ConsoliDator® Wireless Systems
Instruction Manual

- **Allows Remote Monitoring & Alarming**
- **Reduces Installation Costs Versus Hard-Wired**
- **Minimizes Manual Reading Costs**
- **Monitors up to Eight Signals**
- **Communicates up to 1200 Feet Indoors, 5 Miles Outdoors**
- **Monitors & Logs Data at Remote Office Location**
- **Makes Multiple-Use of Data**
- **Pre-Wired Sub-Panel**
- **Pre-programmed Wireless Modules**
- **Free Configuration & Monitoring Software**

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Disclaimer

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

WARNING: Risk of electric shock or personal injury.

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

Limited Warranty

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

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INTRODUCTION

ConsoliDator Wireless systems provide an alternative lower cost solution for making remote connections to or from the Consolidator. Connect wirelessly to remote analog inputs with or without wireless Modbus serial communications, or to remote analog outputs (retransmission) with or without Modbus serial communications, or to just a Modbus serial communications master device (i.e. computer).

The wireless devices are pre-wired and pre-programmed making the wireless installation simpler. In most applications, the ConsoliDator Wireless system is ready out-of-the-box. With some simple pre-planning, you can go wireless quickly and reliably.

The wireless systems include either the 4-channel model PD941-8K9-15 ConsoliDator, or the 8-channel model PD981-8K9-15. The wireless remote analog field devices are pre-mounted in a NEMA 4X enclosure. For maximum flexibility, you mount the antennas. They can be mounted on the enclosures or remotely via 20 or 50 ft cables. For longer communications distances, optional 6 or 9 db yagi antennas can be incorporated.

ORDERING INFORMATION

Model	Description	Contents*					
		A	B	C	D	E	F
PDS941W	PD941 with (4) Wireless Analog Inputs		•			•	
PDS941WR	PD941 with (4) Wireless Analog Inputs & Radio Modem		•	•			•
PDS941R	PD941 with Wireless Radio Modem			•	•		
PDS941RET	PD941 with (4) Wireless 4-20 mA Retransmission Outputs	•				•	
PDS941RETR	Same as above, except with Radio Modem	•		•		•	
PDS981W	PD981 with (8) Wireless Analog Inputs		•			•	
PDS981WR	PD981 with (8) Wireless Analog Inputs & Radio Modem		•	•			•
PDS981R	PD981 with Wireless Radio Modem			•	•		

* See pictures below for reference

A

4-20 mA Out from ConsoliDator

B

4-20 mA In to ConsoliDator

C

Radio Modem

D

Serial Communications

E

4-20 mA

F

4-20 mA + Serial Communications

COMPLIANCE INFORMATION

Wireless Device

Approvals: CE compliant, FCC Approved
Certifications: FCC: Part 15 Class A; CISPR (EN55022) Class A; EN61000-6-1, 2, 3, 4, 5, 6, 8, 11

ConsoliDator

Approvals: UL listed product
UL File Number: E160849; 508 Industrial Control Equipment

DC Power Supply

Approvals: UL & C-UL listed, CE compliant
Safety Standards: UL508, TUV EN60950-1 approved, NEC class 2/LPS compliant
EMI Conduction & Radiation: Compliance to EN55011, EN550022 (CISPR22) Class B
Harmonic Current: Compliance to EN61000-3-2, -3
EMS Immunity: Compliance to EN61000-4-2, 3, 4, 5, 6, 8, 11, ENV50204, ENV55024, EN61000-6-1, EN61204-3 Light industry level, criteria A

ConsoliDator Enclosure

Approvals: Type 1, 2, 3, 3R, 4, 4X, 12 & 12K UL & C-UL listed enclosure
Fuse Holder: UL rating 250 V, 20 A; UL File Number: E14853; CSA rating 250 V, 16 A; CSA File: 47235
Fuse: UL Rating 5 A, 250 V; UL File Number E10480; CSA rating 5 A, 250 V; CSA File 29862
Switch: UL rating 10 A @ 125 VAC, 6 A @ 250 VAC; UL File Number: E121922

Field Enclosure

Approvals: UL rating type 4X; UL File Number E178096

SAFETY INFORMATION

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

WARNING: Risk of electric shock or personal injury.

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

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PRE-INSTALLATION INFORMATION

The following section reviews key information that is critical to understanding and correctly installing your ConsoliDator Wireless System. It is highly recommended that you read this section in full to plan your installation setup prior to beginning the installation process. Precision Digital technical support will assume customers have read the information within this section.

NOTE: Read this section prior to the installation of your ConsoliDator Wireless System.

PARTS LIST

System Contents

The ConsoliDator Wireless System is provided with all hardware and devices necessary for the installation of the components included with the specific model number ordered. Prior to installation, confirm that all correct contents have been provided. The following tables show the contents provided with each model number and how the contents are packaged.

PDS941R

Qty	Description
1	PD941-8K9-15, ConsoliDator 4
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZP9D-96RM-MR, Serial Radio Modem
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless Serial Hardware Kit “C”
1	Serial to Wireless Converter Hardware Kit “E”

PDS981R

Qty	Description
1	PD981-8K9-15, ConsoliDator 8
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZP9D-96RM-MR, Serial Radio Modem
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless Serial Hardware Kit “C”
1	Serial to Wireless Converter Hardware Kit “E”

PDS941RET

Qty	Description
1	PD941-8K9-15, ConsoliDator 4
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
4	Pre-Wired ConsoliDator 3-Terminal Plugs
1	ZZ9D-96RM-MR, Wireless Base Module
1	ZZ-4AI, Wireless Module
1	NEMA 4X Plastic Field Enclosure Containing:
1	Plastic Back Panel with DIN Rail
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZZ9D-ND-MR, Wireless Base Module
1	ZZ-AO-2, Wireless Module
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless I/O Hardware Kit “B”
1	Field Enclosure Wireless I/O Hardware Kit “D”

PDS941RETR

Qty	Description
1	PD941-8K9-15, ConsoliDator 4
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
4	Pre-Wired ConsoliDator 3-Terminal Plugs
1	ZZ9D-96RM-MR, Wireless Base Module
1	ZZ-4AI, Wireless Module
1	ZP9D-ND-MR, Serial Radio Modem
1	NEMA 4X Plastic Field Enclosure Containing:
1	Plastic Back Panel with DIN Rail
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZZ9D-ND-MR, Wireless Base Module
1	ZZ-AO-2, Wireless Module
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless I/O Hardware Kit “B”
1	ConsoliDator Wireless Serial Hardware Kit “C”
1	Field Enclosure Wireless I/O Hardware Kit “D”
1	Serial to Wireless Converter Hardware Kit “E”

PDS941W

Qty	Description
1	PD941-8K9-15, ConsoliDator 4
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
4	Pre-Wired ConsoliDator 3-Terminal Plugs
1	ZZ9D-96RM-MR, Wireless Base Module
1	ZZ-4AO-2, Wireless Module
1	NEMA 4X Plastic Field Enclosure Containing:
1	Plastic Back Panel with DIN Rail
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZZ9D-ND-MR, Wireless Base Module
1	ZZ-AI, Wireless Module
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless I/O Hardware Kit “B”
1	Field Enclosure Wireless I/O Hardware Kit “D”

PDS981W

Qty	Description
1	PD981-8K9-15, ConsoliDator 8
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
8	Pre-Wired ConsoliDator 3-Terminal Plugs
1	ZZ9D-96RM-MR, Wireless Base Module
2	ZZ-4AO-2, Wireless Module
1	NEMA 4X Plastic Field Enclosure Containing:
1	Plastic Back Panel with DIN Rail
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZZ9D-ND-MR, Wireless Base Module
2	ZZ-AI, Wireless Module
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless I/O Hardware Kit “B”
1	Field Enclosure Wireless I/O Hardware Kit “D”

PDS941WR

Qty	Description
1	PD941-8K9-15, ConsoliDator 4
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
4	Pre-Wired ConsoliDator 3-Terminal Plugs
1	ZZ9D-96RM-MR, Wireless Base Module
1	ZZ-4AO-2, Wireless Module
1	ZP9D-ND-MR, Serial Radio Modem
1	NEMA 4X Plastic Field Enclosure Containing:
1	Plastic Back Panel with DIN Rail
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZZ9D-ND-MR, Wireless Base Module
1	ZZ-AI, Wireless Module
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless I/O Hardware Kit “B”
1	ConsoliDator Wireless Serial Hardware Kit “C”
1	Field Enclosure Wireless I/O Hardware Kit “D”
1	Serial to Wireless Converter Hardware Kit “E”

PDS981WR

Qty	Description
1	PD981-8K9-15, ConsoliDator 8
1	PDA2904, ConsoliDator Enclosure Containing:
1	Pre-Wired ConsoliDator Backpanel
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
8	Pre-Wired ConsoliDator 3-Terminal Plugs
1	ZZ9D-96RM-MR, Wireless Base Module
2	ZZ-4AO-2, Wireless Module
1	ZP9D-ND-MR, Serial Radio Modem
1	NEMA 4X Plastic Field Enclosure Containing:
1	Plastic Back Panel with DIN Rail
1	MDR-20-24, 120 VAC to 24 VDC DIN Rail Mounted Power Supply
2	DIN Rail End Brackets
1	ZZ9D-ND-MR, Wireless Base Module
2	ZZ-AI, Wireless Module
1	ConsoliDator Enclosure Hardware Kit “A”
1	ConsoliDator Wireless I/O Hardware Kit “B”
1	ConsoliDator Wireless Serial Hardware Kit “C”
1	Field Enclosure Wireless I/O Hardware Kit “D”
1	Serial to Wireless Converter Hardware Kit “E”

Hardware Kit Contents

The system include Hardware Kits as described below.

A: ConsoliDator Enclosure Kit

Qty	Description
1	LIMS900, System Instruction Manual
1	LIM2901, PDA2904 Instruction Manual
1	PDX690, RTV NEMA 4X Sealant Tube (b)
4	PDA2904 Mounting Feet (a)
8	Cable Organizers (c)
2	Pair of Fuse & Switch Quick Disconnects (d)

B: ConsoliDator Wireless I/O Kit

Qty	Description
1	Wireless Module Instruction Manual
1	Wireless Module CD & Software
1	ZZ-PROG1, Wireless Module Programming Kit
1	RPSMA Antenna Cable (f)
1	900 MHz Rubber Duck Antenna (e)

C: ConsoliDator Wireless Serial Kit

Qty	Description
1	Wireless Module Instruction Manual
1	Wireless module CD & Software
1	RPSMA Antenna Cable (f)
1	900 MHz Rubber Duck Antenna (e)

D: Field Enclosure Wireless I/O Kit

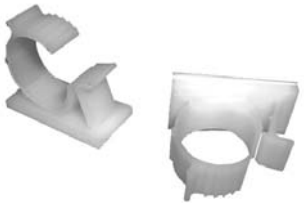
Qty	Description
1	Wireless Module Instruction Manual
1	Wireless module CD & Software
1	PDX690, RTV NEMA 4X Sealant Tube (b)
4	NEMA 4X Field Enclosure Mounting Feet (g)
1	RPSMA Antenna Cable (f)
1	900 MHz Rubber Duck Antenna (e)

E: Serial to Wireless Converter Kit

Qty	Description
1	Wireless Module Instruction Manual
1	Wireless module CD & Software
1	6' DB9 COM Serial Communications Cable (j)
1	6" DIN Rail (h)
1	900 MHz Rubber Duck Antenna (e)
1	Wall-Plug AC to DC Transformer (i)

(a) PDA2904 Mounting Feet

(b) PDX690, NEMA 4X Sealant

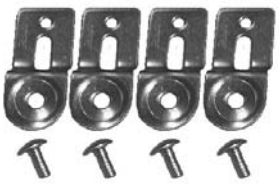


(c) Cable Organizers

(d) Pair of Disconnects

(e) 900 MHz Rubber Duck Antenna

(f) RPSMA Antenna Cable



(g) Field Enclosure Mounting Feet

(h) 6" DIN Rail

(i) Wall-Plug AC/DC Transformer

(j) 6' COM Serial Cable

SYSTEM BASIC OVERVIEW

The ConsoliDator Wireless System consists of up to three separate locations linked through the use of integrated wireless transceivers. The following section discusses the basic setup of the systems, and the various locations and component functions.

The specific locations to be installed and equipment included in your ConsoliDator Wireless System will vary based on the specific model number ordered. (See page 2 for a list of system contents.)

PDS941 & PDS981 ConsoliDator Remote Input & Monitoring Systems

This section includes the ConsoliDator Wireless System models PDS941R, PDS941W, PDS941WR, PDS981R, PDS981W, and PDS981WR.

All models include a *Control Station* location where the ConsoliDator assembly is mounted for monitoring and control.

There are three parts to these systems:

Model numbers with a “W” include a *Field Location* for remote sensor inputs.

Model numbers with a “R” include a *Software Monitoring Site* for connecting to the ConsoliDator with serial communications, including the ConsoliDator monitoring software.

CONTROL STATION

The *Control Station* location includes the PDA2904 ConsoliDator NEMA 4X enclosure and the ConsoliDator unit. The end user should install this wherever the local display is needed. Up to two antennas may be mounted in the PDA2904 enclosure.

FIELD LOCATION

The *Field Location* is where the remote 4-20 mA input signals are located that will be monitored at the *Control Station*. The NEMA 4X field enclosure with wireless remote inputs will be mounted here, and up to eight 4-20 mA inputs connected to it.

SOFTWARE MONITORING SITE

The *Software Monitoring Site* is the location where the RS-232 serial communications line is located that will be communicating with the ConsoliDator. This may then link to another serial converter, or be connected directly to a PC for ConsoliDator software or any other Modbus control or monitoring system. This site mounts only a small serial to wireless module that can be positioned easily in an office or network site. Antenna mounting at this site is critical, see Antenna Location Recommendations on page 15.

NOTE: For recommendations on mounting the antennas, see Antenna Mounting Recommendations on page 15.

NOTE: All system installation locations come with AC/DC power supplies and may be installed anywhere with 10 to 30 VDC or 90 to 264 VAC power available.

NOTE: High gain antennas are available to replace the standard antenna and increase range. High gain antennas are mounted with separate kits and antenna cables to the same connections used for the standard antenna.

PDS941 ConsoliDator Remote Output & Monitoring Systems

This section includes the ConsoliDator Wireless System model numbers PDS941RET and PDS941RETR.

Both models include a *Control Station* location where the ConsoliDator assembly is mounted for monitoring and control, and a *Field Location* for remote 4-20 mA ConsoliDator signal outputs.

The PDS941RET includes a *Software Monitoring Site* for connecting to the ConsoliDator with serial communications, including the ConsoliDator monitoring software.

CONTROL STATION

The *Control Station* location includes the PDA2904 ConsoliDator NEMA 4X enclosure and the ConsoliDator unit. The end user should install this wherever the local display is needed. Up to two antennas will be mounted in the PDA2904 enclosure.

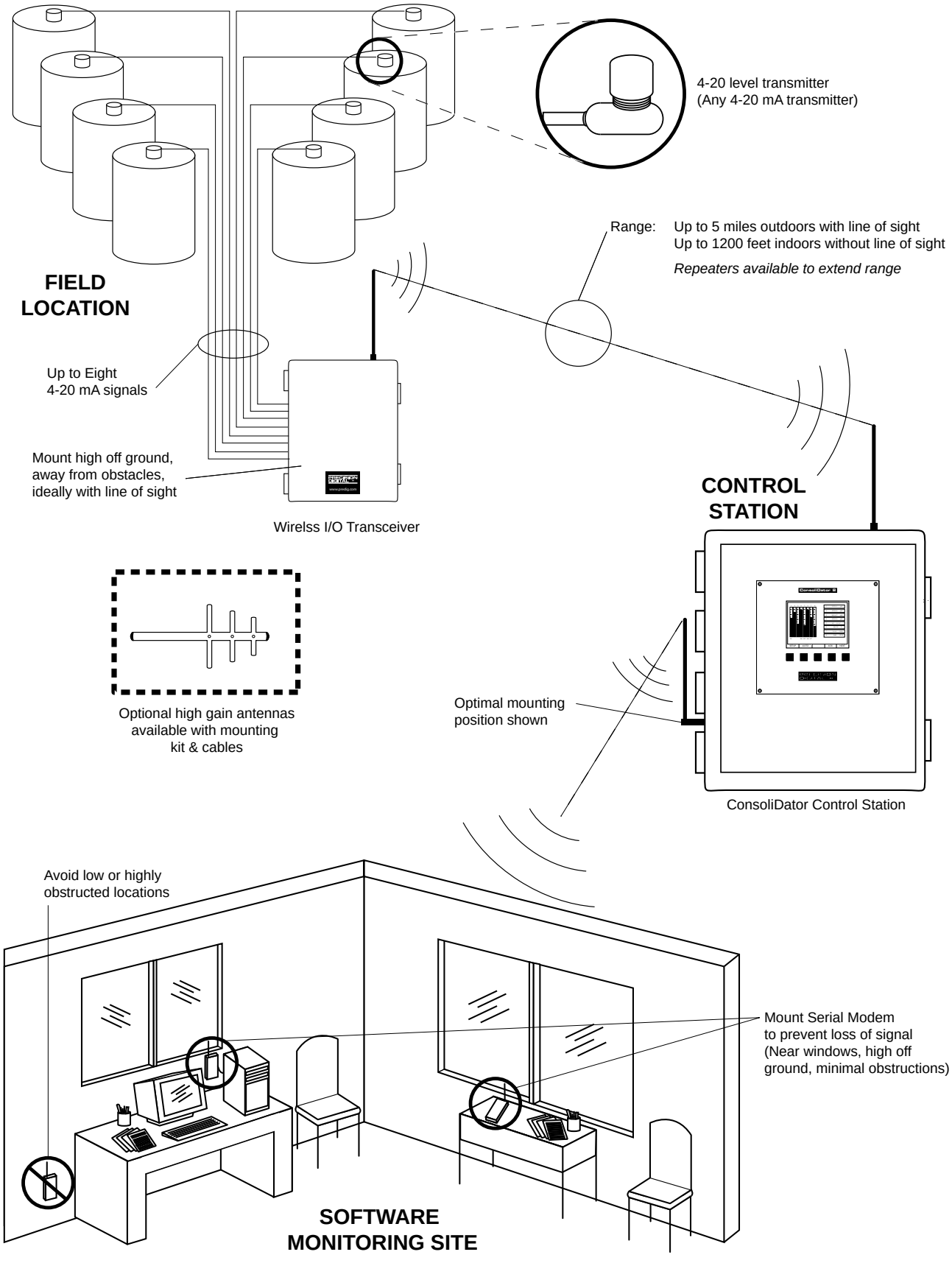
FIELD LOCATION

The *Field Location* is where the remote 4-20 mA outputs from the ConsoliDator are located for use as remote displays or for input into a control system. The NEMA 4X field enclosure with wireless remote outputs will be mounted here, and the four 4-20 mA outputs wired. Because it has no display, this enclosure may be mounted for best wireless transmission.

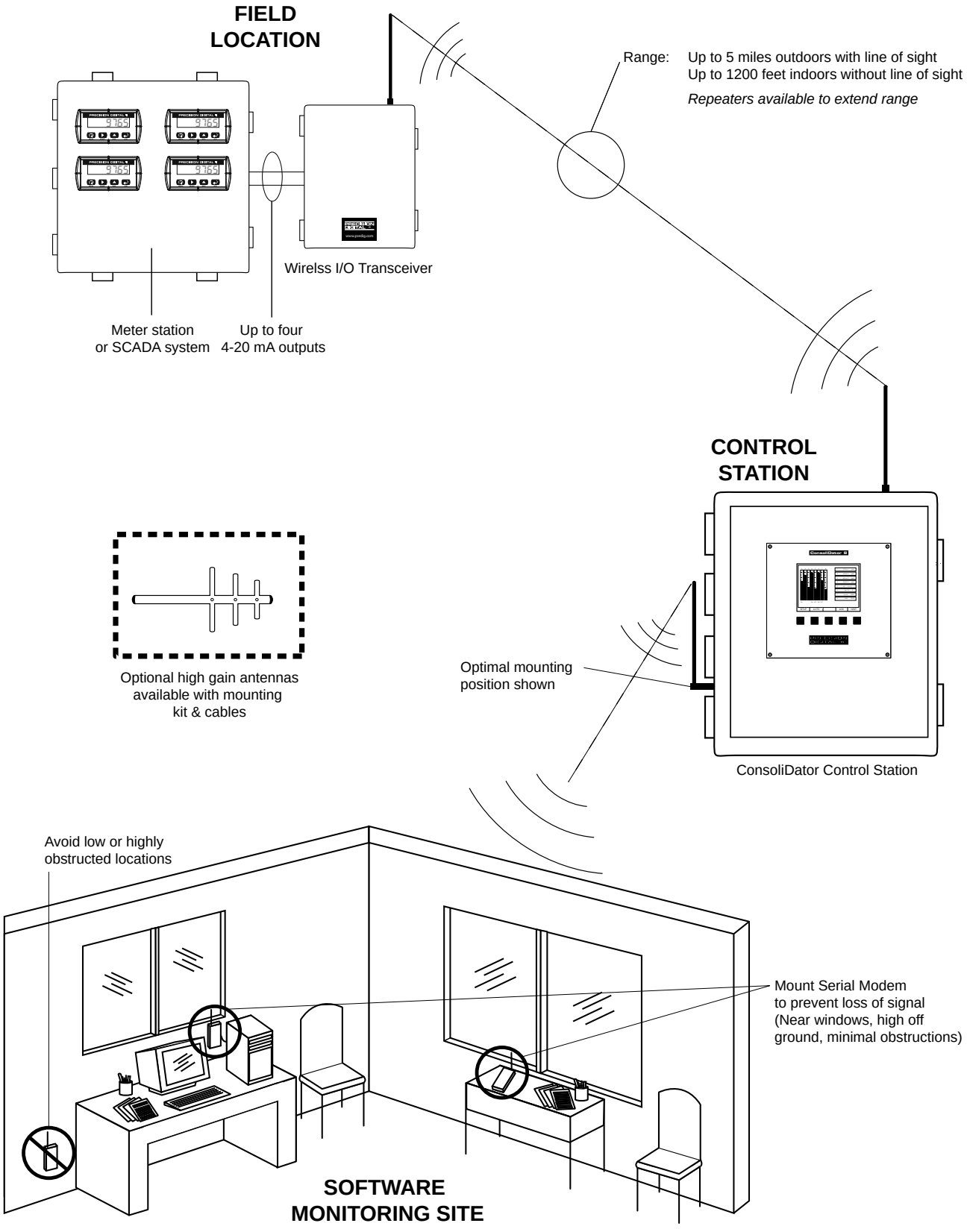
SOFTWARE MONITORING SITE

The *Software Monitoring Site* is the location where the RS-232 serial communications line is located that will be communicating with the ConsoliDator. This may then link to another serial converter or be connected directly to a PC for ConsoliDator software or any other Modbus control or monitoring system. This site mounts only a small serial to wireless module that can be positioned easily in an office or network site. Antenna mounting at this site is critical, see Antenna Location Recommendations on page 15.

ConsoliDator Remote Input System Diagram



ConsoliDator Remote Output System diagram



KEY CONCEPTS FOR SUCCESSFUL WIRELESS SYSTEMS

In order to successfully setup your ConsoliDator Wireless System, it is critical to understand some basic wireless concepts. This knowledge will help you pick the ideal antenna locations and mounting schemes, maintain realistic range expectations, and avoid costly system rework to fix a failed installation.

The 10 Commandments of Wireless Communications

The following article, *The 10 Commandments of Wireless Communications*, has been reprinted below with the permission of the author, B&B Electronics Manufacturing Company.

Ten Commandments of Wireless Communications | WP-33-REV0-0109-1/6

The Ten Commandments of Wireless Communications

10 Steps to Assure Wireless Success

1. Thou shall know thy dBm and recall thy high school logarithms.

Radio Frequency (RF) power is measured in milli Watts (mW) or, more usefully, in a logarithmic scale of decibels (dB), or decibels referenced to 1 mW of power (dBm). Since RF power attenuates as a logarithmic function, the dBm scale is most useful. Here are some examples of how these scales relate:

1mW = 0dBm
2mW = 3dBm
4mW = 6dBm
10mW = 10dBm
100mW = 20dBm
1W = 30dBm

A 2-fold increase in power yields 3dB of signal.
A 10-fold increase in power yields 10dB of signal.
A 100-fold increase in power yields 20dB of signal.

2. Covet not high frequencies - as the lower the frequency, the more forgiveth the laws of physics and propagation.

Industrial applications typically operate in “license free” frequency bands, also referred to as ISM (Industrial, Scientific and Medical). The frequencies and power of these bands varies from country to country. The most common frequencies encountered are:

- 2.4 GHz – nearly worldwide
- 915 MHz band – North America, South America, some other countries
- 868 MHz band – Europe

As frequency rises, available bandwidth typically rises, but distance and ability to overcome obstacles is reduced. For any given distance, a 2.4 GHz installation will have roughly 8.5 dB of additional path loss when compared to 900 MHz. However, lower frequencies require larger antennas to achieve the same gain.

3. *Honor thy receive sensitivity - as long-range performance is not a function of transmit power alone.*

The more sensitive the radio, the lower the power signal it can successfully receive, stretching right down to the noise floor. There is so much variety in "specsmanship" for radio sensitivity, that it is difficult to make a meaningful comparison between products. The most meaningful specification is expressed at a particular bit error rate and will be given for an ideal environment shielded from external noise. Unless you're in a high RF noise environment (typically resulting from numerous similar-frequency radio transmitters located nearby), the odds are good that the noise floor will be well below the receive sensitivity, so the manufacturer's rated receive sensitivity will be a key factor in your wireless system and range estimates.

You can often improve your receive sensitivity, and therefore your range, by reducing data rates over the air. Receive sensitivity is a function of the transmission baud rate so, as baud rate goes down, the receive sensitivity goes up. Many radios give the user the ability to reduce the baud rate to maximize range.

The receive sensitivity of a radio also improves at lower frequencies, providing another significant range advantage of 900 MHz (vs. 2.4 GHz) - as much as six to twelve dB!

4. *Thou shalt be wary of radio noise and recognize situations whereth radio noise may hamper thine installation.*

RF background noise comes from many sources, ranging from solar activity to high frequency digital products to all forms of other radio communications. That background noise establishes a noise floor which is the point where the desired signals are lost in the background ruckus. The noise floor will vary by frequency.

Typically the noise floor will be lower than the receive sensitivity of your radio, so it will not be a factor in your system design. If, however, you're in an environment where high degrees of RF noise may exist in your frequency band, then use the noise floor figures instead of radio receive sensitivity in your calculations. If you suspect this is the case, a simple site survey to determine the noise floor value can be a high payoff investment.

When in doubt, look about. Antennas are everywhere nowadays - on the sides of buildings, water towers, billboards, chimneys, even disguised as trees. Many sources of interference may not be obvious.

5. Thou shalt always know thine fade margin - lest ye have a wireless link that worketh not in rain, snow, or the presence of interference.

Fade margin is a term critical to wireless success. Fade margin describes how many dB a received signal may be reduced by without causing system performance to fall below an acceptable value. Walking away from a newly commissioned wireless installation without understanding how much fade margin exists is the number one cause of wireless woes.

Establishing a fade margin of no less than 10dB in good weather conditions will provide a high degree of assurance that the system will continue to operate effectively in a variety of weather, solar, and RF interference conditions.

There are a number of creative ways to estimate fade margin of a system without investing in specialty gear. Pick one or more of the following and use it to ensure you've got a robust installation:

a. Some radios have programmable output power. Reduce the power until performance degrades, then dial the power back up a minimum of 10dB. Remember again, doubling output power yields 3 dB, and an increase of 10dB requires a ten-fold increase in transmit power.

b. Invest in a small 10dB attenuator (pick the correct one for your radio frequency!). If you lose communications when you install the attenuator installed in-line with one of your antennas, you don't have enough fade margin.

c. Antenna cable is lossy, more so at higher frequencies. Specifications vary by type and manufacturer so check them yourself but, at 900MHz, a coil of RG58 in the range of 50 to 100 feet (15 to 30 m) will be 10dB. At 2.4GHz, a cable length of 20-40 feet (6 to 12 m) will yield 10dB. If your system still operates reliably with the test length of cable installed, you've got at least 10dB of fade margin.

6. Thou shalt use thine given powers of mathematics and logic when specifying wireless equipment.

Contrary to popular opinion, no black art is required to make a reasonable prediction of the range of a given radio signal. Several simple concepts must be understood first, and then we can apply some simple rules of thumb.

The equation for successful radio reception is:

TX power + TX antenna gain – Path loss – Cabling loss + RX antenna gain – 10dB fade margin > RX Radio sensitivity or (less commonly) RF noise floor

Weather conditions also play a large role. Increased moisture in the air increases path loss. The higher the frequency, the higher the path loss.

Beware leafy greens. While a few saplings mid-path are tolerable, it's very difficult for RF to penetrate significant woodlands. If you're crossing a wooded area you must elevate your antennas over the treetops.

Industrial installations often include many reflective obstacles leading to numerous paths between the antennas. The received signal is the vector sum of each of these paths. Depending on the phase of each signal, they can be added or subtracted. In multiple path environments, simply moving the antenna slightly can significantly change the signal strength.

Some obstacles are mobile. More than one wireless application has been stymied by temporary obstacles such as a stack of containers, a parked truck or material handling equipment. Remember, metal is not your friend. An antenna will not transmit out from inside a metal box or through a storage tank.

Path Loss Rules of Thumb:

- To ensure basic fade margin **in a perfect line of sight application, never exceed 50% of the manufacturer's rated line of sight distance.** This in itself yields a theoretical 6dB fade margin – still short of the required 10dB.
- De-rate more aggressively if you have obstacles between the two antennas, but not near the antennas.
- **De-rate to 10% of the manufacture's line of sight ratings if you have multiple obstacles, obstacles located near the antennas, or the antennas are located indoors.**

8. Antennas

Antennas increase the effective power by focusing the radiated energy in the desired direction. Using the correct antenna not only focuses power into the desired area but it also reduces the amount of power broadcast into areas where it is *not* needed.

Wireless applications have exploded in popularity with everyone seeking out the highest convenient point to mount their antenna. It's not uncommon to arrive at a job site to find other antennas sprouting from your installation point. Assuming these systems are spread spectrum and potentially in other ISM or licensed frequency bands, you still want to maximize the distance from the antennas as much as possible. Most antennas broadcast in a horizontal pattern, so vertical separation is more meaningful than horizontal separation. Try to separate antennas with like-polarization by a minimum of two wavelengths, which is about 26 inches (0.66 m) at 900 MHz, or 10 inches (0.25 m) at 2.4 GHz.

9. Cable loss

Those high frequencies you are piping to your antennas don't propagate particularly well through cable and connectors. Use high quality RF cable between the antenna connector and your antenna and ensure that all connectors are high quality and carefully installed. Factor in a 0.2 dB loss per coaxial connector in addition to the cable attenuation itself. Typical attenuation figures for two popular cable types are listed below.

	Loss per 10 feet (3 meters) of cable length	
Frequency	**RG-58U**	**LMR-400**
900 MHz	1.6 dB	0.4 dB
2.4 GHz	2.8 dB	0.7 dB

While long cable runs to an antenna create signal loss, the benefit of elevating the antenna another 25 feet (7.6 m) can more than compensate for those lost dB.

10. Thou shalt recognize the issues of latency and packetization before thou issueth purchase orders.

Before you lift a finger towards the perfect wireless installation, think about the impact of wireless communications on your application. Acceptable bit error rates are many orders of magnitude higher than wired communications. Most radios quietly handle error detection and retries for you - at the expense of throughput and variable latencies.

Software must be well designed and communication protocols must be tolerant of variable latencies. Not every protocol can tolerate simply replacing wires with radios. Protocols sensitive to inter-byte delays may require special attention or specific protocol support from the radio. Do your homework up front to confirm that your software won't choke, that the intended radio is friendly towards your protocol, and that your application software can handle it as well.

Attenuation Awareness

The Consolidator uses a 900 MHz radio frequency signal to send data wirelessly for up to 5 miles. This frequency is much more penetrating (going through walls, floors, and other objects) than the 2.4 GHz alternative. It also allows for the use of much more sensitive receivers. But at that distance, the communication path must be line-of-sight.

Anything in the communication path will shorten the distance that the Consolidator can communicate due to this signal attenuation. This includes obvious things like buildings, walls, trees, people, trucks, and more. But it also includes some not so obvious things such as rain, snow, and the curvature of the earth. This is probably the single most important consideration when installing a wireless system.

So when planning your wireless system, minimize the attenuation by optimally placing the transceiver antennas (height, near windows, outside, etc.). Please read B&B's white paper entitled "The Ten Commandments of Wireless Communications" as shown above before starting your installation.

To test your newly installed and working system for susceptibility to variable effects such as weather, verify the signal strength by using a common 10 db signal atennuator on one of the wireless antennas. This will indicate if your signal strength can withstand common interference that may occur after the installation.

If you find your wireless application may be a challenge, call us for technical support. You may just need a pair of high gain directional antennas, or the addition of a repeater.

Antenna Location Recommendations

The location of the antenna is an important factor when finding a spot for the Wireless Consolidator or its wireless Field packages (i.e. remote analog inputs). Below you will find a checklist that should help you establish a good location for the wireless devices.

1. Miles apart

If you know you are going to be trying to communicate very long distances, purchase a pair of 9db gain yagi antennas and mount them as high as possible on an external mast or wall and point them directly at each other in a manner which minimizes obstacles within their line-of-sight.

2. Near windows

If you plan to communicate from the inside to the outside of a building, try to locate the internal antenna/unit near a window, so that the radio signal path is through the window, and not through a wall.

3. Height

If you are only communicating within a few hundred feet line-of-sight, height is probably not an advantage. Height with line-of-sight is only an advantage when it clears more obstacles, or when going longer distances. In those case:

a. Always mount the antenna/unit as high as practical.

i. Obviously, the Consolidator must be mounted at a height that makes it readable/usable. If there is a requirement for height in order to clear certain obstacles or to go longer distances then an externally mounted yagi antenna will be required.

ii. Do not use an externally mounted antenna, at least initially, unless you are going very long distances, or have significant obstacles in the RF path (within 500-750 feet).

4. Vertical paths

Transceiver antennas should always be positioned so that they are on a parallel plane with each other. The worst position would be if both antennas were vertical and located above each other (i.e. 1st to 2nd floor). The second worse case would be if the antennas were oppositely polarized (one vertical, one horizontal). In vertical applications, align them so that they are both in a parallel plane. For example. If one was directly one floor above the other, you would adjust the antennas so they were horizontal. Having parallel planes is the key.

5. Metal surroundings

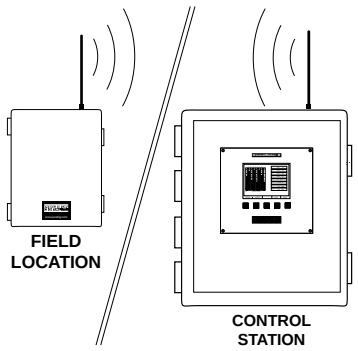
Any significant metal in close proximity to an antenna can make signal propagation unpredictable. It may be good or bad. It is best to isolate the antennas from large metal objects. If that is not possible, consider a 6 db yagi antenna pointed away from the metal object and toward the opposite antenna.

6. Electrically noisy areas

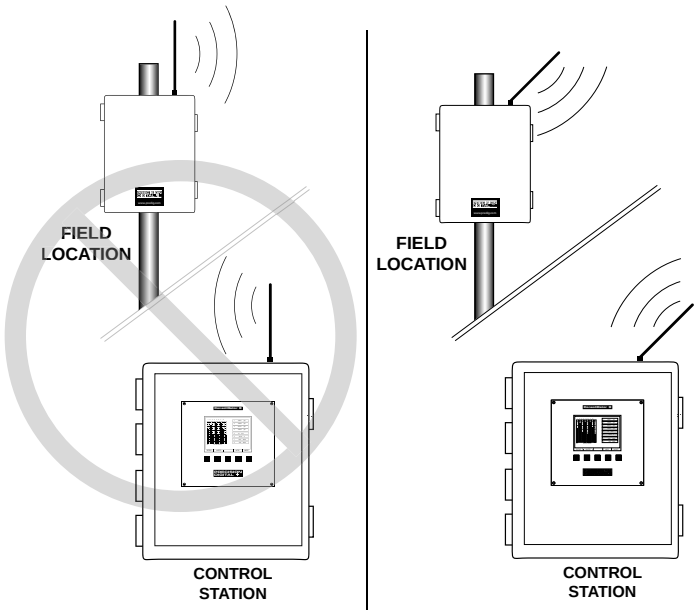
Electrical RF noise can reduce a receiver's ability to sort out valid RF signals and reduce the wireless range of communications. If there are large pumps, transformers, or other sources of RF interference, the signal should be increased and more focused with the use of directional yagi antennas. Optimally, the yagi should be pointed away from the RF interference at 90 degree angles. In addition, the advanced user should consider whether vertical or horizontal polarization would yield an optimum signal. Call us for assistance.

7. Multi-pathing

Multi-pathing is a phenomena and not a science. In some plants when using wireless technology it is possible that stronger signals are received by moving an antenna just a few inches (or feet) in order to receive a stronger signal. When first installing a wireless solution, this effect should be investigated by moving the antenna/unit around and looking for a stronger signal (serial modem only). This is an indication that there are multiple reflective paths that the RF signal is taking. These paths may or not be reliable. However, since they are the stronger signal they should be the position of choice. It may be wise to make this location portable for a few days before affixing the antenna/unit until a clear and repeatable signal has been established.



Recommended Horizontal Path Antenna Positions



Not Recommended **Recommended**

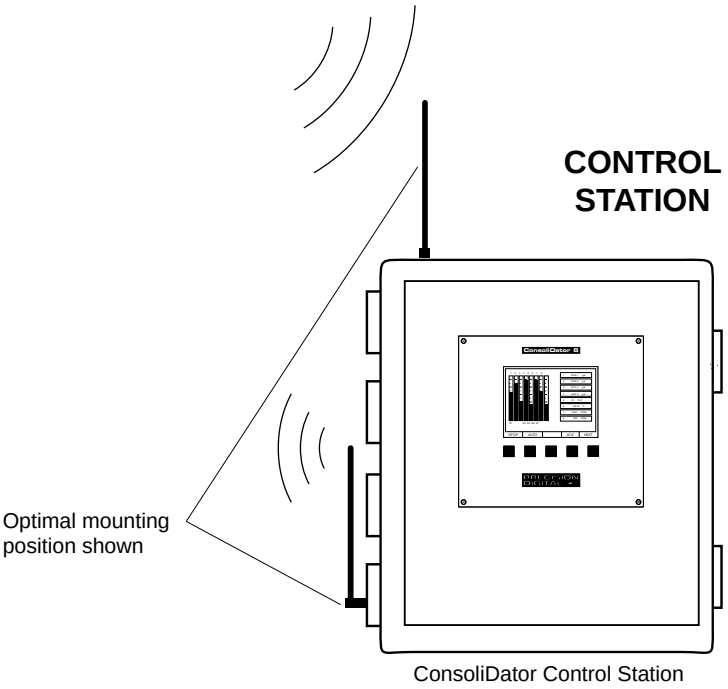
Vertical Path Antenna Positions

INSTALLATION TIPS BY LOCATION

The following section details some helpful tips to consider when setting up your ConsoliDator Wireless System. Some key points may be repeated from elsewhere in this manual as reminders.

CONTROL STATION

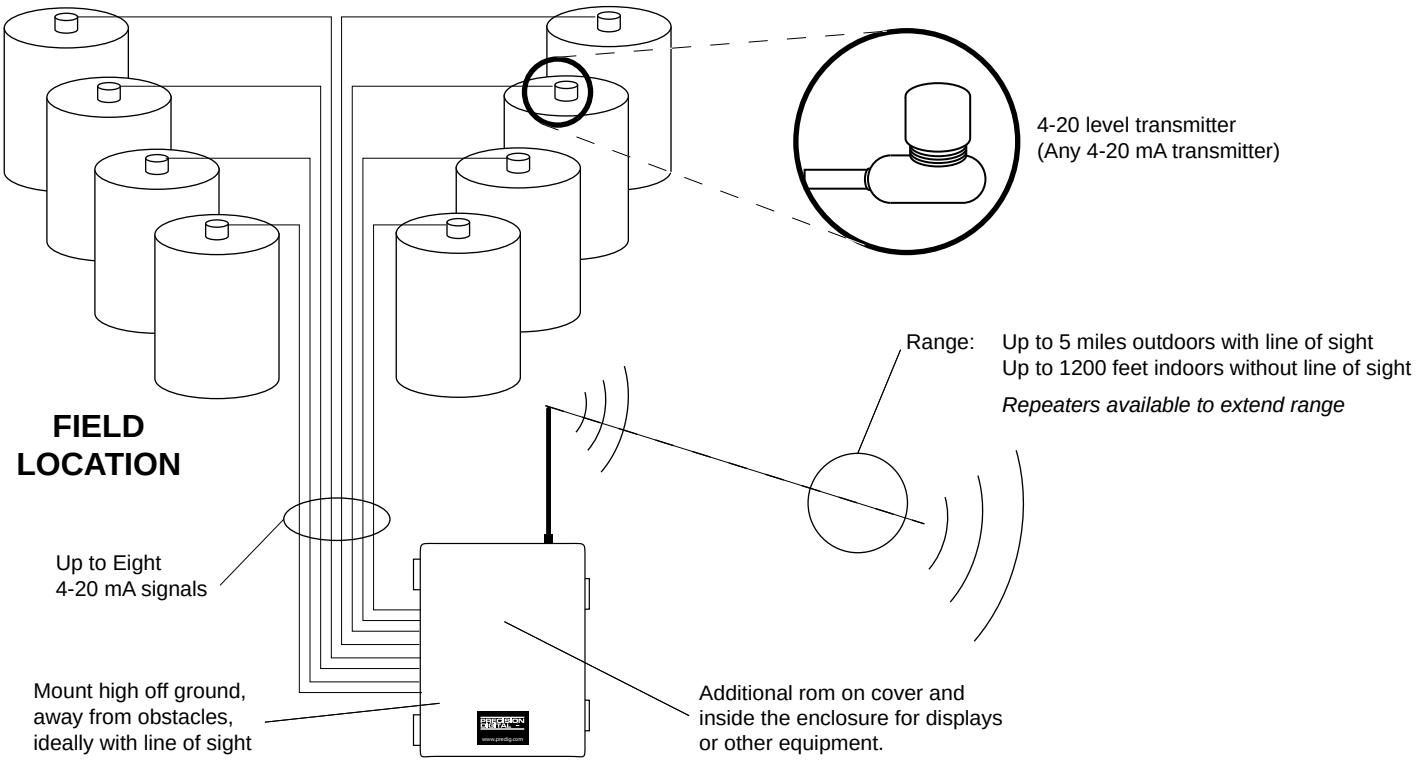
- The *Control Station* includes the ConsoliDator display, and will likely be mounted near the ground to be easily read. In outdoor applications is critical to avoid ground planes and obstructions from the antenna(s) of the *Control Station* to the remote locations; use antenna extension cables and high gain antennas if necessary.
- The location of the antenna can have unpredictable impacts on signal strength for indoor applications. Try several locations if signal strength is a problem.
- Antenna placement at the *Field Location* is often the most versatile possible of all the locations. Place the antenna as high off the ground as possible to avoid ground planes and line of sight obstructions.
- Make note of any potential sporadic obstructions that may not be present at the time of installation. These include trees that may currently not have leaves, access roads that vehicles may frequent, or future planned construction.



ConsoliDator Control Station

FIELD LOCATION **- ANALOG INPUTS**

- When planning the location of the field enclosure to received up to 4 or 8 4-20 mA analog inputs, it is important to remember that all 4-20 mA inputs must be run to the enclosure. A central location to all signal sources will make wiring easier.
- Make note of any potential intermittent obstructions that may not be present at the time of installation. These include trees that may currently not have leaves, access roads that vehicles may frequent, or future planned construction.



Wirelss I/O Transceiver

• Prior to completely mounting your field enclosure, it is highly recommended that you test the system range and functionality to assure it can communicate with the *Control Station*. After a successful test, the field enclosure may be secured. Minor shifts in location can have a significant impact, and several location attempts should be made if problems occur with signal strength. Place the antenna as high off the ground as possible to avoid ground planes and line of sight obstructions.

FIELD LOCATION **- ANALOG OUTPUTS**

• When planning the location of the field enclosure to retransmit the ConsoliDator's four 4-20 mA outputs, it is important to remember that all 4-20 mA outputs are generated at the same the enclosure. A central location to all connected devices is recommended for ease of wiring.

• Antenna placement at the *Field Location* is often the most versatile possible of all the locations. Place the antenna as high off the ground as possible to avoid ground planes and line of sight obstructions where possible.

• Make note of any potential intermittent obstructions that may not be present at the time of installation. These include trees that may currently not have leaves, access roads that vehicles may frequent, or future planned construction.

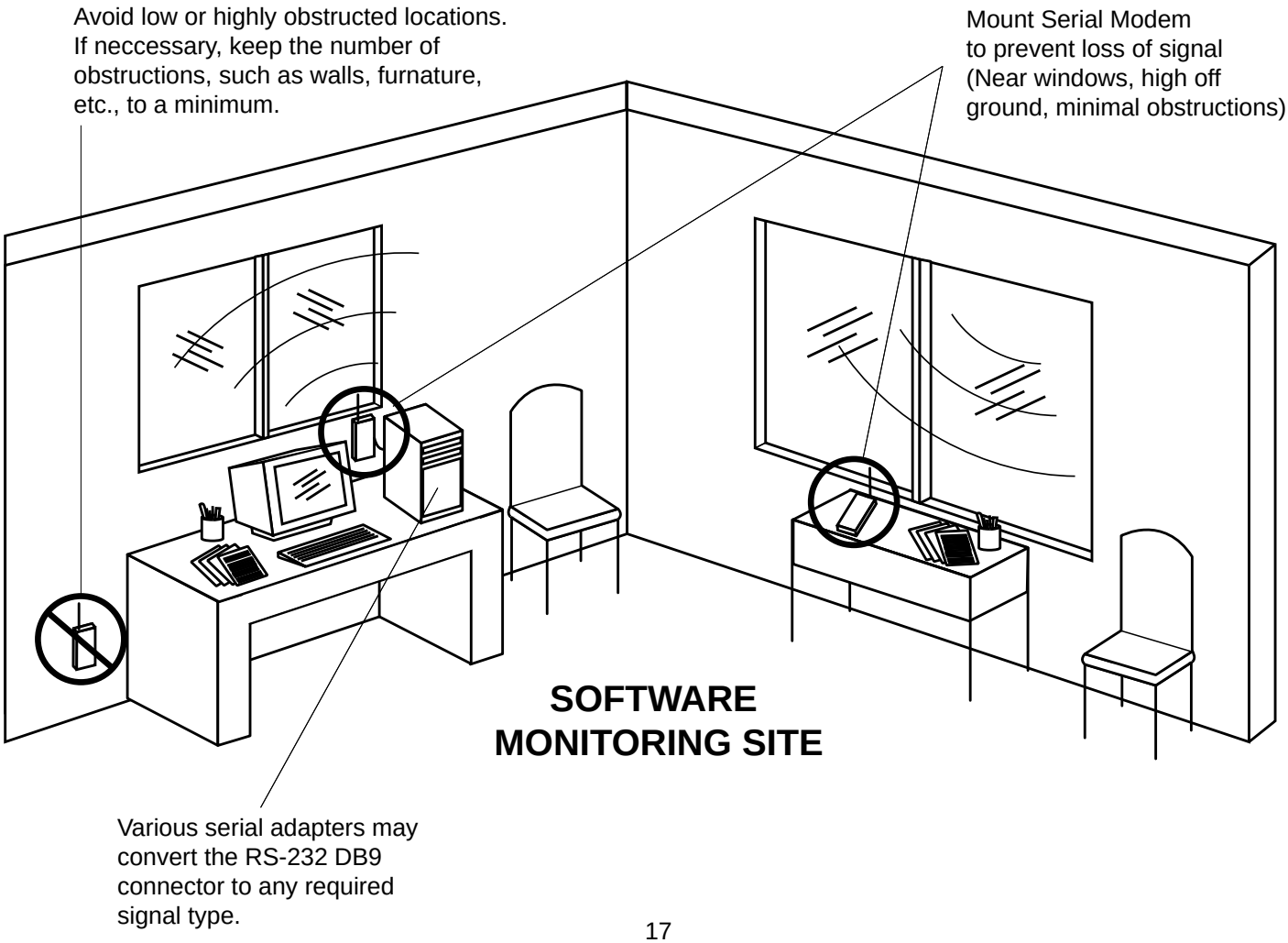
• Prior to completely mounting your field enclosure, it is highly recommended that you test the system range and functionality to assure it can communicate with the *Control Station*. After a successful test, the field enclosure may be secured. Minor shifts in location can have a significant impact, and several location attempts should be made if problems occur with signal strength. Place the antenna as high off the ground as possible to avoid ground planes and line of sight obstructions.

SOFTWARE MONITORING SITE

• The serial radio modem should be installed with line of sight to the *Control Station* for best signal strength. If this is not possible, keep the number of obstructions, such as walls and furniture, to a minimum.

• Mount the modem antenna as high in the area as possible. Especially in indoor-to-outdoor applications, it is easy to run into ground planes from sloped terrain outside.

• The radio modem is connected with an RS-232 signal using a standard DB9 COM cable provided with the system. Alternatively, this signal may be converted to RS-485, Ethernet, or other signal types by using any commonly available serial adapters, including those available from Precision Digital.



SPECIFICATIONS

NOTE: For detailed specifications of a specific component, see the individual instruction manuals included for all key parts of this system.

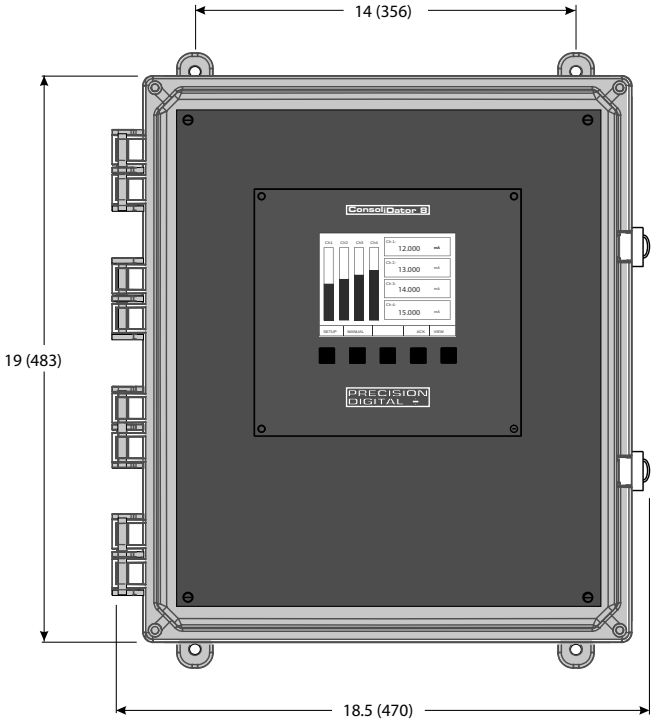
CONSOLIDATOR

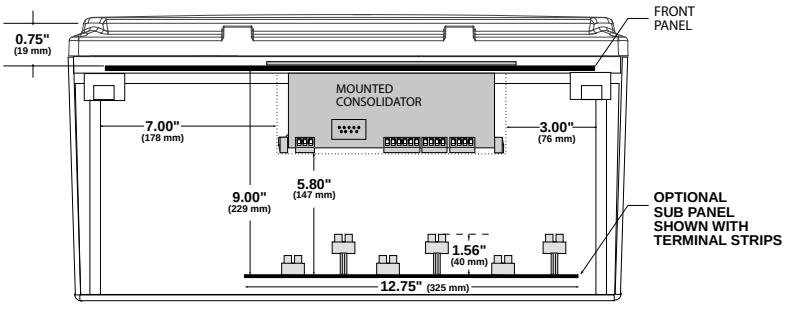
Included Model Number: PDS941: PD941-8K9-15 or
PDS981: PD981-8K9-15

ENCLOSURES

ConsoliDator Enclosure w/PDP2904

Overall Dimensions: 18.5" x 19.0" x 11.0" (W x H x D) (470 mm x 483 mm x 279 mm)
Inside Dimensions: 16.0" x 18.0" x 9.8" (W x H x D) (406 mm x 457 mm x 249 mm)
Material: Enclosure and Cover: Polycarbonate; Front Panel: Painted aluminum; Cover Latches: Stainless Steel
Sub-Panel: Anodized aluminum
Color: Enclosure Light Gray; Cover: Transparent; Front Panel: Blue





Field Enclosure with Sub-Panel

Overall Dimensions: 10.83" x 12.80" x 7.09" (W x H x D) (275 mm x 325 mm x 180 mm)
Inside Dimensions: 10.0" x 12.0" x 5.5" (W x H x D) (255 mm x 305 mm x 140 mm)
Material: Enclosure and Cover: Polycarbonate/Polyester blend
Sub-Panel: Plastic with mounting grid
Color: Enclosure: Light gray; Cover: Solid
Ratings: IP66, UL508 Type 4X

SYSTEM INPUT POWER

ConsoliDator: 90-264 VAC, 47-63 Hz, 20 VAC or 8-30 VDC, 15 W
Wireless Module Power: 10-46 VDC or 24 VAC ±10%, 11.7 W max
24 VDC Power Supply Power In: 85-264 VAC, 120-370 VDC
24 VDC Power Supply Power Out: 24 VDC, 24 W max

WIRELESS HARDWARE & COMMUNICATION

Frequency: 900 MHz ISM Band
RF Output Power: 100 mW (20 db)
Range: 1200 ft. Indoors / 5 miles Outdoors (LOS)
Note: Wireless ranges are difficult to predict without knowledge of antennas, cables, and the environment of the application. PDC recommends testing of wireless environments before installation as well as the following good wireless installation practices per industry standards. Ranges shown are best case scenario, specific application ranges may vary and require additional accessories.
Network ID Number: Selectable 16 to 256; default analog IO module, 16; default serial module, 255 (FF)
Channel Number: Selectable 0 to 6; default analog IO module, 0; default serial module 6.
Peer-to-Peer Address: 1 Master and Slave selectable address from 1 to 255; default 1
Standard Antenna: 3 db rubber duck antenna with rotation and angle joint
Note: Additional high-gain antennas are available. See accessories
Antenna Cable: Antenna cable & jack result in approximately 3 db loss
Total System Analog Input Accuracy: ±0.5% FS ± 1 count typical; ±1.16% FS ± 1 count max
Total System Analog Output Accuracy: ± 0.52% FS ± 0.01 mA typical; ±1.18% FS ±0.01 mA max
Wireless Module Digital Input Voltage Range: 0 to 48 VDC
Wireless Module Low Voltage Digital Input: 0 to 0.8 V max
Wireless Module High Voltage Digital Input: 4.0 V minimum
Wireless Module Digital Output: Sinking, 0 to 48 VDC
ConsoliDator Update Rate: Approximately 4 seconds
Software Update Rate: 5-20 seconds, 10 seconds typical
Operating Temperature: 0 to 50°C
Relative Humidity: 0 to 90% non-condensing

INSTALLATION

The following section describes the installation process for the ConsoliDator Wireless System.

It is highly recommended that the system components be wired, setup near each other, and tested as close as possible to actual conditions prior to final installation to verify system function, help troubleshoot if problems exist, and make configuration and testing easier.

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

WARNING: Risk of electric shock or personal injury.

PRE-WIRED COMPONENTS

The system is provided with a ConsoliDator and field enclosure pre-assembled with backplanes and DIN rails. The factory installs all the wireless devices on the associated DIN rails within the enclosures, pre-wires the analog inputs/outputs of the consolidator through the PDP2905 ConsoliDator enclosure backpanel to the associated analog outputs/inputs of the wireless modules, and labels the plugs for easy understanding and installation.

The factory does not wire input power lines or drill any antenna openings or provide conduit holes in enclosures.

UNPACKING

Remove all components from the shipping box. Remove the PDA2904 enclosure from its box.

Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

Verify all main components and hardware kits are present. See the Parts List on page 4 for details. If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

Under most circumstances, this is the only instruction manual you will need to refer to since the wireless devices have been pre-programmed. However, we have also included manuals for wireless devices for your reference.

CONTROL STATION INSTALLATION

All PDS900 Series systems follow the installation instructions below for installation of the PDA2904 enclosure assembly. Small Components used in this section can be found in the component bag labeled “A: Consolidator Enclosure” or are clearly identifiable.

1. Mount the PDA2904 assembly at desired location. Refer to Mounting Location Recommendations on page 16 for location selection guides and suggested actions prior to installation.

   Note: Mounting feet for wall mounting the PDA2904 and field enclosure are included.

2. Remove the Consolidator from its packaging and install in the front panel of the PDA2904 per LIM2901 and LIM980.
3. Drill any conduit holes for wiring power or additional Consolidator signals as required for the end user application. Connect conduit as required.
4. Wire additional Consolidator inputs and outputs as desired, per LIM980. Inputs, outputs, or serial cables that are part of the wireless system come pre-wired for use, only additional, non-wireless lines need to be connected. Note: The pre-installed and wired devices include a 120 VAC to 24 VDC power supply for use in powering the wireless modules. Additional cable organizers are included to assist in wiring.
5. Use the included PDX690 sealant during the installation, including during antenna jack installation, to seal drilled enclosure holes to maintain the NEMA 4X rating.
6. For **PDS941W**, **PDS941WR**, **PDS941RET**, **PDS981W**, and **PDS981WR**: The following instructions install the wireless I/O module antennas used for 4-20 mA wireless transmission. Components referred to can be found in the component bag labeled “B: Consolidator Wireless I/O” or are clearly identifiable.

   a. Drill ¼” diameter holes for antenna jack placement. If multiple antennas will be required at the PDA2904 in a PDS941WR or PDS981WR system, place antennas using the recommendations on page 15.

   b. Connect the female end of an RPSMA antenna extension cable to the wireless I/O module. Secure the male end through the ¼” hole using supplied hardware. Secure and waterproof the installation using the PDX690 sealant on the inside of the enclosure.

   c. Connect the pre-wired analog input terminal blocks to the corresponding labeled input terminals on the Consolidator.

   d. Connect the included Antenna to the installed antenna jack.

   e. Connect the ConsoliDator input power using the fuse and optional switch on the front panel of the PDP2905 per LIM2901. Fuse and switch disconnects are included.

   If supplying 24VDC, both the Consolidator and wireless modules may be run directly. If supplying 120 or 240 VAC, the Consolidator may be connected directly per LIM980, but the DIN Rail mounted power supply must be used to supply 24 VDC to the wireless modules. Do not use the Consolidator 24 VDC outputs to power the wireless modules.

   Use the PDP2905 as desired for ease of wiring. For specific input voltage ranges, power requirements, etc., see individual device instruction manuals.
7. For **PDS941R**, **PDS941WR**, **PDS981R**, and **PDS981WR**: The following instructions install the wireless serial communication module used for RS-232 transmission. Components referred to can be found in the component bag labeled “C: Consolidator Wireless Serial” or are clearly identifiable.

a. Drill ¼" diameter holes for antenna jack placement. If multiple antennas will be required at the PDA2904 in a PDS941WR or PDS981WR system, place antennas using the recommendations on page 15.

b. Connect the female end of an RPSMA antenna extension cable to the serial wireless module, and secure the male end through the ¼" hole using supplied hardware. Secure and waterproof the installation using the PDX690 sealant.

c. Connect the RS-232 cable from the serial wireless module to the ConsoliDator.

d. Connect the included Antenna to the installed antenna jack.

e. Connect the consolidator input power using the fuse and optional switch on the front panel of the PDP2905 per LIM2901. Fuse and switch disconnects are included.

If supplying 24VDC, both the ConsoliDator and wireless modules may be run directly. If supplying 120 or 240 VAC, the ConsoliDator may be connected directly per LIM980, but the DIN Rail mounted power supply must be used to supply 24 VDC to the wireless modules. Do not use the ConsoliDator 24 VDC outputs to power the wireless modules.

Use the PDP2905 as desired for ease of wiring. For specific input voltage ranges, power requirements, etc., see individual device instruction manuals.

FIELD LOCATION INSTALLATION

The *Field Location* components used for the wireless analog inputs/outputs are included on models **PDS941W**, **PDS941WR**, **PDS941RET**, **PDS981W**, and **PDS981WR**. The following instructions install the wireless I/O modules for remote transmission and the plastic NEMA 4X enclosure included as part of the system. Components referred to can be found in the component bag labeled “D: Field Enclosure Wireless I/O” or are clearly identifiable.

1. Mount the field enclosure assembly as desired. Refer to Mounting Location Recommendations on page 16 and 17 for mounting recommendations prior to installation.
2. Drill any conduit holes for wiring power or additional signals as required for the end user’s application. Connect conduit as required.
3. Drill ¼” diameter holes for antenna jack placement. Place antennas using the recommendations on page 15.
4. Connect the female end of an RPSMA antenna extension cable to the wireless module, and secure the male end through the ¼” hole using supplied hardware. Secure and waterproof using the PDX690 sealant.
5. Wire field signals to the wireless analog I/O modules.

   a. For **PDS941W**, **PDS941WR**, **PDS981W**, and **PDS981WR**: Wire 4-20 mA input signals to the labeled analog input channels as desired on the wireless modules. NOTE: All analog input “AI –“ terminals are a shared common node.

   b. For **PDS941RET**: Wire 4-20 mA powered output signals channels. Channels are labeled to match Consolidator output channels.
6. Wire input power as needed. If supplying 24VDC, the wireless modules may be run directly off 24VDC. If supplying 120 or 240 VAC, the DIN Rail mounted power supply must be used to supply 24 VDC to the wireless modules. For specific input voltage ranges, power requirements, etc., see Specifications on page 18.

Note: The backpanel and DIN rail may be used to mount any additional devices desired.

SOFTWARE MONITORING SITE INSTALLATION

The *Software Monitoring Site* components used for remote serial communication with the ConsoliDator are included on models **PDS941R**, **PDS941WR**, **PDS981R**, and **PDS981WR**. The following instructions install the remote wireless serial communication module used for RS-232 transmission. Components referred to can be found in the component bag labeled “E: Serial to Wireless Converter” or are clearly identifiable.

1. If necessary, mount the device and supplied DIN rail where desired. Refer to Mounting Location Recommendations on page 17 for mounting recommendations prior to installation.
2. Apply power to the serial to wireless module using the supplied wall transformer.
3. Connect the supplied COM cable to the DB9 port on the device, and plug into the computer running the desired software (such as the Consolidator monitoring software).
4. For more information on the setup and operation of this module, see the supplied instruction manual.

Note: Optionally, the Serial to Wireless module may be DIN rail mounted in the field enclosure with the analog I/O wireless modules. If this is done, you may use the same power source for all modules, and wire as desired.

ACCESSORIES

There are a number of accessories available for the ConsoliDator Wireless System. These include high gain Yagi antennas and signal repeaters. Installation instructions are included with all accessories.

For details on these products, please visit www.predig.com.

INSTALLATION/SETUP MODIFICATION

The above installation instructions detail the default configuration for the PDS900 Series systems. For information on changing the system configurations, see the appropriate component instruction manual. All required components for modifying the wireless device settings are included with this system, including manuals and programming devices.

SETUP & PROGRAMMING

The following section describes the setup and programming sequence for the ConsoliDator Wireless System.

CONTROL STATION SETUP

All PDS900 Series systems include a PD941 or PD981 ConsoliDator. Once installed in the PDA2904 and all connections wired, the ConsoliDator can be setup from the front panel using the front panel softkeys.

For complete information on setting up the ConsoliDator for your application, please reference the ConsoliDator instruction manual included with the unit as part of the system.

The wireless modules that come pre-installed in the PDA2904 on the PDP2904 DIN rail are programmed at the factory to communicate with the wireless modules at the *Field Location* and the *Software Monitoring Site* (depending on what is included with the system). Most system installations will not need to alter the programming of these modules. See Advanced Setup Notes on page 21 for details on when this may be necessary.

If programming changes to the wireless modules are required, the programming kit required for setup of the wireless analog I/O modules is included in this system. Refer to the wireless module instruction manual for details on reprogramming the modules.

FIELD LOCATION SETUP

The *Field Location* components used for the wireless analog inputs/outputs are included on models **PDS941W**, **PDS941WR**, **PDS941RET**, **PDS981W**, and **PDS981WR**

The wireless modules that come pre-installed in the NEMA 4X plastic field enclosure are programmed at the factory to communicate with the wireless modules pre-installed in the PDA2904 at the *Control Station* with the ConsoliDator. Most system installations will not need to alter the programming of these modules. See Advanced Wireless Setup Notes on page 21 for details on when this may be necessary.

If programming changes to the wireless modules are required, the programming kit required for setup of the wireless analog I/O modules is included in this system. Refer to the wireless module instruction manual for details on reprogramming the modules and the wireless module software CD to install the programming software.

SOFTWARE MONITORING SITE SETUP

The *Software Monitoring Site* components used for remote serial communication with the ConsoliDator are included on models **PDS941R**, **PDS941WR**, **PDS981R**, and **PDS981WR**.

The stand-alone serial to wireless module is programmed at the factory to communicate with the serial to wireless module pre-installed in the PDA2904 at the *Control Station* with the ConsoliDator. Most system installations will not need to alter the programming of these modules. See Advanced Wireless Setup Notes on page 21 for details on when this may be necessary.

If programming changes to the serial to wireless module is required, the module may be directly connected to a computer using the RS-232 DB9 connector and a computer COM port for programming. Refer to the wireless module instruction manual for details on reprogramming the modules and the wireless module software CD to install the programming software.

If either the ConsoliDator or serial to wireless module serial communication parameters are changed, it is important that the serial communication parameters in both wireless modules and the ConsoliDator are identical.

ADVANCED WIRELESS SETUP NOTES

Most system installations will not need to alter the programming of the wireless modules. The following instances and requirements exceptions to this, and detail the changes necessary to setup the system.

Multiple ConsoliDator Wireless Systems

All wireless modules come programmed to communicate as necessary for communication within one ConsoliDator Wireless System. However, the default settings are identical for all wireless systems. If more than one ConsoliDator Wireless System is installed within range of each other, some wireless communication parameters must be changed.

The following wireless communication parameters are programmed using a computer to connect to each wireless module. Note that both modules in a wireless link require identical setting and reprogramming if any changes are made. See the wireless module device instruction manual for details on changing these parameters.

The wireless system includes the wireless programming module show below; used to program the analog input/output boards as described in the wireless module instruction manual.

Network ID Number

The Network ID Number must be unique for every module pair. Selectable from 16 to 256; default analog IO module setting is 16; default serial module setting is 255 (FF).

Channel Number

The Channel Number must be unique for every module pair. Selectable from 0 to 6; default analog IO module setting is 0; default serial module setting is 6.

Multiple Wireless Module Networks

Multiple wireless networks may be setup within range of each other. If the wireless networks are provided by the same type of devices as are included in the ConsoliDator Wireless System, then each wireless module pair must have a unique Network ID Number and Channel number.

See the wireless module device instruction manual for details on changing these parameters.

Network ID Number

The Network ID Number must be unique for every module pair. Selectable from 16 to 256; default analog IO module setting is 16; default serial module setting is 255 (FF).

Channel Number

The Channel Number must be unique for every module pair. Selectable from 0 to 6; default analog IO module setting is 0; default serial module setting is 6.

High Gain Antennas

Some applications may require the use of high gain antennas to extend range.

High gain antennas are generally mounted using an antenna cable between the wireless module antenna jack and a remote mounted antenna positioned for line of sight or the best possible signal path. High gain antennas utilize the same mounting recommendations as for the standard antennas included in this system. In addition, antennas such as Yagi style antennas may be very direction sensitive, so care should be taken to properly align the antenna per the mounting instruction.

High gain antennas are a preferable approach to repeaters for signal integrity and speed considerations.

Please read B&B's white paper entitled "The Ten Commandments of Wireless Communications" for more information on how antenna gain can affect your range and signal transmission power.

For more information on high gain antennas, antenna cables, and accessories available from Precision Digital, please visit www.predig.com.

Wireless Signal Repeaters

Some applications may require the use of wireless signal repeaters to extend range. Repeaters are available for the ConsoliDator Wireless System to extend the range of the wireless analog signals or serial communication signals.

The repeater package available for the wireless analog signals requires no additional setup or programming. Minor wireless module reprogramming is required to add a repeater to the serial communications wireless link.

It is not recommended that system be designed that are outside of the suggest range of this system. Ideally, repeaters are used to boost weak or sporadic signals, and should not be relied upon to extend the range of the modules to the extreme of the repeater's range.

For more information on repeater packages available for this system, please visit www.predig.com.

TROUBLESHOOTING TIPS

The ConsoliDator Wireless System consists of multiple component parts as well as the possibility of complex wireless signal pathing issues. This section provides some tips to follow when preparing to troubleshoot problems with your system.

Read the Pre-Installation information section of this manual.

To prevent problems, it is recommended that installers read all the Pre-Installation Information details provided in this manual before installing any system hardware. Reading it afterward may alert you to inherent flaws in the wireless module locations, range, or setup.

Test the system prior to installation.

It is also recommended that the system be test wired and programmed before final installation, while the components can be physically together on a test bench. This will help narrow potential problems to the wireless signals if all signal and communications have been tested prior to installation at the wireless locations.

Check component instruction manuals for help.

In addition to this manual, each system component is provided with an instruction manual. Please reference the Troubleshooting section in any applicable manual to help resolve any problems that arise. These manuals contain the detailed information for setting up and operating your system components.

Be sure you are troubleshooting the right system component.

The first troubleshooting step is to figure out the system component that is causing a problem. You will save yourself time and effort, as well as make possible technical assistance from Precision Digital much easier by determining what component is causing the problem with your system.

Common Quick-Fixes

Make sure range is reasonable.

Verify the range between the wireless antennas is within the reasonable range expectations provided in the Specifications section of this manual. If they are not, then high gain antennas, repeaters, or a change of location may be required.

Check the wireless signal path for obstructions.

Verify that the wireless signal path between component antennas is as close to line of sight as possible. Assure no earth planes (such as hills) are in the signal path. If the system was working and has stopped, check that no new obstructions are present such as vehicles that may have parked in the signal path.

Try several wireless antenna locations.

Remember that wireless signal paths can be unpredictable. If the wireless range is reasonable, but the signal is not being picked up, try several wireless antenna mounting locations. A small shift in location may have a significant impact on signal strength.

Check for wireless signal loss elements.

Verify that no additional antenna cables have been used. These may cause significant power loss on the transceiver signals. Also verify the antenna and antenna cables provided are installed securely.

Verify PDA2904 backpanel wiring.

With numerous wires going into and out of the ConsoliDator, wiring mistakes for input, output, or power signals are possible. The PDA2904 backpanel provides a convenient way to organize these wires. Verify the wiring on the PDA2904 back panel provided as part of the system.

Double-check the simple troubleshooting steps.

Verify all devices are powered and properly wired. Cycle power to all system elements. Verify the devices outside the ConsoliDator Wireless System, such as transmitters and serial communication programs, are setup properly and functioning as expected.

Contacting Technical Support

Before contacting Precision Digital technical support please be prepared with the following.

Have the right tools available.

In order to properly troubleshoot the system, it is recommended that a electrical multi-meter and a 4-20 mA source be available. This will be required to help our technical support services narrow down the problem component of the system.

Know your system.

Have information such as the range between the antennas, basic installation locations, and past troubleshooting efforts available to discuss with technical support.

For Technical Support

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

Fax: (508) 655-8990

Email: support@predig.com

NOTES:

HOW TO CONTACT PRECISION DIGITAL

- **For Technical Support**

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

  Fax: (508) 655-8990

  Email: support@predig.com

- **For Sales Support or to place an order:**

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

  Fax: (508) 655-8990

  Email: sales@predig.com

- **For the latest version of this manual or other product information, visit:**

  www.predig.com