PDW90 Point to Multi-Point Wireless System
Instruction Manual

- Signal Wire Replacement System Consisting of Wireless Base Station and Field Units
- Wireless Point to Multi-Point Signal Wire Replacement for up to 32 4-20 mA Signals
- Range: 1 Mile Line-of-Sight Outdoor, 500 Feet Indoor; Repeaters Available to Extend Range
- Wireless Transmission Between Base Station and any Field Unit of
    - 4-20 mA (Separate Signals to and from Base Station)
    - Discrete (4 digital I/O Signals to and from Base Station)
    - RS-485 Modbus
- Inputs: (Wired to Field Units) 4-20 mA or 0-10 V (1), Discrete/Digital (up to 4), Modbus
- Outputs: (Wired to Field Units) 4-20 mA (1), Discrete/Digital (up to 4), Relays (2, opt), Modbus
- Base Station I/O Modules for 4-20 mA Inputs, 4-20 mA Outputs, Relay Outputs, Digital I/O
- Base Stations with slots for 2, 6, or 16 Field Installable I/O Modules and Modbus
- Loss of Signal (LoS) Digital Output
- PDA10 Signal Strength Survey Tool to "Try Before You Buy"
- Simple to Configure Using PDW Manager Programming Software and On-Board USB
- Device Communication Secured by Enabling 128-bit AES Encryption
- Password Protection
- Remote Yagi Directional Antennas Available
- Base Stations Housed in Plastic NEMA 4X Field Enclosures
- Field Units Available in IP68, NEMA 4X Aluminum & Stainless Steel Enclosures
- Field Unit Operating Temperature Range: -55 to 75°C (-67 to 167°F)
- PCBs are Conformal Coated for Dust & Humidity Protection
- Power: 9-30 VDC, Base Station & Field Units
- 3-Year Warranty

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Disclaimer

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⚠️ **CAUTION**

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

⚠️ **WARNINGS**

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

⚠️ **IMPORTANT**

- The term "discrete" is sometimes used in this document to refer to digital inputs and outputs, where the value is either 0 or 1 (Logic Low or High).
- When referencing Modbus, this manual uses the terms "Client" to refer to what was previously called "Master" and "Server" to refer to what was previously called "Slave".

⚠️ **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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Introduction

In its most basic form, the PDW90 consists of field units (up to 32) that accept 4-20 mA signals and transmits them wirelessly to a base station. The primary advantage of this system is how simple and economical it is to get multiple signals (not just 4-20 mA, also discrete (digital) and Modbus) from where you have them to where you need them – all without having to run wires!

The wireless communication between the field units and the base station is bi-directional. That means you can send 4-20 mA, discrete and Modbus signals from the field units to the base station and also send completely different 4-20 mA, discrete and Modbus signals from the base station to the field units. For instance, the field unit could send a 4-20 mA signal to the base station corresponding to the level in a tank and the base station could send a 4-20 mA signal to the field unit to control a valve.

Field units are also equipped with four digital I/O that can each be independently programmed as an input or an output. A Loss of Signal warning is also available by connecting devices to the G and LS screw terminals.

To indicate alarm situations in the field, the field unit can be equipped with an optional, field installable, two relays module. These relays are rated Form A (SPST) 5A and are controlled by the digital outputs on the base station.

The base stations are available in configurations for 2, 6, or 16 I/O slots for a variety of field installable I/O modules. The available I/O modules are:

- Dual Analog Input
- Dual Analog Output
- Dual Relay Output
- Four Digital I/O

The specified range between the base station and field units is 1 mile line-of-sight outdoor and 500 feet indoor and repeaters are available to extend the range. A low-cost wireless survey tool, Model PDA10, is available to test the signal strength of your application before you buy. And if the PDW90 system does not work in your application, you can return it for full credit!

Key Features

Rugged Plastic NEMA 4X Field Enclosure with Hinged Door and Clasps to Access Electronics

Antenna Included (Installed by User)

USB for PC Programming Software

LCD Displays Current Field Unit's Signal Strength

RS-485 Connection

9-30 VDC Power

Wireless Antenna Connector

PRECISION DIGITAL WIRELESS

1 MILE OUTDOOR LINE-OF-SIGHT
500 FT INDOOR RANGE

Factory Installed Attached Antenna with 3/4" NPT Conduit Connection

Flange for Wall or Pipe Mounting

IP68, NEMA 4X Die-Cast Aluminum & Stainless Steel Enclosures

32-Character Dual-Line Alphanumeric Dot Matrix LCD with Backlight

Four CapTouch Buttons Behind Glass

Field Unit

014 RSSI 10 RT
LINK OK

Two 3/4" NPT Conduit Openings for Wiring

Base Stations with 16, 6, or 2 Slots for Installable Modules

Four Types of Modules Available: Dual Analog Inputs, Dual Analog Outputs, Four Digital I/O, and Dual Relay Outrputs

Removable Connector Plugs (1) One with Each Module

Base Station

PDW Manager PC Software

PDW Manager PC Software is required to program the PDW90 wireless base station; there are no programming buttons on the unit. PDW field units have programming buttons that can be used for basic setup, but PDW Manager software is required for advanced feature programming. Field units and base stations connect to a PC via a USB connection with the provided cable. PDW Manager is available for download at www.predig.com/pdwmanager.

Easy-To-Install I/O Modules

These modules designed specifically for the PDW90 base stations are easy to install and add functionality to the wireless system. The electronics in the modules are completely enclosed for protection. There are four types of modules available: dual analog inputs, dual analog outputs, four digital I/O, and dual relay outputs. Each module also comes with a removable connector plug for easy wiring.

Plastic NEMA 4X Base Stations Available in Three Sizes

The PDW90 base stations are available in three different sized plastic NEMA 4X enclosures based on how many inputs and outputs are needed. The cover on the two larger enclosures is hinged and secured with stainless steel clasps. The cover on the smaller enclosure is secured with screws. The largest base station can house up to 16 I/O modules. The middle size base station can hold up to 6 modules and the smallest base station can hold 2 modules.

CapTouch Through-Glass Buttons

The PDW90 field units are equipped with four capacitive sensors that operate as through-glass buttons so that they can be operated without removing the cover (and exposing the electronics) in an unclean area.

CapTouch buttons are designed to work under any lighting condition and are not affected by random changes in light or shadows. To protect against false triggering a long button press of about 2 seconds is required to wake up the buttons when they have not been in use for more than 20 seconds.

Field Units Available in Aluminum or Stainless Steel

The PDW90 field units are available in an IP68, NEMA 4X aluminum or stainless steel enclosure. The enclosures feature a built-in flange for wall or pipe mounting, built-in loop for a stainless steel tag, locking screw, and hole for a tamper-proof wire & seal. The enclosure also includes two 3/4" threaded conduit openings for wiring. The field units can operate in temperatures of -55 to 75°C (-67 to 167°F).

Field Unit Relays Option Module

The PDW90 field units are available with a relays option module that includes two Form A (SPST) relays. The module is easily installed by the user into the base of the enclosure with the four screws provided. The removable connector plugs make wiring easy.

Application Examples

Wireless Tank Level Monitoring of Two Tanks with Field Alarms
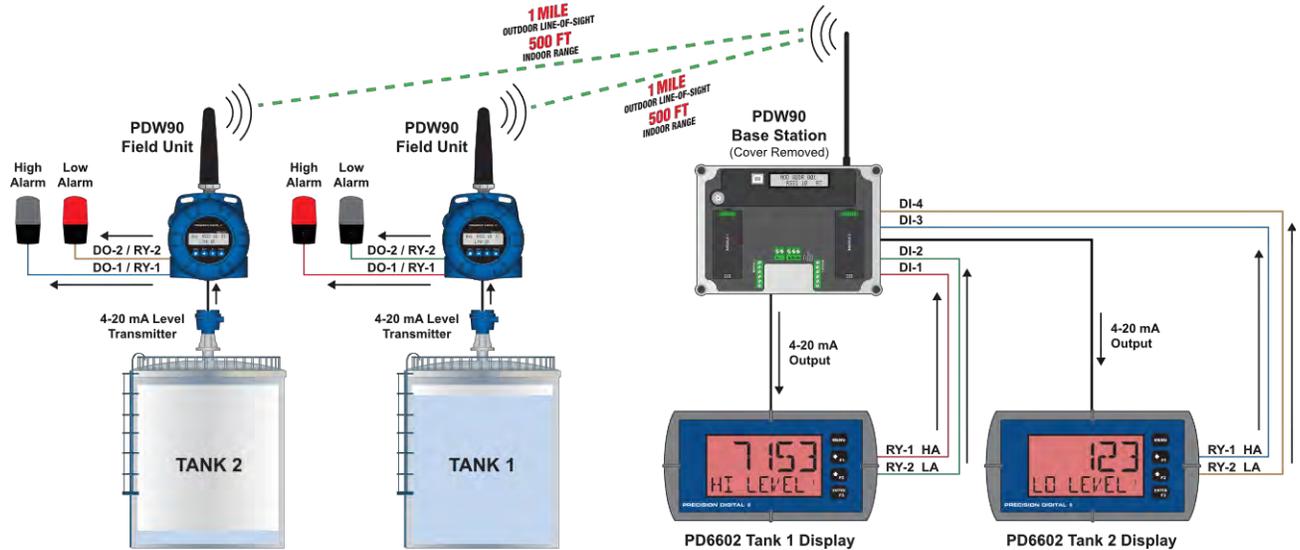
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- In the two tanks, the level transmitter's 4-20 mA signal is connected to the PDW90 field unit's analog input.
- The PDW90 field unit then wirelessly transmits the level signal to the base station located in the control room, where the base station's 4-20 mA output duplicates the signal.
- The base station's analog outputs are connected to two PD6602 loop-powered meters, which display the 4-20 mA signals as volume in gallons and check the level for high and low conditions.
- The low and high alarm light / horns in the field are driven as follows:
  - Relay 1 (RY-1) in the PD6602 tank 1 display is connected to digital input 1 (DI-1) on the base station. This signal is wirelessly transmitted to the field unit on tank 1. (On the field unit) digital output 1 (DO-1) controls relay 1 (RY-1), which turns on the high alarm light / horn, warning the operator.

  - Relay 2 (RY-2) in the PD6602 tank 2 display is connected to digital input 2 (DI-4) on the base station. This signal is wirelessly transmitted to the field unit on tank 2. (On the field unit) digital output 2 (DO-2) controls relay 2 (RY-2), which turns on the low alarm light / horn, warning the operator.

Parts Needed for This System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-02	1	PDW90 Wireless Process Signal Base Station, (2) I/O Slots
PDWM90-BASE-2AO	1	PDW90 Dual Analog Output Base Station Module
PDWM90-BASE-4DI	1	PDW90 Four Digital I/O Base Station Module

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	2	PDW90 Wireless Process Signal Field Unit
PDWM-2RY	2	Relays Option Module, Two Form A (SPST)

Other Products

Model Number	Qty	Description
PDA-LHR	4	Red Light / Horn
PD6602-L2N	2	1/8 DIN Loop-Powered Digital Panel Meter with Two Relays

Wireless Tank Level Monitoring of Level Switches
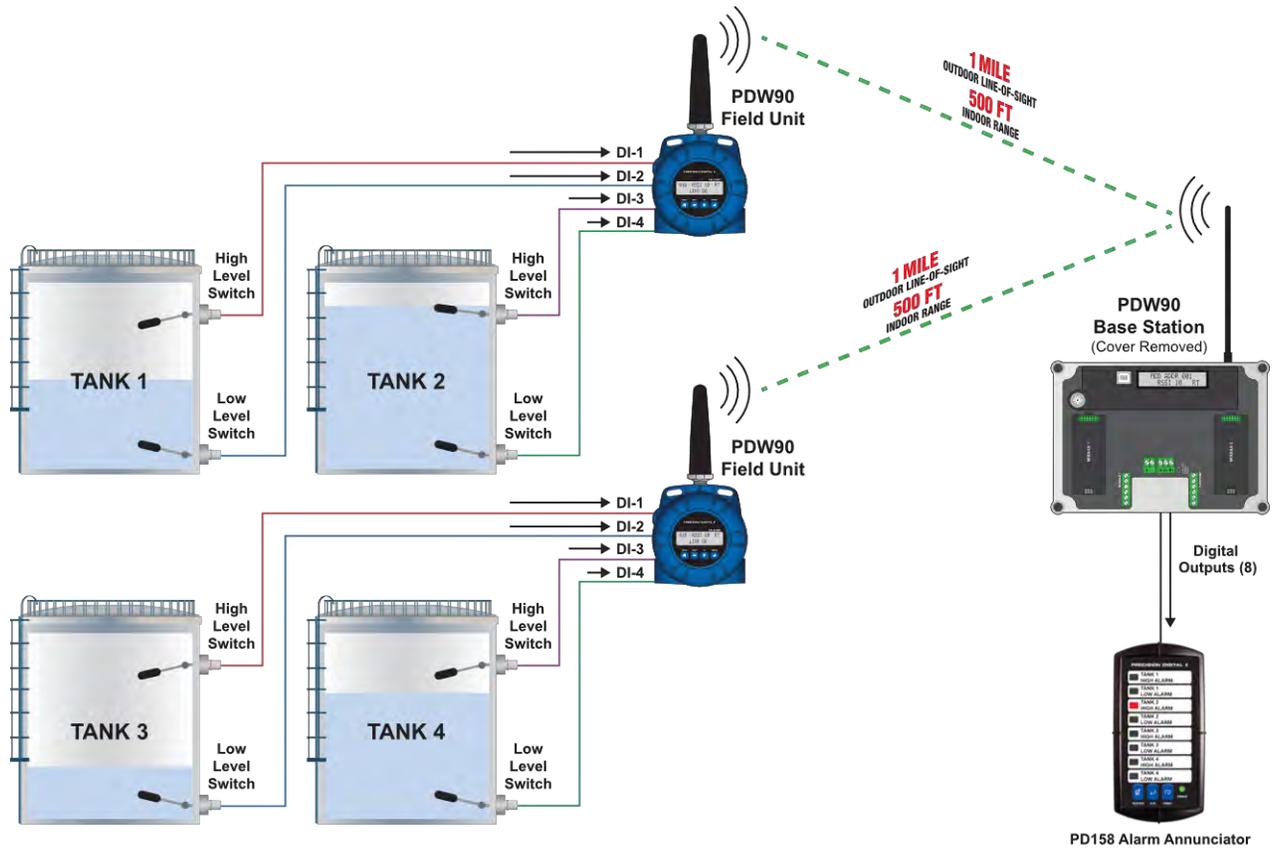
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- The switch contacts from the two level switches in each tank are connected to the digital inputs on the field units.
- The states of the switch contacts are wirelessly transmitted to the base station.
- The digital outputs from the base station are connected to a PD158 Vigilante II 8-point annunciator for local indication of tank level status.

Parts Needed for This System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-02	1	PDW90 Wireless Process Signal Base Station, (2) I/O Slots
PDWM90-BASE-4DI	2	PDW90 Four Digital I/O Base Station Module

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	2	PDW90 Wireless Process Signal Field Unit

Other Products

Model Number	Qty	Description
PD158-6R2-1	1	1/8 DIN 8-Input Alarm Annunciator

Wireless Tank Level Monitoring of 32 Modbus RTU Server Transmitters
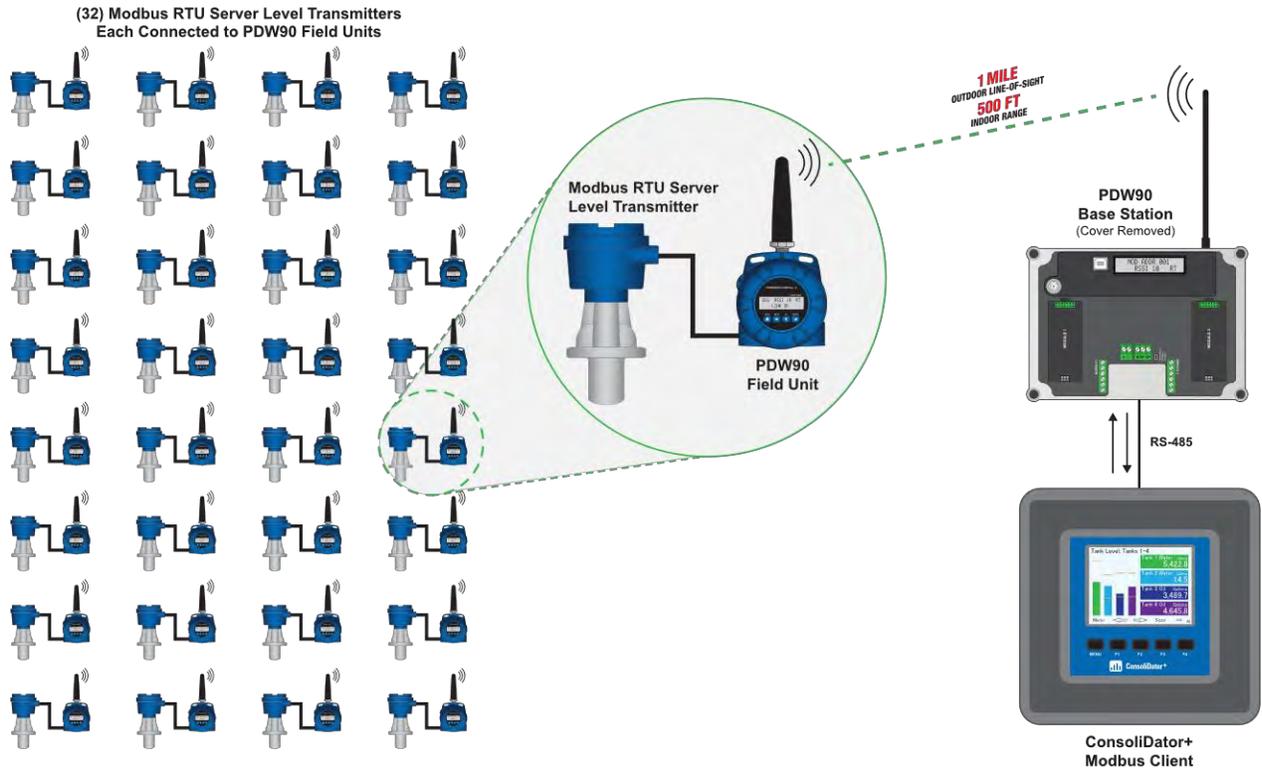
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- The 32 field units are **not** wired together.
- Each field unit sends the Modbus signal wirelessly to the base station.
- The base station is connected to a ConsoliDator+ that displays the level in the tanks.
- The ConsoliDator+ acts as the client.

⚠️ **IMPORTANT**

- Modbus client *must* be connected to the base station RS-485.

Parts Needed for This Modbus System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-02	1	PDW90 Wireless Process Signal Base Station, (2) I/O Slots (`None being used in this application`)

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	32	PDW90 Wireless Process Signal Field Unit

Other Products

Model Number	Qty	Description
PD9000-GP	1	ConsoliDator+ Multivariable Controller
PDK9000-M1	1	Add-On Feature: ConsoliDator+ Modbus Client/Snooper/Spoofer

Note: A potentially lower cost solution to this application would be to use a PDW30 point-to-point system. All the level transmitters would be wired on one RS-485 bus that would be connected to a PDW30 Primary Unit. The Primary Unit would wirelessly transmit the Modbus signal to a PDW30 Secondary Unit.

Wireless Tank Level Monitoring of 32 4-20 mA Transmitters
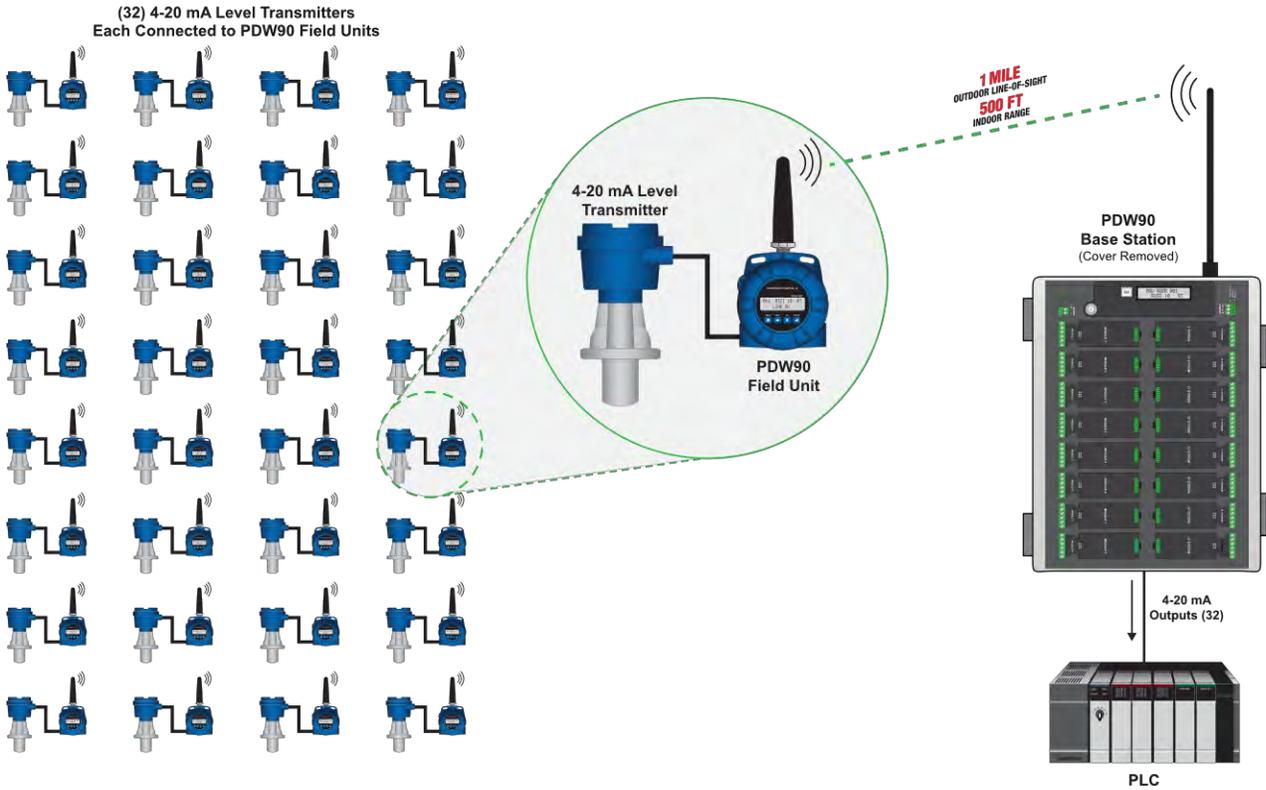
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- The 32 field units send the 4-20 mA signals wirelessly to the base station.
- The base station outputs (32) 4-20 mA signals that correspond to signals that are wirelessly transmitted to the base station to a PLC.

Parts Needed for This System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-16	1	PDW90 Wireless Process Signal Base Station, (16) I/O Slots
PDWM90-BASE-2AO	16	PDW90 Dual Analog Output Base Station Module

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	32	PDW90 Wireless Process Signal Field Unit

Wireless Remote Valve Control on Two Tanks
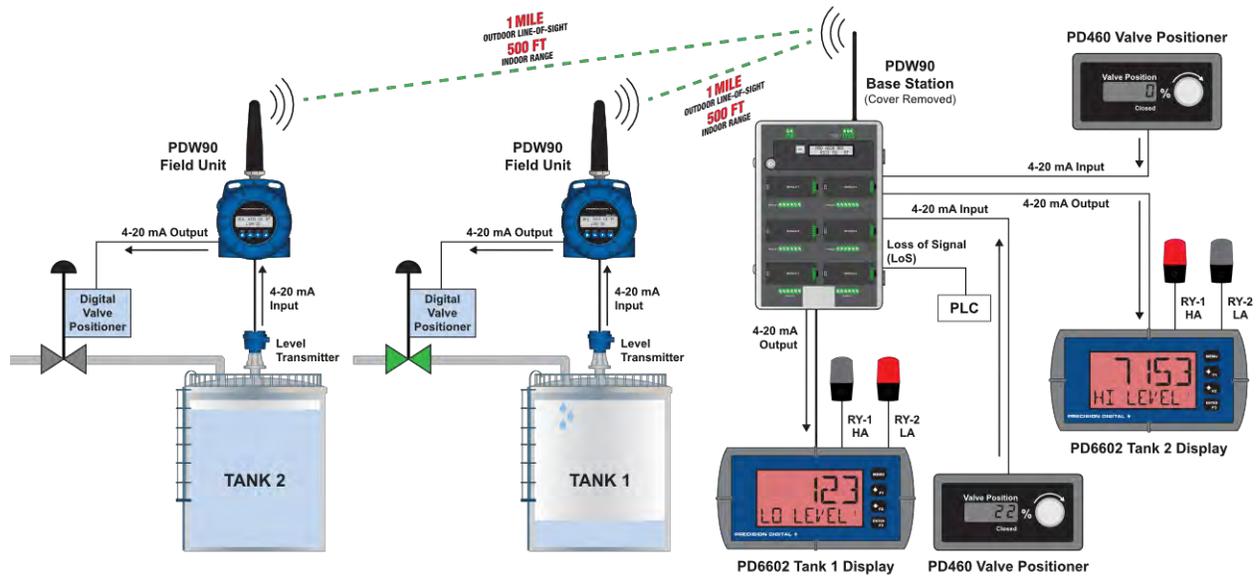
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- In the two tanks, the level transmitter's 4-20 mA signal is connected to the PDW90 field unit's analog input.
- The PDW90 field unit then wirelessly transmits the level signal to the base station located in the control room, where the base station's 4-20 mA output duplicates the signal.
- The base station's analog outputs are connected to two PD6602 loop-powered meters, which display the 4-20 mA signals as volume in gallons and check the level for high and low conditions.
- The operator uses a PD460 valve positioner to send a 4-20 mA signal to the base station's analog input.
- That valve position signal is wirelessly transmitted to the field unit located in the field at the tank, where the field unit's 4-20 mA output duplicates the signal.
- The field unit's 4-20 mA output is connected to a digital valve positioner. The valve is opened, and the tank starts to fill again.
- The operator monitors the level rising or falling on the PD6602 displays and uses the PD460 valve positioner to close or open the valve when the tank reaches the desired level.
- A digital output on digital I/O module is used to generate a Loss of Signal signal (LoS).

Parts Needed for This System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-06	1	PDW90 Wireless Process Signal Base Station, (6) I/O Slots
PDWM90-BASE-2AI	1	PDW90 Dual Analog Input Base Station Module
PDWM90-BASE-2AO	1	PDW90 Dual Analog Output Base Station Module
PDWM90-BASE-4DI	1	PDW90 Four Digital I/O Base Station Module (used for Loss of Signal; LoS)

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	2	PDW90 Wireless Process Signal Field Unit

Other Products

Model Number	Qty	Description
PDA-LHR	4	Red Light / Horn
PD6602-L2N	2	1/8 DIN Loop-Powered Digital Panel Meter with Two Relays
PD460	2	Panel Mount 4-20 mA Valve Positioner

Wireless Tank Level Monitoring on Four Tanks
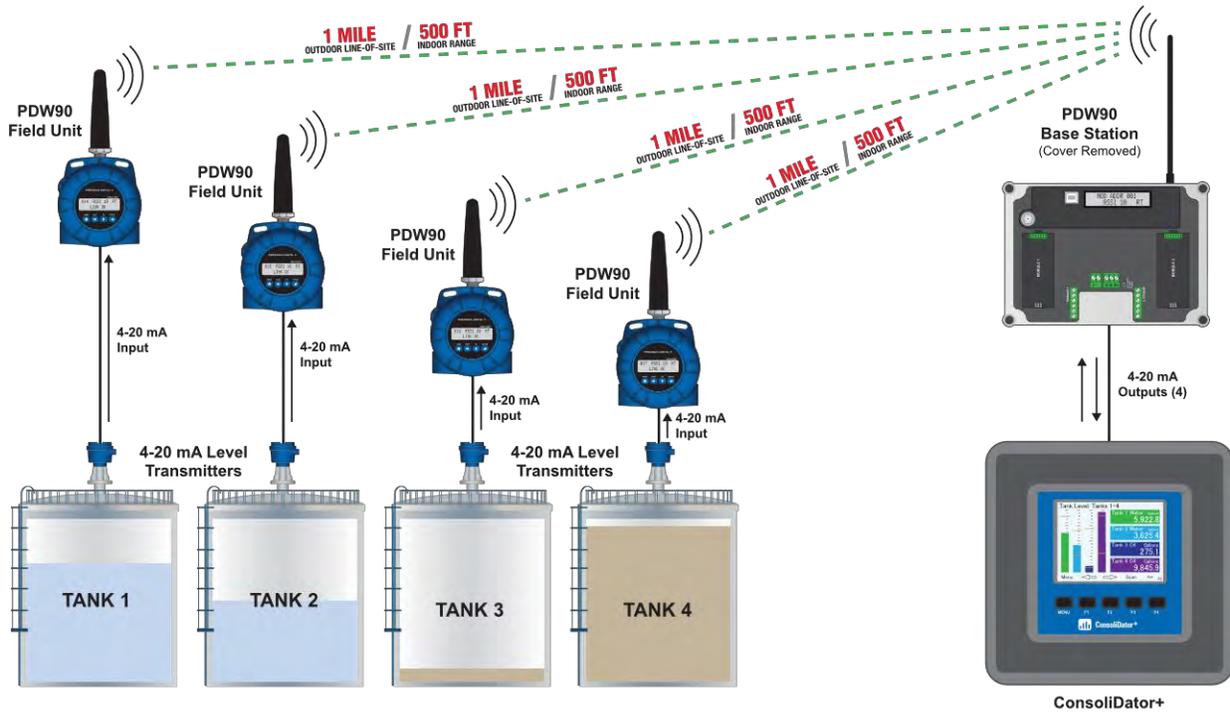
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- The level in each tank is measured by a 4-20 mA level transmitter that is connected to a PDW90 field unit.
- Each PDW90 field unit wirelessly transmits the 4-20 mA signal back to the base station.
- The base station is equipped with two dual analog output modules that that send the 4-20 mA signals to the ConsoliDator+

Parts Needed for This System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-02	1	PDW90 Wireless Process Signal Base Station, (2) I/O Slots
PDWM90-BASE-2AO	2	PDW90 Dual Analog Output Base Station Module

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	4	PDW90 Wireless Process Signal Field Unit

Other Products

Model Number	Qty	Description
PD9000-GP-4AI	1	ConsoliDator+ Multivariable Controller with Four 4-20 mA inputs

Wireless Transmission of Modbus Inputs and Outputs
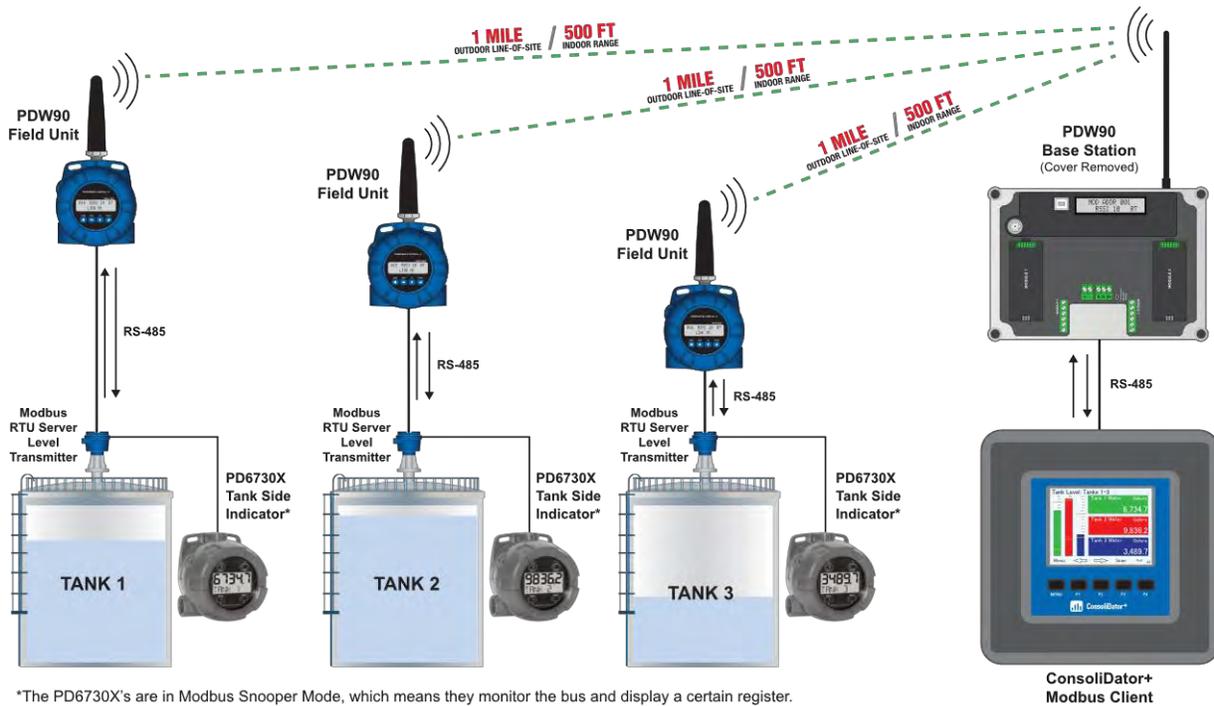
*The PD6730X's are in Modbus Snooper Mode, which means they monitor the bus and display a certain register.

Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- The ConsoliDator+ Modbus client is connected to the base station and sends wireless requests to the level transmitters via the PDW90 field units.
- The ConsoliDator+ Modbus client processes the data received from the field units (via the base station) and displays it in engineering units.
- The PD6730X Modbus scanner can provide tank side indication of level, temperature, interface and other Modbus variables.

⚠ **IMPORTANT**

- Modbus client *must* be connected to the base station RS-485.

Parts Needed for This System:

Base Station

Model Number	Qty	Description
PDW90-GP-PL-BASE-02	1	PDW90 Wireless Process Signal Base Station, (2) I/O Slots

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	3	PDW90 Wireless Process Signal Field Unit

Other Products

Model Number	Qty	Description
PD9000-GP	1	ConsoliDator+ Multivariable Controller
PD9000-M1	1	Add-On Feature: ConsoliDator+ Modbus Client/Snooper/Spoofer
PD6730-AX0-I-2	3	General Purpose Modbus Scanner for Tank Side Level Indication

Extending Signal Range with PDWR Repeaters
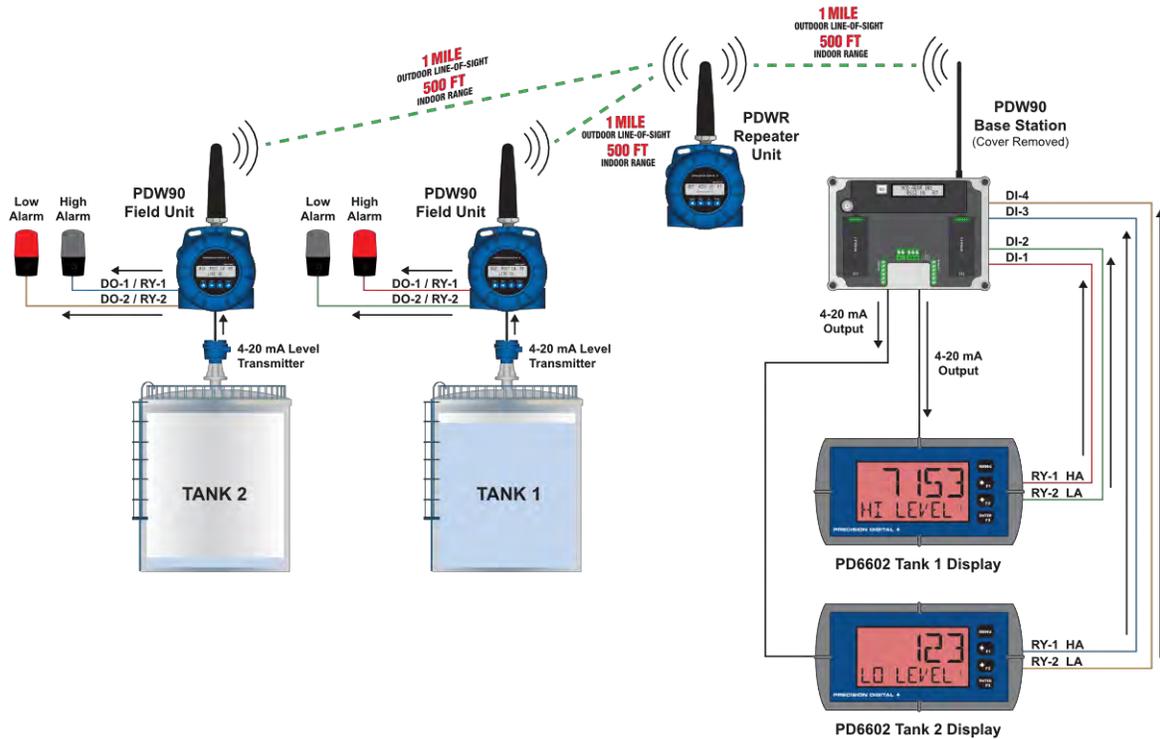
Note: Power requirements / connections not shown in diagram. Consult manuals for details. Cover of PDW90 removed to show I/O modules.

- The PDW30 field units are too far away from the base station, so a PDWR repeater unit is installed in the application to extend the wireless signal range.
- The mA signals are transmitted wirelessly to the PDW90 base station through the PDWR repeater unit.
- The base station's analog outputs are connected to PD6602 loop-powered meters, which display the 4-20 mA signals as volume in gallons.
- The low and high alarm light / horns in the field are driven as follows:
  - o Relay 1 (RY-1) in the PD6602 tank 1 display is connected to digital input 1 (DI-1) on the base station. This signal is wirelessly transmitted to the field unit via the PDWR repeater unit. (On the field unit) digital output 1 (DO-1) controls relay 1 (RY-1), which turns on the high alarm light / horn, warning the operator.
  - o Relay 2 (RY-2) in the PD6602 tank 2 display is connected to digital input 2 (DI-4) on the base station. This signal is wirelessly transmitted to the field unit via the PDWR repeater unit. (On the field unit) digital output 2 (DO-2) controls relay 2 (RY-2), which turns on the low alarm light / horn warning the operator.

Parts Needed for This System:

Base Station

| Model Number	Qty	Description
PDW90-GP-PL-BASE-02	1	PDW90 Wireless Process Signal Base Station, (2) I/O Slots
PDWM90-BASE-2AO	1	PDW90 Dual Analog Output Base Station Module
PDWM90-BASE-4DI	1	PDW90 Four Digital I/O Base Station Module

Field Units

Model Number	Qty	Description
PDW90-GP-AL-FIELD	2	PDW90 Wireless Process Signal Field Unit
PDWM-2RY	2	Relays Option Module, Two Form A (SPST)
PDWR-GP-AL-REP	1	PDWR Wireless Process Signal Repeater Unit

Other Products

Model Number	Qty	Description
PDA-LHR	4	Red Light / Horn
PD6602-L2N	2	1/8 DIN Loop-Powered Digital Panel Meter with Two Relays

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Ordering Information

PDW90 Wireless Components

Base Stations

Model Number	Description
PDW90-GP-PL-BASE-02	PDW90 Point-to-Multipoint Wireless Process Signal Base Station, (2) I/O Modules Slots[1]
PDW90-GP-PL-BASE-06	PDW90 Point-to-Multipoint Wireless Process Signal Base Station, (6) I/O Modules Slots[1]
PDW90-GP-PL-BASE-16	PDW90 Point-to-Multipoint Wireless Process Signal Base Station, (16) I/O Modules Slots[1]

Field Installable Base Station Modules

Model Number	Description
PDWM90-BASE-2AI	PDW90 Dual Analog Input Base Station Module[2]
PDWM90-BASE-2AO	PDW90 Dual Analog Output Base Station Module[2]
PDWM90-BASE-2RY	PDW90 Dual Relay Output Base Station Module[2]
PDWM90-BASE-4DI	PDW90 Four Digital I/O Base Station Module[2]

Field Units

Model Number	Description
PDW90-GP-AL-FIELD	PDW90 Point-to-Multipoint Wireless Process Signal Field Unit, Aluminum Enclosure[3]
PDWR-GP-AL-REP	PDWR Repeater to Extend Wireless Distance, Aluminum Enclosure[1]
PDW90-GP-SS-FIELD	PDW90 Point-to-Multipoint Wireless Process Signal Field Unit, Stainless Steel Enclosure[3]
PDWR-GP-SS-REP	PDWR Repeater to Extend Wireless Distance, Stainless Steel Enclosure[1]

Field Unit Module

Model Number	Description
PDWM-2RY	Relay Option Module, Two Form A (SPST)[4]

System Components Examples

See *Application Examples starting* on page *8* for ordering information of typical applications.

Accessories

Model Number	Description
PDA10	PDW Wireless Signal Strength Survey Tool
PDWA3120-N	20-Foot RP-SMA F to N Male Extension Cable for Yagi Antenna[5]
PDWA3140-N	40-Foot RP-SMA F to N Male Extension Cable for Yagi Antenna[5]
PDWA3120-S	20-Foot RP-SMA M/F Extension Cable for Omnidirectional Antenna[5]
PDWA3140-S	40-Foot RP-SMA M/F Extension Cable for Omnidirectional Antenna[5]
PDWA3900-6Y-N	Yagi Antenna 6dB
PDWA3900-9Y-N	Yagi Antenna 9dB
PDWA3900-20-N	PDW 900 MHz Omnidirectional Antenna, M20
PDWA3900-34-N	PDW 900 MHz Omnidirectional Antenna, 3/4" NPT
PDWA6963-SS	Stainless Steel Pipe Mount Kit for One PDW30 Primary/ Secondary Unit, PDW90 Field Unit or PDWR Repeater Unit[6]
PDAPLUG75	3/4" Metal Conduit/Stopping Plug
PDAREDUCER-75M-50F	M-3/4" NPT to F-1/2" NPT Reducer with Approvals
PDAREDUCER-75M-M20F	M-3/4" NPT to F-M20 NPT Reducer with Approvals
PDA-MICROUSB	Micro-USB PC Programming Cable for Field Unit (supplied)
PDA-USB	Standard USB PC Programming Cable for Base Station (supplied)
PDA-SSTAG	Custom Stainless Steel Tag (See website for convenient ordering form)

Notes:

1. Antenna included with the base station is installed by the user.
2. Base station modules are ordered separately and installed in base station by customer.
3. PDW90 field units and PDWR repeaters come standard with two 3/4" NPT conduit holes. To order models with M20 conduit holes instead, add -22 at the end of the part number (e.g. PDW90-GP-AL-FIELD-22).
4. The PDWM-2RY Relays Option Module is installed by the customer using the four screws provided.
5. Antenna extension cables include the following parts: (1) Extension Cable, (1) Antenna Coupler, (1) 8" Length of Coax Seal Tape, (1) 3/4" NPT Cable Gland
6. (2) Two PDWA6963-SS mounting kits are required for mounting a PDW unit on a horizontal pipe.

Field Installable Base Station Modules

I/O modules designed specifically for the PDW90 base stations are easy to install and add functionality to the wireless system. There are four types of modules available: dual analog inputs, dual analog outputs, four digital I/O, and dual relay outputs.

Model Number	Description
PDWM90-BASE-2AI	PDW90 Dual Analog Input Base Station Module
PDWM90-BASE-2AO	PDW90 Dual Analog Output Base Station Module
PDWM90-BASE-2RY	PDW90 Dual Relay Output Base Station Module
PDWM90-BASE-4DI	PDW90 Four Digital I/O Base Station Module

PDWR Wireless Signal Repeaters

PDWR wireless signal repeaters are used to retransmit wireless signals when connectivity is an issue. They are incredibly simple to install as they only require power and a network ID. Any units in range of the repeater with the same network ID will retransmit through it, thus increasing signal strength. Use repeaters to broadcast over very long distances or around permanent obstacles.

Model Number	Description
PDWR-GP-AL-REP	PDWR Repeater to Extend Wireless Distance, Aluminum Enclosure[1]
PDWR-GP-SS-REP	PDWR Repeater to Extend Wireless Distance, Stainless Steel Enclosure[1]

PDWA6963-SS Pipe Mounting Kit

The PDWA6963-SS provides a convenient way to mount one PDW30 primary/secondary, PDWR repeater, or PDW90 field unit to a horizontal or vertical 1.5" or 2" pipe such that the antenna is not right on top of the metal pipe.

Model Number	Description
PDWA6963-SS	Stainless Steel Pipe Mount Kit for One PDW30 Primary/Secondary Unit, PDW90 Field Unit or PDWR Repeater Unit
Note: (2) Two PDWA6963-SS mounting kits are required for mounting a PDW unit on a horizontal pipe.	

PDA10 Wireless Surveying Tool Kit

The handheld and target units are used to survey wireless signal strength throughout nonhazardous areas of a facility prior to PDW30 or PDW90 equipment installation. The target unit is set in a desired installation location and the handheld is brought to another installation location. The handheld unit will provide an indication of signal strength between the two units.

Model Number	Description
PDA10	PDW Wireless Signal Strength Survey Tool Kit

PDWA3900 Yagi High-Gain Directional Antenna
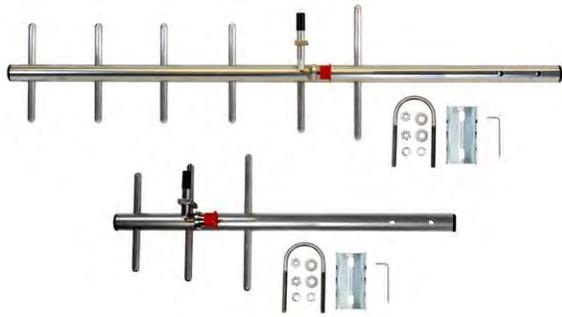
The PDWA3900 Yagi antennas are made to work with point-to-point and point to multi-point applications. These high gain antennas are ideal to use with Precision Digital's PDW products because they give you the flexibility of installing the antenna exactly where you need to bridge your point to multi-point wireless process signals while keeping the PDW unit in a convenient location for monitoring.

Model Number	Description
PDWA3900-6Y-N	Remote 6 dB Yagi High-Gain Directional Antenna
PDWA3900-9Y-N	Remote 9 dB Yagi High-Gain Directional Antenna

PDWA3100 Antenna Extension Cables
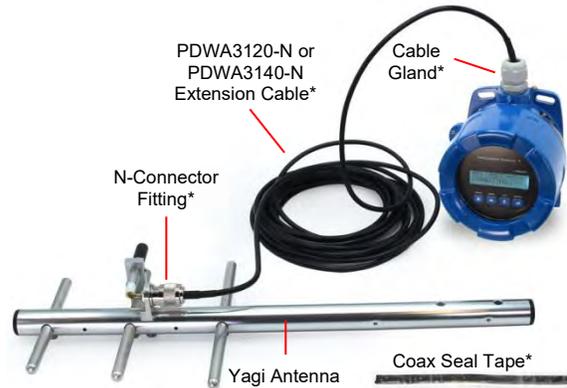
*Included with PDWA3120-N or PDWA3140-N Extension Cable.

The PDWA3120-N and PDWA3140-N are 20-foot and 40-foot extension cables used to extend the distance between the Yagi Antenna and the PDW30 or PDW90 wireless units. The extension cables also come with an antenna coupler to connect the PDW wireless device to the antenna extension cable, coax seal tape, and a 3/4" NPT cable gland.

Model Number	Description
PDWA3120-N	20-Foot RP-SMA F to N Male Extension Cable for Yagi Antenna
PDWA3140-N	40-Foot RP-SMA F to N Male Extension Cable for Yagi Antenna

Specifications

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

PDW90 Base Station

General

Maximum Connected Field Units	32 field units per base station
Display	32-character dual-line alphanumeric dot matrix LCD display with backlight Visual Area: 2.54" x 0.63" (64.6 x 16.0 mm) Character Height: 0.2" (5.5 mm) Display used for displaying communications link status and signal strength.
Network ID	Programmable: 0 - 99
Peak Antenna Gain	2.15 dBi ± 1.0
Programming Methods	Via PC with PDW Manager software. Configuration files can be saved for later use.
Input Power	9-30 VDC, 40 W maximum. Minimum power: 2.0 W (Modbus only). Power consumption is dependent on type and number of modules installed, refer to each individual module's power specification to calculate the total power needed.
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
Isolation	500 V
Environmental	Operating temp. range: -40 to 65°C (display inoperable < -20 °C) Storage temp. range: -40 to 85°C Relative humidity: 0 to 90% non-condensing Printed circuit boards are conformally coated
Connections	Removable screw terminal blocks accept 12 to 22 AWG wire.
Connectors Tightening Torque	4.5 lb-in (0.5 Nm)
Enclosure	NEMA 4X; Thermoplastic Polyester; Color: Gray
Dimensions	2-Module Base Station: 7.9" x 5.9" x 6.4" (200 mm x 150 mm x 163 mm) (W x H X D) 6-Module Base Station: 7.9" x 11.8" x 7.0" (201 mm x 300 mm x 178 mm) (W x H X D) 16-Module Base Station: 11.81" x 15.75" x 7.08" (300 mm x 400 mm x 180 mm) (W x H X D) Antenna Height: 6.73" (171 mm) Note: Antenna is installed by the user.
Weight	2-Module Base Station: 2.1 lbs (0.6 kg) 6-Module Base Station: 3.3 lbs (1.5 kg) 16-Module Base Station: 5.5 lbs (2.5 kg)
Warranty	3 years parts and labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Dual Analog Input Module

Inputs	(2) Two Field selectable: 4-20 mA, 0-10 V, 0-5 V, 1-5 V
Accuracy	±0.03% of calibrated span ±1 count
Isolation	1500 VRMS
Recalibration	All ranges are calibrated at the factory. Recalibration is recommended at least every 12 months.
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
Power Consumption	0.84 W max @ 24 V Add to base station minimum power.
Input Impedance	Voltage ranges: greater than 110 kΩ; Current ranges: less than 220 Ω
HART Transparency	Analog input will not interfere with existing HART communications on the wired 4-20 mA signal.

Dual 4-20 mA Output Module

Outputs	(2) Two		
Output Source	Analog input from connected wireless unit		
Calibration	Factory calibrated: 4.000 to 20.000 = 4-20 mA output		
Accuracy	± 0.1% of span ± 0.004 mA		
Isolation	500 V		
Temperature Drift	0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient		
Power Consumption	2.42 W max @ 24 V Add to base station minimum power.		
Loop Power Supply	Internally powered; no external supply needed		
Output Loop External Resistance	Power Supply	Minimum	Maximum
	24 VDC	10 Ω	900 Ω
Loss of Signal (RF)	After approximately 15 seconds of trying to reconnect, the mA output will go to the Link Lost Output value selected via the PDW Manager software (*i.e.* 3.2, 3.5, 3.8, 20.5, 20.8, 23.0 mA, or Stay as Is).		

Digital Inputs / Outputs Module

Channels	(4) Four digital I/O connections, independently field selectable as either inputs or outputs. A digital output can be used to indicate loss of wireless signal as described below.
Active Low or Active High	DI/DO logic can be selected via the PDW Manager software.
DI Logic High	3 to 5 VDC
DI Logic Low	0 to 1.1 VDC
DI Contact	Dry contact to ground can be used to activate the input
DO Logic High	3.0 to 5.0 VDC
DO Logic Low	0 to 0.5 VDC
Power Consumption	0.50 W max @ 24 V Add to base station minimum power.
Source Current	20 mA maximum output current
Sink Current	0.5 mA minimum input current
Loss of Signal (RF)	Digital output goes to the Link Lost Output state selected via the PDW Manager software. Active: Logic high (5 V) Inactive: Logic low (0 V) Stay as Is: State does not change

Dual Relays Module

Number of Relays	(2) Two
Rating	SPDT (Form C); rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads; see page *35* for details.
Initialization	After power failure, relays will initialize to default state before reconnecting to wireless units.
Power Consumption	2.56 W max @ 24 V Add to base station minimum power.
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.
Loss of Signal (RF)	If mapped to digital input channel, the relay goes to the state selected via the PDW Manager software. Active: Relay energizes Inactive: Relay de-energizes Stay as Is: State does not change

System Power Consumption Examples

Base Station	Analog Input*	Analog Output*	Digital I/O**	Relays*	Power (W)
2 Slots	0	2	0	0	4.9
2 Slots	1	1	0	0	6.8
6 Slots	2	2	1	1	10.9
6 Slots	0	4	0	2	16.8
16 Slots	5	5	2	4	27.8
16 Slots	0	8	4	4	33.6

*Modules with (2) I/O or (2) relays
**Modules with (4) digital I/O

PDW90 Field Unit

General

Display	32-character dual-line alphanumeric dot matrix LCD display with backlight
	Visual Area: 2.54" x 0.63" (64.6 x 16.0 mm)
	Character Height: 0.2" (5.5 mm)
	Display is used for programming assistance and displaying communications link status, signal strength, values for the analog inputs and outputs, and status of digital inputs and outputs.
Network ID	Field selectable: 0 - 99
Peak Antenna Gain	1.8 dBi +/- 1.0
Programming Methods	Programming (complete): PC with PDW Manager software. Programming (all but advanced): Four CapTouch through-glass buttons.
Recalibration	All inputs and outputs are calibrated at the factory. Recalibration is recommended at least every 12 months.
Process/ Digital I/O Display	Press the Next button once to display the present analog input and output. Press the Next button again to display digital I/O states.
Password	A programmable password restricts modification of program settings.
Power	9-30 VDC, 2.5 W max
	Note: If analog and digital outputs are off: 1.0 W min
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
Isolation	500 V
Environmental	Operating temp. range: -55 to 75°C (display inoperable < -20 °C) Storage temp. range: -55 to 85°C Relative humidity: 0 to 90% non-condensing
	Printed circuit boards are conformally coated
Connections	Removable screw terminal blocks accept 12 to 26 AWG wire.
Connectors Tightening Torque	4.5 lb-in (0.5 Nm)
Mounting	May be mounted directly to conduit. Built-in flange for 1.5" to 2" pipe or wall mounting. See *Field Unit Dimensions* on page *29* for mounting space requirements.
Overall Dimensions	5.25" x 11.63" x 4.80" (133 mm x 295 mm x 122 mm) (W x H x D)
Weight	Aluminum: 5.6 lbs (2.5 kg)
	Stainless Steel: 9.8 lbs (4.4 kg)
Warranty	3 years parts and labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Enclosure

Material	-AL Models: ASTM A413 LM6 die-cast aluminum, copper-free, enamel coated. -SS Models: ASTM A743 CF8M investment-cast 316 stainless steel
Gasket	Fluoroelastomer
Rating	NEMA 4X, IP68
Color	-AL: Blue; -SS: Silver
Window	Borosilicate glass
Conduits	Three ¾" NPT threaded conduit openings; One used for mounting the antenna (factory installed), the other two available for field wiring.
	M20 conduits are available. See *Ordering Information* on page *16* for details.
Flange	Built-in flange for wall and pipe mounting.
Tamper-Proof Seal	Enclosure lid may be secured with tamper-proof seal.
Instrument Tag Loop	Built-in loop for securing stainless steel tag.

Analog Input

Field Selectable Input	4-20 mA, 0-10 V, 0-5 V, 1-5 V
Accuracy	±0.03% of calibrated span ±1 count
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 Impedance	Voltage ranges: greater than 110 kΩ; Current ranges: less than 220 Ω
HART Transparency	HART signals will not transmit wirelessly. The 4-20 mA signal value will transmit normally (without any HART information) even if a HART signal is present.
	The analog input will not interfere with HART communications within the wired 4-20 mA loop.

Isolated 4-20 mA Transmitter Output

Output Source	Analog input from connected wireless unit
Calibration	Factory calibrated: 4.000 to 20.000 = 4-20 mA output
Accuracy	± 0.1% of span ± 0.004 mA
Loop Power Supply	Internally powered by 24 VDC; no external supply needed
Temperature Drift	0.4 µA/°C max from 0 to 65°C ambient, 0.8 µA/°C max from -40 to 0°C ambient
Loss of Signal (RF)	After approximately 15 seconds of trying to reconnect, the mA output will go to the Link Lost Output value selected via the PDW Manager software (*i.e.* 3.2, 3.5, 3.8, 20.5, 20.8, 23.0 mA, or Stay as Is).

External Output Loop Resistance	Power supply	Minimum
	24 VDC	10 Ω

Digital Inputs / Outputs

Channels	(4) Four (discrete) digital I/O connections, independently field selectable as either inputs or outputs. A digital output can be used to indicate loss of wireless signal as described below.
DI Logic High	3 to 24 VDC (30 V tolerant)
DI Logic Low	0 to 1.1 VDC
DI Contact	Dry contact to ground can be used to activate the input (Active Low)
DO Logic High	3.0 to 5.0 VDC
DO Logic Low	0 to 0.5 VDC
Output Source Current	20 mA maximum output current
Input Sink Current	0.5 mA minimum input current

⚠ IMPORTANT

I/O Operation Configured with PDW Manager

- Active Low Digital Input: A closed dry contact from a digital input terminal to GND will result in a digital output high on the corresponding output pin of the other unit.
- Active High Digital Input: To reverse the output logic, deselect the corresponding digital input box in the PDW Manager software. An open circuit or a logic high at the input will result in a digital output high on the corresponding output pin of the other unit.

Loss of Signal (RF)

Connections	Terminals G and LS on the Digital I/O connector
Function	After approximately 15 seconds of trying to reconnect, the Loss of Signal function will occur and result in the Digital output going to the Link Lost Output state selected via the PDW Manager software.
	Active: Logic high (5 V) Inactive: Logic low (0 V) Stay as Is: State does not change

Optional Relays

Number of Relays	(2) Two Form A (SPST)
Rating	250 VAC @ 5 A resistive load
	30 VDC @ 5 A resistive load
	250 VAC @ 2 A inductive load
	30 VDC @ 2 A inductive load
Relay Isolation (Dielectric Strength)	3,000 VAC, 50/60 Hz for 1 min
Noise Suppression	Metal oxide varistors across contacts
Relay Control	Relay coils are controlled by the digital outputs (e.g. DO-1 & DO-2)

⚠ IMPORTANT

- The relays option module is sold separately, and it is installed on the base of the enclosure by the user.

PDWR Wireless Repeater

General

Display	32-character dual-line alphanumeric dot matrix LCD display with backlight
	Visual Area: 2.54" x 0.63" (64.6 x 16.0 mm)
	Character Height: 0.2" (5.5 mm)
	Display is used for programming assistance and displaying communications link status and signal strength.
Number of Repeaters	Up to 3 repeaters per system
Network ID	Field selectable: 0 - 99
Peak Antenna Gain	1.8 dBi +/- 1.0
Programming Methods	Change network ID and factory defaults only.
	Four CapTouch through-glass buttons or PC with PDW Manager software.
Password	A programmable password restricts modification of programmed settings.
Input Power	9-30 VDC, 1.0 W max
Non-Volatile Memory	All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.
Isolation	500 V
Environmental	Operating temp. range: -55 to 75°C (display inoperable < -20 °C) Storage temp. range: -55 to 85°C Relative humidity: 0 to 90% non-condensing
	Printed circuit boards are conformally coated
Connections	Removable screw terminal blocks accept 12 to 26 AWG wire.
Connectors Tightening Torque	4.5 lb-in (0.5 Nm)
Mounting	May be mounted directly to conduit. Built-in flange for 1.5" to 2" pipe or wall mounting. See *Field Unit Dimensions* on page *29* for mounting space requirements.
Overall Dimensions	5.25" x 11.63" x 4.80" (133 mm x 295 mm x 122 mm) (W x H x D)
Weight	Aluminum: 5.6 lbs (2.5 kg)
	Stainless Steel: 9.8 lbs (4.4 kg)
Warranty	3 year parts and labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

See the PDWR Wireless Repeater manual for more information on how to extend the range of wireless signals.

Enclosure

Material	AL Models: ASTM A413 LM6 die-cast aluminum, copper-free, enamel coated. -SS Models: ASTM A743 CF8M investment-cast 316 stainless steel
Gasket	Fluoroelastomer
Rating	NEMA 4X, IP68
Color	-AL: Blue; -SS: Silver
Window	Borosilicate glass
Conduits	Three ¾" NPT threaded conduit openings; One used for mounting the antenna (factory installed), the other two available for field wiring.
	M20 conduits are available. See *Ordering Information* on page *16* for details.
Flange	Built-in flange for wall and pipe mounting.
Tamper-Proof Seal	Enclosure lid may be secured with tamper-proof seal.
Instrument Tag Loop	Built-in loop for securing stainless steel tag.

Base Station, Field Unit, Repeater

Wireless Radio

Frequency	900 MHz
Range	500 ft (152.4 m) indoor, 1 mi (1.61 km) outdoor (line-of-sight)
Encryption	AES 128-bit encryption available using PDW Manager software.
Interference Reduction	Frequency Hopping Spread Spectrum (FHSS)
Power Output	24 dBm (250 mW)
Sensitivity	-101 dBm

RS-485 Modbus® RTU Serial Communications

> ⚠ **IMPORTANT**
>
> - Modbus Client *must* be connected to the base station.

Compatibility	EIA-485
Connectors	Removable screw terminal connector
Max Distance	3,937' (1,200 m) max
Baud Rate	1200 – 57,600 bps
Data	8 bit (1 start bit, 2 stop bits)
Parity	Even, Odd, or None with 1 or 2 stop bits
Modbus Timeout	0.5, 1, 2, 3, 4, 5 seconds; user selectable
Isolation	1500 VRMS

PDW Manager Software

System Requirements	Microsoft® Windows® 10/11
Communications	USB 2.0
	Base Station: Standard USB A to USB Type B
	Field Unit: Standard USB A to micro-USB Type B
Configuration	Configure the base station and the field units via the base station's USB.
	Inputs on the base station are mapped to outputs on the selected field unit.
Compatibility	The PDW Manager v2.0.0 is compatible with previous firmware version 1.10; but there is a possibility of issues in the GUI (Graphical User Interface), but it should not be a problem configuring the supported features.
Utility	Use to program all settings on base station and field units.
	Save configuration files for later use with similar systems, base station only.
Availability	Download from predig.com/pdwmanager

Safety Information

⚠️ CAUTION

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

⚠️ WARNINGS

- Read all product labels completely and follow all instructions and requirements listed on the labels for installation or service.
- Installation and service should be performed only by trained service personnel. Service requiring replacement of internal components must be performed at the factory.

Unpacking

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

Installation

Base Station: All I/O modules and wiring connectors can be accessed by unlatching the clasps and opening the hinged door of the enclosure.

Field Units: To access the connectors, remove the enclosure cover and unclip the display module by pulling it from the enclosure. The display module may be disconnected from the relays option module (if installed) to facilitate field wiring.

Base Station Antenna & Wiring Holes

Predrilled holes are not provided in the base station enclosure for making wiring connections or mounting the antenna. Drilling of holes is left to the end user so that they may be placed wherever appropriate for the application. Be sure to use suitable hardware (cable glands, plugs, etc.) to maintain NEMA 4X/IP66 rating on the enclosure.

Field Units Mounting Instructions

There are three ways to mount the field units:

1. To a wall with the built-in flange

2. To a 1.5" or 2" pipe using the PDWA6963-SS stainless steel pipe mounting kit as shown on page *30*.

3. Supported by the conduit using the conduit holes provided.

The factory installed antenna is threaded into one of the three conduit holes and may be moved as appropriate for the installation.

Base Station Mounting Instructions

The base station can be wall mounted using the included mounting hardware. Securely screw the four brackets into the threaded holes provided at the rear of the enclosure with the bend facing toward the wall to provide the necessary clearance. Then, secure exposed mounting holes to wall.
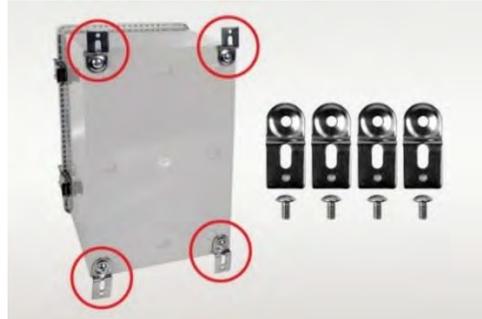
The PDW90 16-Module Base Station shown with supplied mounting flanges and 4 screws installed.

Antenna Mounting Instructions

1. Remove the antenna, IP65 rated antenna bulkhead adapter, and antenna coupler from the accessory bag.
2. Connect the antenna coupler's right angle connector to the antenna connection on the base station.
3. Drill a 5/16" (7.9 mm) hole into the enclosure making sure the antenna coupler connected to the base station is within its reach.
4. Insert the antenna bulkhead adapter into the drilled hole from the outside. Secure it with the provided washer and bulkhead nut from the inside and tighten to ensure a proper seal.
5. Connect the straight side of the antenna coupler to the inside connection of the antenna bulkhead adapter.
6. Install the antenna on the outside connection of the antenna bulkhead adapter.
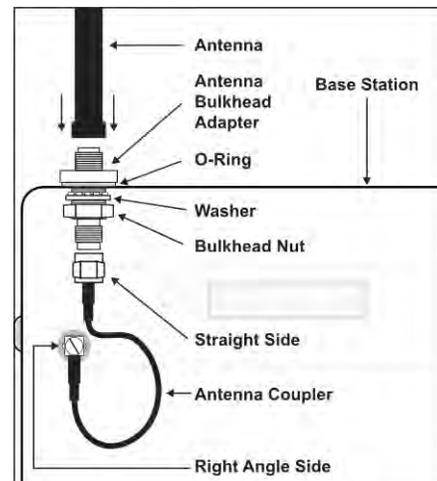
Field Unit Cover Jam Screw

The cover jam screw should be properly installed once the wireless units have been wired and tested. The cover jam screw is intended to prevent the removal of the units' cover while in operation without the use of tools. Using a M2 hex wrench, turn the screw clockwise until the screw contacts the unit. Turn the screw an additional 1/4 to 1/2 turn to secure the cover.

⚠ **CAUTION**

- Excess torque may damage the threads and/or wrench.

FCC Notice

Contains FCC ID: MCQ-XB900HP
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

⚠ **IMPORTANT**

- The RF module has been certified for remote and base radio applications. If the module will be used for portable applications, the device must undergo SAR testing. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

- If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Re-orient or relocate the receiving antenna, Increase the separation between the equipment and receiver. Connect equipment and receiver to outlets on different circuits or consult the dealer or an experienced radio/TV technician for help.

Canada (IC) Notice

Contains Model: XB900HP, IC: 1846A-XB900HP

Integrator is responsible for its product to comply with IC ICES-003 & FCC Part 15, Sub. B - Unintentional Radiators. ICES-003 is the same as FCC Part 15 Sub. B and Industry Canada accepts FCC test report or CISPR 22 test report for compliance with ICES-003.

Dimensions

Base Station Dimensions

6.73"
(171 mm)

5.9"
(150 mm)

5.9"
(150 mm)

6.4"
(163 mm)

7.9"
(200 mm)
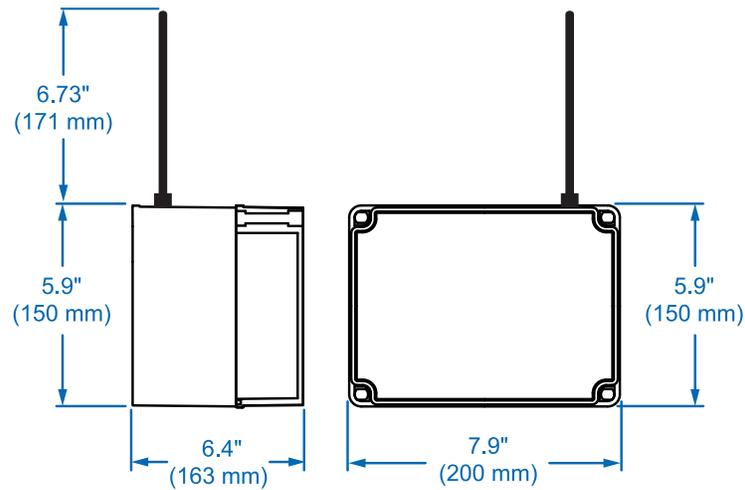
Figure 1. 2-Module Base Station Dimensions

6.73"
(171 mm)

11.3"
(287 mm)

11.8"
(300 mm)

11.8"
(300 mm)

7.0"
(178 mm)

7.9"
(201 mm)
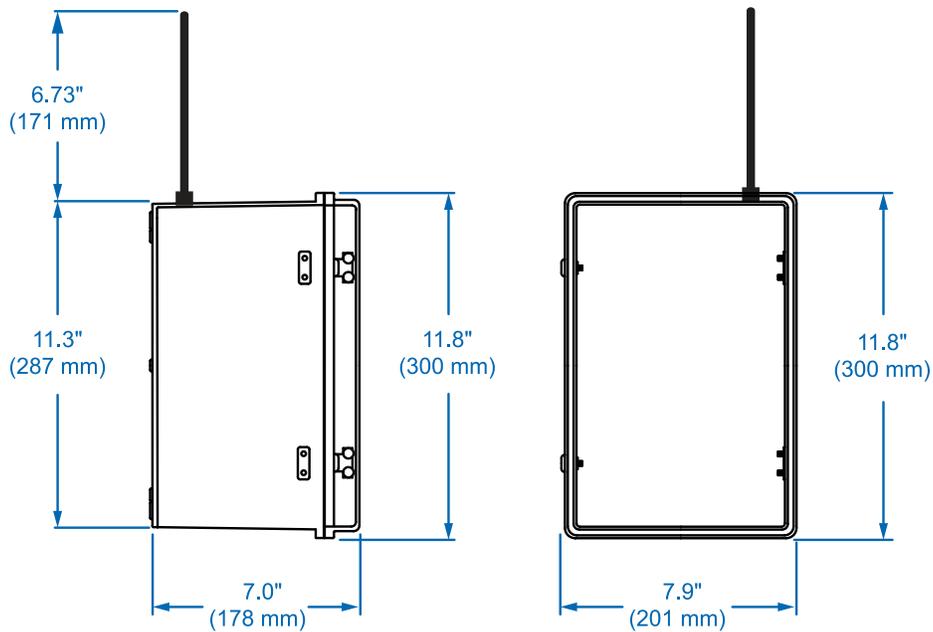
Figure 2. 6-Module Base Station Dimensions

6.73"
(171 mm)

15.04"
(382 mm)

15.75"
(400 mm)

15.75"
(400 mm)

7.08" (180)

11.81" (300)
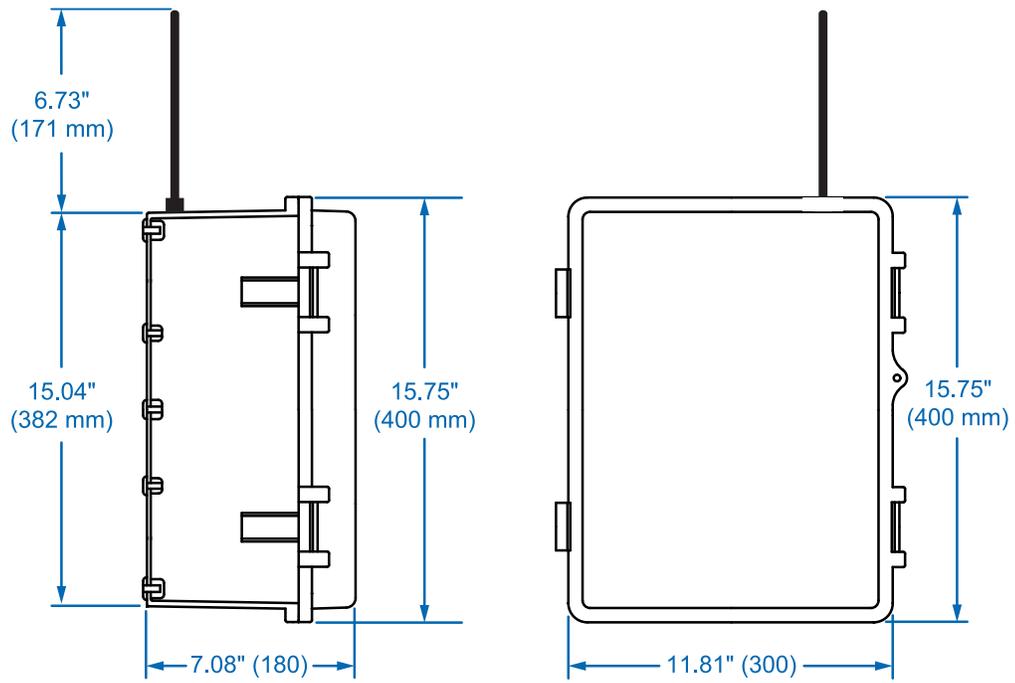
Figure 3. 16-Module Base Station Dimensions

Field Unit Dimensions
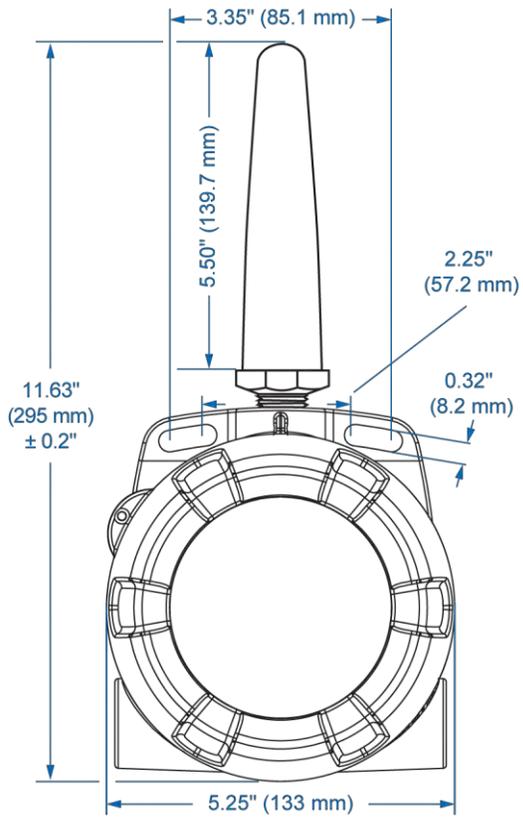
Figure 4. Enclosure & Antenna Dimensions – Front View
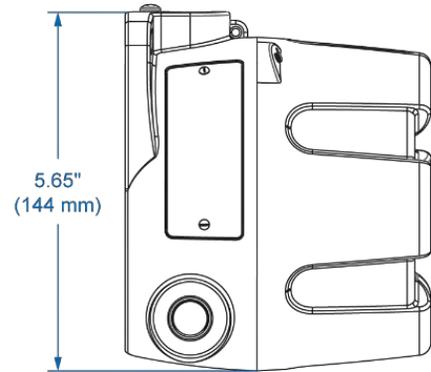
Figure 5. Enclosure Dimensions – Side View
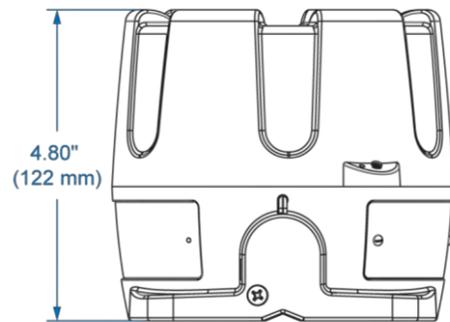
Figure 6. Enclosure Dimensions – Top View

PDWA6963-SS Stainless Steel Pipe Mount Kit for Field Units

The PDWA6963-SS provides a convenient way to mount PDW30, PDWR, and PDW90 wireless field units to horizontal or vertical 1.5" or 2" pipes such that the antenna is not right on top of the metal pipe.

The components in the mounting kit are made from 316 stainless steel and all necessary hardware is provided to mount one unit on a vertical pipe. To mount a unit to a horizontal pipe, two kits are required.

Mounting Instructions

1. Attach the mounting plate to the PDW wireless unit with the provided hardware using the round holes on the plate.
2. Mount the plate to the pipe with the provided U-bolt / hardware using the slotted holes on the mounting plate.
3. For best results, mount unit so antenna is as far away from metal devices as possible.
4. Two PDWA6963-SS mounting kits are required for mounting a PDW unit on a horizontal pipe.
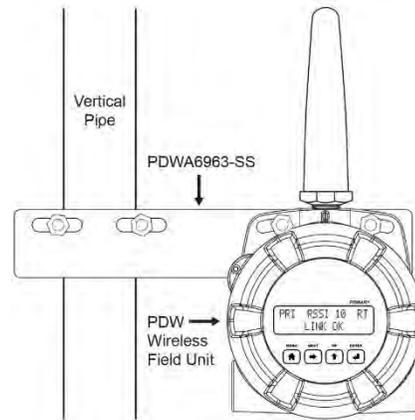
Figure 7. PDW Unit Mounted to Vertical Pipe with One PDWA6963-SS Kit

Vertical Pipe Mounting

Horizontal Pipe Mounting

Figure 8. PDW Unit Mounted to Horizontal Pipe with Two PDWA6963-SS Kits

Base Station Connections

The connectors for the base station are accessed by opening the enclosure door. Power, signal, I/O, and Modbus RS-485 connections are made to removable screw terminal connectors.

⚠ **WARNINGS**

- The PDW90 base station must be powered down completely prior to installing or removing any modules. Failure to do so could result in damage to the electronics.
- Static electricity can damage sensitive components.
- Observe safe handling precautions for static-sensitive components.
- Use proper grounding procedures/codes.
- Observe all safety regulations. Electrical wiring should be performed in accordance with all agency requirements and applicable national, state, and local codes to prevent damage to the device and ensure personnel safety.

Base Station Sub Panel (Connector Boards)

The following diagrams show the locations of the field installable I/O module slots and screw terminal headers on the PDW90 base stations for 16, 6, and 2-module configurations. Also shown is the wireless antenna connection, USB cable port for PDW Manager programming software, Modbus and power terminals, and LCD display.
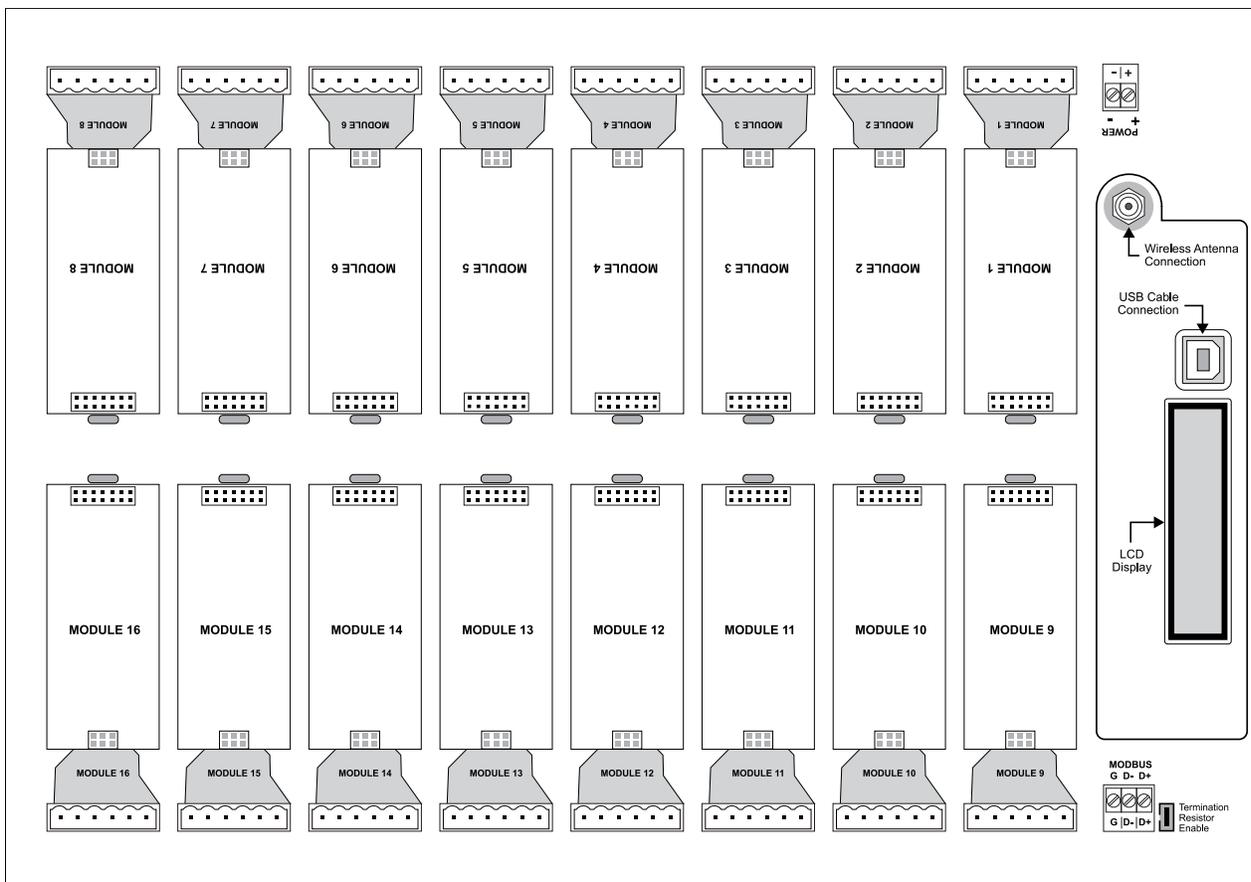
Figure 9. 16-Module Base Station Sub Panel (Connector Board)
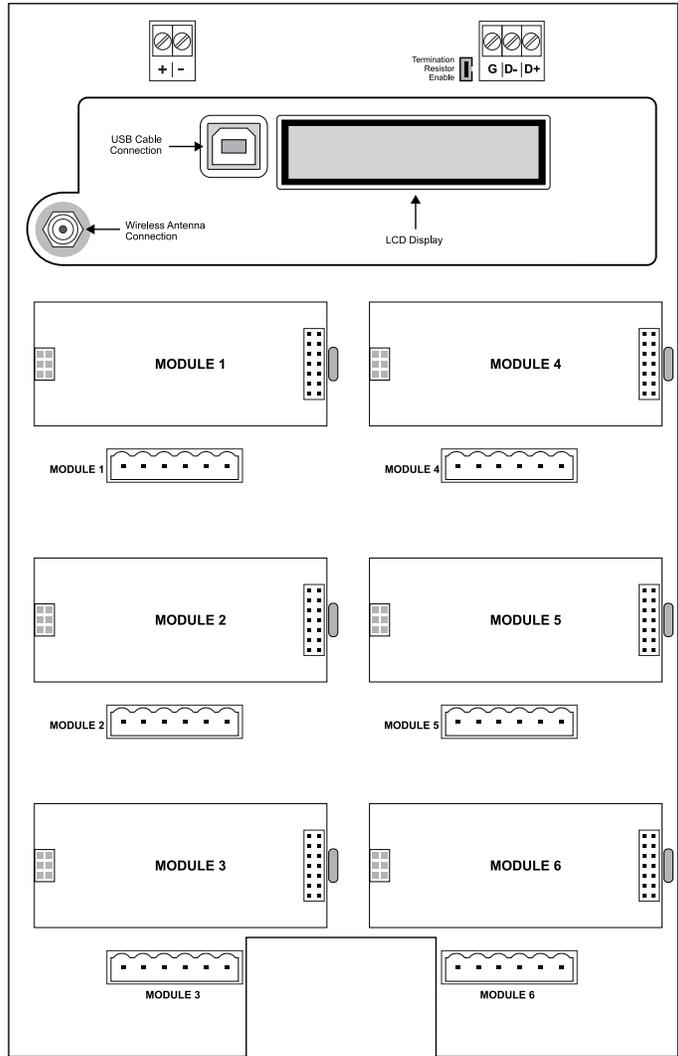
Figure 10. 6-Module Base Station Sub Panel (Connector Board)
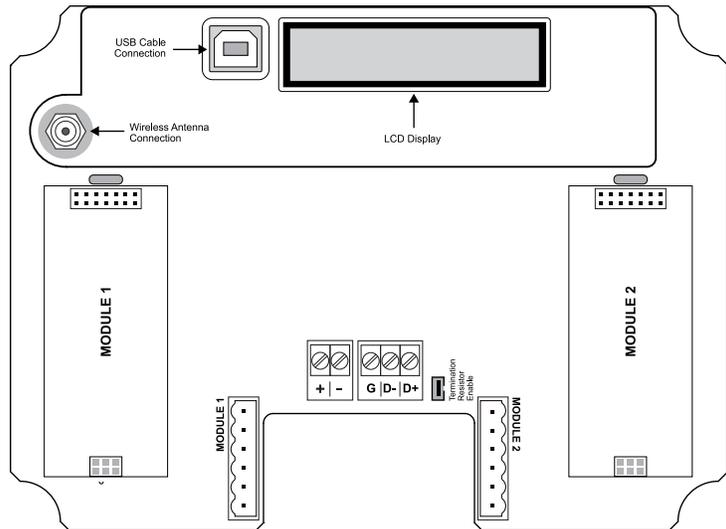
Figure 11. 2-Module Base Station Sub Panel (Connector Board)

Installing Base Station I/O Modules

The input/output modules easily snap into place on the connector board of the base station ensuring a secure and perfect fit every time. Each module also comes with connector plugs for easy wiring. There are four types of modules available: Dual Analog Inputs, Dual Analog Outputs, Four Digital I/O, and Dual Relay Outputs.

The modules are completely enclosed to protect the electronics.

The back of the module contains the connector pins that plug into the connector board.

Insert the tab on the module into the slot on the connector board to line up and easily snap it into place.

Press the module firmly into place to secure.

Connector plugs easily snap into the connector board.

Press the connector plug firmly into place to secure.

Base Station Wiring Diagrams

Power Connections

Power connections are made to a two-terminal connector labeled POWER in *Figure 12.*

Make sure that the power supply can provide between 9 and 30 VDC to the wireless device.
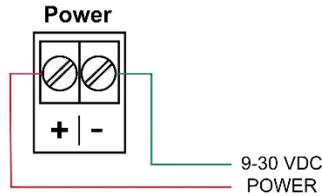
Figure 12. Base Station Power Connections

Dual Analog Input Connections

The analog input module can accept either 4-20 mA, 0-10 V, 0-5 V, or 1-5 V. The appropriate input type must be independently programmed for each input channel.

The analog input will not interfere with any existing HART signal on a 4-20 mA current loop. However, the HART signal **will not** be transmitted wirelessly.
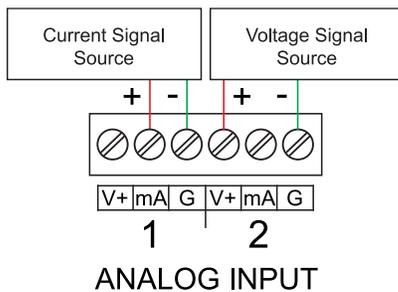
Figure 13. Base Station Analog Input Connections

Dual Analog Output Connections

The mA output module can be programmed to output a 4-20mA analog signal associated with a remote field unit's analog input or Modbus register.

The signal can be transmitted to any device scaled to read a 4-20 mA signal as shown below. The analog output is internally powered; no external power supply is required.
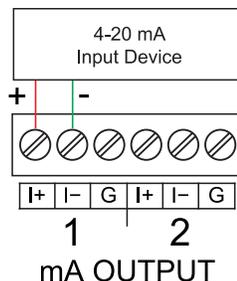
Figure 14. Base Station Analog Output Connections

Four Digital I/O Connections

The digital I/O module includes four independently programmable I/O channels. All digital connections are referenced to ground; digital input connections have an internal pull-up resistor.

Note: *Each connection may be set as either an input or an output. A digital output can be used to indicate loss of wireless signal.*

In the diagram below, D3 is a digital input and D4 is a digital output.
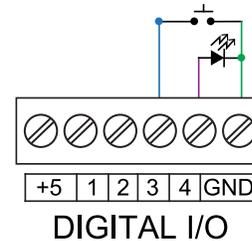
Figure 15. Base Station Digital I/O Connections

Dual Relays Output Connections

The relays module includes two mechanical relays. Relay connections are made to the six-terminal connector shown in

Figure 16.

Each relay's C terminal is common only to the normally open (NO) and normally closed (NC) contacts of the corresponding relay.

If a field unit's digital input channel is mapped to a relay module channel on the base station, the effect may be opposite of what is expected. An open connection at the digital input will result in the relay going into an active state. This is because the digital input channels are active low. This can be changed by swapping the NO and NC connections to the relay channel.
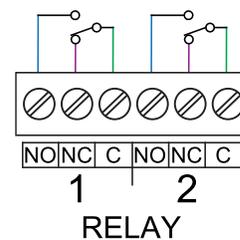

Figure 16. Base Station Relays Connections

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Switching Inductive Loads

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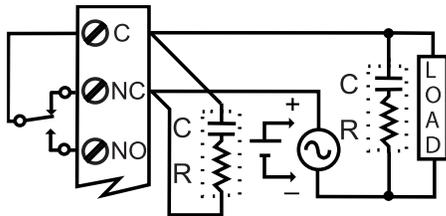

Figure 17. AC and DC Loads Protection

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 device's relay screw terminals. An RC network may also be installed across the load. Experiment for best results.*
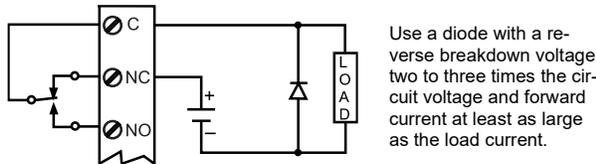
Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

Figure 18. Low Voltage DC Loads Protection

RC Networks Available from Precision Digital

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

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

Modbus RTU Serial Communications

The PDW90 base station acts as a simple pass-through for Modbus communications. As such, multiple Modbus enabled devices may transmit and receive wirelessly using the base station.

Note: Modbus Client must be connected to Base Station.
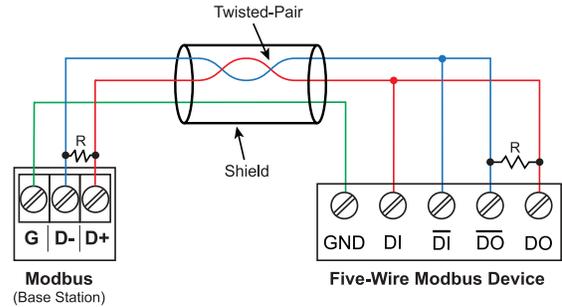
**Figure 19. Base Station Five-Wire RS-485 Modbus Connections**
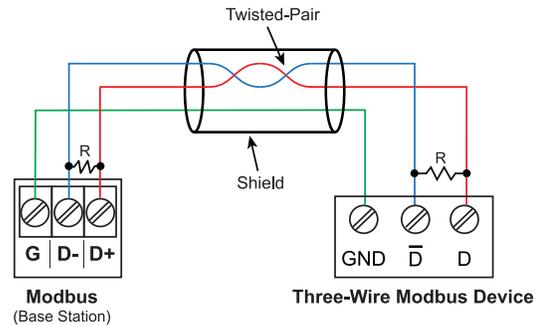
Figure 20. Base Station Three-Wire RS-485 Modbus Connections
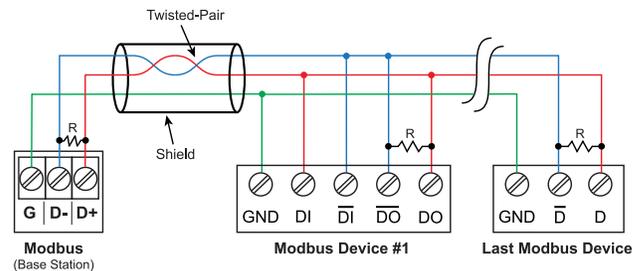

Figure 21. Base Station Multiple Device RS-485 Modbus Connections

Notes:
  1. *Termination resistors are optional, and values depend on the cable length and characteristic impedance. Consult the cable manufacturer for recommendations.*
  2. *Use shielded cable, twisted-pairs plus ground. Connect ground shield only at one location.*

Field Unit Connections

To access the connectors, remove the enclosure cover and unclip the display module by pulling it from the enclosure. Signal and power connections are made to removable connectors on the back of the display module. Relay output connections (if installed) are made to removable connectors on the relays option module mounted in the base of the enclosure. The display module may be disconnected from the relays option module to facilitate field wiring. Grounding connections are made to the two ground screws provided on the base of the enclosure, one internal and one external.

⚠ WARNINGS

- Static electricity can damage sensitive components.
- Observe safe handling precautions for static-sensitive components.
- Use proper grounding procedures/codes
- Observe all safety regulations. Electrical wiring should be performed in accordance with all agency requirements and applicable national, state, and local codes to prevent damage to the device and ensure personnel safety.

Display & Relays Option Modules Installation

The display module snaps into built-in rails on the enclosure ensuring a secure and perfect fit every time. No tools are needed to install or remove it. The relays option module is screwed into the base of the enclosure with the four screws provided. Both modules are completely enclosed to protect the printed circuit boards.
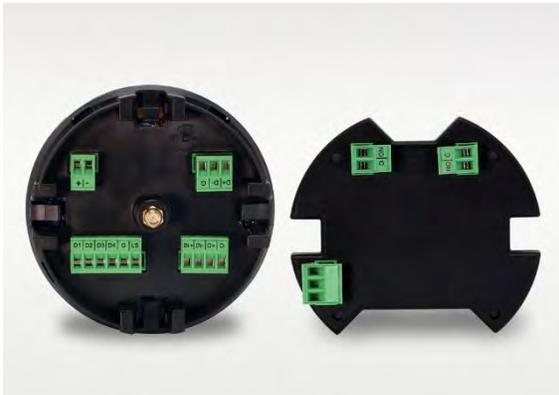
Display Module (Left) and Relays Option Module (Right)

Display Module Connected to Antenna
(Connect the antenna to the display module using the included antenna coupler)

Relays Option Module Mounted on the Bottom of Enclosure
(Install the module using the four screws provided)

Display Module Mounted on Built-In Rails
(Snap the module into place lining it up with the rail caps)

The following diagrams show the locations of the connectors on the back of the display module and the relays option module on the base of the enclosure.

Display Module   **Relays Option Module**
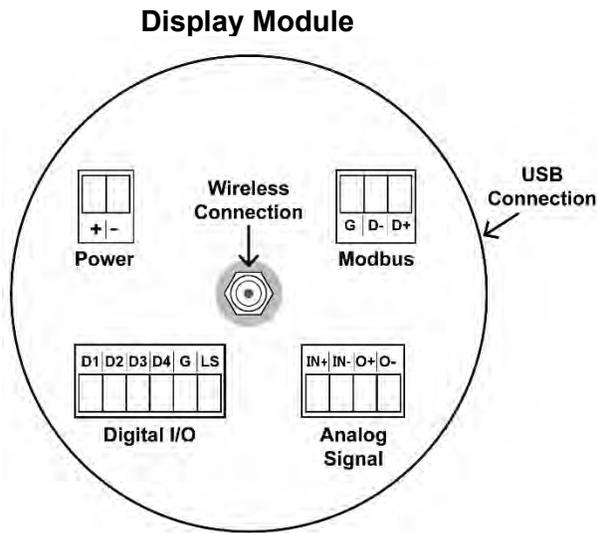

Figure 22. Field Unit Display Module Connectors
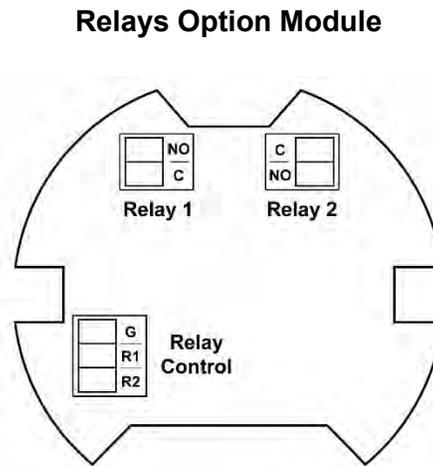
Figure 23. Field Unit Relays Option Module Connectors

⚠ IMPORTANT

- Use a flat screwdriver to loosen up the removable terminal blocks

Field Unit Wiring Diagrams

Power Connections

Power connections are made to a two-terminal connector labeled POWER in *Figure 24.* The Field Unit is reverse polarity protected; it will not be damaged if wired backward.

Make sure that the power supply can provide between 9 and 30 VDC to the wireless device.
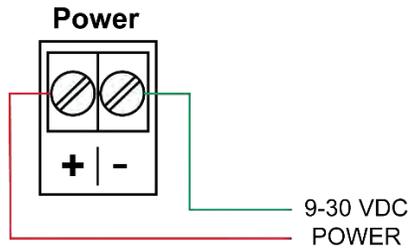
Figure 24. Field Unit Power Connections

Power Field Unit and 2-Wire Transmitter from Same Power Supply

The Field Unit may be powered from the same power supply that powers the 2-wire (loop-powered) transmitter, assuming that the supply provides enough voltage and current for both units. To power both devices from the same supply, wire the devices to the supply as shown below.
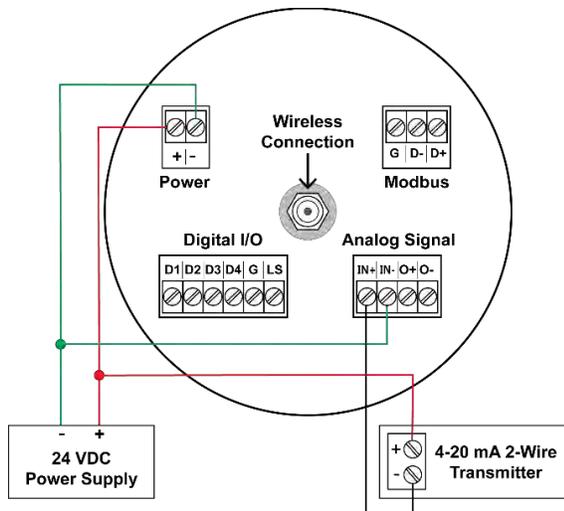
Figure 25. Field Unit and 2-Wire Transmitter Powered from Same Supply

Input Signal Connections

The analog input may be either 4-20 mA, 0-10 V, 0-5 V, or 1-5 V. The appropriate input type must be programmed for each unit.

Once the appropriate input type has been programmed, wire the analog signal source to the device as shown in the diagram below.

The analog input will not interfere with any existing HART signal on a 4-20 mA current loop. However, the HART signal **will not** be transmitted wirelessly.
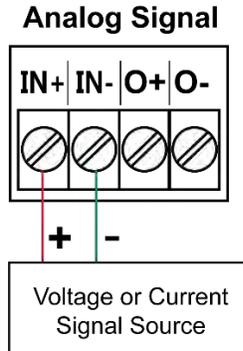

Figure 26. Field Unit Analog Input Connections

4-20 mA Output Connections

The 4-20 mA output corresponds with the analog input signal on the paired wireless device. The analog output signal is always 4-20 mA, regardless of the input type on the other wireless module.

For instance, if the analog input type on the first device was 0-10 V and the input value was 5 V, the second device would output 12 mA.

Connect the *mA OUT* terminals to a device scaled to read a 4-20 mA signal.

The analog output is internally powered; no external power supply is required.
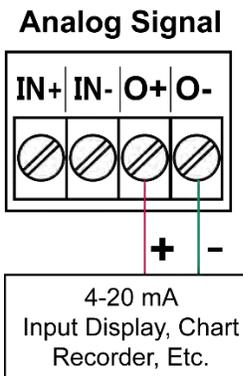
Figure 27. Field Unit 4-20 mA Output Connections

Digital I/O Connections

All digital connections are referenced to ground. The base station I/O settings determine the I/O settings of the field units (e.g. if D1 of the base station is an input then it can only be mapped to a digital output of a field unit).
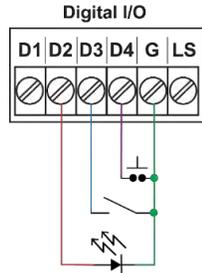

Figure 28. Field Unit Digital I/O Connections

Note: Each connection may be set independently in the device settings as either an input or an output. In the diagram above, D4 & D3 are digital inputs and D2 is a digital output.

Loss of RF Signal Connections

The Loss of Signal terminal (LS) can be used to alert another device, such as a PLC, that the wireless signal has been lost. After approximately 15 seconds of trying to reconnect, the Loss of Signal function will occur and result in the Loss of Signal digital output going to the Link Lost Output state selected via the PDW Manager software.
Active: Logic high (5 V)
Inactive: Logic low (0 V)
Stay as Is: State does not change.
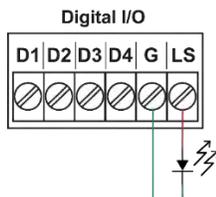
Figure 29. Field Unit Loss of Signal Connections

Relays Option Connections

The relays are controlled by the digital outputs on the display module so it is necessary to connect R1 and R2 terminals on the relays option module to digital outputs on the display module.
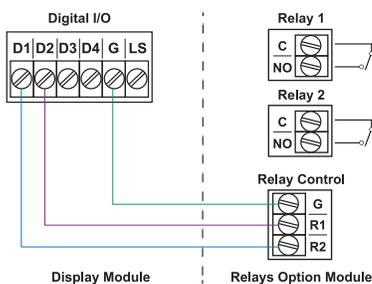

Figure 30. Relays Controlled by Digital Outputs

Note: Connections between relay control connection and relays are with traces on PCB

Modbus RTU Serial Communications

The Field Unit acts as a simple pass-through for Modbus communications. As such, multiple Modbus enabled devices may be transmitted wirelessly using the Field Unit.

Note: Modbus Client must be connected to Base Station.
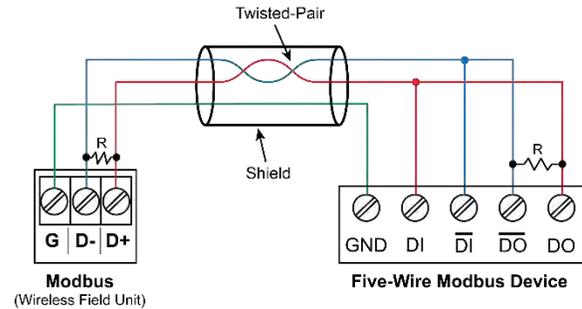
**Figure 31. Field Unit Five-Wire RS-485 Modbus Connections**
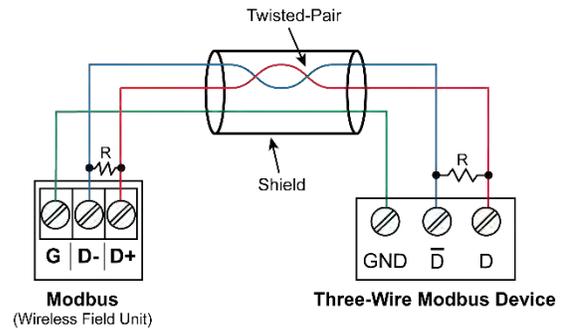
**Figure 32. Field Unit Three-Wire RS-485 Modbus Connections**
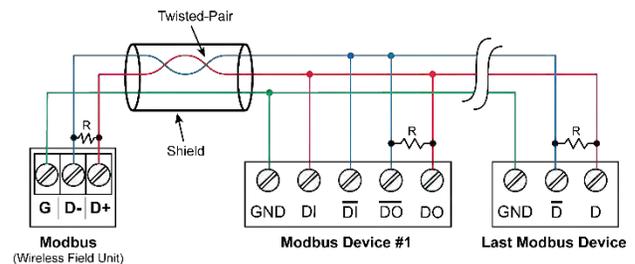
Figure 33. Field Unit Multiple Device RS-485 Modbus Connections

Notes:
1. *Termination resistors are optional, and values depend on the cable length and characteristic impedance. Consult the cable manufacturer for recommendations.*
2. *Use shielded cable, twisted-pairs plus ground. Connect ground shield only at one location.*

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Setup and Programming

> *The base station and field units are factory calibrated prior to shipment to read analog inputs in milliamps or volts depending on the input selection. The calibration equipment is certified to NIST standards.*

Overview

Setup and programming of the base station is done using PDW Manager programming software.

Setup of the wireless field units is done either wirelessly through the base station using PDW Manager programming software, or via direct USB programming with PDW Manager.

The field units' CapTouch through-glass buttons are for very limited programming options, such as network ID and Modbus address.

Programming the Base Station

The base station is programmed using PDW Manager programming software. PDW Manager is available for download at www.predig.com/pdwmanager.

Once the software is running, power the unit using a 24 VDC power supply and connect the base station's micro USB port to a PC using the provided USB cable.
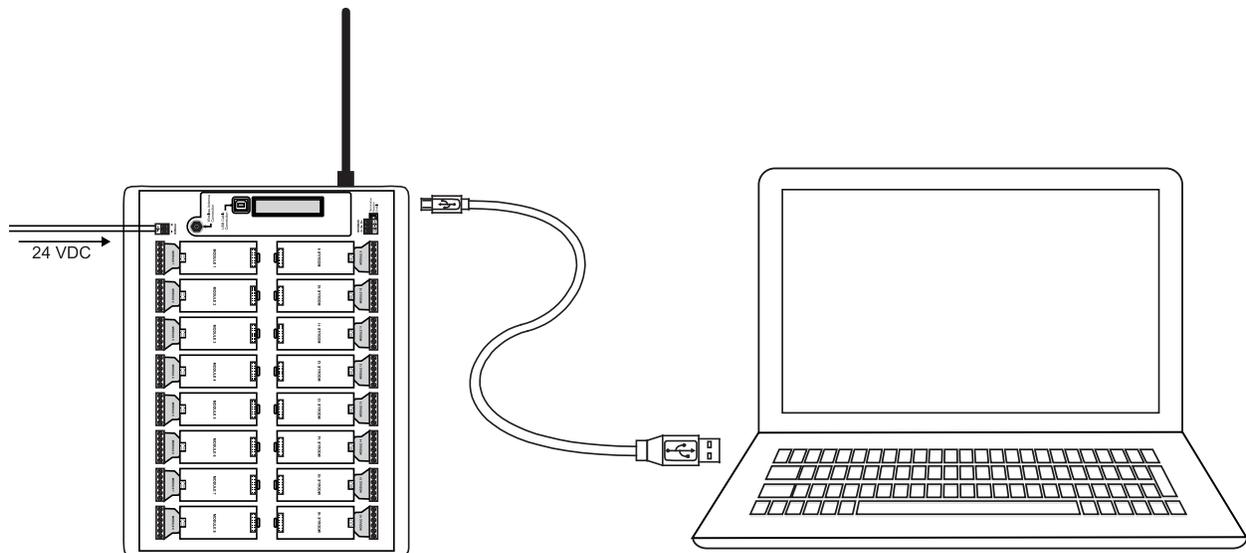
Note: The base station must be powered externally prior to programming via USB

.

The PC will automatically install the appropriate device drivers. Once this has completed, the device will appear in the *Device* list at the top of the PDW Manager window. Click *Connect*.

Connecting Field Units to the Base Station

The first step in the PDW90 programming process is to connect all of the wireless field units to the base station. Configuration of the base station is accomplished using the PDW Manager software. The field units may be programmed using PDW Manager, however, because of the limited number of options, it is easier in most cases to use the CapTouch through-glass buttons. See *Programming the Field Units* on page *52* for details on field unit programming.

After the base station has been connected to PDW Manager (see page *40*), field units can be connected to it from the *Field Unit Configuration* tab. Select each unit from the *Unassociated Field Units* list and click the *Add to Client List* button.

Field units must have the same network ID and encryption settings as the base station in order to connect. Each field unit must be programmed to have its own unique Modbus address.

Connected Field Units
This is a list of all currently connected wireless field units. Select one to configure its settings.

Disconnected Field Units
This is a list of wireless field units that have disconnected from the base station. Units will appear in this list if they are on the client list of the base station but are out of range, have powered off, or had their settings changed to no longer be able to communcate with the base station.

Unassociated Field Units
This is a list of wireless field units that can be connected to the base station. In order for a field unit to appear in the list, it must have the same network ID and encryption settings as the base station, be powered on, and be within range.

Note: All units must be powered in order to connect them to the base station.

Base Station Configuration

The *Base Station Configuration* tab is where the base station name, network ID, password, and Modbus settings may be modified. Once the modifications are complete, click the *Save Settings* button to write the current settings to the device.

If changes have been made that have not been saved, the settings can be loaded from the base station by clicking the *Read Settings* button.

Base Station Name
Click Change Name to enter a new human readable name for the base station.

Network ID
Enter a unique network ID for each base station in the facility.

Modbus Settings
Change these settings to match those of the Modbus® network with which this unit is communicating. Modbus address must be unique among other connected Modbus devices, including wireless field units.

Read Settings
Click this button to load settings from the base station hardware and display them here. This will overwrite any changes made in the software.

Save Settings
Click this button to write all of the changes made in the above fields to the base station hardware.

Change Password
Click this button to change the password needed to change device settings. Enter 0000 to disable.

Disconnect
Click this button to disconnect from the PDW90 base station and prepare it to be unplugged from the computer.

Note: Do not click Save Settings button after changing the password. Click Disconnect to confirm the password has been changed.

Input / Output Base Station Module Configuration

The *Base Station I/O Configuration* tab is where individual I/O modules connected to the base station are programmed. Click on one of the installed modules in the *I/O Modules* list to the left of the screen to begin programming that module.

Dual Analog Input Base Station Module

Each Dual Analog Input module has two input channels. Each channel may be independently programmed to accept either a 4-20 mA, 0-10 V, 0-5 V, or 1-5 V analog input. These channels may also be mapped to remote analog outputs or Modbus registers. Once the module's settings have been modified, click the *Save Module Configuration* button to save these settings to the base station.

If changes to the module have been made that have not been saved, the settings can be loaded from the base station by clicking the *Read Settings from Hardware* button. Resetting the selected module to its default settings can be done by clicking the *Load Default Settings* button.

The Monitoring area at the bottom may be used to view the current analog input reading or manually test analog input operation.

Save Configuration
Click this button to save all changes made to the selected module. This will not save changes to other modules.

Input/Output Modules
This field consists of a list of modules installed in the base station. Select one of the modules to configure. In this example, the analog inputs module is selected.

Analog Input Mode
Select the analog input mode (4-20mA, 0-10V, 0-5V, 1-5V) or disable the analog input channel.

Format and Scaling
Select a data format and word order. Input the minimum and maximum scaling range in the appropriate fields.

Load Default Settings
Load the factory default settings for the currently selected I/O module. This will overwrite any changes.

Read Settings from Hardware
Click this button to load settings from the base station hardware and display them here. This will overwrite any changes made in the software.

Monitoring
Use this to monitor the current input state or to manually test analog input operation.

I/O Mapping
Set a wireless field unit's analog output or a Modbus server register to receive from this input channel.

Modbus Access
Displays the Modbus readings for server address, registers, Interger, long int, and float.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

Dual Analog Output Base Station Module

Each Analog Output module has two 4-20 mA output channels. Each channel may be independently programmed and mapped to remote analog inputs or Modbus registers. Once the module's settings have been modified, click the *Save Module Configuration* button to save these settings to the base station.

If changes to the module have been made that have not been saved, the settings can be loaded from the base station by clicking the *Read Settings from Hardware* button. Resetting the selected module to its default settings can be done by clicking the *Load Default Settings* button.

The Monitoring area at the bottom may be used to view the current analog input reading or manually test analog input operation.

Save Configuration
Click this button to save all changes made to the selected module. This will not save changes to other modules.

Input/Output Modules
This field consists of a list of modules installed in the base station. Select one of the modules to configure. In this example, the 4-20 mA outputs module is selected.

Module Settings
Select a channel, enable or disable the analog output mode, and select the mA value for the link lost output.

Format and Scaling
Select a data format and word order. Input the minimum and maximum scaling range in the appropriate fields.

Load Default Settings
Load the factory default settings for the currently selected I/O module. This will overwrite any changes.

Read Settings from Hardware
Click this button to load settings from the base station hardware and display them here. This will overwrite any changes made in the software.

Monitor and Testing
Use this to monitor the current output state or to manually test analog output operation.

I/O Mapping
Set a wireless field unit's analog input or a Modbus server register to receive from this output channel.

Modbus Access
Displays the Modbus readings for server address, registers, Interger, long int, and float.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

Four Digital I/O Base Station Module

Each *Digital I/O* module has four I/O channels. Each channel may be independently programmed as either an input or an output. These channels may also be mapped to a remote digital I/O or Modbus register. Once the module's settings have been modified, click the *Save Module Configuration* button to save these settings to the base station.

If changes to the module have been made that have not been saved, the settings can be loaded from the base station by clicking the *Read Settings from Hardware* button. Resetting the selected module to its default settings can be done by clicking the *Load Default Settings* button.

The Monitoring area at the bottom may be used to view the current digital I/O state or manually test digital I/O operation.

Save Configuration
Click this button to save all changes made to the selected module. This will not save changes to other modules.

Input/Output Modules
This field consists of a list of modules installed in the base station. Select one of the modules to configure. In this example, the digital I/O module is selected.

Analog I/O Mode
Select channel to modify. Select the digital I/O mode (input or output) and select the mA value for the link lost output.

Modbus Access
Use this information to access this channel from a Modbus enabled device.

Load Default Settings
Load the factory default settings for the currently selected I/O module. This will overwrite any changes.

Read Settings from Hardware
Click this button to load settings from the base station hardware and display them here. This will overwrite any changes made in the software.

Monitor and Testing
Use this to monitor the current digital I/O state or to manually test digital I/O operation.

I/O Mapping
Set a wireless field unit's digital I/O or a Modbus server register to send/receive to this channel.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

Dual Relay Base Station Module

Each *Relays* module has two channels. Each channel may be independently programmed and mapped to remote digital I/O or Modbus registers. Once the module's settings have been modified, click the *Save Module Configuration* button to save these settings to the base station.

If changes to the module have been made that have not been saved, the settings can be loaded from the base station by clicking click the *Read Settings from Hardware* button. Resetting the selected module to its default settings can be done by clicking the *Load Default Settings* button.

The Monitoring area at the bottom may be used to view the current relay state or manually test relay operation.

Save Configuration
Click this button to save all changes made to the selected module. This will not save changes to other modules.

Input/Output Modules
This field consists of a list of modules installed in the base station. Select one of the modules to configure. In this example, the relays module is selected.

Relays Channel/Mode
Select channel to modify, enable or disable the relay channel, check failsafe, and set the link lost output to active or inactive.

Modbus Access
Use this information to access this channel from a Modbus enabled device.

Load Default Settings
Load the factory default settings for the currently selected I/O module. This will overwrite any changes.

Read Settings from Hardware
Click this button to load settings from the base station hardware and display them here. This will overwrite any changes made in the software.

Monitor and Testing
Use this to monitor the current relay state or to manually test relay operation.

I/O Mapping
Set a wireless field unit's digital input or a Modbus server register to control this relay channel.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

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Field Unit Configuration

The *Field Unit Configuration* tab is where connected field units are programmed to communicate with the base station. Select a connected field unit from the *Connected Clients* list in order to begin programming that unit.

A field unit's human readable name is changed by clicking the *Change Name* button. Be sure to give each field unit a descriptive name, such as the location of the unit in your facility or the devices connected to it, in order to make future programming easier.

Analog Input

Each field unit's analog input is programmed to accept a 4-20 mA, 0-10 V, 0-5 V, or 1-5 V signal. Once the module's settings have been modified, click the *Save Configuration* button to save these settings to the field unit.

The *I/O Mapping* section will show to what (if any) device the analog input has been mapped. The *Monitoring* section at the bottom is used to view the current analog input reading or manually test analog input operation.

Field Unit Name
Click *Change Name* to enter a new human readable name for the base station.

Connected Field Units
List of field units connected to the base station. Select one of the field units to configure. Disconnected field units will appear in the window below

Analog Input Mode
Select the analog input mode (4-20mA, 0-10V, 0-5V, 1-5V) or disable the analog input.

Modbus Access
Use this information to access the output from a Modbus enabled device.

Format and Scaling
Set data type and scaling for Modbus communications.

Monitor and Testing
Use this to monitor the current input state or to manually test analog input operation.

I/O Mapping
Set the wireless field unit's analog input to send to the base station. Typically set from the *Base Station I/O Configuration* tab.

Save Configuration
Click this button to save all changes made to the selected field unit. This will not save changes to other modules.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

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4-20 mA Analog Output

The *4/20mA Output* tab is used to program the selected field unit's analog output. Once the module's settings have been modified, click the *Save Configuration* button to save these settings to the field unit.

The *I/O Mapping* section will show to what (if any) device the analog input has been mapped.

The *Monitoring and Testing* section is used to monitor the current input state or to manually test analog output operation.

Field Unit Name
Click *Change Name* to enter a new human readable name for the base station.

Connected Field Units
List of field units connected to the base station. Select one of the field units to configure. Disconnected field units will appear in the window below.

Analog Output Mode
Disable or enable the 4-20mA analog output. Set the mA value for link lost output.

Modbus Access
Use this information to access the output from a Modbus enabled device.

Format and Scaling
Set data type and scaling for Modbus communications.

Monitor and Testing
Use this to monitor the current input state or to manually test analog output operation.

I/O Mapping
Set the wireless field unit's analog output to send to the base station. Typically set from the *Base Station I/O Configuration* tab.

Save Configuration
Click this button to save all changes made to the selected field unit. This will not save changes to other modules.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

Digital I/O

Each field unit has four digital I/O channels. Each channel can be independently programmed as either an input or an output. Once the module's settings have been modified, click the *Save Configuration* button to save these settings to the field unit.

The *I/O Mapping* section will show to what (if any) device the digital I/O has been mapped.

The *Monitoring and Testing* section is used to monitor the current digital I/O state or manually test the digital I/O operation.

Connected Field Units
List of field units connected to the base station. Select one of the field units to configure. Disconnected field units will appear in the window below.

Digital I/O Mode
Select the digital I/O mode (input or output) or disable the selected digital I/O channel.

Modbus Access
Use this information to access this channel from a Modbus enabled device.

Monitor and Testing
Use this to monitor the current digital I/O state or to manually test digital I/O operation.

Loss of Signal (LoS) Output
Select the digital output logic, if the RF link is lost.

I/O Mapping
Set the wireless field unit's digital I/O to send/receive to the base station. Typically set from the *Base Station I/O Configuration* tab.

Save Configuration
Click this button to save all changes made to the selected field unit. This will not save changes to other modules.

Note: For information about Modbus Access, please see *Modbus Register Address vs Modbus Register Number* on pages *50*.

Modbus RTU

Each field unit is capable of transmitting Modbus RTU serial communications. Enter the Modbus network settings on the *Modbus* tab in order to communicate with the Modbus network. The Modbus address must be unique in order to ensure field unit/base station connectivity.

Once the module's settings have been modified, click the *Save Configuration* button to save these settings to the field unit.

Field Unit Name
Click *Change Name* to enter a new human readable name for the field unit.

Connected Field Units
List of field units connected to the base station. Select one of the field units to configure. Disconnected field units will appear in the window below.

Remove from Field Units List
Click this button to remove the selected field unit from the field units list.

Modbus Settings
Change these settings to match those of the Modbus network with which this unit is communicating. The Modbus address must be unique for each wireless field unit.

Save Configuration
Click this button to save all changes made to the selected field unit. This will not save changes to other modules.

Modbus Register Address vs Modbus Register Number

In order to address the wireless units' Modbus registers, depending on the type of Modbus device, it are necessary to provide either the *register address* or the *register number*. PDW Manager shows the *register address* of input and output devices in the section labeled *Modbus Access*, as shown below:

Modbus Access :
Server Address: 1   Registers: Integer: 256   Long Int: 320   Float: 384

In this example, if the Modbus device requires a *register address*, use the value 2112 to access the long int value.

If the Modbus device requires a *register number*, add 40,001 to the *register address* (in this case: 42,113) to access the long int value. The table at right shows additional *register address* to *register number* conversions.

Register Address	Register Number
0	40,001
256	40,257
2048	42,049
3328	43,329

Advanced Configuration for Base Station

Device communication can be secured by enabling 128-bit AES encryption. A channel mask may also be set for interference immunity. The encryption key and channel mask are entered on the *Advanced* tab. Once the encryption information is entered, click *Save Settings*.

If changes have been made that have not been saved, the settings can be loaded from the base station by clicking the *Read Settings* button.

The wireless field units must share identical encryption keys in order to communicate with the base station, so be sure to enter the same information for all of the field units. See *Programming the Field Units with PDW Manager* on page *56* for information on programming the field units.

To reset the base station to factory default settings, click the *Reset all system parameters to Factory Defaults* button. All field units are removed from the base station data base.

Channel Mask
Set a channel mask for interference immunity.

AES Encryption
Devices can be programmed to communicate securely using 128-bit AES encryption. Enable encryption using the drop-down at the top and enter an encryption key. The two key fields must start with "0x" followed by 16 hexadecimal characters (for example: 0x46D34C5666542D06).

Read Settings
Click this button to load settings from the base station hardware and display them here. This will overwrite any changes made in the software.

Base Station Management
Click these buttons to perform administrative tasks such as clearing the list of connected field units and resetting the base station to factory default settings.

Save Settings
Click this button to write all of the changes made in the above fields to the base station hardware.

Generate Key
Once the AES encryption settings are programmed, click this button to generate the encryption key.

Programming the Field Units

Settings other than advanced ones can be programmed using the CapTouch through-glass buttons or using PDW Manager. Because of the limited number of options available for the field units, it is easier in most cases to use the programming buttons.

When programming the field units using the programming buttons, use the MENU button to enter or exit *programming mode*, the NEXT button to cycle forward through menu options, the UP button to cycle backward through menu options, and the ENTER button to select the menu item or option you want. During number entry, use the NEXT button to select a digit and the UP button to increment the selected digit.

Press the NEXT button while in *run mode* to show the current analog and digital inputs and outputs.

Buttons & Display for PDW90 Field Unit

Button/Symbol	Description
MENU	**MENU** Enter or exit the device menu
ENTER	**ENTER** Select a menu item of option
UP	**UP** Cycle backward through menus or increment digit
	Display previous I/O
NEXT	**NEXT** Cycle forward through menus or select next digit
	Display next I/O

Display	Status
RSSI	**Received Signal Strength Indicator** Indicates the wireless signal strength between wireless devices on a scale of 1 to 10.
RT	**Receiving/Transmitting** Flashes while the devices are sending and/or receiving data.
001-247	**Modbus Address** Indicates the Modbus address of the field unit. This is the unique identifier that the base station uses to communicate with the field unit.
LINK OK / CONNECTING	**Link Status** Displays whether or not the units are currently connected.
AIN / AOUT	**Analog Input/Analog Output** Labels for the current analog input and analog output (Shown when the *Next* button is pressed)
DI / DO	**Digital Input/Digital Output** Labels for each of the current digital inputs or outputs (Shown when the *Next* button is pressed twice)

CapTouch Buttons

The PDW90 field units are equipped with four capacitive sensors that operate as through-window buttons so that certain features can be programmed without removing the cover (and exposing the electronics) in a harsh operating area.

The first time CapTouch buttons are used, or after 20 seconds of inactivity, a long finger press for about two seconds directly over the marked button area of any button is required to wake up the buttons. After that, a brief press directly over the marked button area is all that is required to actuate a button.

When the cover is removed or re-installed, the CapTouch buttons can be used only after the meter completes a self-calibrating routine (which can take up to 20 seconds). Additionally, the sensors are disabled when more than one button is pressed, and they will automatically re-enable after a few seconds.

CapTouch Button Tips

The CapTouch buttons are designed to work under any lighting condition and to protect against false triggering.

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

> ⚠ **IMPORTANT**
>
> - The first time the CapTouch buttons are used, or after 20 seconds of inactivity, a long finger press directly over the marked button area of any button of about two seconds is required to wake up the buttons.
> - When the cover is removed or re-installed, the CapTouch buttons can be used only after the meter completes a self-calibrating routine (which can take up to 20 seconds).
> - CapTouch buttons will not work if two or more buttons are detected as being pressed simultaneously. Be careful to avoid triggering multiple buttons or reaching across one button location to press another.

Field Unit Setup Menu

The setup menu consists of analog, digital (discrete), and Modbus input/output settings, network ID, password, and factory defaults restoration.
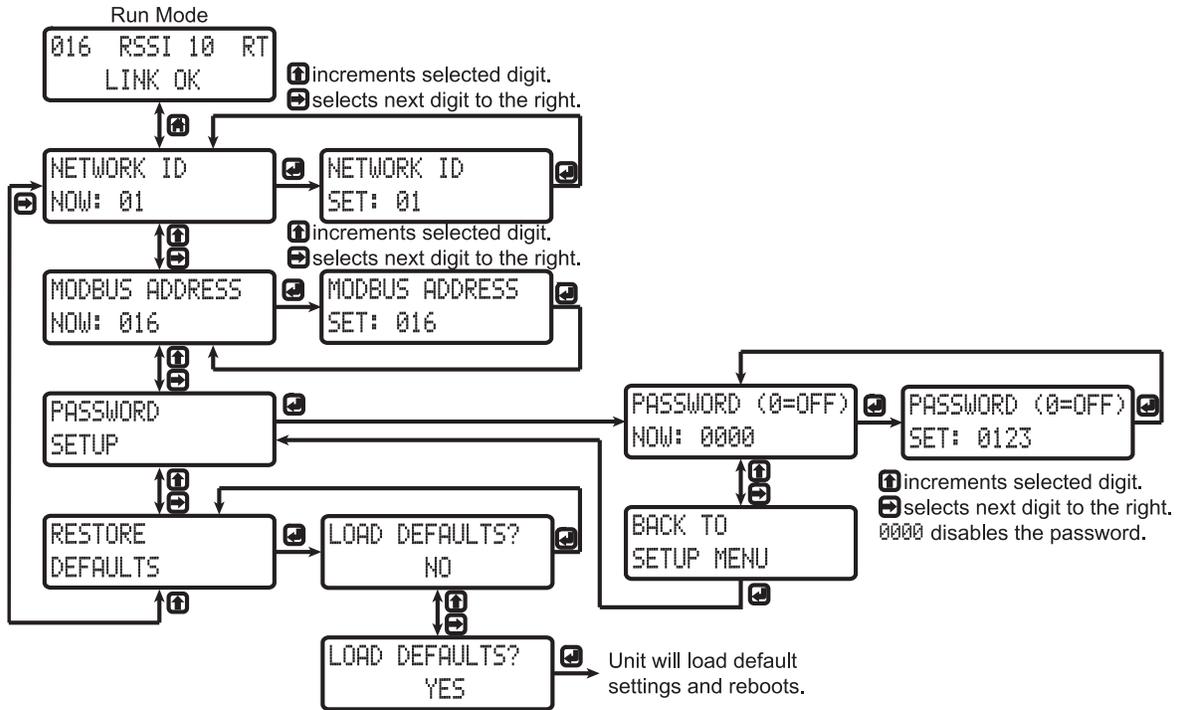
Display Functions & Messages

Shown below is a list of all display messaged in each field unit's setup menu. This list is in order of appearance when pressing the NEXT button. An indented line indicates a sub-menu or item.

Display	Action/Setting Description
NETWORK ID	Displays the point-to-multipoint wireless network ID (press *enter* to change)
01-99	The network ID can be any number between 01 and 99
MODBUS ADDRESS	The unique ID used by the base station to differentiate between field units
001-247	The Modbus address can be any number between 001 and 247
PASSWORD SETUP	Change the device password
PASSWORD (0=OFF)	Displays the current device password (press *enter* to change)
0000-9999	Password can be any number from 0001 to 9999 (0000 disables)
BACK TO SETUP MENU	Return to the setup menu
RESTORE DEFAULTS	Restore the unit to factory default settings
LOAD DEFAULTS?	Factory restoration confirmation prompt
NO	No, do not restore the device to factory defaults (press *enter*)
YES	Yes. restore the device to factory defaults (press *enter*)

Entering Numeric Values

Numeric values are set using the NEXT and UP buttons. Press NEXT to select next digit and UP to increment digit value.

The selected digit will flash.

Press the ENTER button, at any time, to accept the value or the MENU button to exit without saving.
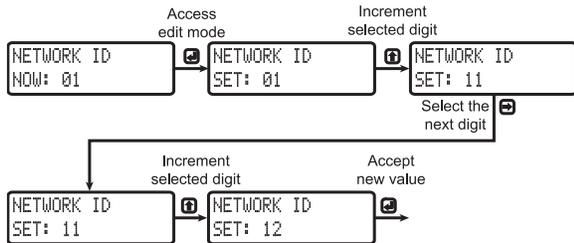
Network ID

The *Network ID* is the unique network identifier that allows all field units to connect to the base station. The ID can be set to any number between *01* and *99*. All field units must be set to the same *Network ID* as the base station in order to communicate. Multiple field unit/base station pairs may be installed within range of each other by setting unique *Network ID*s.

Modbus Address

The *Modbus Address* is used to identify each individual field unit connected to the point-to-multipoint wireless network. The Modbus address can be any number between *001* and *247*. This address must be unique among all field units on the same *Network ID*. This address must also be unique among all other Modbus devices connected to the network.

Password Setup

The wireless field units may be protected with a four-digit numeric password in order to prevent unauthorized tampering. When a password has been set, you will be prompted to enter that password in order to access the device menu.

To disable password protection, simply enter 0000 as the password.
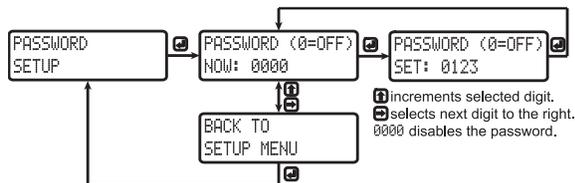
⚠ IMPORTANT

- The settings of the field units are saved in the base station. The base station ignores the field unit's password.

Making Changes to a Password Protected Wireless Unit

Once a password has been set on the device, you will be required to enter that password before being allowed to access the device menu.
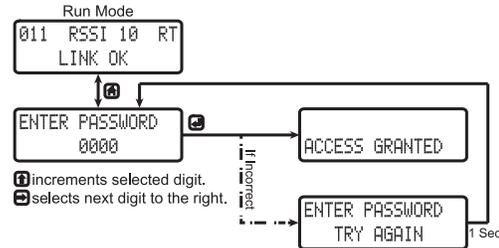
Note: *Setting a password will require you to enter the password to access the device settings via the PC software as well.*

Did you forget the password?
The password may be disabled by entering a master password. If you are authorized to make changes, enter the master password 7300 to unlock the device.

Restore Defaults

If a mistake has been made while programming the primary or secondary device, and it is unclear where the error occurred, the best option may be to perform a factory reset of the device and begin again.
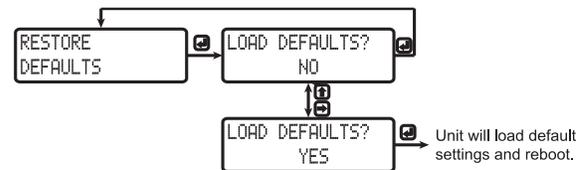

Display Signal I/O and Digital I/O Status

Pressing either the UP or NEXT buttons while the device is in run mode will cycle through the display modes. These modes are, in order, *link status*, *analog I/O*, and *digital I/O*.


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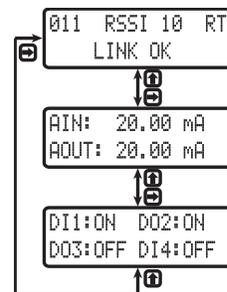
Programming the Field Units with PDW Manager

The field units can be programmed using the PC based PDW Manager, although it is easier to use the CapTouch through-glass buttons because of the limited number of options available on the field unit. Field units connect to a PC via the micro USB connection on the side of the electronics module, underneath the enclosure cover. Use of PDW Manager is required for programming advanced settings such as digital I/O logic (high or low), loss of signal (LoS) digital output state or analog output value, wireless encryption, and analog signal calibration.

PDW Manager is available for download at www.predig.com/pdwmanager. Once the software is running, power the unit using a 9-30 VDC power supply and connect the device to the PC using the provided USB cable.
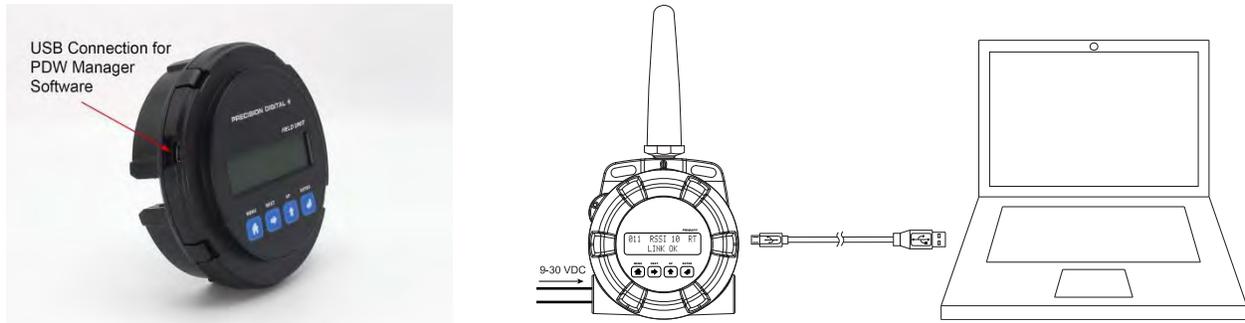
Note: Units must be powered externally prior to programming via USB.

The PC will automatically install the appropriate device drivers. Once this has completed, the device will appear in the *Device* list at the top of the PDW Manager window. Click *Connect*.
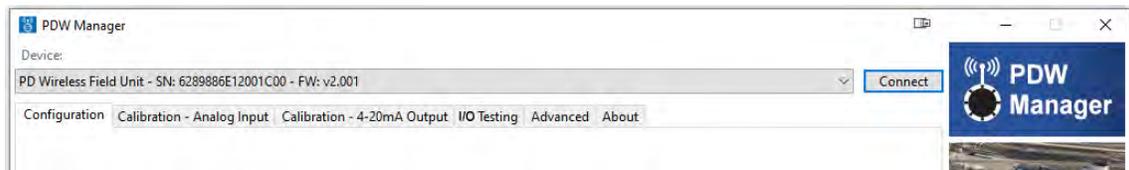
Configuring the Field Units

The image below shows the available options on the *Configuration* tab while the field unit is connected.
The network ID, Modbus settings, and password are configured from this tab.

Device Name
Click Change Name to enter a new human readable name for the wireless device.

Network ID
Enter the same Network ID as the base station for each PDW90 field units.

Analog Input Mode
Select what type of analog input the device is receiving.
(4-20 mA, 0-10 V, 0-5 V, 1-5 V)

Digital I/O Settings
Select whether each digital connection on the device is receiving a digital input or a digital output.

Modbus Settings
Change the Modbus timeout to match that of the Modbus network with which this unit is communicating. The Modbus address must be unique among other Modbus devices, including other wireless field units.

Read Settings
Click this button to load settings from the wireless hardware and display them here. This will overwrite any changes made in the software.

Save Settings
Click this button to write all of the changes made in the above fields to the wireless hardware.

Change Password
Click this button to change the password needed to change device settings. Enter 0000 to disable.

Disconnect
Click this button to disconnect from the wireless unit and prepare it to be unplugged from the computer.

Calibrate the Field Unit's Analog Input and Output

The field unit's analog input and output can be calibrated using the *Analog Input and 4/20mA Output* tabs.

Note: The field units are factory calibrated prior to shipment to read analog input in milliamps and volts depending on the input selection. The calibration equipment is certified to NIST standards.
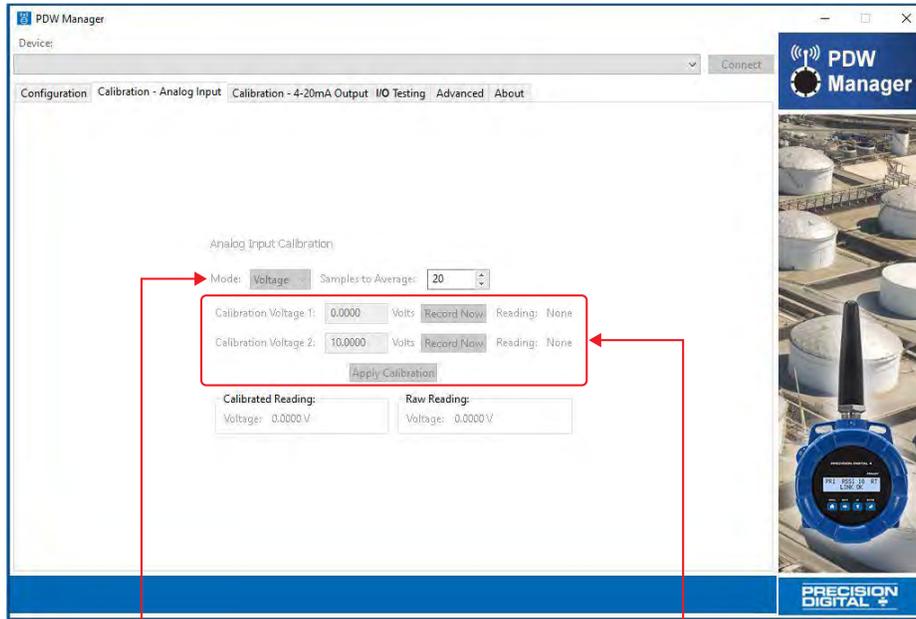

Analog Input Calibration Mode
Change analog input calibration mode to either current or voltage. This will change the active analog input mode on the device and allow for calibration.

Input Calibration
Record the high and low analog input range from a calibration device and apply calibration to the wireless unit.

I/O Testing on the Field Unit

The *I/O Testing* tab allows for monitoring and testing digital I/O activity, monitoring the analog input and the current 4-20 mA analog output, and displaying the device log's technical information for testing and debugging purposes.
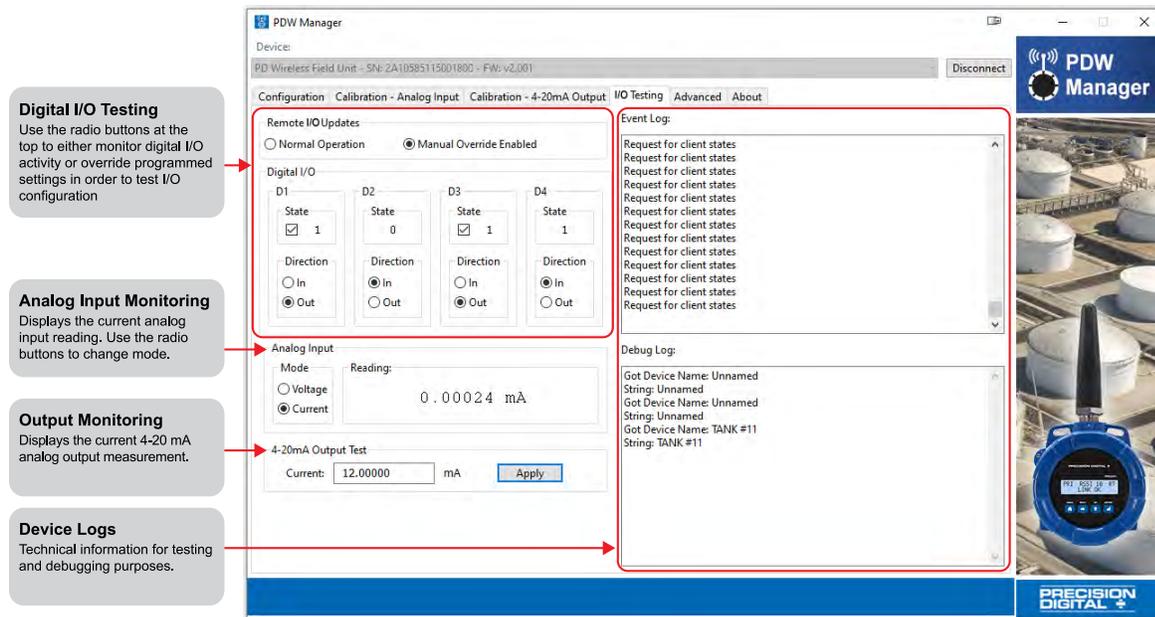
Digital I/O Testing
Use the radio buttons at the top to either monitor digital I/O activity or override programmed settings in order to test I/O configuration

Analog Input Monitoring
Displays the current analog input reading. Use the radio buttons to change mode.

Output Monitoring
Displays the current 4-20 mA analog output measurement.

Device Logs
Technical information for testing and debugging purposes.

Advanced Configuration for Field Units

⚠ **IMPORTANT**

- The advanced configuration for field units is accessible only by connecting directly to USB port of the field unit.

Device communication can be secured by enabling 128-bit AES encryption. A channel mask may also be set for interference immunity. The encryption key and channel mask are entered on the *Advanced* tab. Once you have entered the encryption information, click *Save Settings*. If changes have been made that have not been saved, the settings can be loaded from the base station by clicking the *Read Settings* button.

The base station and field units must share identical encryption keys in order to communicate, so be sure to enter the same information for the base station and all of the field units. See *Programming the Base Station* on page *40* for information on programming the base station.

Channel Mask
Set a channel mask for interference immunity.

AES Encryption
Devices can be programmed to communicate securely using 128-bit AES encryption. Enable encryption using the drop-down at the top and enter an encryption key. The two key fields must start with "0x" followed by 16 hexadecimal characters (For example: 0x46D34C5666542D06).

Read Settings
Click this button to load settings from the wireless unit hardware and display them here. This will overwrite any changes made in the software.

Reset to Factory Defaults
Click this button to permanently reset all settings on the device to factory defaults. This will overwrite all changes made to the device.

Save Settings
Click this button to write all of the changes made in the above fields to the wireless unit hardware.

Generate Key
Click this button to generate an AES encryption key.

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Troubleshooting

If you are experiencing difficulties with your wireless installation, consult the troubleshooting steps listed below. For best results, identify the symptoms of the problem you are having and attempt all the corrective actions listed for the particular symptom.

Symptom	Possible Cause	Corrective Action
Devices will not connect. 	Devices have mismatched network IDs.	• Devices will not connect if they do not have the same network ID. Verify that both devices share the same network ID.
	Devices are out of range or there are obstacles blocking the wireless path.	• Bring devices closer together to see if it alleviates the issue. Units will display LINK OK if they are connected. If devices connect, consider placing closer together permanently, removing any obstacles, or mounting higher. • Ensure antennas are on parallel plane. Devices that are vertically separated will not have as strong of a connection. • If communicating over distance of miles, consider installing PDWR Repeaters or a high gain directional antenna.
	Multiple wireless devices in the area with the same ID.	• If there are multiple PDW90 wireless systems or PDW30 wireless signal bridges, verify that each system has its own unique network ID. All units intended to communicate with each other should share a unique network ID.
	Encryption keys do not match	• If using encryption, ensure that the encryption keys on both devices match exactly.
Intermittent signal issues. 	Signal is too low.	• Check RSSI. If signal is too low, consider moving devices closer together, clearing obstacles in wireless path, or mounting devices higher. • Ensure devices are on parallel plane. • If communicating over distance of miles, consider installing high gain directional antenna.
	Temporary obstacles are blocking the wireless path.	• Temporary obstacles, such as large trucks or heavy equipment, can interfere with wireless path. Consider moving wireless units higher or to an area with less traffic.
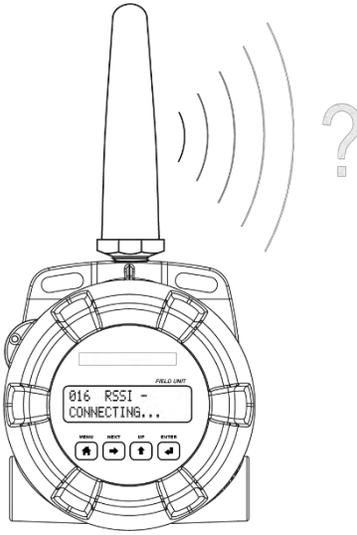
Symptom	Possible Cause	Corrective Action
Destination device reads out of range, zero, or incorrect.	Wireless device has mismatched input type.	• Make sure that input type on the device is correct for the analog input being used. Options are 4-20 mA, 0-10 V, 0-5 V, or 1-5 V.
	Destination device is not scaled properly.	• Destination device must accept 4-20 mA signal and be scaled to properly display the signal. Check the manufacturer's instruction manual for how to do this.
	Signal connections are improperly wired.	• Double check to make sure all of the signal connections are properly wired to all devices. Check connections starting on page *30*.
While trying to connect field units using PDW Manager, none appear in the Unassociated Remote Units list.	Devices have mismatched network IDs.	• Devices will not connect if they do not have the same network ID. Verify that all devices share the same network ID.
	Multiple field units have same Modbus address.	• If multiple field units share the same Modbus address it will cause a conflict. Verify that all field units have unique Modbus addresses.
	Devices have differing encryption settings.	• Encryption settings must be the same on all devices. Use PDW Manager to verify the encryption settings on all devices.
Device will not power on.	Not enough voltage is coming from the power supply.	• Devices require at least 9 VDC each in order to power on. Check that the power supply is providing enough voltage to the device and that there are not too many devices drawing power from the supply.
	Devices are improperly wired.	• Check to make sure all power connections are properly wired to all devices. Check connections starting on page *30*.
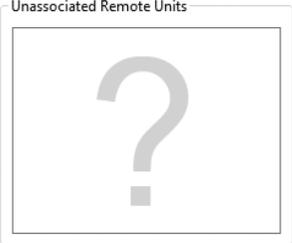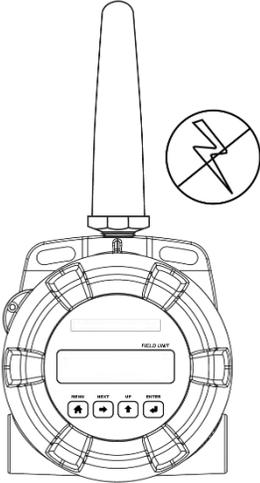
Device will not connect to PC via USB.	Wireless device is not powered.	• The Base Station and the Field units require 9-30 VDC power in order for the PC to recognize them. Power the wireless device and try again.
	Software version is outdated	• Check that you are running the latest software version. The latest version of PDW Manager can be downloaded at www.predig.com/pdwmanager.
	USB cable is faulty	• Try connecting the wireless device using a known good USB cable.
CapTouch buttons not working.	Device has just been powered on	• When first powered on, the CapTouch buttons require a long press to initialize. After the first long press, you can use them normally.
	Lid was removed or put back on	• After removing or putting the lid back on, the CapTouch buttons are re-calibrating and will be inoperable for 20 seconds. After the calibration period has passed, long press any of the buttons to start using them again.
	CapTouch buttons have timed out and are inoperable	• After a 20 second period of inactivity, the CapTouch buttons will go back to their sleep state. Another long press is required to wake them up.
Other symptoms not described above. **?**		If you are experiencing a symptom not listed here, or the suggested troubleshooting steps do not alleviate your problem, please attempt to restore the wireless devices to system defaults by following the instructions on page *55*. If you require technical support, please contact us at: **Phone:** (800) 610-5239 or (508) 655-7300 **Email:** support@predig.com **Web:** www.predig.com
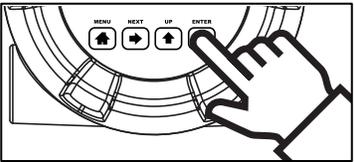
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Contact Precision Digital

Technical Support

Call: (800) 610-5239 or (508) 655-7300

Email: support@predig.com

Sales Support

Call: (800) 343-1001 or (508) 655-7300

Email: sales@predig.com

Place Orders

Email: orders@predig.com

For the latest version of this manual please visit

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