NoWire Model 1100 – Wireless Input Point Solution
(wireless digital points for meters and industrial equipment)
Installation and Operation Manual

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1 Overview
The NoWire Model 1100 provides a wireless link for digital input/output signals.

1. Display readings wirelessly from up to 32 water, gas, and electric meters or run-time sensors via a wireless connection to your meter’s digital pulse output.
2. Display readings from up to 4 direct wired water, gas, and electric meters or run-time sensors via NoWire’s 4 wired pulse inputs.
3. Provide a wireless link for 4 digital output signals to digital input equipment. Any of the 32 wireless or 4 wired input points can be routed to NoWire’s 4 optically isolated outputs. This creates a wireless link for industrial control signals or creating an additional pulse output for meters.
4. No software is required. All configuration is done through setup menus using the three pushbuttons and LCD display.
5. Data from NoWire can be pushed to the internet via CellConnect™ GSM Cell modem, WebConnect™ Ethernet modem, or a third party device via Modbus RTU communications.

2 Warnings
WARNING: A potential risk exists if this Operations and Installation Manual are not followed.

3 NoWire Quick Start
This Quick Start section is to help you get up to speed with how to setup and configure the basics of NoWire quickly. It is not intended to replace other instructions and details elsewhere in this manual but to simply allow you to get familiar with the operation of this product.

3.1 Configuring a Wireless Input Pulse Meter
1. You will need the NoWire 1100, a 12VDC power supply, an EN1501 wireless pulse transmitter, and a small screw driver.

2. Remove the NoWire cover and connect the 12VDC power supply positive and negative wires to the V+ and V- terminals of the terminal block in the bottom left corner of the circuit board.

3. Plug the 12VDC power supply into a 120V outlet and wait for NoWire to power up and go through its self checks.

4. Follow the steps below. The text between the LCD screen images is the NoWire button to press to move to the next screen.

The setup menus are password protected. The factory default password is 00000 and may be changed in the System Items sub-menu. Pressing NEXT will get you into the setup menus.
5. Open the case of the EN1501 pulse transmitter by pressing in on the right side that has the small hole. Press the reset button to assign the transmitter. Close the transmitter case.
6. Press the BACK button 2 times to exit the setup menus. The display now alternates between the two following screens:

![Screen 1]

The second screen displays the meter reading of Wireless Input #1. If you had a meter connected to the terminal block of the EN1501 pulse transmitter you would see the meter reading as pulses are received by the connected meter.

### 3.2 Configuring a Wired Input Pulse Meter

1. You will need the NoWire 1100, a 12VDC power supply, and a small screw driver.

2. Remove the NoWire cover and connect the 12VDC power supply positive and negative wires to the V+ and V- terminals of the terminal block in the bottom left corner of the circuit board.

3. Plug the 12VDC power supply into a 120V outlet and wait for NoWire to power up and go through its self checks.

4. Follow the steps below. The text between the LCD screen images is the NoWire button to press to move to the next screen.

   ![Screen 2]

   The setup menus are password protected. The factory default password is 00000 and may be changed in the System Items sub-menu. Pressing NEXT will get you into the setup menus.

   ![Screen 3]

   Pressing NEXT will rotate through the various menus. It rotates through the System Items, the 32 Wireless Inputs, the 4 Wired Pulse Inputs, and the 4 Wired Pulse Outputs. Press NEXT 31 times will land you on the Pulse Input #1 setup menu item. Once there press CHANGE to setup Wired Pulse Input #1.

   ![Screen 4]

   The first sub-menu item allows you to tell NoWire to display Wired Pulse Input #1 on the display. Press CHANGE repeatedly to toggle between Yes and No. Once Yes is selected press BACK to save the selection.
Pressing the NEXT key will rotate through Wired Pulse Input #1’s sub-menu items. Press NEXT once to modify the Description. Press CHANGE to begin Description changes.

The CHANGE and NEXT buttons are used to modify the characters of a text or numeric entry field. CHANGE increments the character. NEXT moves to the next character position. Press and hold a button for rapid entry. Use the CHANGE and NEXT buttons to enter “PI 1” for the description. When done press BACK.

5. Press the BACK button 2 times to exit the setup menus. The display now alternates between the two following screens:

The second screen displays the meter reading of Wired Pulse Input #1. If you have a meter connected to the terminal block connection P1 and PG you would see the meter reading as pulses are received by the connected meter.

6. To simulate a meter pulse you may short the P1 and PG terminals. Each time these terminals are connected together a pulse is recognized by NoWire and the meter reading will increment.

Touch P1 and PG together to simulate a wired meter pulse.
4 NoWire Circuit Board

1. 12VDC External power connection, V+ : 12VDC, V- : Ground.
2. 4 Wired Pulse Input connections. P1 & P2 are the positive terminal and share PG as the negative (ground) terminal. P3 & P4 are the positive terminal and share PG as the negative (ground) terminal.
3. Optically Isolated Pulse Outputs. 1+ is the positive terminal and 1- is the negative terminal. Same for points 2, 3, and 4. May not be optically isolated if Pulse Output Jumpers (see 10) are set as such.
4. RS485 Half Duplex Modbus connection.
5. COM2, 9 pin female D connector.
6. 120 ohm RS485 termination resistor jumper (J18). Top=No Connected, Bottom=Connected
7. Main Status LED. Solid green: No issues exist, Blinking Red, issues exist. See section [link] for more information on blink codes.
10. Pulse Output jumpers. Allows for output connections to power and ground for making powered outputs (voiding optical isolation). Output point jumpers to the right: Pulse Output is optically isolated and non-powered. Output point jumpers to the left: Pulse Output is connected to NoWire power and ground for creating a non-isolated 5V powered output.

11. LCD contrast adjustment (VR1).

12. FW update jumpers J1 and J5.

13. COM1, 9 pin female D connector for FW update.

14. LCD menu navigation push buttons. Press and hold for repeat key operation.

15. Connector for external EN4000 wireless receiver. Only utilized with NoWire 1100-2 models without the internal wireless EN4000 receiver.

16. S1 and S2 Red status LEDs. Special status indication. S1 blinking: EN4000 wireless receiver communications, S2 blinking: COM2 communications.

5  Installation Checklist
NoWire installation requires the following items:

5.1  Required items included
- NoWire 1100 with internal receiver.
- Power supply: 12VDC, 500mA Class II.
- Small flat head screw driver for NoWire terminal blocks and transmitter terminal block connections.

5.2  Items sold separately
- EN1501 pulse transmitters or EN1210 universal transmitters for wireless points.
- Outdoor enclosures to house the transmitters.
- Meters with digital pulser.

5.3  Hardware you must provide
- Low voltage wiring (telephone, cat5 or thermostat wire) for connection from your meters to the transmitters, from the meters to the wired pulse inputs of NoWire, and from the pulse outputs to your input equipment.
- RS485/RS232 compatible cabling for connection to Com2 Modbus serial port or terminal block connection.
- Mounting screws for attaching NoWire enclosure to a flat surface.
- ½” conduit and conduit fittings connecting into NoWire.
- Any additional tools required for the installation.

6  Installation Instructions

6.1  Mount the NoWire enclosure
- Here are some items to consider when deciding where to permanently locate the NoWire enclosure.
  o Place where it will be easy to view the NoWire LCD display.
  o NoWire is outdoor rated if proper watertight conduit connections are used.
  o Locate out of direct sunlight to avoid exceeding the maximum temperature rating.
o Locate near a 120V outlet where the NoWire power supply will be plugged in.
o Allow room for conduit bends and runs that connect to the bottom of the NoWire enclosure. (if required for application)
o Locate away from other equipment per your local electrical codes.
o Locate in an area that allows for optimal wireless communications from the meter transmitters. Though the wireless communications was designed for use inside of buildings with obstacles and such it is best to avoid mounting NoWire in enclosed rooms that have metal or thick rebar reinforced concrete walls or deep down in sub-basements far away from the transmitters that need to be seen by it. If this is unavoidable then you may need an external receiver (NoWire 1100-2) that can be mounted in an optimal location connected to NoWire up to 50 feet away. Repeaters may also be used in this situation. See the Wireless Theory of Operation section.

- Remove the NoWire cover by unscrewing the 4 corner screws on the cover.
- Note the deep channels in the corners of the enclosure that have a 1/8” hole at the bottom. This is where mounting screws are inserted. These do not need to be water tight since they are outside the front cover gasket.
- Using the appropriate mounting screws for your location, attach the NoWire enclosure to your flat surface.
- If you wish to use conduit for routing your NoWire wiring, you may remove the wire fitting on the bottom of the NoWire enclosure and attach a ½” conduit. Use a water tight fitting if you need to keep NoWire water tight.

6.2 Attach optional external wiring to NoWire

6.2.1 Wired Pulse Inputs
If you are using wired pulse inputs to directly connect your meters then wire the pulse output wires from the meters into terminals P1 through P4 utilizing the PG terminals as the common ground reference point. See [link] for more details on wired pulse inputs.

6.2.2 Wired Pulse Outputs
If you are using the pulse outputs to connect to external equipment do the following: For pulse output #1 wire the 1+ terminal to the positive signal of your equipment and the 1- terminal to the negative or ground reference signal of your equipment. For pulse output 2 through 4 wire to terminals 2+/ 2-, 3+/ 3-, and 4+/ 4- respectively.

6.2.3 RS232/RS485 Connections
If you are communicating with NoWire using Modbus connect using RS232 or half duplex multi-drop RS485. For RS232 connections connect your RS232 cable to NoWire COM2 DB9 female connector. For RS485 either connect to D+, D-, and GND on the NoWire terminal block or connect to pin 1 (D+), pin 9 (D-) and pin 5 (GND) to NoWire COM2 DB9 female connector.

6.2.4 Apply Power to NoWire
NoWire comes with a 12VDC power supply. Before plugging the power supply into a 120V outlet, route the power supply wire up thru the NoWire wire entry location on the bottom of the enclosure and connect the wires to the V+ and V- terminal block on the bottom left side of the NoWire circuit board. Be sure the positive wire is connected to V+ and the negative wire is connected to V-. The + and – designations should be shown on the power supply itself or the power supply wires. Once your power
connections are complete to NoWire and you have double checked all your other wiring connections to NoWire, plug in the 12VDC power supply to the 120V outlet.

7 Setup Menus Operation

7.1 Meter data display and setup menus

On each displayed wireless point the top right most character is reserved to display wireless point status. In this case the “T” indicating “Tamper” signifying the transmitter case is open.
7.2 System Items menu

- **SI:FW Version**
  - Version 02.02
  - NoWire Firmware Version.

- **SI:Current Time**
  - 01:00am
  - Change the current time.

- **SI:Current Date**
  - 01/01/12
  - Change the current date.

- **SI:12/24HR: 12HR**
  - CHANGE to Modify
  - Change whether the date is displayed in 12 hour format (5:43pm) or 24 hour format (17:43).

- **SI:Backlight:ON**
  - CHANGE to Modify
  - Turn the LCD backlight on or off.

- **SI:Receiver:ON**
  - CHANGE to Modify
  - If you are using NoWire without an EN4000 wireless receiver turn this option off. This is if you are using NoWire for Wired Pulse Inputs only.

- **SI:Com2 Modbus**
  - CHANGE to Modify
  - Options are Modbus, GSM Cell, and Ethernet/Wifi. Change to GSM Cell if using CellConnect™ Cellular Modem. Change to Ethernet/Wifi if using WebConnect™ Ethernet or Wifi Modem. See installation manual for specific option selected.

- **SI:xx x x x x x**
  - CHANGE to Modify
  - Various status and configuration menu items depending on Com2 option selected in previous menu item. See installation manual for specific option selected.

- **SI:Edit Passcode**
  - 00000
  - CHANGE to edit
  - This allows you change the passcode for entering the setup menus. Be sure to write down the changed passcode prior to exiting the setup menus. You will now use the changed passcode when entering the setup menus.
7.3 Wireless Input menu

- **W01:Display:** Change to Modify
  - **CHANGE to edit**
  - Change to yes if you wish this wireless input point to be displayed in the rotating meter reading screens once you exit the setup menus.

- **W01:Description:** Change to Modify
  - **CHANGE to edit**
  - Change the wireless input point description that is displayed in the rotating meter reading screens.

- **W01:Units:** Change to Modify
  - **CHANGE to edit**
  - Change the wireless input point units that is displayed in the rotating meter reading screens after the meter reading.

- **W01:Meter Reading:**
  - **CHANGE to edit**
  - Change the wireless input point current meter reading. This is usually done to match the actual meter reading with the reading that is displayed on NoWire.

- **W01:Pulse Value:**
  - **CHANGE to edit**
  - Change the wireless input point pulse value. This is the value that is added to the meter reading for each pulse that is received by NoWire. Valid range is 0.0001 to 9999.999. A value of 1.000 will increment the meter reading by 1 each time a pulse signal is received by the meter attached to this wireless point transmitter.

- **W01:Decimal Plcs:**
  - **CHANGE to edit**
  - Change the number of decimal places that are displayed when displaying the meter reading. Valid range is 0 to 3.

- **W01:Leak Alm:** Change to Modify
  - **CHANGE to edit**
  - Change to YES if you wish to perform leak alarm detection on this point. A leak alarm will be detected if the value for this input changes every consecutive 2.5 hour period for 48 hours. A leak alarm will clear if the value for this input does not change for two consecutive 2.5 hour periods. An “L” is displayed for the input point if a leak alarm has been detected.

- **W01:No Pulse Out:** Change to Assign
  - **CHANGE to edit**
  - Change if a pulse output will follow this wireless input. If a pulse output is already assigned by another input then it will not be available for selection. This is handy if you to drive external equipment with the wireless input pulses.

- **W01:Assign Xmitr:** Change to Assign
  - **CHANGE to edit**
  - This allows you to assign a transmitter to this wireless input. After pressing CHANGE the display will indicate to press the reset button on the transmitter and will wait for you to do so. Open up the transmitter case and find the reset button to press. If the transmitter is already assigned this display allows you to remove the transmitter associated with this wireless input point.

  - **(if transmitter assigned)**

- **W01:Xmitter Rvrd:**
  - **CHANGE to edit**
  - Displays the date and time when NoWire received the last transmission from the assigned transmitter. Status display only.
Displays the ID of the transmitter assigned to this wireless input. Status display only.

Displays the type of transmitter assigned to this wireless input. Status display only.

Displays the number of internal pulses seen by the transmitter. For EN1501 transmitters these counts come from the transmitter message and are cleared when the reset button of the transmitter is pressed. For EN1210 and other transmitters NoWire increments this count each time the Alarm0 bit status is cleared. Status display only.

Displays the transmitter status. T=tamper: case open. R=transmitter reset. F=fast mode (transmission once per minute). B=battery low. L=leak alarm. Z=transmitter not heard from for more than 24 hours. OK indicates there are no issues with this transmitter. Status display only.

Displays the signal strength of the last reception from the transmitter. Levels are on a Db scale. A level of 4 or more is a good signal.

### 7.4 Wired Pulse Input menu

**PI1:Display:** Change to edit

Change to yes if you wish this wired pulse input point to be displayed in the rotating meter reading screens once you exit the setup menus.

**PI1:Description** Change to edit

Change the wired pulse input point description that is displayed in the rotating meter reading screens.

**PI1:Units** Change to edit

Change the wired pulse input point units that is displayed in the rotating meter reading screens after the meter reading.

**PI1:Meter Reading** Change to edit

Change the wired pulse input point current meter reading. This is usually done to match the actual meter reading with the reading that is displayed on NoWire.
7.5 Pulse Output menu

Displays which input is assigned to this Pulse Output. Add or remove which input is assigned to the Pulse Outputs by going into the Wireless Input and Wired Pulse Input setup menus.

8 Detail of Operations

8.1 NoWire Operation

8.1.1 Input Point Display Screens
NoWire rotates through displaying the data for all wireless input points and wired pulse input points that have their individual settings set to “Display: YES” in the setup menu. Each screen displays for a period of time then moves to the next screen. Pressing NEXT immediately moves to the next screen. Pressing and holding NEXT will repeat the NEXT key moving through multiple input points quickly. They are displayed in order of their input point; wireless input #1, #2, …, #31, #32, wired pulse input #1, #2, #3, #4. Be sure to setup each point in the order in which you want them displayed.

Information in each display screen is as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meter Reading</td>
<td>Units</td>
</tr>
</tbody>
</table>

Change the wired pulse input point pulse value. This is the value that is added to the meter reading for each pulse that is received by NoWire. Valid range is 0.0001 to 9999.999. A value of 1.0000 will increment the meter reading by 1 each time a pulse signal is received by the meter attached to this wireless point transmitter.

Change the number of decimal places that are displayed when displaying the meter reading. Valid range is 0 to 3.

Change to YES if you wish to perform leak alarm detection on this point. A leak alarm will be detected if the value for this input changes every consecutive 2.5 hour period for 48 hours. A leak alarm will clear if the value for this input does not change for two consecutive 2.5 hour periods. An “L” is displayed for the input point if a leak alarm has been detected.

Change if a pulse output will follow this wired pulse input. If a pulse output is already assigned by another input then it will not be available for selection. This is handy if you to drive external equipment with the wired pulse input pulses.
[Description] 14 characters as defined in the setup menu for the input point.

[Status] Status of the wireless input point:
- **T**: Tamper. Case is open.
- **B**: Low Battery.
- **L**: Leak alarm. A leak alarm will be detected if the value for this input changes every consecutive 2.5 hour period for 48 hours. A leak alarm will be clear if the value for this input does not change for two consecutive 2.5 hour periods.
- **R**: Transmitter was reset. Display will clear on its own.
- **F**: Fast transmission mode. Transmits once every minute rather than once every hour. Useful in troubleshooting wireless communications. Force this mode of the EN1501 by pressing the tamper switch 3 times within 10 seconds. It will automatically exit fast mode after 3 days or if reset is pressed.
- **Z**: Transmitter hasn’t been seen in 24 hours.
- *****: Multiple conditions exist.

[Meter Reading] The meter reading value of the input point. The Pulse Value as defined in the setup menu for this point is added to the Meter Reading for each new pulse received.

[Units] 7 characters as defined in the setup menu for the input point.

You may also see the wireless input point status by viewing the “Xmitter Stat” setup screen for any individual wireless input point in the setup menu.

### 8.1.2 System Status Screen

At the beginning of each input point display screen rotation the System Status Screen is displayed.

```
NoWire 1100  
R:11,T:9,11
```

The second line shows the individual wireless input point status conditions. If more exist than can be displayed a “+” is displayed at the end of the line. The above example indicates wireless input point #11 has been reset and wireless input point #9 and #11 have a tamper condition. “System OK” message indicates no wireless input issues exist.

### 8.1.3 Status LED codes

The Status LED located just above the input power terminal block signifies the conditions and status of the system and all inputs. When a condition exists it “blinks” a code indicating the priority of the status, one blink, highest priority, 3 blinks, lowest priority. Count the blinks by the number of times the Status LED blinks red before pausing.

**Solid Green**: No input point issues exist.

**One Red Blink**: One or more wireless inputs haven’t been seen for more than 24 hours. Other conditions may exist of lower priority. This high priority condition also causes the backlight on the LCD screen to blink periodically to alert attention.

**Two Red Blinks**: One or more wireless input has a low battery condition. Other conditions may exist of lower priority.

**Three Red Blinks**: One or more wireless input has a tamper or reset condition.

If any of the wireless inputs have the conditions above and are assigned to a pulse output the red LED of the pulse output will blink the individual input point condition.
8.1.4 Wired Pulse Input and Pulse Output green LEDs
The green LEDs for each wired pulse input, P1-P4, turn on when their respective input condition is detected closed. The green LED for each pulse output, OUT1-OUT4, turn on when their respective output is closed.

8.2 Wireless System

8.2.1 Wireless hardware
NoWire utilizes the Inovonics Echostream wireless equipment for its wireless communication backbone. Since 1986, Inovonics Wireless has shipped almost two million Radio Frequency (RF) products. Inovonics has been a pioneer and a leader in the field of wireless signal/control and voice communications. Inovonics developed the TapWatch® submetering system based upon their field proven wireless security systems and has been the leading wireless submetering system since it was introduced in early 1998.

8.2.2 How the wireless communication works
The system works in the unlicensed wireless spectrum of 902-928 MHz which is the same as many cordless telephones, security systems, wireless modems, etc. Specifically it uses a frequency hopping spread spectrum strategy. An Inovonics Wireless battery operated transmitter is installed on each meter that provides a dry or electronic contact pulse output. The transmitter sends a data packet about once an hour broadcasting its unique transmitter number, the current count of pulses gathered from the meter, and any other special information. The other information is data like a low battery or to inform that someone has opened the cover of the transmitter (called a tamper). The transmitter is low powered so the battery will last a long time (up to 8 years).

Since the transmitters have limited range and there can be environmental barriers to radio frequency transmission, NoWire with its receiver may not be able to hear the transmission of data. To allow for this, Inovonics wireless repeaters are installed at key locations on the site. The repeaters are higher powered than transmitters and are connected to AC power. They take valid transmissions and repeat them at high power so the NoWire receiver can hear the message. Multiple repeaters may be used to relay the message to the NoWire receiver. NoWire collects the messages, deletes any duplicate ones, stores, and processes them to display meter readings.

8.2.3 Basics of Radio Frequency (RF)
It is necessary for installers to understand the basics of radio frequency and the types of environmental factors that can result in the NoWire system not working or performing at peak efficiency.

8.2.3.1 Radio Frequency in General
Radio Frequency is electrical energy that is conducted through the air. It requires a transmitter to send the information, and a receiver with antennas that receive the information. Antennas either radiate (emit) a signal, or receive a signal, or they can do both. The electricity that is sent through the air has a frequency. It looks like a wave. As the wave goes further and further from its sending antenna, the signal propagates and becomes weaker.
8.2.3.2 Frequency Spectrum
NoWire wireless communications use the unlicensed frequency, 902-928 MHz, the same frequencies as are used by some cordless telephones, security systems, and other miscellaneous devices. The frequencies that are used for RF transmission are regulated by the government. In the United States, the FCC (Federal Communications Commission) decides who is able to use which frequencies and for which purposes, and it issues licenses for specific frequencies for specific functions (like radio stations, TV stations, cell phones, etc.) In the U.S., there are a few frequencies called the unlicensed spectrum which anyone is allowed to use within certain limits. No end user license is required to use products using these frequencies. Devices using these frequencies are restricted in power so they don’t interfere with other devices using this same part of the spectrum. (For example, these are the frequencies many of us use for cordless telephones in our homes.)

8.2.3.3 RF Factors That Will Affect NoWire communications
The amount of transmission power is a factor in how far away the signal can be heard. As RF leaves a transmitting antenna, signal strength decreases as the distance from the transmitter increases. Radio signals can be affected by atmospheric conditions resulting in phenomena called fades and multipath. Both fade and multipath can result in a particular frequency not transmitting efficiently at a given place at a given time. In other works, it could be present one minute and gone the next for one frequency at one place. Radio signals can bounce or be reflected off objects, or be absorbed by some objects. Some materials affect RF more than others. Many, but not all, of the materials used in building construction and landscaping will affect how RF works.

As stated, some materials allow RF to pass through, some materials block or disperse the radio waves, and yet other materials absorb the radio waves. For example:

- Wood, sheet rock, plain glass, usually let the RF pass.
- Metal, metal studs, stucco with wire mesh, chain link fencing, plaster with wire mesh, concrete with wire mesh, solar panels, metal satellite dishes, cinder block can interfere with RF. Because of RF interference, DO NOT INSTALL transmitters or repeaters on metal siding, inside of metal boxes, on the surface of metal boxes, or in metal lined rooms like walk-in coolers or freezers.
- Some modern windows with built in resistance to solar gain use materials which may interfere with RF.
- Vegetation can interfere with RF. The transmission environment changes when leaves are on the trees and when they have fallen off.
- Hills and earthen berms can absorb or deflect a lot of RF. Try to minimize the number of obstacles between the transmitters and repeaters or the NoWire receiver.
- Auto and truck traffic. If there is a busy road or a truck parking lot between transmitter and repeater, the signals may at times bounce off the vehicles.
- People usually don’t bother RF from passing.
8.2.3.4 Frequency Hopping
The wireless system has been designed to effectively deal with RF blocking. Since the transmitters are mandated to be low powered, the transmission environment constantly changes, and barriers come and go, not all of the transmissions from the transmitters may be received at the NoWire receiver. To counteract these effects, the NoWire system uses a technique called frequency hopping. This means that messages are sent more than once on separate frequencies. Frequency hopping is also known as spread spectrum. In the following illustration, narrowband means that the signal is sent over one frequency. In spread spectrum, the same message is sent over multiple frequencies.

8.2.3.5 Transmitter Level and Margin

[Diagram showing frequency hopping and transmitter level margin]
8.2.4 Wireless System Planning
You must determine if NoWire will need repeaters to get the transmitter signals to be received by the NoWire receiver. For smaller installations you may not need repeaters if the transmitters are within a few hundred feet of the NoWire receiver or even further if there are few or no obstacles. For larger spread out installations you will need to determine where repeaters need to be placed. Here is an example of a multi-family property with marked repeater locations.

8.2.4.1 Determine if repeaters are necessary
To determine if repeaters are necessary you may utilize NoWire with an EN1501 transmitter in fast mode. By moving the EN1501 transmitter around to your meter locations while transmitting in fast mode you may read the transmitter signal level to determine first if it is seen by NoWire and, if so, is the signal level strong enough.

- Locate NoWire where it will be installed and apply power.
- Using the setup menus assign an EN1501 transmitter to a wireless input point if not already assigned.
- Open the EN1501 case and press the tamper spring down 3 times within 10 seconds. This will put it in fast mode and transmit once every minute. The transmitter will stay in fast mode for 3 days, or until the reset button is pressed. NoWire will display a status code of “F” when it detects the transmitter in fast mode.
- Locate the transmitter in the desired test location.
- Using the setup menus for the assigned wireless input point scroll to the “Xmitter Rcvd” setup screen. This will indicate the date and time it last received a transmission. This will automatically update with each reception of a message from the transmitter. Stay on this screen for a few minutes and verify the transmitter message is received every minute.
- Continue to scroll through the setup menus to the “Xmitr Levels” setup screen. If the Level is greater than 4 then the signal is strong enough. Note: You may wish to stay on this screen for a while until the Level value settles to its final value. If it was strong when it was first received then it may take some time before the true level is established.
8.3  The Installation Process

8.3.1  Project Coordination
Project coordination for a large installation usually includes:

- Designing the repeater backbone, if needed, and determine the most efficient repeater locations.
- Working with the property owner to determine the location for NoWire and associated power.
- Determining if repeaters are required and will be installed indoors or outdoors.
- Working with the property owner to have AC power installed at the repeater locations. NOTE: Repeaters ship with a 14 VAC transformer that connects to a 110 VAC outlet.
- Verifying that all transmitters and repeaters are assigned to NoWire and labeling each with their installation location.
- Working up an installation plan with the property owner so installers have access to the transmitter and repeater locations.
- Supervising the installation of all the components.
- Acting as the single point of contact for the property owner.

Because an installation on an existing site (called a retrofit) can be disruptive to the tenants and the property manager, it is necessary to make the whole process as professional and efficient as possible and all of the installers need to be sensitive to both groups. If the NoWire system is being installed in new construction, there should be no impact on tenants.

8.3.2  Install NoWire
Please see the Installation Instructions section earlier in this manual for installing the NoWire enclosure.

8.3.3  Assign the wireless transmitters
Following the instructions in the Setup Menus Operation section earlier in this manual assign each transmitter to a wireless input point. Label each transmitter with its point number or location description so you keep them identified. Assign them in the order in which you want their meter readings to be displayed.

8.3.4  Install the transmitters
The transmitters are small devices that are battery powered. They are intended to be mounted indoors only unless housed in an outdoor enclosure sold separately.

8.3.4.1  Pre-installation
- Inspect the installation I Before starting to install transmitters, look around at the location for the best place to install a transmitter. Consider these environmental factors.
  - **Heat.** Even though the transmitters will operate continuously between 32 to 140 degrees Fahrenheit, the longest battery life will occur between 70-90 degrees
Fahrenheit. The typical closets or cabinets where this device is installed have poor ventilation and often shares the space with water heaters and other heat producing equipment. The temperature can go up dramatically when the doors are closed. If the transmitter is inside a closet with louvered doors, make sure the louvers aren’t all plugged up and air can flow freely.

- **Humidity.** The transmitters must be installed in a non-condensing environment. Watch for water puddles on the floor, on top of water heaters, etc. as these may indicate leaks or other problems that require the attention of the property manager. Also look for condensation (or sweating”) above the mounting location of the transmitter. In humid environments, cold water pipes, air exchange units and air conditioners will sweat and drops of water will fall to the floor. Do not mount the transmitter on or under anything with potential to sweat and drip water on the transmitter. If the location where the transmitter will be installed is a place where there is a potential for flooding (such as a basement apartment, in the same room as a water heater, etc.), mount the transmitter high.

- **Building construction.** Consider the effects of building materials on RF. Are there metal studs? Are the walls built of stucco with wire mesh inside? Are there steel boxes, sheet metal air exchange units or metal ductwork that could cause problems the RF signal? If you run into an unusual situation, give us a call. Installations have been successfully done in these types of environments however additional RF knowledge and tools are needed.

- **Line of sight.** Although it is not technically a requirement to be within line of sight, consider what is between the transmitter and the repeater or the NoWire receiver. Is there a lot of concrete and steel construction? Are there earthen berms or hills? Are there a lot of trees (this may not always be evident in the months when leaves have fallen)? If there is any way to do it, mount the transmitter where it won’t be affected by these elements. Mount the transmitter as high as possible. If there is any suspicion that the location of the transmitter may be a problem, you may require a repeaters in the area to get the RF level to an acceptable stength.

- **Installation in Closets.** In an apartment environment, the utility meters are often installed in closets. Sometimes, the meters are in closets that are also in use by the tenants. If the installation location is a closet, take extra care to robustly mount the transmitter in a location where it will not be bumped or knocked off the wall or covered with RF blocking agents like foil Christmas wrap.

- **Don’t block the Meter Face.** When installed, the RF transmitter must not prevent the visual reading of the meter register.
  - Verify you have the correct transmitter for the apartment. It is extremely important to put the right transmitter in the right apartment so the customer gets billed correctly.
  - Verify you can mount the transmitter to the wall, to the piping, or to the meter. The manufacturer, type of meter used and the pulser wire (supplied by the meter manufacturer) will determine where the transmitter can be installed. The preferred installation is to screw mount the transmitter to a safe wall location or wire-tie it to the piping. If it is installed on a wall, it should be mounted within 10 feet of the meter (closer is always better).

### 8.3.4.2 Mounting the transmitter

The following installation instructions are guidelines. No two installations are alike. Some installations may require some departure from standard procedures so good judgment is the best guide. In most cases, wall or pipe mounting is desirable. Some of the pulser wires are only 6 inches long so the only
alternative may be to attach the transmitter to the meter itself using double sided tape. If this is the case, extra care must be taken to keep the transmitter above or on the side of the meter to avoid condensation or any chance of getting standing water in the housing. Some manufacturers have optional longer cords or give instructions on how to build longer cords. Double sided tape in certain environments is not as reliable for adhering to the wall as is using a mounting screw. The transmitter could easily fall in to a place that prevents the RF from being heard. Adhesives can lose effectiveness over time, especially in hot environments like water heater closets. If tape is to be used, make sure the mounting surface is clean and dry.

BEFORE DRILLING, ALWAYS BE CERTAIN YOU CAN DO SO SAFELY AND WITHOUT CAUSING DAMAGE. MAKE SURE YOU WILL NOT BE DRILLING INTO WATER PIPES, SEWER PIPES, GAS LINES, ELECTRICAL WIRES, AND ELECTRICAL BOXES OR THROUGH THE WALL.

NOTE: Some meters are polarity sensitive, meaning there are specific positive and negative terminals. The wiring must be terminated correctly inside the transmitter. Failure to cable it correctly can cause the transmitter to be destroyed. If you do not know whether or not the meter you are installing to is polarity sensitive, contact Submeter Solutions for guidance.

- Remove the cover from the transmitter. To open the housing, press down on the base tab near the cabling through hole while lifting away the cover. Properly opening the transmitter housing will not damage the housing. CAUTION: Inside the casing are some electronic components that have adjustment screws. Under no circumstance should you touch these screws. They can only be adjusted at the factory.
- Using a small flat-bladed screwdriver, carefully remove the battery. The mounting hole is behind it. You may also slide a wire-tie thru the mounting holes.
- Mount the transmitter in the predetermined safe location using a mounting screw, wire-tie or some other hardware (as required). If you are mounting this to sheet rock, always use an anchor so it is secure and will not get pulled down. Make sure the thru-hole is pointing in the desired direction. One screw is usually sufficient.
- Reinsert the battery.
- Press the reset button on the transmitter.
8.3.4.3 Connecting the transmitter to the meter
The cable between the transmitter and the meter may be manufactured for the specific meter and should be with the meter already or the installer should have been given a supply of them. Measure out enough wire to connect the meter to the transmitter with enough length to properly “dress” the cabling.

- Strip the two wires at the transmitter end. About 1/8 inch is sufficient.
- Remove the blue terminal block by pulling it up off the two pins.
- Loosen the two screws in the terminal block.
- Put the two ends of the stripped wire into the terminal block and tighten the screws.
- If the wiring from the meter is “polarized” (meaning one wire must be wired only to a negative terminal, the other only to a positive terminal), the negative connection is the terminal closest to the edge of the transmitter board.
- Guiding the cable through the thru-hole in the housing, secure the terminal block to the terminals by pressing the terminal block down on the two pins.
- Dress and staple the cabling.
- Connect the meter end of the cable to the meter. Specific instructions may apply. Consult the meter manufacturer for specific information on how to connect to the meter pulser.

8.3.4.4 Initialize the transmitter

- Make a notation of the meter reading from the meter face. Be sure to note which location the reading is for. This information can be entered in the NoWire setup menu for the wireless input point.
- PRESS THE RESET BUTTON. This resets the transmitter count to zero.
- Put the cover back on the casing.
9 NoWire Specifications

9.1 General Specifications
Setup and Configuration No software required. Password protected setup menus.
Processor R8C/35C – 16bit embedded CPU, 20MHz.
Console 2x16 backlit LCD, 3 push buttons.
LED 4 pulse output, 4 pulse input, power/status, 2 status.
Power Requirement 120VAC Wall Transformer included, 12VDC, Class2.
Pulse Inputs 4 dry contact or electronic, <2k ohms senses closed.
Pulse Outputs 4 optically isolated to 5kVrms. Optionally sources power.
Wireless Inputs 32 pulse/digital output meters.
Housing NEMA4X outdoor rated polycarbonate enclosure.
Size 6.73 x 4.76 x 2.17 in.

9.2 Wireless Specifications
Brand EchoStream by Inovonics.
Operating Frequency 902-928 MHz, unaffected by WiFi or 900MHz cordless phones.
Modulation Frequency hopping, spread spectrum.
Transmitter EN1501, EN1210, 32F to 140F, 90% rel. humidity (non-cond.)
Transmitter case Indoor rated. Purchase small NEMA4X outdoor enclosure for outdoors.
Transmitter Range Open field up to 5000 ft.
Typical Battery Life 6 years operating between 70-90F. Reduced with higher temps.
Extended Life Transmitter 20 years calculated, 10 years guaranteed (EN1501-XL)
Repeater EN5040-T, -20F to 145F, 90% rel. humidity (non-cond.)
Repeater Range Open Field up to 4 miles.
Limited Warranty
SUBMETER SOLUTIONS IS PROVIDING THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS WARRANTY IS BUYER’S EXCLUSIVE REMEDY FOR ALL CLAIMS AGAINST SUBMETER SOLUTIONS. SUBMETER SOLUTIONS SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES. SUBMETER SOLUTIONS’ TOTAL LIABILITY FOR ALL CLAIMS SHALL BE LIMITED TO THE PRICE PAID FOR ITS PRODUCT.

Submeter Solutions promises buyer that any standard product manufactured by Submeter Solutions shall be free from all material defects in design, material, or manufacturing for a period of 1 year from the manufacture date; provided, however, that the warranty shall not extend to ordinary wear and tear or to normally replaceable components (e.g., batteries). During the warranty period, Submeter Solutions may repair or replace (in its sole discretion) any product suffering from a warranty defect and returned freight prepaid by buyer, with no charge to buyer for any warranty repair or replacement. The warranty shall remain in full force and effect for such 1 year period, provided that the product: (1) was installed, operated, and maintained properly; (2) has not been abused or misused; (3) has not been repaired, altered, or modified outside of Submeter Solutions’ authorized facilities; (4) has not been sold subject to other warranty terms specified at the time of sale; and (5) is still owned by the original purchaser. This warranty provides specific legal rights that may be varied by state law. Submeter Solutions’s products are not designed for life or safety applications.

Product Application Limitation
Submeter Solutions products are not intended for use in critical applications such as nuclear facilities, human implantable devices or life support. Submeter Solutions is not liable, in whole or in part, for any claims or damages arising from such uses. Submeter Solutions strongly believes in continuous improvement, therefore we must reserve the right to change specifications and product offerings without notice. Where possible, we will substitute products with equivalent functionality when necessary.

NOTICE

- This product is not intended for life safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance to all applicable codes.