

# MODBUS<sup>®</sup> SERIAL INPUT METER

Snooper Model PD865



- RS-485 Modbus<sup>®</sup> RTU input
- Six full digits 999,999
- Sunlight readable LED display
- Scale in engineering units
- 16-point linearization
- Square root & programmable exponent
- Exact display of input data
- 4-20 mA analog output option
- Two Form A 3 A relays standard
- Two Form C 3 A relays option
- Up to four pump alternation control
- Universal power supply

## EASY SETUP & PROGRAMMING

The PD865 Snooper Modbus Serial Input Meter can be programmed as a Modbus RTU Master or Slave. As a Master, the Snooper reads a slave device, scales the data from it, displays the result, and operates the internal relays and 4-20 mA output. As a Slave, it is controlled by a master device. The data sent to it by the master is scaled, displayed, and used to operate the relays and 4-20 mA output.


The Snooper is housed in a shallow-depth 1/8 DIN panel meter enclosure that features a NEMA 4X front panel. Data is displayed on an adjustable intensity, six-digit, seven-segment LED display. The Snooper can be powered from 85-265 VAC or 12-36 VDC. It comes standard with 2 relays and is available with 2 additional relays and 4-20 mA output as options.

A Quick Start Guide of the entire menu structure is available.

## Front Panel Buttons



## Front Panel Button Legend

-  **MENU** Button
-  **RIGHT** Arrow & **RESET** Button
-  **UP** Arrow & **MAX** Button
-  **ENTER** & **ACK** Button

## Front Panel LED Legend

LED	Status
1	Alarm 1
2	Alarm 2
3	Alarm 3
4	Alarm 4
S	Set Point Indicator
R	Reset Point Indicator

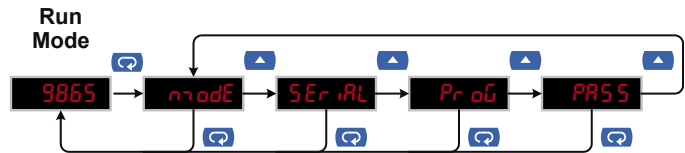
## User Friendly Menu Structure

To simplify programming, the Snooper setup functions are divided into two menus. The main menu consists of the most commonly used functions and the advanced features menu handles the special functions used less frequently.

## Main Menu

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

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



## Setting Numeric Values

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

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

The decimal point is selected by going to the Program-Decimal Point menu.



## Setup & Programming

### Operating Modes (תצורה)

The Mode menu is used to select how the meter is to function:

- **Master:** Reads a slave device, scales the data from it, displays the result, and operates the relays and 4-20 mA output.
- **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. All parameters are accessible via the Slave Mode Register Table.

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

### Master Mode (תצורה)

The Master mode contains five additional submenus: select which Function Code to use, Slave Register Number, Data type and format, Slave Response timeout, and Polling time.

## Slave Mode (SLAVE)

There are no menus required for the Slave mode. All the parameters are predefined in the Slave Mode Register Table.

## Serial Communications (SERIAL)

The meter has an RS-485 interface. The Serial menu is used to program the address, baud rate, parity, and byte-to-byte timeout. In Master mode, the *address* represents the address of the slave device being accessed. In Slave mode the *address* represents the address of the Snooper.

## Program Menu (PROG)

The Programming menu contains the menus for Decimal Point, Scale, Relays, and Analog Output (4-20 mA).

## Decimal Point (DEC Pt)

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

## Scale Display Value (SCALE)

The data that the meter receives can be scaled to display in engineering units. When the Linear function is selected, up to 16 points may be programmed to handle non-linear data. If either the Square Root or Programmable Exponent function is selected, only two points are available for scaling. See the Advanced Features/Display Function menu for more information.

## Setting the Relay Operation (RELAY)

This menu allows you to set up the operation of the relays:

1. Relay action
2. Set point
3. Reset point
4. Fail-safe operation
5. Time delay
6. Communications break action

*See instruction manual for description of display functions and messages*

## Setting the Relay Action (ACT)

The relays Action menu allows the user to set up the operation of the relays. 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. Off (relay and status LED disabled)

## Programming Set & Reset Points (SET)

High alarm indication: program set point above reset point.  
 Low alarm indication: program set point below reset point.  
 The deadband is determined by the difference between set and reset points. Minimum deadband is one display count. If set and reset points are programmed the same, relay will reset one count below set point.

### \* Quick Points \*

Press **Up** arrow and **Menu** buttons at the same time to access set/reset points quickly.

## Setting Fail-Safe Operation (FAILSAFE)

The fail-safe operation is set independently for each relay. Select On to enable or select Off to disable fail-safe operation.

## Programming Time Delays (DELAY)

Each relay has an On and Off time delay that may be programmed between 0 and 199 seconds. The relays will transfer only after the condition has been maintained for the corresponding time delay.

## Scaling 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. No equipment is needed to scale the analog output; simply program the display values to the corresponding mA output signal.

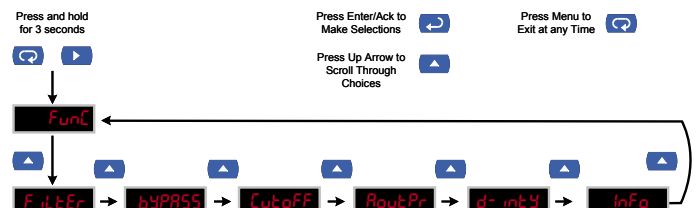
## Setting Up the Password (PASS)

The Password menu is used to program a four digit password to prevent unauthorized changes to the programmed parameter settings

## Advanced Features Menu

To simplify the setup process, functions not needed for most applications are located in the Advanced Features menu: *Display Function, Noise Filter, Noise Filter Bypass, Cutoff, Analog Output Programming, Display Intensity, and Information.*

- Press and hold the **Right** arrow button and **Menu** buttons for three seconds to access the Advanced Features. (Tip: press and hold the **Right** arrow button first, then the **Menu** button). Press the **Up** arrow button to scroll through the advanced features menu.
- Press **Menu** button at any time, to exit and return to Meter Run. Changes made to settings prior to pressing **Enter/Ack** button are not saved.
- Changes to the settings are saved to memory only after pressing **Enter/Ack** button.
- The display automatically moves to the next menu every time a setting is accepted by pressing **Enter/Ack** button.



## Maximum & Minimum Readings

The primary function of the front panel buttons during operation is to display the maximum and minimum readings reached by the process or temperature inputs.

## Powerful Relay Functionality

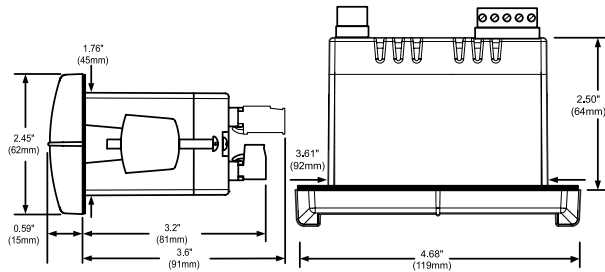
All relay functions are set up from the front panel

- Automatic reset only
- Automatic or manual reset
- Latching or non-latching relays
- Pump alternation control
- On and off time delays from 0 to 199 seconds
- Fail-safe operation is user selectable

## QUICK INSTALLATION

The meter is housed in a shallow-depth case that is designed for easy installation and servicing. The extra large front bezel is rated Type 4X, IP65. The mounting brackets are locked in place to make it easy to mount the meter in the panel. Removable screw terminal connectors make for easy and convenient wiring.

## Mounting Dimensions



Notes:

1. Panel cutout required: 1.772" x 3.622" (45 x 92 mm)
2. Panel thickness: 0.04"– 0.25" (1.0 – 6.4 mm)
3. Mounting brackets locked in place for easy mounting

## FIELD ENCLOSURES

The meter is available with a wide variety of NEMA 4, NEMA 4X, & explosion-proof enclosures.

## NEMA 4 & NEMA 4X Enclosures

The NEMA 4 and NEMA 4X enclosures are available in plastic, stainless steel, and steel. They come with pre-punched 1/8 DIN cutouts for up to ten meters. The meters are mounted in the enclosure door and can be programmed without opening the enclosure. Options include 2" pipe mounting kits and engraved plastic labels.

*See the Trident Enclosures data sheet for complete details and specifications regarding the NEMA 4 & NEMA 4X enclosures.*

## Low-Cost Plastic NEMA 4X Enclosure

The PDA2801 is a low-cost, compact, plastic NEMA 4X enclosure that will house one Snooper meter.



## Plastic, Steel & Stainless Steel



These NEMA 4 & 4X enclosures house from one to ten meters and feature a hinged door.

Enclosures and meters are ordered and packaged separately.

## Engraved Plastic Labels

These custom engraved plastic labels are the perfect solution for identifying both the enclosure and each individual meter.

*Whether the meters are mounted in one of our enclosures or installed into your existing control panel these custom engraved plastic labels are the answer you're looking for!*

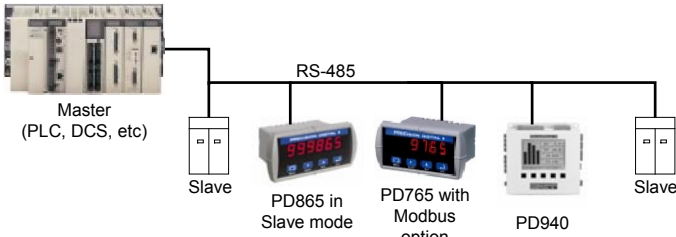
## Explosion-Proof Enclosures

These explosion-proof enclosures house one or two Snoopers and are UL & C-UL Classified as NEMA 7 & 9 for location in Class I, Groups C & D, Class II, Groups E,F,G and Class III. Enclosures and meters are ordered and packaged separately.

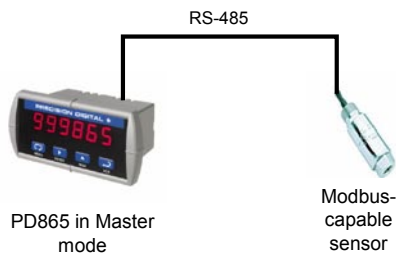


## OPERATION

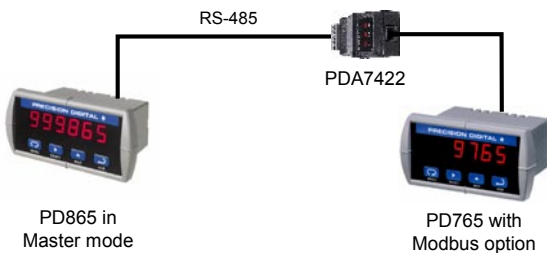
The Snooper Model PD865 meter is capable of operating as a Modbus Master or Slave. As a Slave, the meter requires connection to a master device: PLC, DCS, etc. As a Master, the meter interfaces to one slave device. The following figures show several possible connection schemes.



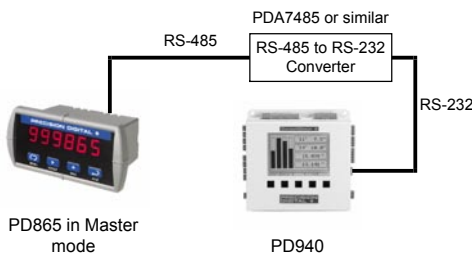
**PD865 Connected to a Master**



**PD865 Connected to a Smart Sensor**



**PD865 Connected to a PD765 Trident**



**PD865 Connected to a PD940 ConsoliDator**

## ORDERING INFORMATION

Snooper Model PD865		
85-265 VAC** Model	12-36 VDC** Model	Options Installed
PD865-6R2-06		None
PD865-6R5-16		4-20 mA Output & 24 VDC Transmitter Supply
PD865-6R7-16		2 Relays, 4-20 mA Output & 24 VDC Transmitter Supply
	PD865-7R5-06	4-20 mA Output
	PD865-7R7-06	2 Relays & 4-20 mA Output

All models are supplied with 2 Form A relays.  
\*\*May be powered from AC or DC, see Specifications for details.

Accessories	
Model	Description
PDA7485-I	RS-232 to RS-422/485 Isolated Converter
PDA7485-N	RS-232 to RS-422/485 Non-Isolated Converter
PDA8485-I	USB to RS-422/485 Isolated Converter
PDA8485-N	USB to RS-422/485 Non-Isolated Converter
PDX6901	Suppressor (snubber): 0.01 $\mu$ F/470 $\Omega$ , 250 VAC

Setup, Calibration & Labels	
Model	Description
PDN-CAL	2-Point Input Calibration
PDN-CAL2	Multi-Point Calibration
PDN-CAL3	4-20 mA Output Calibration
PDN-CSETUP	Custom Setup
PDN-CERTCAL	Certificate of Calibration
PDN-CERTCAL2	Certificate of Calibration with Data
PDLXXXX	Engraved Plastic Labels

## SPECIFICATIONS

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

### General

**Input/Output:** Modbus RTU RS-485

**Display:** 0.56" (14.2 mm) red LED, 6 digits; displays from -199999 to 999999, automatic leading zero blanking

**Display Intensity:** Eight user selectable intensity levels

**Decimal Point:** Up to five decimal places: d.ddddd, dd.dddd, ddd.ddd, dddd.dd, ddddd.d, or dddddd

**Front Panel:** NEMA 4X, IP65; panel gasket provided

**Programming Methods:** Four front panel buttons or via Modbus registers (Slave mode only)

**Scaling:** Input may be scaled from -199,999 to 999,999

**Function:** Linear, square root, or programmable exponent from 0.50000 to 2.99999

**Multi-Point Linearization:** 2 to 16 points

**Noise Filter:** Programmable 2 to 199 (0 will disable filter)

**Bypass:** 0.2 to 99.9% of full-scale

**Cutoff:** 0 to 999999; 0 disables cutoff

**Display Update Rate:** Master: 10/sec to 1 every 25.5 seconds;

Slave: Dependent on master device (PLC, DCS, etc)

**Overrange:** Display flashes 999999

**Underrange:** Display flashes -199999

**Max/Min Display:** Stored until reset by user or meter is turned off; user can reset by front panel buttons or via Modbus registers.

**Password:** Restricts modification of programmed settings.

**Non-Volatile Memory:** Settings stored for a minimum of 10 years.

**Power Options:** 85-265 VAC, 50/60 Hz; 90-265 VDC, 20 W max or 12-36 VDC; 12-24 VAC, 6 W max.

**Required Fuse:** UL Recognized, 5 A max, slow-blow; up to 6 meters may share one fuse.

**Normal Mode Rejection:** 64 dB at 50/60 Hz

**Transmitter Supply:** Isolated 24 VDC ±10% @ 200 mA max

**Isolation:** 4 kV input/output-to-power line, 500 V input-to-output or output-to-24 VDC supply

**Operating Temperature:** 0 to 65°C

**Storage Temperature:** -40 to 85°C

**Relative Humidity:** 0 to 90% non-condensing

**Connections:** Removable screw terminals accept 12 to 26 AWG

**Enclosure:** 1/8 DIN, high impact plastic, UL 94V-0, color: gray

**Weight:** 9.7 oz (275 g) (including options)

**UL File Number:** E160849; 508 Industrial Control Equipment

**Warranty:** 3 years parts & labor

**Extended Warranty:** 1 or 2 years, refer to Price List for details.

### Operating Modes

**Master:** Processes data read from a Modbus RTU slave device (only one parameter at a time can be programmed for reading).

**Slave:** Processes data sent from a Modbus RTU master device.

Note that the relays and the 4-20 mA output are functional in either mode.

### Master Mode Settings

**Function Code:** Select which Modbus function code (03 or 04) to use in reading the slave device.

**Register Number:** 1 to 65536. Specifies which register(s) to read in the slave device. Register number is preceded by register type (3xxxxx or 4xxxxx). Five or six digit register number allowed.

**Data Type:** Select the data format that the slave device uses; select between Short (2 byte) and Long (4 byte), Integers or Floating point (4 byte), Signed or Unsigned (integer only), and byte order (big-endian vs little-endian).

**Slave Response Timeout:** 0 to 25.5 seconds, limited by Poll Time value. This is the time allowed for slave to respond to a command.

**Poll Time:** 0.1 to 25.5 seconds between read commands.

### Relays

**Rating:** 2 Form A (SPST) standard; 2 Form C (SPDT) optional; rated 3 A @ 30 VDC or 3 A @ 250 VAC, resistive loads

**High or Low Alarm:** User may program any alarm for high or low

**Deadband:** 0-100% FS, user selectable

**Relay Operation:**

1. Automatic (non-latching)
  2. Latching
  3. Pump alternation control (up to 4 relays)
- Relay Reset:** Selectable via front panel or Modbus registers
1. Automatic reset only (non-latching)
  2. Automatic plus manual reset at any time (non-latching)
  3. Manual reset only, at any time (latching)
  4. Manual reset only after alarm condition has cleared (latching)

**Automatic Reset:** Relays reset when input passes the reset point

**Manual Reset:** Front panel button, Modbus registers (Slave only)

**Time Delay:** 0 to 199 seconds, on and off delays, programmable and independent for each relay

**Fail-Safe Operation:** Programmable, independent for each relay

**Communications Break:** No change, Relay on, or Relay off. Controls the condition the relay goes to when a slave device does not reply (Master mode only).

**Auto Initialization:** When power is applied to the meter, relays will reflect the state of the input to the meter.

### Serial Communications

**Compatibility:** EIA-485

**Protocol:** Modbus RTU

**Address:** 1 to 247. Specifies the address of the slave device (Master mode) or the address of the PD865 (Slave mode).

**Baud Rate:** 300 to 19,200 bps

**Data:** 8 bits (1 start bit, 1 stop bit; 1 or 2 stop bits with no parity)

**Parity:** None, even, or odd

**Byte-to-Byte Timeout:** 0.01 to 2.54 seconds

**Turn Around Delay:** Less than 2 ms (fixed)

### Isolated 4-20 mA Transmitter Output

**Scaling Range:** 1.000 to 23.000 mA; reverse scaling allowed.

**Calibration:** Factory calibrated 4.000 to 20.000 mA

**Accuracy:** ±0.1% FS ±0.004 mA

**Recalibration:** Recommended at least every 12 months.

**Temperature Drift:** 50 PPM/°C

**Transmitter Supply:** Isolated 24 VDC ±10% @ 200 mA max

**Isolation:** 500 V input-to-output or output-to-24 VDC supply; 4 kV output-to-power line

**External Loop Power Supply:** 35 VDC maximum

**Output Loop Resistance:**

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

**Data Source:** Display value, maximum display value, minimum display value, or Modbus register

**Overrange:** Programmable mA output for overrange condition

**Underrange:** Programmable mA output for underrange condition

**Communications Break:** Programmable mA output when a slave device does not reply within the Slave Response Timeout

**Maximum Output:** Programmable absolute maximum mA output

**Minimum Output:** Programmable absolute minimum mA output

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