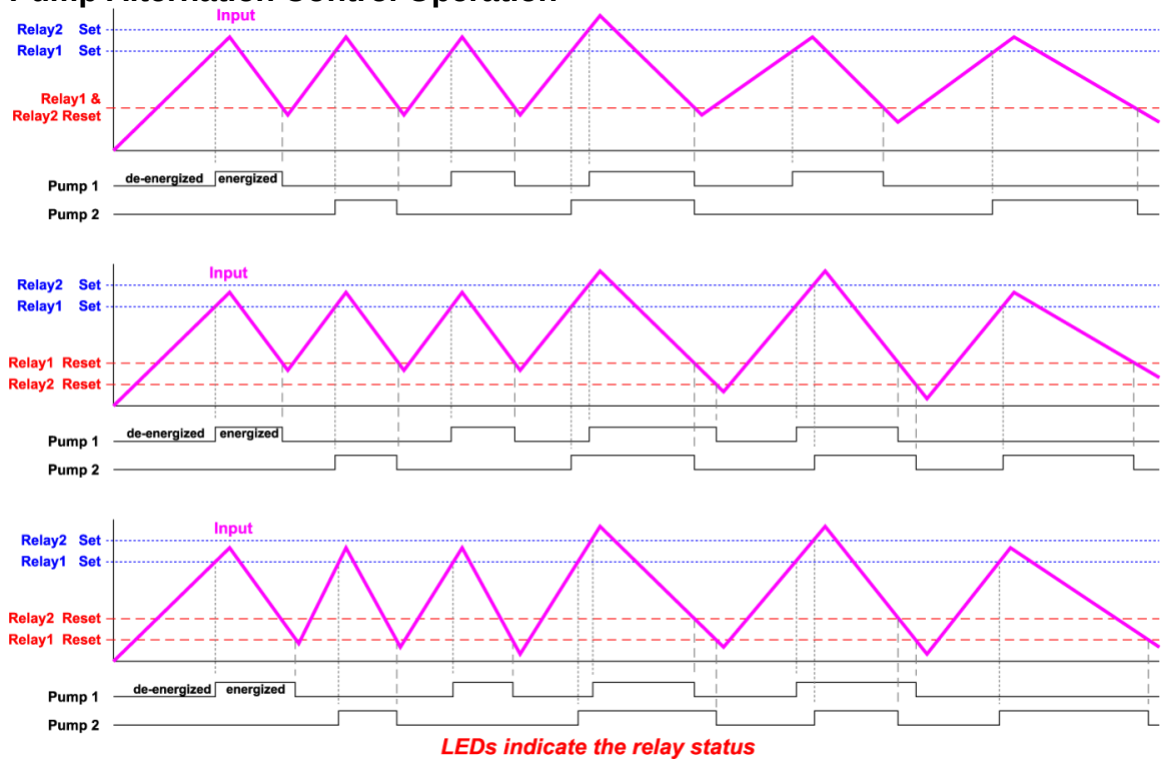
Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to alarm state.

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

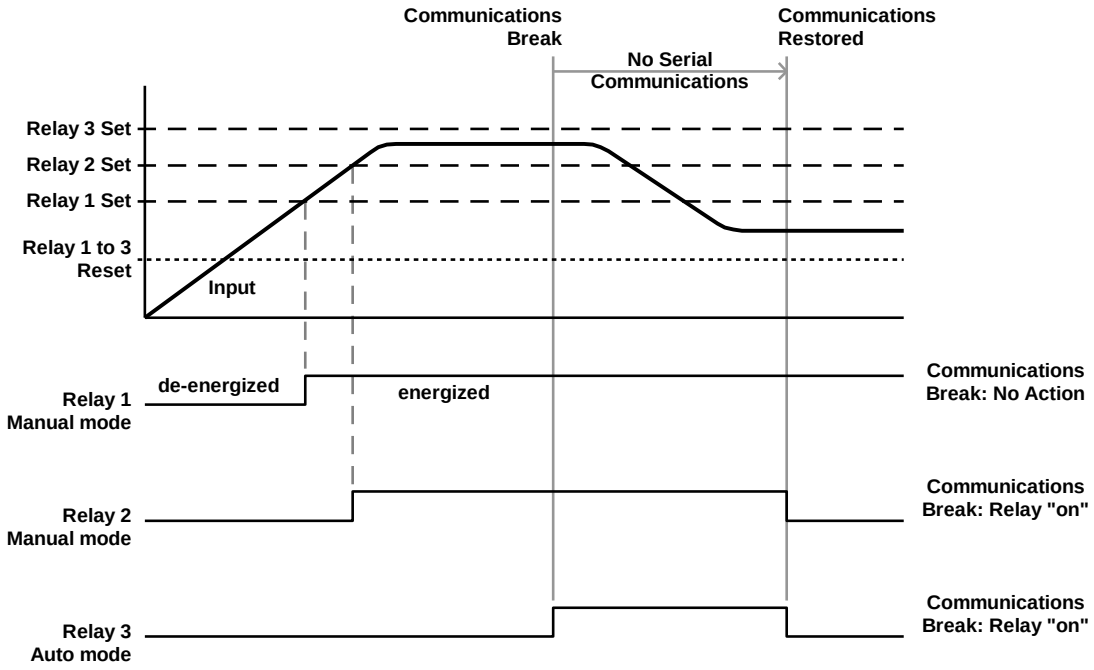


LEDs indicate the relay status

Relay Operation After Communications Break

When a Master scanner fails to receive a reply from the slave it is called a Communications Break. The relays can be programmed to react to this event by going On, Off, or No Action. After communication is restored the relays are turned off or on, based on their operating mode and their set and reset points, without regard to their prior state. This is similar to the auto initialization on power up. Below is a diagram showing three examples.

The same is true for a scanner set up to operate in Snooper mode.



Relay Operation Details

Overview

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

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

Relays Auto Initialization

When power is applied to the scanner, the front panel LEDs and alarm relays will reflect the state of the input to the scanner after the first response from the slave device. 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 (FAiLSF)

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

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

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

Front Panel LEDs

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

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

The scanner 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.

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

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

⚠ WARNING

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

Non-Latching Relay (AUto)

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

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

Non-Latching Relay with Manual Reset (A-nAn)

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

In addition, the relay can be manually reset while the alarm condition still exists, but the LED will stay on until the scanner 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 scanner is set up for manual reset at any time. Acknowledging the alarm even if the alarm condition is still present resets the relay and turns off the LED.

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

Latching Relay with Clear (Lt-CLr)

In this application, the scanner 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 scanner 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

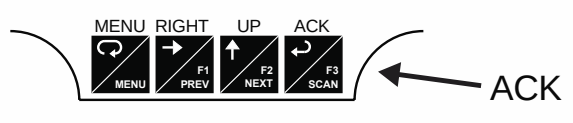
Light / Horn / Button Accessories

Add visible and audible ways to indicate alarm conditions on any Helios meter with the MOD-PD2LH Light / Horn / Button accessories. The light with built-in 85 dB horn, and button come mounted and wired to the Helios. Meter and accessories are ordered as separate items. See *Ordering Information* on page *6*.

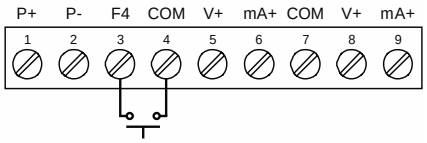
Acknowledging Relays

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

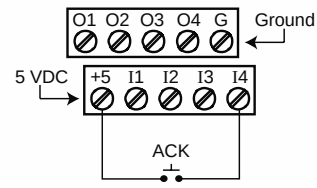
1. Via the programmable front panel function keys F1-F3 (Example: F3 assigned to ACK).



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



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



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

Acknowledging Relays with Remote Control Station

Relays may be remotely acknowledged by connecting the PDA2361-A to either the F4 terminal or a digital input as described above.

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 4 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

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

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.

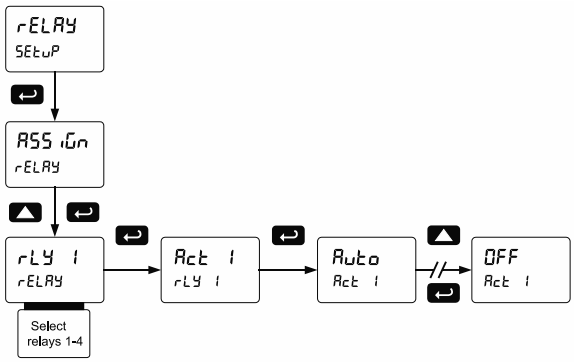
Pump Alternation Operation

1. Pump #1 turns on when the level reaches 30.000, when level drops below 10.000 pump #1 turns off.
2. The next time the level reaches 30.000, pump #2 turns on, when the 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 to 10.000 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 4 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.

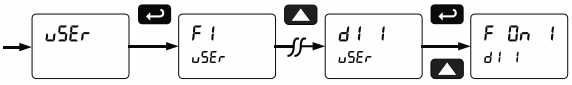
Setting Up the Interlock Relay (Force On) Feature

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

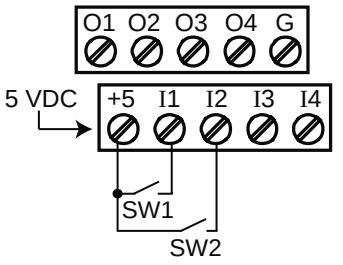
1. Access the *Setup – Relay – Action* menu and set the action to off.



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



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



Interlock Relay Operation Example

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

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

⚠ IMPORTANT

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

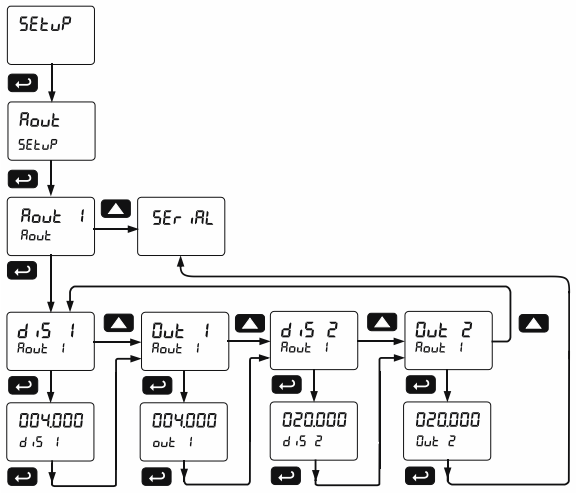
Scaling the 4-20 mA Analog Output (Aout)

The 4-20 mA analog output can be scaled to provide a 4-20 mA signal for any display range selected. The Analog Output can be mapped to PVs or Math Channels. To select the channel and source assignments the analog output are assigned to, see *Analog Output Source Programming* (AoutPr) on page *66*.

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 output based on display values.

> For further details, see *Setting Numeric Values* on page *29,* Analog Output Value for Loss of 4-20 mA Input (Loop Break) on page *66*



Notes: Changes to the settings are saved to memory only after pressing ENTER. Changes made to settings prior to pressing ENTER are not saved. Once ENTER is pressed, the display moves to the next menu.

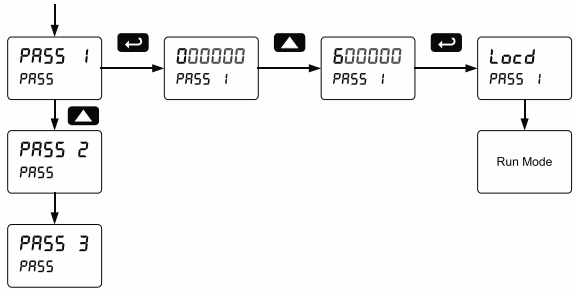
Setting Up the Password (PASS)

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.

Protecting or Locking the Scanner

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

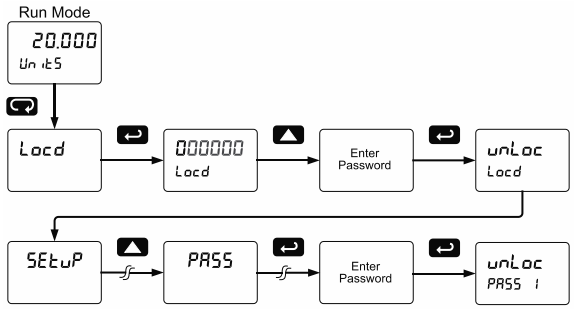


Making Changes to a Password Protected Scanner

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



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

If the password entered is incorrect, the scanner 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.

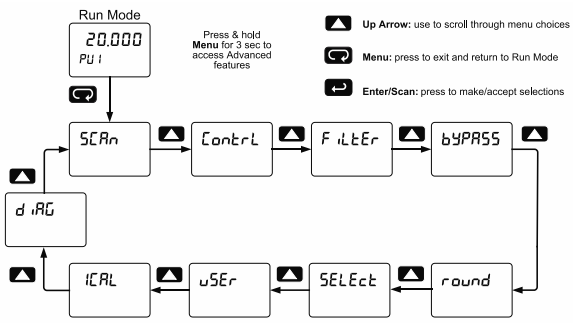
Did you forget the password?

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 scanner.

Advanced Features Menu

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

1. *Scan Mode: Auto or manual; Go on alarm or stop on alarm*
2. *Control relays and analog output*
3. *Noise Filter*
4. *Noise Filter Bypass*
5. *Rounding Feature*
6. *Select Math*, *Linearization function, Cutoff*
7. *User Programming for function keys and digital I/O*
8. *Analog Channels Input Calibration*
9. *System Information*



Advanced Menu Navigation Tips

- Press and hold the **Menu** button for three seconds to access the Advanced Features Menu.
- Press the **Up** arrow button to scroll through the Advanced Features Menu.
- Press **Menu** at any time, to exit and return to Run mode.
- Changes made to settings prior to pressing **Enter/Scan** are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/Scan**.
- The display automatically moves to the next menu every time a setting is accepted by pressing **Enter/Scan**.

Advanced Features Menu & Display Messages

Advanced Features Menu & Display Messages

Display	Parameter	Action/Setting
SCAn	*Scan*	Enter *Scan* menu
nmodE	*Scan Mode*	Select Auto or Manual Scan Mode
Auto	*Automatic*	Select Automatic Scan Mode
t imE	*Scan Time*	Select Scanning Time
nmAn	*Manual*	Select Manual Scan Mode
ALArnm	*Alarm*	Select Go or Stop Alarm
Go	*Go*	Select Alarm Go
StoP	*Stop*	Select Alarm Stop
ContrL	*Manual Control*	Enter *Manual Control* menu for relays and analog output 1
Auto	*Automatic*	Select Automatic Control of Outputs and Relays
nmAn	*Manual*	Select Manual Control of Outputs and Relays
Aout 1	*Analog Output 1*	Select Analog Output 1 for manual control
rLY 1	*Relay 1*	Select Relay 1-4 for manual control
on	*On*	Select *On* for Relay 1-4
oFF	*Off*	Select *Off* for Relay 1-4
FiLtEr	*Filter*	Enter *Filter* menu
PU 1	*PV 1 Filter*	Program Filter Value for PV 1
PU 2	*PV 2 Filter*	Program Filter Value for PV 2
byPASS	*Filter Bypass*	Enter *Filter Bypass* menu
PU 1	*PV 1 Filter Bypass*	Program Filter Bypass Value for PV 1
PU 2	*PV 2 Filter Bypass*	Program Filter Bypass Value for PV 2
round	*Rounding Feature*	Enter *Rounding Feature* menu
1*	*1 Rounding Value*	Program Rounding Value for PV *(User-selectable & rounds to the nearest 1, 2, 5, 10, 20, 50, 100)
SELEct	*Select*	Enter *Select* menu
Functn	*Function*	Enter data *Linearization Function* menu
PU 1*	*PV 1 Function*	*Enter *Linearization Function* menu for all enabled PVs
Ch C1*	*Ch C1 Function*	*Enter *Linearization Function* menu for all enabled math channels
LinEAr	*Linear*	Enter *Linear* menu
no PtS	*Number of Points*	Enter *Number of Linearization Points*
SCALE	*Scale*	Scale *Number of Linearization Points*

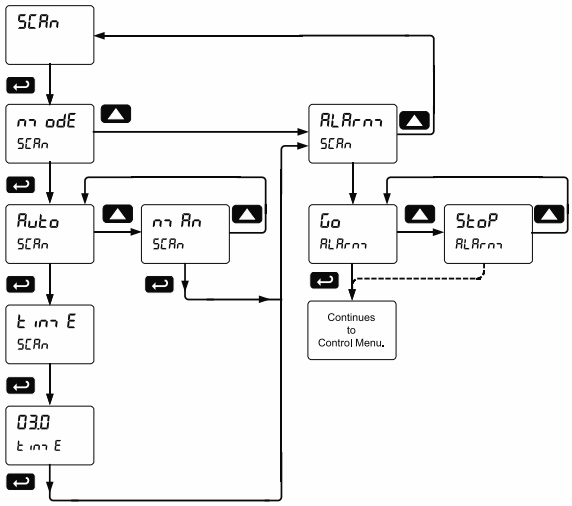
Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
InP 1	*Input 1*	Scale input 1 signal or program input 1 value
diS 1	*Display 1*	Program display 1 value
InP 2	*Input 2*	Scale input 2 signal or program input 2 value (up to 32 points for PV1 & PV2)
diS 2	*Display 2*	Program display 2 value (up to 32 points for PV1 & PV2)
SqURrE	*Square Root*	Enter *Square Root* menu
ProG E	*Programmable Exponent*	Enter *Programmable Exponent* menu
15000	*Programmable Exponent Value*	Enter the Programmable Exponent Value
rht	*Round Horizontal Tank*	Enter *Round Horizontal Tank* menu
Inch	*Inch*	Enter to calculate tank values in Inches
cnt	*Centimeters*	Enter to calculate tank values in Centimeters
diAntr	*Diameter*	Enter tank diameter
LEnGth	*Length*	Enter tank length
mtRth	*Math*	Enter *Math* menu
Ch C1*	*Channel C1*	*Enter *Math Channel C1-C4* menu
OPErtn	*Operation*	Enter *Math Operation* menu
ConSt	*Constant*	Enter *Math Constant* menu
AddEr	*Adder*	Enter *Adder Value*
FACtr	*Factor*	Enter *Factor Value*
Sumt	*Sum*	Math Function *Sum*
d.F	*Difference*	Math Function *Difference*
d.FAbS	*Absolute Difference*	Math Function *Absolute Difference*
AVG	*Average*	Math Function *Average*
mtuLt.	*Multiply*	Math Function *Multiply*
d.Ud.dE	*Divide*	Math Function *Divide*
H.-PU	*Max*	Math Function *Maximum of all selected PVs*
Lo-PU	*Min*	Math Function *Minimum of all selected PVs*
drAu_	*Draw*	Math Function *Draw*
u_AVG	*Weighted Average*	Math Function *Weighted Average*
rAt.o	*Ratio*	Math Function *Ratio*
ConcEn	*Concentration*	Math Function *Concentration*
mtRth2	*Math2*	*Resultant Math* Channel Math operation applied to other math channels (e.g. C3 = C1/C2)
Sumt	*Sum*	Math2 Function *Sum*
d.F	*Difference*	Math2 Function *Difference*

Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
d.FAbS	*Absolute Difference*	Math2 Function *Absolute Difference*
AVG	*Average*	Math2 Function *Average*
mtuLt.	*Multiply*	Math2 Function *Multiply*
d.Ud.dE	*Divide*	Math2 Function *Divide*
CutoFF	*Cutoff*	Enter *Low Flow Cutoff* menu
PU 1	*PV 1 Cutoff*	Program Cutoff Value for PV 1
PU 2	*PV 2 Cutoff*	Program Cutoff Value for PV 2
AoutPr	*Analog Output Program*	Enter *Analog Output Programmable* parameters menu
Aout 1	*Analog Output 1*	Analog Output 1 (If Installed)
SourCE	*Analog Output Data Source*	Enter Analog Output Data *Source* menu
PU 1*	*Source PV*	*Select *PV* for Analog Output Data Source
Ch C1*	*Source Math Channel*	*Select *C1-4* for Analog Output Data Source
SEt 1*	*Set Point 1-4*	*Select Set Points 1-4
brEAK	*Communica-tions Break*	Enter the Analog Output value when *Communications Break* is detected
IGnorE	*Ignore Break*	Ignore Break
ForcE	*Force Break*	Force Break
CAL.b	*Calibration*	Enter the Analog Output *Calibration* menu
mtAX	*Maximum*	Select *Maximum* value for all Analog Outputs
mt.in	*Minimum*	Select *Minimum* value for all Analog Outputs
O-rAnG	*Overrange*	Enter the Analog Output value for an *Overrange* condition
u-rAnG	*Underrange*	Enter the Analog Output value for an *Underrange* condition
uSEr	*User*	Enter the *User* menu for assigning function keys and digital I/O
F1*	*F1-4*	*F1-F4 Function Keys
PrEU	*Previous*	Previous PV
nEXt	*Next*	Next PV
SCAn	*Scan*	Scan or pause scan
AcK	*Acknowledge*	Acknowledge relays
rESEt	*Reset*	Enter *Reset* menu
rSt H.	*Reset Max*	Reset Maximum
rSt Lo	*Reset Min*	Reset Minimum
rSt HL	*Reset Max-Min*	Reset Maximum & Minimum
rELAY	*Relay*	Relay menu
SEt 1*	*Set Points 1-4*	Set Points 1-4
rLY d	*Relay Disable*	Relay Disable (all relays)

Advanced Features Menu & Display Messages		
Display	**Parameter**	**Action/Setting**
rLY E	*Relay Enable*	Relay Enable (all relays)
O HoLd	*Output Hold*	Output Hold (all relays)
d HoLd	*Display Hold*	Display Hold (while held low)
d iSAbL	*Disable*	Disable
ContrL	*Manual Control*	Manual Control menu
dI !*	*DI 1-4*	*Digital Inputs 1-4
mnEnu	*Menu*	Menu
r iGht	*Right*	Right
uP	*Up*	Up
EntEr	*Enter*	Enter
F on !*	*Force On Relay 1*	*Force On Relay 1-4
dO !*	*DO 1-4*	*Digital Outputs 1-4
ALrn !*	*Alarm 1-4*	*Alarm 1-4
AcK	*Acknowledge*	Acknowledge
rESEt	*Reset*	Enter *Reset* menu
rSt Hi	*Reset Max*	Reset Maximum
rSt Lo	*Reset Min*	Reset Minimum
rSt HL	*Reset Max-Min*	Reset Maximum & Minimum
d iSAbL	*Disable*	Disable
iCAL	*Input Calibration*	Enter analog channels *Input Calibration* menu
Ch-A	*Channel A*	Enter *Input Channel A*
Ch-b	*Channel B*	Enter *Input Channel B*
mnA	*Milliamps*	Enter *Milliamps*
C CAL	*Milliamp Calibration*	Enter *Milliamp Calibration*
C Lo	*Milliamp Low Signal*	Enter *Milliamp Low Signal*
C Hi	*Milliamp High Signal*	Enter *Milliamp High Signal*
Volt	*Volts*	Enter *Volts*
U CAL	*Voltage Calibration*	Enter *Voltage Calibration*
U Lo	*Voltage Low Signal*	Enter *Voltage Low Signal*
U Hi	*Voltage High Signal*	Enter *Voltage High Signal*
Error	*Error*	Error Message for *Unsuccessful Calibration*
diAG	*Diagnostic*	Enter *Diagnostics menu*
rESEt	*Reset*	Reset to Factory Defaults
LEd t	*LED Test*	LEDs cycle through all digits, decimal points, and indicators
inFo	*Info*	Displays Scanner information
SFt	*Software*	Displays *Software* information
VEr	*Software Version*	Displays *Software Version* information

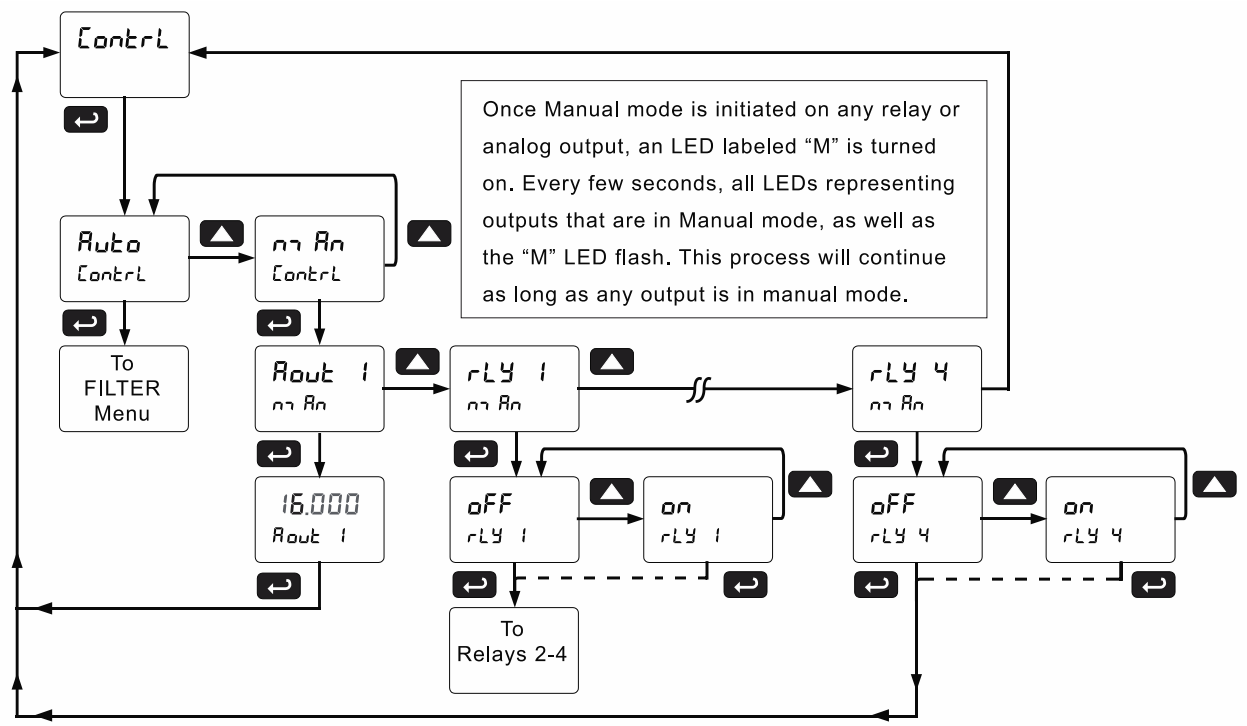
Scan Function (SCAn)

The *Scan* menu is used to program the PV scan mode and the scanner's behavior on alarm condition. The operator is able to scan automatically based on a time parameter, or scan manually with front panel keys or digital inputs. The operator is also able to set the scanner to stop on alarm or continue scanning on alarm. To resume scanning the operator must press the Next or Previous button. Please follow the menu below for details. In the Stop on Alarm mode, the scanner will go to the alarmed PV and remain there until the operator manually advances to the next PV or returns to the previous PV. If a new alarm is detected the process is repeated. The scanner ignores old alarms.



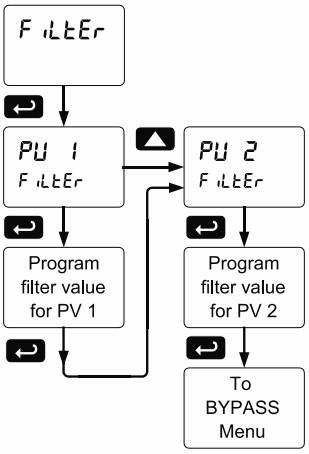
Manual Control Menu (ContrL)

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



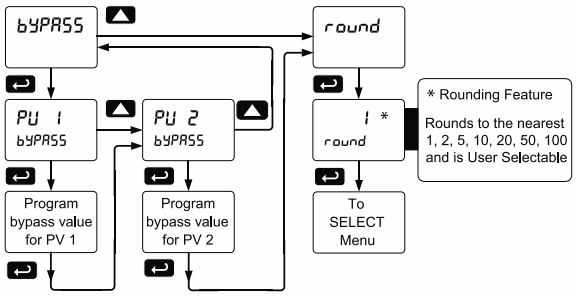
Noise Filter (FiLtEr)

Most applications do not require changing this parameter. It is intended to help attain a steady display with unsteady (noisy) input data. The field selectable noise filter averages any minor or quick changes in the input data and displays the reading with greater stability. Increasing the filter value will help stabilize the display. However, this will reduce the display response to changes on the input data. The filter level may be set anywhere from 2 to 199. Setting the filter value to zero disables the filter function, and the bypass setting becomes irrelevant. This parameter is associated with the analog input channels, PV1, and PV2.



Noise Filter Bypass (bYPASS)

The scanner can be programmed to filter small input changes, but allow larger input changes to be displayed immediately, by setting the bypass value accordingly. If the input signal goes beyond the bypass value, it will be displayed immediately with no averaging done on it. The noise filter bypass value may be set anywhere from 0.2 to 99.9. Increasing the bypass value may slow down the display response to changes on the input signal.



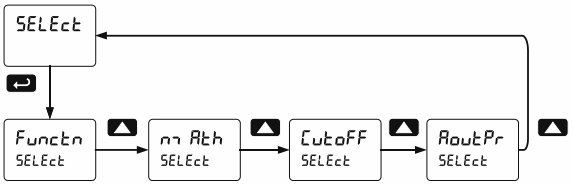
Rounding Feature (round)

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

Rounding causes the display to round to the nearest value according to the rounding criteria selected.

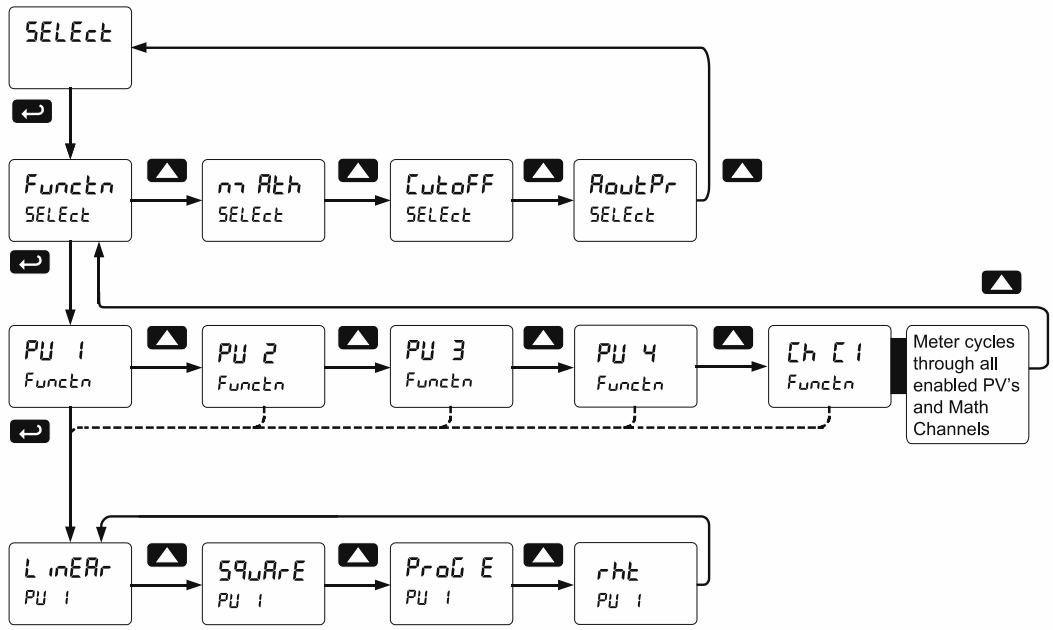
Select Menu (SELEct)

The *Select* menu is used to select the input data linearization function (linear, square root, programmable exponent, or round horizontal tank), math functions, constants, low-flow cutoff, and analog output programming. Multi-point linearization is part of the linear function selection.



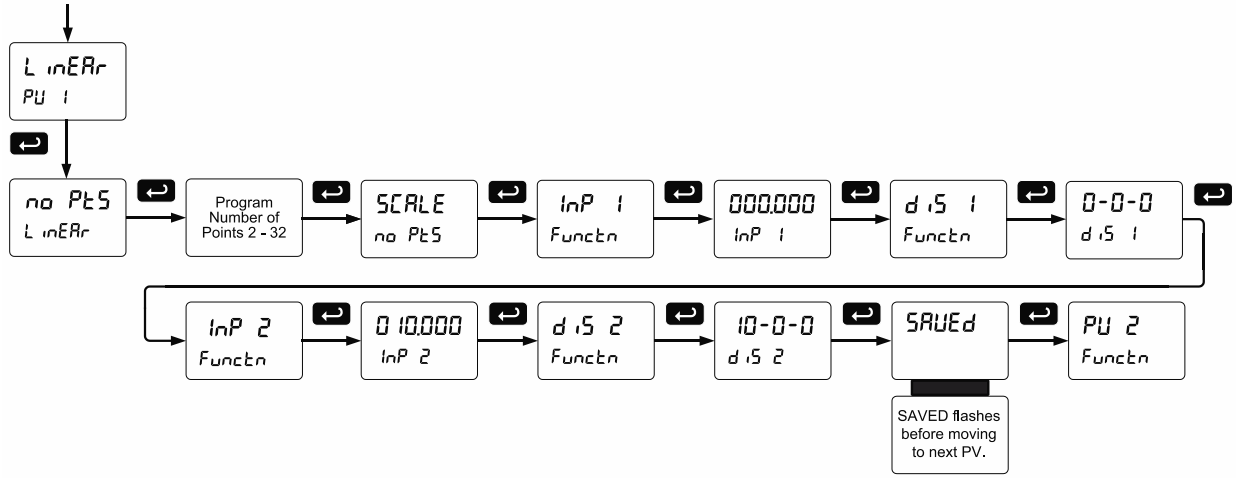
Input Data Conditioning Function Menu (Functn)

The *Function* menu is used to select the input-to-output transfer function applied to the input data: linear, square root, programmable exponent, or round horizontal tank volume calculation. Multi-point linearization (for PV1 and PV2) is part of the linear function selection. Scanners 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 data (e.g 0.000 = 0.000, 10.000 = 10.000, and then 5.000 = 5.000).



Linear Function Menu (L inEAr)

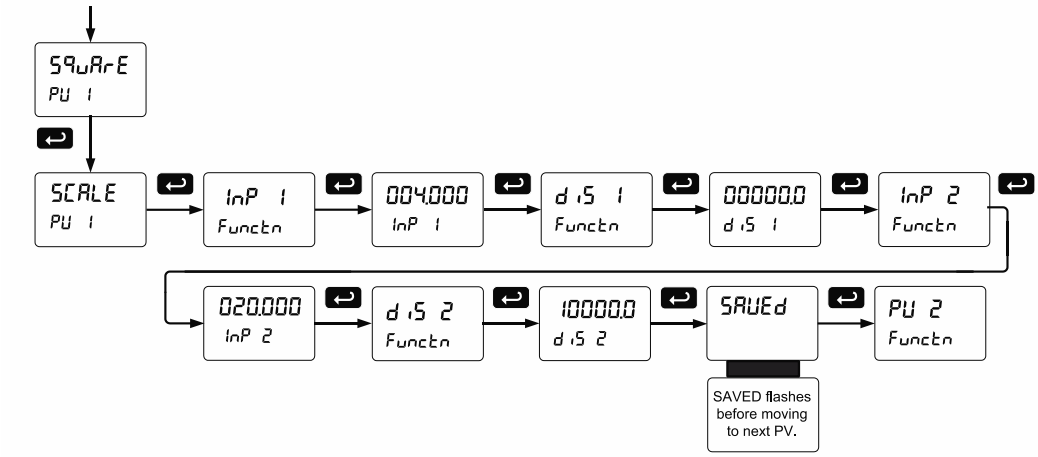
Scanners are set up at the factory for linear function with 2-point linearization. Up to 32 linearization points can be selected for PV1 and PV2 under the *Linear* function in the *Advanced Features* menu. The multi-point linearization can be used to linearize the display for non-linear signals such 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 exponents.



Note: Multi-point Linearization applies to PV1 and PV2 only. All other PVs use two linearization points.

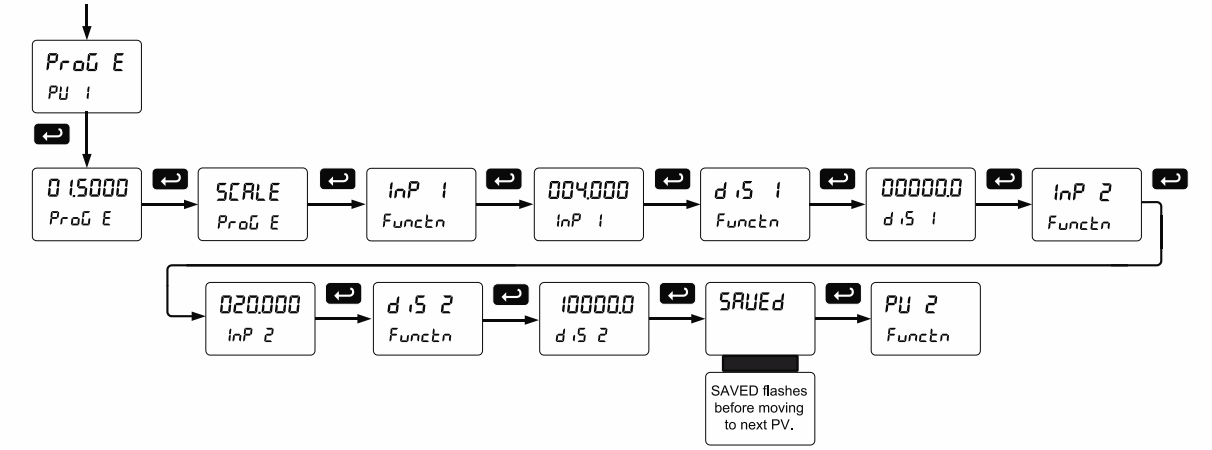
Square Root Function Menu (SQUARE)

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 scanner 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 Function Menu (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 scanner 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 scanner.



Round Horizontal Tank Function Menu (rHt)

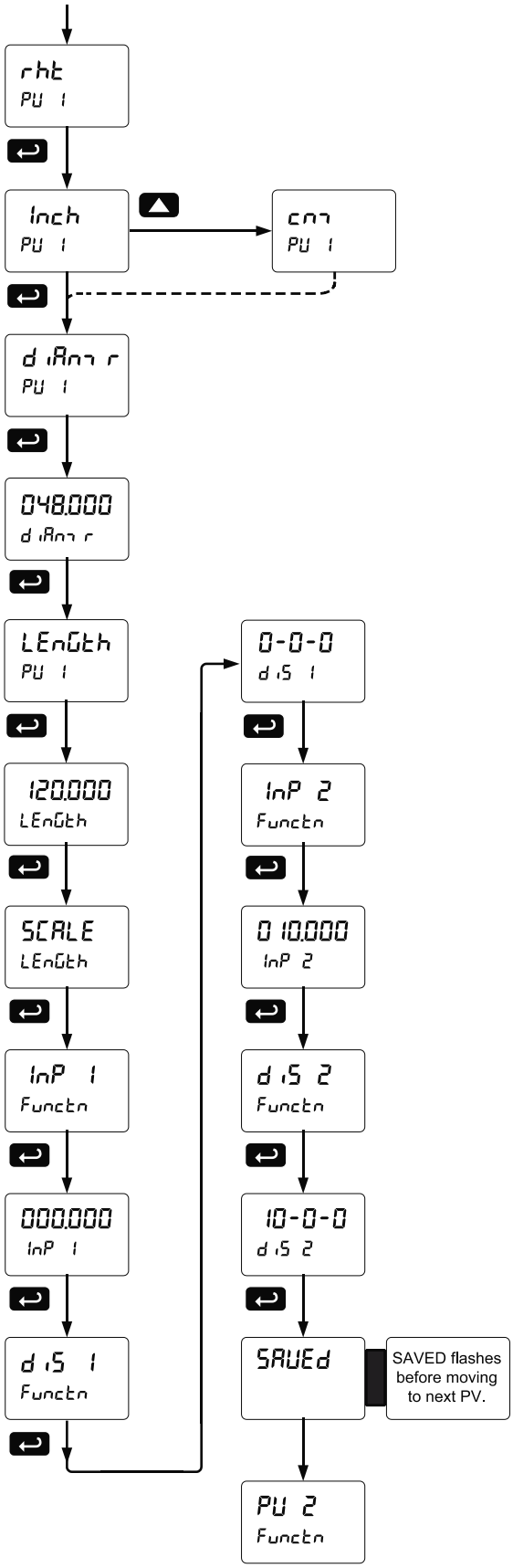
This function is used to calculate volume in a round horizontal tank with flat ends. The volume is calculated based on the diameter and length of the tank. The tank's dimensions can be entered in inches or centimeters; the scanner automatically calculates the volume in gallons or liters. After entering the dimensions, complete the scaling process with the display values calculated by the scanner. The scanner can be re-scaled to display the volume in any engineering unit without the need to re-enter the dimensions again.

Changing the Volume from Gallons to Liters

In the graphic, entering the 48" for the diameter and 120" for the length of the round horizontal tank, the scanner automatically calculates that the volume of the tank is 940.02 gallons.

1. Convert gallons to liters
   1 US gallon = 3.7854 L
   940.02 gal = 3558.4 L
2. Go to the *Setup - PV - Decimal Point* menu and change the decimal point to 1 decimal.
3. Go to the *Setup - PV - Scale* menu and press Enter until d.S 2 is shown on display line 1.
4. Press Enter and change the display 2 value to 3558.4.
5. The scanner is now displaying the volume in liters.

Note: The display can be scaled to display the volume in any engineering units.



Math Functions (ᴍᴀTH)

The *Math* menu is used to select the math function that will determine the channels' C1-C4 value. These math functions are applied to PVs and other math channels. The results are displayed by selecting Display Channel C (ᴅ Ch C) in the *Display* menu. Most math functions may be applied to all PVs: For example, it is possible to add up to 16 PVs and calculate the total volume of all the tanks in a field. The Math2 function allows for further calculations on the results of other math channels (e.g. C4 = C2/C1).

The following math functions are available:

Name	**Math Operation (Examples)** (P = Adder, F = Factor)	**Setting**
Addition	(PV1+PV2+P)*F	SUMᴍ
Difference	(PV1-PV2+P)*F	ᴅIF
Absolute difference	((Abs(PV1- PV2)+P)*F	ᴅIFAbS
Average	(((PV1+PV2)/2)+P)*F	AVG
Multiplication	((PV1*PV2)+P)*F	ᴍULTI
Division	((PV1/PV2)+P)*F	ᴅIVIDE
Max PV	Max value of all selected PVs	HI-PV
Min PV	Min value of all selected PVs	LO-PV
Draw	((PV1/PV2)-1)*F	DRAW
Weighted average	((PV2-PV1)*F)+PV1	WAVG
Ratio	(PV1/PV2)*F	RATIO
Concentration	(PV1/(PV1+PV2))*F	CONCEN
Math 2	Math on other math channels	ᴍᴀTH2
Addition	C3 = (C1+C2+P)*F	SUMᴍ
Difference	C4 = (C1-C2+P)*F	ᴅIF
Absolute difference	C3 = ((Abs(C1- C2)+P)*F	ᴅIFAbS
Average	C4 = (((C1+C2)/2)+P)*F	AVG
Multiplication	C3 = ((C1*C2)+P)*F	ᴍULTI
Division	C4 = ((C1/C2)+P)*F	ᴅIVIDE

Math Constants (CONST)

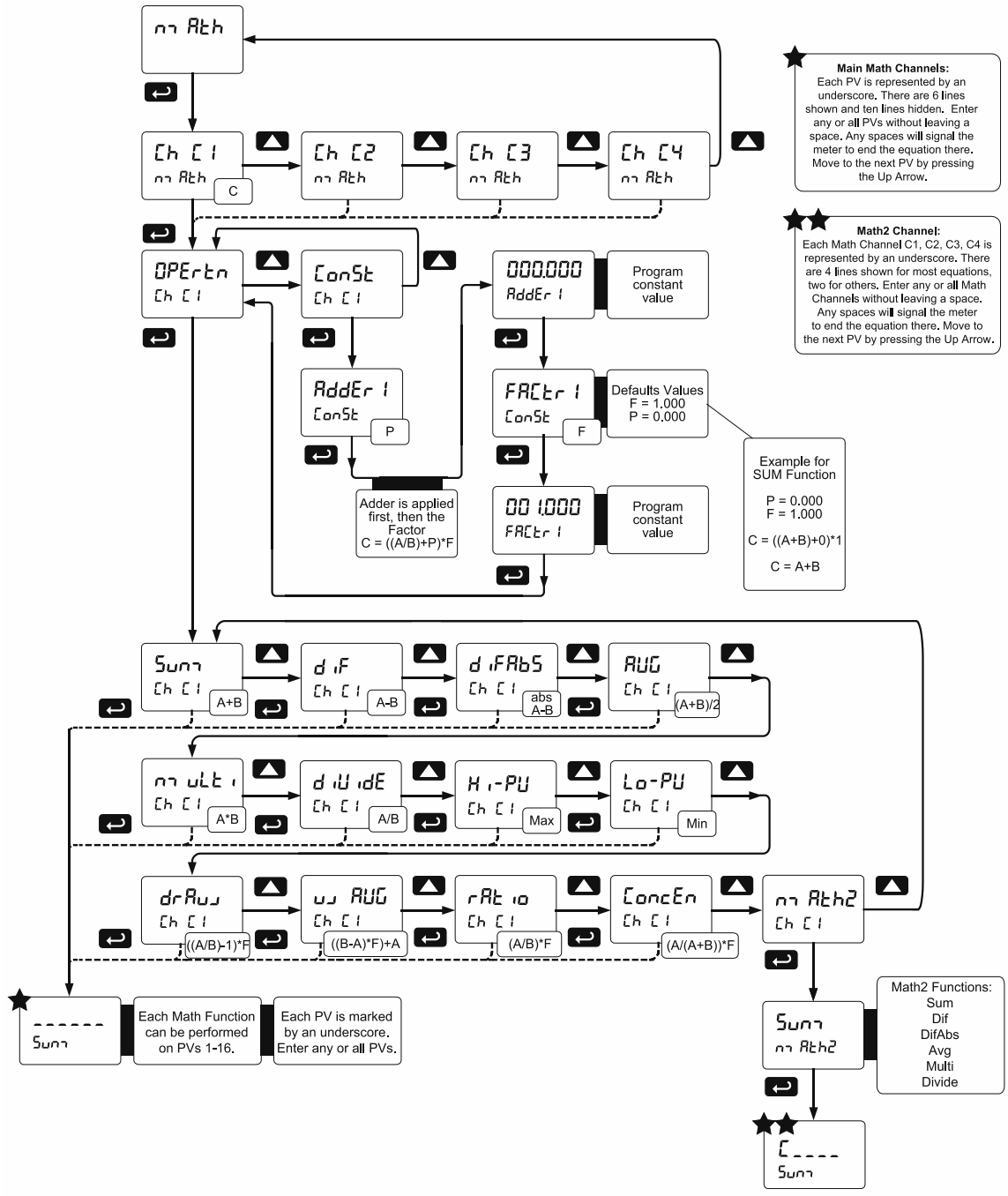
The *Math Constants* menu is used to set the constants used in the math channel. The math functions include the selected PVs, as well as the constants P (Adder) and the Factor F (Multiplier) as indicated in the above examples.

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 above chart details the math functions that may be selected in the *Math Function* menu.

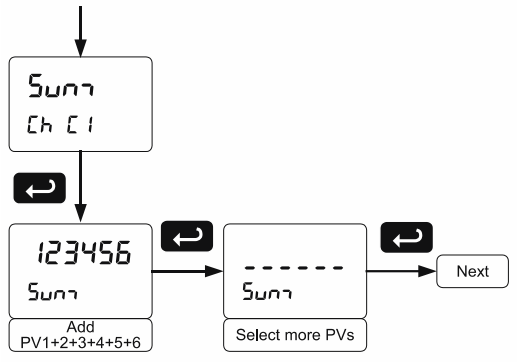
Math Function Menu (mAth)



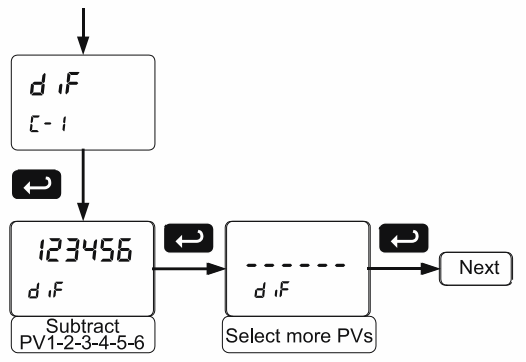
Notes:

1. *In the above menu, "A" & "B" in equations can represent any PVs (PV1-PV16). See table above.*
2. *Each digit represents one PV in hexadecimal format, except PV16 (G).*
3. *PV1 – PV9 = 1 - 9, PV10 – PV16 = A – G*
4. *No PV selected = "underscore symbol"*
5. *Digit range: 1-G, then "_"*
6. *If there is an empty digit, the scanner will end the equation at that point.*
7. *For Math2 Channel, "C" is fixed, indicating which Math Channels are being processed.*
8. *Please refer to the following graphics for details on various Math Functions:*

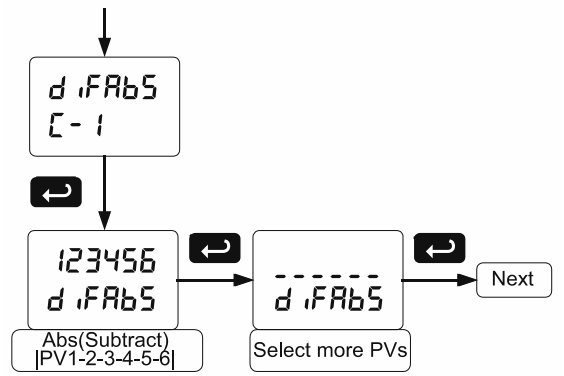
Sum Menu (Sum)



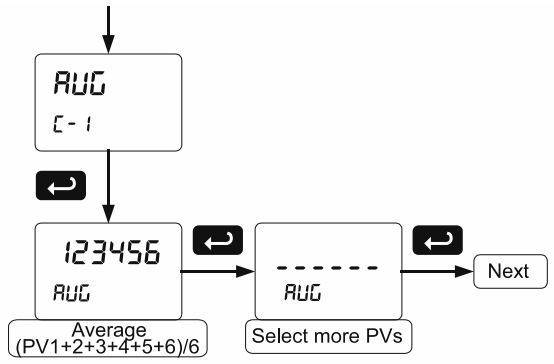
Difference Menu (dIF)



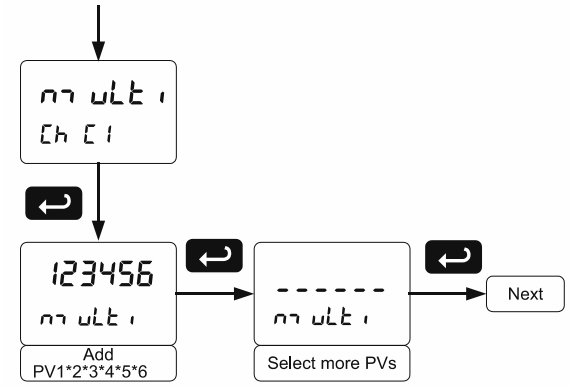
Difference Absolute Menu (dIFAbS)



Average Menu (AUG)

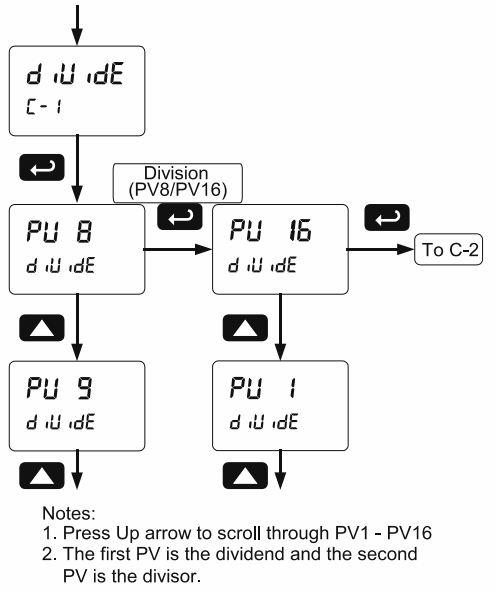


Multiplication Menu (nuLtI)



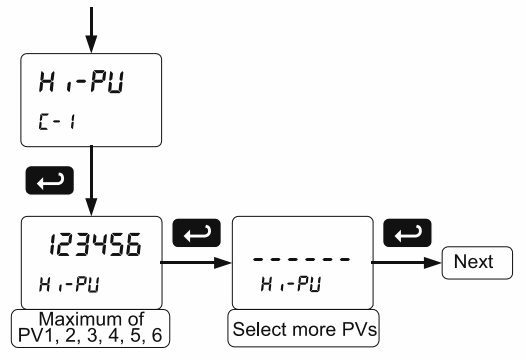
Divide Menu (dIVIdE)

Only two PVs at a time will be used for this function.

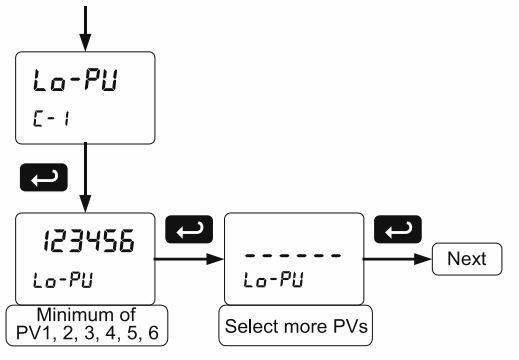


Notes:
1. Press Up arrow to scroll through PV1 - PV16
2. The first PV is the dividend and the second PV is the divisor.

Maximum PV Menu (H i-PU)

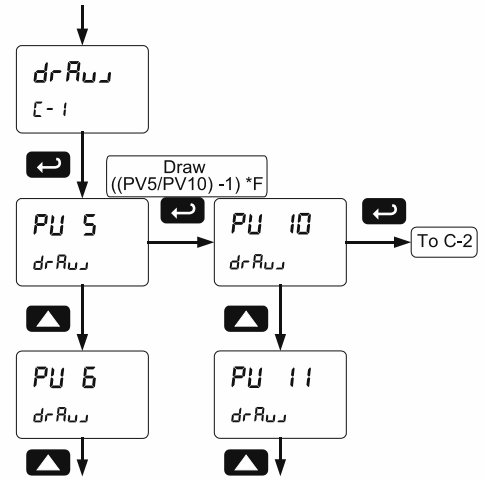


Minimum PV Menu (Lo-PU)



Draw Menu (drAuJ)

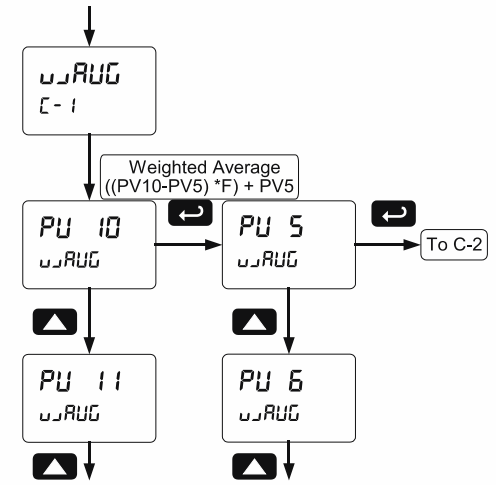
Only two PVs at a time will be used for this function.



Notes:
1. Press Up arrow to scroll through PV1 - PV16
2. The first PV is the dividend and the second PV is the divisor.

Weighted Average Menu (uJAUG)

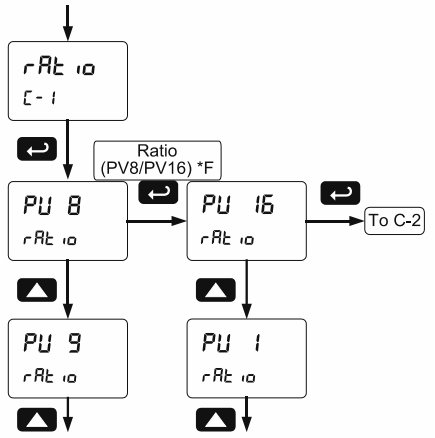
Only two PVs at a time will be used for this function



Notes:
1. Press Up arrow to scroll through PV1 - PV16
2. The first PV selected is the first PV in the equation.

Ratio Menu (rAt io)

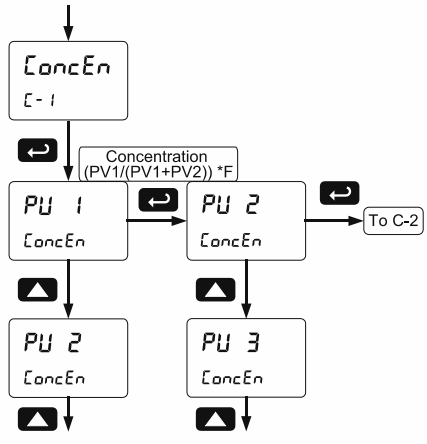
Only two PVs at a time will be used for this function



Notes:
1. Press Up arrow to scroll through PV1 - PV16
2. The first PV is the dividend and the second PV is the divisor.

Concentration Menu (ConcEn)

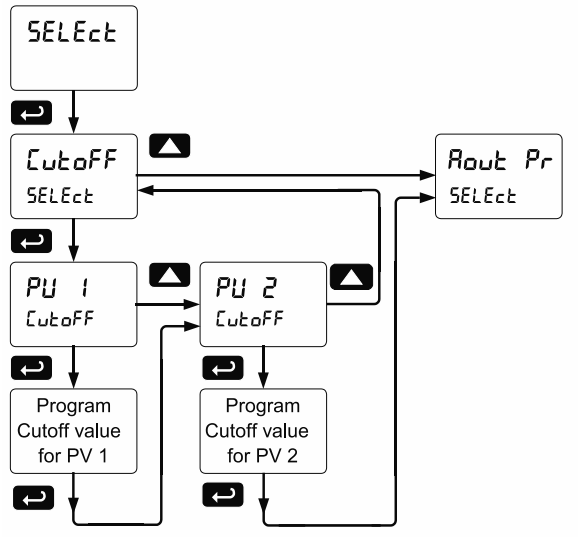
Only two PVs at a time will be used for this function



Notes:
1. Press Up arrow to scroll through PV1 - PV16
2. The first PV is the dividend and the Sum of the PVs is the divisor.

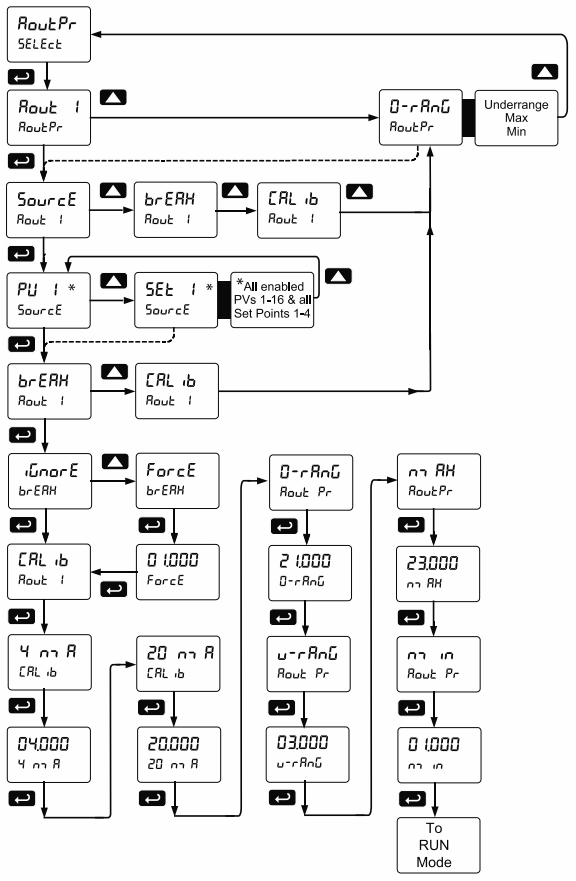
Low-Flow Cutoff (CutoFF)

The low-flow cutoff feature allows the scanner to be programmed so that the often unsteady output from a differential pressure transmitter, at low flow rates, always displays zero on the scanner. The cutoff value may be programmed from 0.1 to 999999. When the input data is below the cutoff value, the scanner will display zero. Programming the cutoff value to zero disables the cutoff feature. The cutoff can be disabled to display negative values.



Analog Output Source Programming (AoutPr)

The 4-20 mA analog outputs can be programmed for source of data, overrange and underrange, absolute maximum and minimum output, and communications break values. They can also be recalibrated.



- To calibrate the analog outputs, follow the graphic above.
- The overrange and underrange values are the values that will be output when the display shows an overrange or underrange condition. This setting is common to all analog outputs.
- The maximum and minimum values are the absolute limits for the 4-20 mA output. This setting is common to all analog outputs.
- The communications break value determines the mA output when a Slave fails to reply to a command within the Response time.

Analog Output Value for Loss of 4-20 mA Input (Loop Break)

The AoutPr - Break menu is used to force the analog output to go to a user-specified mA value if a break condition is detected in the 4-20 mA input loop. Selecting Ignore causes the mA output to go to the minimum value.

Analog Output Calibration

- There is **no need to recalibrate** the 4-20 mA output when first received from the factory.
- The 4-20 mA outputs is ***factory calibrated*** prior to shipment. The calibration equipment is certified to NIST standards.

The 4-20 mA output can be recalibrated in the field. A calibrated digital meter with an input range of at least 25 mA and a resolution of 1 µA is recommended.

⚠ CAUTION

- If an uncalibrated meter or a meter with less resolution is used, the calibration of the 4-20 mA output could be adversely affected.

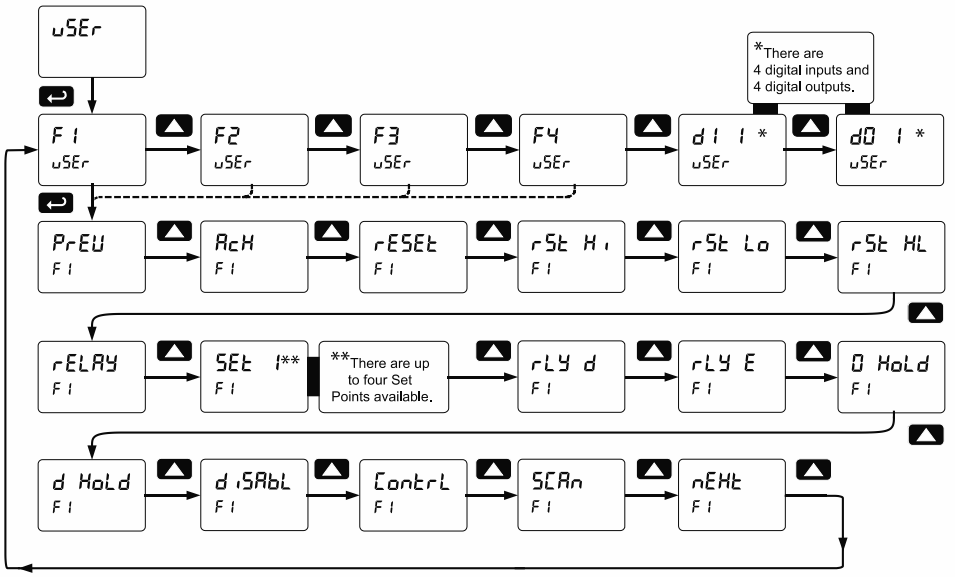
Analog Output Calibration Procedure

1. Wire the PD2-6080/1 4-20 mA output to a current loop that includes a power supply (internal or external 12 to 24 VDC), and the mA input on the digital meter. See *Figure 22. 4-20 mA Output Connections* on page *21* for details.
2. Turn on all devices. Allow for a 15 to 30 minute warm-up.
3. Go to the Advanced Features menu and navigate to the Analog Output Programming (AoutPr)/Calibration (CAL ib) menu and press **Enter**.
4. The display will show 4 mA. The PD2-6080/1 mA output should now be close to 4 mA. Press **Enter** and the display will show 04.000. Enter the actual value read by the digital mA meter and press **Enter**.
5. The display will show 20 mA. The PD2-6080/1 mA output should now be close to 20 mA. Press **Enter** and the display will show 20.000. Enter the actual value read by the digital mA meter and press **Enter**.
6. The PD2-6080/1 will now calculate the calibration factors and store them.
7. Press **Menu** to exit and return to Run mode.

Programmable Function Keys User Menu (uSEr)

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

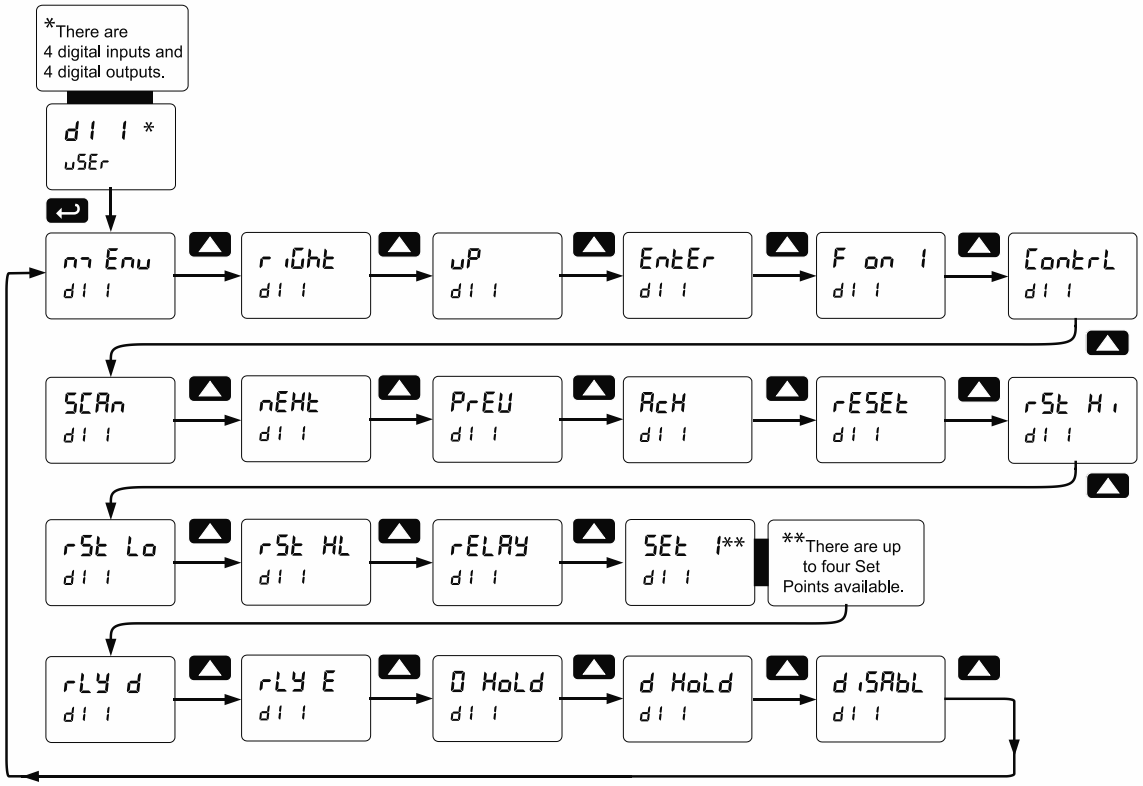
The four digital outputs can be assigned to a number of actions and functions executed by the scanner (i.e. alarms, relay acknowledgement, reset max, min, or max & min, tare, and reset tare). The digital outputs can be used to trigger external alarms or lights to indicate these specific events.



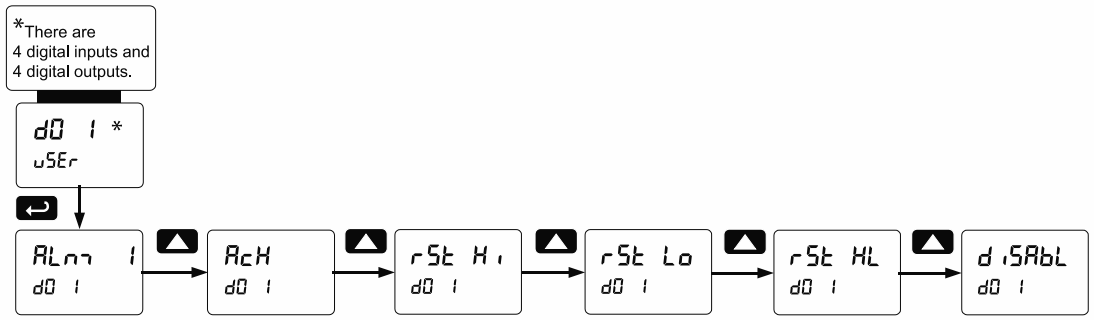
Function Keys & Digital I/O Available Settings

Display	Description
SCAn	Scan through all PVs
nEXt	Skip to the next PV
PrEU	Return to the previous PV
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 H1	Reset the stored maximum display values for all channels
rSt Lo	Reset the stored minimum display values for all channels
rSt HL	Reset the stored maximum & minimum display values for all channels
rELAY	Directly access the relay menu
SEt 1*	Directly access the set point menu for relay 1 (*through 4)
rLY d	Disable all relays until a button assigned to *enable relays* (rLY E) is pressed
rLY E	Enable all relays to function as they have been programmed
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 iSAbL	Disable the selected function key or digital I/O
ContrL	Directly access the manual control menu
mnEnu	Mimic the menu button functionality (digital inputs only)
r iGHt	Mimic the right arrow/F1 button functionality (digital inputs only)
uP	Mimic the up arrow/F2 button functionality (digital inputs only)
EntEr	Mimic the enter/F3 button functionality (digital inputs only)
F on 1*	Force relay 1 (*through 4) into the on state. This function is used in conjunction with a digital input to achieve interlock functionality. See page 51 for details about interlock relays.
ALrm1 1*	Provide indication when alarm 1 (*through 4) has been triggered (digital outputs only)

Digital Input Menu (d I I)



Digital Output Menu (dO I)

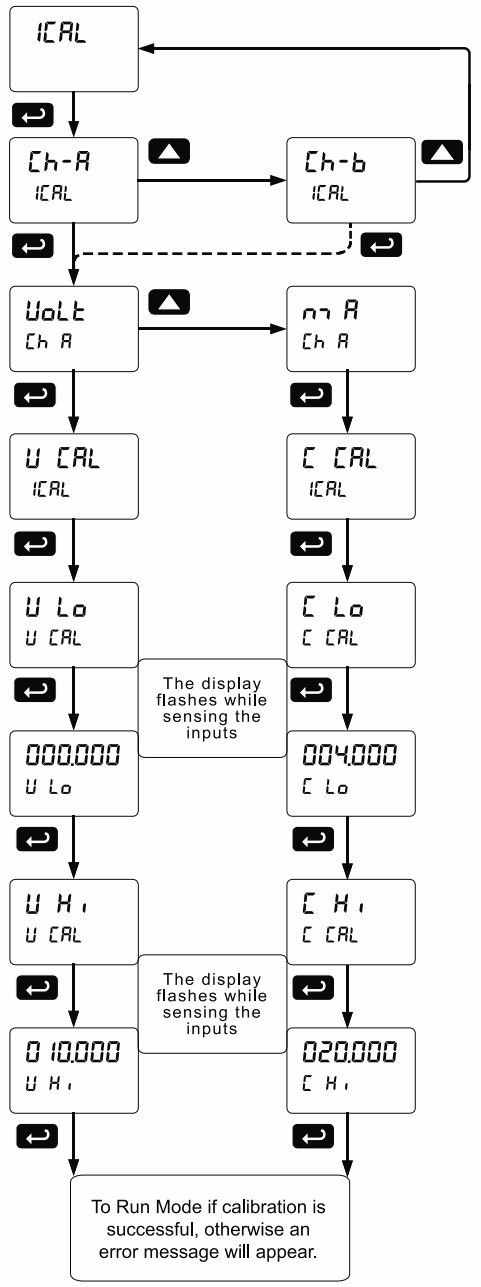


Reset Menu (rESEt)

The *Reset* menu is used to reset the maximum or minimum reading (peak or valley) reached by the process; both may be reset at the same time by selecting “reset high & low” (rSt HL). This is applied to all PVs and math channels.

Resetting is possible by going into the USER menu, selecting a function key or digital input, pressing ENTER to take you to the next level, then pressing the Up arrow until you arrive at the RESET menu. Press ENTER to assign the RESET menu to the selected function key or digital input. Now, when the scanner is in Run Mode, pressing the selected function key will take you to the RESET menu, where you can scroll through Reset Hi (Max), Reset Lo (Min), and Reset HiLo (Reset Max and Min), choosing what value to reset. You can also select the specific reset function (e.g. Reset HiLo) to the selected digital input or function key.

Input Calibration (ICAL)



Recalibrating the Analog Input Channels (Ch-A & Ch-B)

The analog input channels are calibrated at the factory. If recalibration is needed, follow the flowchart menu above and the instructions below.

1. Enter the ICAL menu to calibrate channel A and channel B.
2. Select mA or Volt
3. Apply the low (4 mA or 0 V) and high (20 mA or 10 V) signals as requested.
4. Press Enter to accept the values entered or press Menu to exit calibration without saving the changes.

Error Message (Error)

An error message indicates that the calibration or scaling process was not successful. After the error message is displayed, the scanner reverts to input 2 during calibration or scaling and to input 1 during internal calibration, allowing the appropriate input signal to be applied or programmed.

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

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

Input Range	Input 1 & Input 2 Span
4-20 mA	0.15 mA
±10 VDC	0.10 VDC

Troubleshooting

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

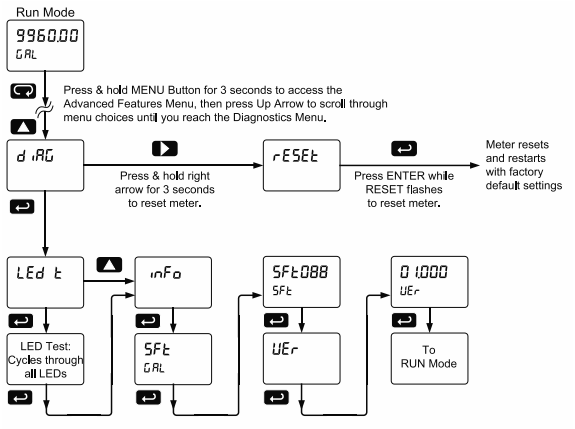
If you have programmed the scanner with the programming buttons and it is not working as intended, try re-programming the scanner using ScanView software.

Symptom	Check/Action
No display at all	Check power at power connector
Not able to change setup or programming, Locd is displayed	Scanner is password-protected, enter correct six-digit password to unlock or Master Password of 508655.
Scanner does not respond to input change	If a *Low-Flow Cutoff* Value has been programmed, the scanner will display zero below that point, regardless of the input – which can appear like the scanner is not responding to an input change. Check to make sure the problem is not being caused by an undesired low-flow cutoff value. To prevent the display from showing a negative value, set the low-flow cutoff to a value greater than zero.
Scanner displays error message during scaling (Error)	Check: Input 2 must greater than Input 1, Input 3 must be greater than Input 2, etc.
Scanner displays 1. 999999 2. -99999	Indicating overrange or underrange condition Check the input data value and scaling in *Setup* menu
Display stop scanning, ■ LED indicator flashing	Check: 1. Stop on alarm feature has been enabled 2. Press PREV or NEXT to resume scanning
Displays brEAK message	Check: 1. RS-485 connection to slave devices 2. Slave Id, register number of slave devices 3. Baud rate and parity of all devices on the bus 4. Scanner Id must be different from other devices
Snooper mode not reading the PVs on the RS-485 bus	Check: 1. Increase Master's Transmit Delay (e.g. Snooper delay = 100ms, Master delay = 110ms) 2. Increase Snooper's byte-to-byte timeout 3. Decrease the slave device's transmit delay to <10ms 4. Snooper cannot read the same PV twice, check setup
Scanner experiencing faults and communication breaks	Check: 1. Increase response time (t-rESP) and/or transmit delay (tr dLY). This may require some trial and error, as these are dependent upon the number of devices on the bus. 2. Internal Scan ID Modbus address. Addresses 256 (mA) or 257 (V) are used for Channel A, while Addresses 258 (mA) or 259 (V) are used for Channel B.
Scanner not communicating with ScanView software	Check: 1. Serial adapter and cable 2. Serial settings 3. Scanner address, baud rate, and transmit delay
Display does not respond to input data, reading a fixed number	Check: Display assignment, it might be displaying max/ min
Display reading is not accurate	Check: 1. PV Scaling 2. Check format selected: Dec or Ft&In
Relay operation is reversed	Check: 1. Fail-safe in *Setup* menu 2. Wiring of relay contacts
Relay and status LED do not respond to signal	Check: 1. Relay action in *Setup* menu 2. Set and reset points
Flashing relay status LEDs	Relays in manual control mode or relay interlock switches opened.
If the display locks up or the scanner does not respond at all	Cycle the power to reboot the microprocessor.
Other symptoms not described above	Call Technical Support for assistance.

Note: Certain sequences of events can cause unexpected results. To solve these issues, it is best to start fresh from factory defaults and use the manual as a step by step programming guide, rather than a random approach to programming. To reset the scanner to factory defaults, see Reset Scanner to Factory Defaults on page 72. In addition, for best results, we recommend using the free ScanView software for all programming needs.

Diagnostics Menu (d iAG)

The *Diagnostics* menu is located in the *Advanced Features* menu, to access *Diagnostics* menu see *Advanced Features Menu* on page *54*. This menu allows the user to test the functionality of all the scanner LEDs, check the scanner's software and version information, and erase the ScanView software installation files from the scanner. Press the Enter button to view the settings and the Menu button to exit at any time.



Determining Software Version

To determine the software version of a scanner:

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 scanner returns to Run Mode after displaying all the settings.

Reset Scanner to Factory Defaults

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

Instructions to load factory defaults:

1. Enter the *Advanced Features* menu, see *Advanced Features Menu* on page *54*.
2. Press Up arrow to go to *Diagnostics* menu
3. Press and hold Right arrow for three seconds, press Enter when display flashes rESEt. *Note: If Enter is not pressed within three seconds, the display returns to Run Mode*.
4. The scanner goes through an initialization sequence (similar as on power-up), and loads the factory default settings.

Testing the Display LEDs

To test all LEDs on the display:

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

Scanner Operation

The PD2-6080/1 scanner is capable of operating as a Modbus Master, Slave or Snooper. As a Slave, the PD2-6080/1 requires connection to a Master device: PLC, DCS, etc. As a Master, the PD2-6080/1 interfaces up to sixteen slave devices and can alternately display their Process Variables. As a Snooper it can be connected anywhere in the RS-485 bus to read any of the variables being requested by the Master device.

Four math channels (C1-C4) are available to perform operations on any PV or math channel, with adder and factor constants, and display the results. Engineering units or tags may be displayed with all PVs or math channels. Another level of Math functions can be performed on the resultant math channel Math2. For example, the operator can use the Math2 Channel to calculate the Sum of all other Math Channels, which may have each performed a different Math function.

The dual-line display can be customized by the user. Typically, the upper display is used to display the PV, while the lower display is used to display the tag for each PV.

Additionally, the scanner can be set up to display any input or math channel on the upper display and alternate between tag & units on the lower display. The relays and analog output can be programmed to operate based on any PV or math channel.

The scanner is capable of accepting two analog 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). The analog input channels must be mapped to PVs using the Slave IDs 256-259.

Button Operation

Button Symbol	Description
MENU 	Press to enter, exit Programming Mode, or exit max/min readings
RIGHT 	Press to move to the previous PV or math channel
UP 	Press to move to the next PV or math channel
ACK 	Press once to pause scanning, press again to resume scanning

Function Keys Operation

During operation, the programmable function keys operate according to the way they have been programmed in the *Advanced Features – User* menu. See *Programmable Function Keys User Menu* (uSEr) on page *68* for details.

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

Digital Inputs Operation

Five (5) digital inputs, F4, DI-1 to DI-4, come standard on the meter. These digital inputs are programmed identically to function keys F1, F2, and F3. The inputs are triggered with a contact closure to +5 in the case of digital inputs 1-4 or with an active high signal, see *Digital I/O Connections* on page *20* for details. The F4 is triggered with a contact closure to COM or with an active low signal. During operation, digital inputs operate according to the way they are programmed in the Advanced Features – User menu.. See *Programmable Function Keys User Menu* (uSEr) on page *68* for details.

Maximum/Minimum Readings

The max & min readings (peak & valley) reached by the PVs or math channels can be displayed by assigning the display to max/min through the *Display Setup* menu.

A digital input should be programmed to reset the max & min readings.

Factory Defaults & User Settings

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

Factory Defaults & User Settings

Parameter	Display	Default Setting
Mode	mode	Master
Function Code	FunCod	03
PV Number	PUnbr	PV1-PV4 Enabled
Slave ID PV1-16	SLAUId	001 - 016
Register Number PV1-16	rEGnbr	40001
Data Type PV1-16	dAtA	Float
Byte Order	1234	Big-endian
Polling Time	t-PoLL	5.0 second
Slave Response Timeout	t-rESP	10.0 second
Serial	SEr iAL	
Scanner ID	SCAnId	246
Baud	bAud	9600
Parity	PAr itY	Even
Byte-to-byte timeout	t-bYtE	0.01 second
Setup	SEtuP	
Tag PV1-16	tAG PU 1	PV 1 – PV 16
Units PV1-16	Un itS PU 1	FEET
Units C1-4	Un itS Ch C1	UnitC1 – UnitC4
Display Format PV1-16	Format PU 1	Dec (PD2-6080) Ft-In-16 (PD2-6081)
Display Format C1-4	Format Ch C1	Decimal
Display decimal point	d iSPdP	ddd.ddd
Float decimal point	FLotdP	ddd.ddd
Number of points	no PtS	2 (all PVs and C channels)
Scaling	SCALE PU 1	All
Input 1	inP 1	0.000
Display 1	d iS 1	0.000
Input 2	inP 2	10.000
Display 2	d iS 2	10.000
Math, channel C1-4	Sum1	Sum
Adder (constant P)	AddEr	0.000
Factor (constant F)	FActor	1.000

Factory Defaults & User Settings

Parameter	Display	Default Setting
Filter	F iLtEr	
Filter, PV 1	Ch-A	70
Filter, PV 2	Ch-b	70
Bypass, PV 1	bYPASS	0.2
Bypass, PV 2	bYPASS	0.2
Round	round	1
Cutoff	CutoFF	
Cutoff value, PV 1	Ch-A	0.0 (disabled)
Cutoff value, PV 2	Ch-b	0.0 (disabled)
Display assignment	dSPLAY	
Line 1	d PU	Display PV
Line 2	d tAG	Display tag
Display intensity	d- inty	6
Relay 1 assignment	PU 1	PV 1
Relay 1 action	Act 1	Automatic
Relay 1 set point	SEt 1	1.000
Relay 1 reset point	rSt 1	0.500
Relay 2 assignment	PU 2	PV 2
Relay 2 action	Act 2	Automatic
Relay 2 set point	SEt 2	2.000
Relay 2 reset point	rSt 2	1.500
Relay 3 assignment	PU 3	PV 3
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	PU 4	PV 4
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	FLS 1	Off
Fail-safe relay 2	FLS 2	Off
Fail-safe relay 3	FLS 3	Off
Fail-safe relay 4	FLS 4	Off
On delay relay 1	On 1	0.0 sec
Off delay relay 1	OFF 1	0.0 sec
On delay relay 2	On 2	0.0 sec
Off delay relay 2	OFF 2	0.0 sec
On delay relay 3	On 3	0.0 sec
Off delay relay 3	OFF 3	0.0 sec
On delay relay 4	On 4	0.0 sec
Off delay relay 4	OFF 4	0.0 sec

Factory Defaults & User Settings

Parameter	Display	Default Setting
Communications break relay 1	On	On
Communications break relay 2	On	On
Communications break relay 3	On	On
Communications break relay 4	On	On
Display 1 analog output	d.S 1	00.00.00
Output 1 value	Out 1	4.000 mA
Display 2 analog output	d.S 2	20.00.00
Output 2 value	Out 2	20.000 mA
Source analog output	SourcE	PV 1
Overrange output	O-rAnG	21.000 mA
Underrange output	u-rAnG	3.000 mA
Communications break output	brEAK	1.000 mA
Maximum output	nrAX	23.000 mA
Minimum output	nr.in	1.000 mA
F1 function key	F1	Previous PV
F2 function key	F2	Next PV
F3 function key	F3	Scan/Pause
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 1	PASS 1	000000 (unlocked)
Password 2	PASS 2	000000 (unlocked)
Password 3	PASS 3	000000 (unlocked)

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