



SNS™ Temperature and Humidity Sensors Installation Guide



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SNS™ Temperature and Humidity Sensors Installation Guide

Product Models

US: SNS2TPS-2, SNS2TPD-2, SNS2TNS-2, SNS2THS-2, SNSATPS, SNSATPD, SNSATHX

UK: SNS2TPS-2, SNS2TPD-2, SNS2TNS-2, SNS2THS-2, SNSGTPS, SNSGTPD, SNSGTHX

EU: SNS2TPS-2, SNS2TPD-2, SNS2TNS-2, SNS2THS-2, SNSCTPS, SNSCTPD, SNSCTHX

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U.S. Patents 6,873,573; 7,352,657. Other Patents Pending.

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Reference Documentation

Note: Reference documentation is located on the SNS Resource CD (Q13140) and in the Support area of the SNS AMP software.

SNS™ Temperature and Humidity Sensors User Guide (SNSDOC-006)

SNS™ AMP Installation and Administration Guide (SNSDOC-005)

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Safety Precautions

Read this document thoroughly before performing any installation or service procedures.

Safety Precautions

SNS sensors are designed for indoor use only and are not weather protected. Operating the sensors outdoors, or in wet areas is an electrical hazard and may damage the temperature sensor while nullifying the warranty.

Equipment Precautions

- To avoid possible electric shock or damage to an SNS sensor, make sure that it is not powered when mounting it.
- For healthcare facilities, sensors are not intended for patient use and must not be installed within 6ft (2m) of patient contact.
- SNS sensors may be cleaned with a cloth moistened with water or a common disinfectant.



Be sure to test any cleaning solutions on a small area of the sensor before using it on the entire sensor.

About this Guide

Documentation Overview

Depending on your function(s), you will find the following documents most helpful:

I am...	I want to...	Document I need...
Installing the SNS AMP Server and Software	<ul style="list-style-type: none"> • Install the AMP • Put the AMP on the network <ul style="list-style-type: none"> • Set time on the AMP • Add AMP Users and Assign Roles • Configure Network and Time Settings • Install Sensor Licenses • Manage Background Jobs 	SNS AMP Quick Start Guide SNS AMP Installation and Administration Guide
Adding Sensors to the Network	<ul style="list-style-type: none"> • Create Default Profiles • Configure Sensors 	SNS Temperature and Humidity Sensors Installation Guide
Installing Sensors	<ul style="list-style-type: none"> • Mount Sensors • Use a Thermobuffer 	SNS Temperature and Humidity Sensors Installation Guide
Using Sensors	<ul style="list-style-type: none"> • Modify Temperature and Humidity Thresholds • Handle Alarms 	SNS Temperature and Humidity Sensors User Guide
Managing, Monitoring, and Reporting on Sensors	<ul style="list-style-type: none"> • Manage Sensors • Monitor Sensors • View and Print Sensor Reports 	SNS Temperature and Humidity Sensors User Guide
Maintain Sensors	<ul style="list-style-type: none"> • Upgrade Sensor Firmware • Change Batteries 	SNS Temperature and Humidity Sensors User Guide

Guide Conventions

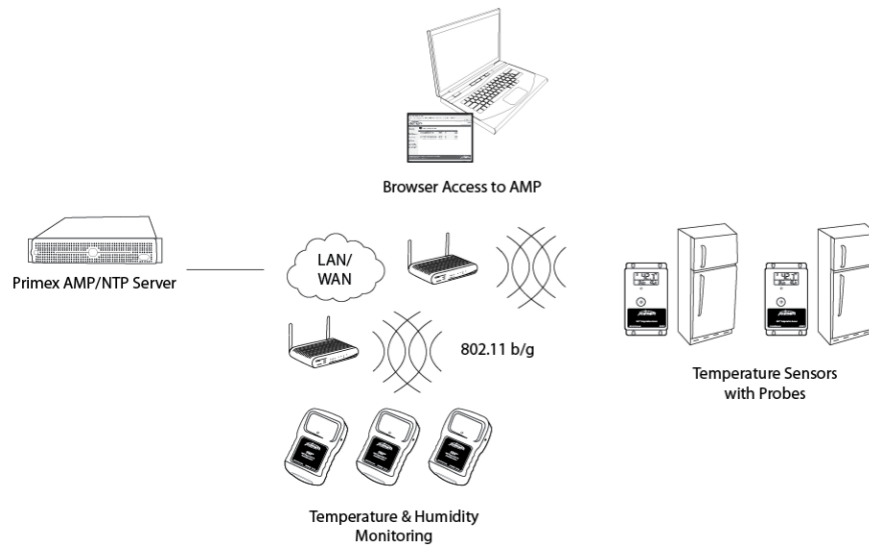
This guide uses typographical conventions to highlight specific types of information.

Information	Example
Graphical user interface tab and menu sequence.	Choose Sensors > Auto-Config .
Graphical user interface pages and controls.	Return to the Sensor Devices page. Click Save .
Command line input.	Type the following: <pre>> cd /var/sns/sns-install</pre>
User-specified input.	Open a browser to http://your.amp.address.com .

Introducing SNS™ Temperature and Humidity Sensors

SNS™ Temperature and Humidity Sensors provide monitoring and logging of environmental conditions throughout your facilities. SNS Temperature and Humidity Sensors (sensor devices) communicate with the Synchronized Network Solutions (SNS) Application Management Platform (AMP)/Network Time Protocol (NTP) server over wireless 802.11 b/g networks. (Some sensor devices can also communicate over the wired Ethernet network.) Figure 1 shows the architecture of an SNS Temperature and Humidity Sensors network.

Figure 1: SNS Temperature and Humidity Sensors Network



Sensor Devices and Accessories

Primex Wireless offers battery- and AC-powered sensor devices and probes. An important accessory for both AC- and battery powered external probe sensors is the SNS thermobuffer, which enables sensor readings to be based on the temperature of the refrigerated assets rather than on the air temperature.

AC-powered Sensor Devices and Accessories

Table 1 and Table 2 describe the AC-powered sensor devices and accessories. For more on AC-powered sensor devices, see Features of SNS AC-powered Sensor Devices on page 12.

Table 1: AC-powered Sensor Device Specifications

Sensor Device Part Number	Sensor Device Description	Input Power	Current Draw	Sensor Device Operating Range
SNSATPD	Dual probe temperature sensor	6-12V _{DC}	300mA@9V _{DC}	32°F to 95°F (0°C to 35°C)
SNSATPS	Single probe temperature sensor	6-12V _{DC}	300mA@9V _{DC}	32°F to 95°F (0°C to 35°C)
SNSATHX	Temperature and humidity sensor	6-12V _{DC}	300mA@9V _{DC}	32°F to 95°F (0°C to 35°C)

Table 2: AC-powered Single and Dual Probe Sensor Device Accessories

Accessory Part Number	Accessory Description	Probe Operating Range
SNS6C1	Thermistor, AC temperature sensor (1/8" probe)	-22°F to 194°F (-30°C to 90°C)
SNS6C2	Thermistor, NIST Traceable AC temperature sensor (1/4" probe),	-22°F to 194°F (-30°C to 90°C)
Q13563-1	25' Thermistor Extension Cable	Minor loss in accuracy in above when extension cables are used
Q13563-2	50' Thermistor Extension Cable	Minor loss in accuracy in above when extension cables are used

Battery-powered Sensor Device Specifications

Table 3 and Table 4 describe the battery-powered sensor devices and accessories.

Table 3: Battery-powered Sensor Device Specifications

Sensor Device Part Number	Sensor Device Description	Input Power	Sensor Device Operating Range
SNS2TPS-2	Single probe, dual battery temperature sensor	2 AA batteries	-40°C-85°C
SNS2TPD-2	Dual probe, dual battery temperature sensor	2 AA batteries	-40°C-85°C
SNS2TNS-2	Sealed, dual battery temperature sensor	2 AA batteries	-40°C-60°C
SNS2THS-2	Dual battery temperature and humidity sensor	2 AA batteries	-40°C-60°C

Table 4: Battery-powered Sensor Device Accessories

Accessory Part Number	Accessory Description	Probe Operating Range
SNS6AC4	Standard 4" RTD Probe, 6' Teflon Cable	-50°C to 125°C
SNS2AC4	Standard 4" RTD Probe, 2' Teflon Cable	-50°C to 125°C
SNS6BC4	Cryo 4" RTD Probe, 6' Sheathed Teflon Cable	-200°C to 125°C
SNS2BC4	Cryo 4" RTD Probe, 2' Sheathed Teflon Cable	-200°C to 125°C
Q13332	USB Programming Cable	N/A
SNS888	AA Lithium Battery 1.5v	N/A

SNS Thermobuffers

A thermobuffer can be used with battery- and AC-powered single and dual probe temperature sensors to simulate the actual temperature of contents within coolers or freezers. The thermobuffer is a bottle of food-grade glycol into which the temperature probe is placed inside the refrigerator. The thermobuffer simulates refrigerated items, which change temperature more slowly than the air when the refrigerator door is opened. Using a thermobuffer with sensor devices limits the impact of fluctuating air temperature on sensor readings and helps provide a higher degree of measurement accuracy. The thermobuffer is effective to a minimum temperature of -27° F.

Table 5: SNS Thermobuffer Accessories

Accessory Part Number	Accessory Description
SNSGRP	SNS Thermobuffer, 4 oz. Glycol Bottle for RTD Probe and Thermistor (NIST)
SNSGLY-1	1 Gallon Food Grade Glycol

Overview of SNS Sensor Network Installation

Prerequisites to SNS Sensor Installation

The following tasks must be complete before installing SNS Sensors.

- Install and set up the SNS Application Management Platform (AMP)/Network Time Protocol (NTP) server.
- Enter the SNS Sensors license key in the AMP.
- Assign the Sensor Admin role to the AMP administrator or other user login.

This installation guide assumes that the AMP and Sensors license are installed and that you can log in to the AMP as a user with the Sensor Admin role. See the SNS AMP Installation and Administration Guide and the SNS Temperature and Humidity Sensors User Guide for details.

Plan the Installation

Sensor device installation begins by planning where to place sensor devices and ensuring that the wireless or wired network is available at these locations.

Note: **Sensor devices must have adequate signal to support wireless operation. Sensor devices will work in areas where a wireless laptop can connect to the network or where signal to noise level measures 20 dB or greater. If wireless signal is inadequate, a wireless Access Point may be added in proximity to improve local signal strength. AC-powered sensor devices can also be connected to the Ethernet network via the RJ45 connector.**

Configure Sensor Devices for the Network

Sensor devices arrive at your facility with no knowledge of the network. The next step in installing the SNS Sensors network is to configure sensor devices. See Configure Sensors for the Network on page 25 for details.

Install and Verify Sensor Devices

Once sensors are configured and you know they can connect to the network, they are ready for installation in their permanent locations. See Install SNS Sensor Devices and Accessories on page 47 for details.

View and Update Sensor Device Information in the AMP

During sensor device configuration and upon installation, you will use AMP screens to verify that the sensor device is communicating with the AMP. You will also use AMP pages to enter information, such as the location of the sensor device or alerting thresholds. See the SNS Temperature and Humidity Sensors User Guide for details.

Network Requirements for SNS Sensor Devices

SNS Temperature and Humidity Sensors work on 802.11 b/g wireless networks. Some sensors also work on wired Ethernet networks. This section describes the requirements for the SNS Temperature and Humidity Sensors network.

Wireless Signal

Sensor devices must have adequate signal to support wireless operation. Sensor devices will work in areas where a wireless laptop can connect to the network or where signal to noise level measures 20 dB or greater. If wireless signal is inadequate, a wireless Access Point may be added in proximity to improve local signal strength. AC-powered sensor devices can also be connected to the Ethernet network via the RJ45 connector.

Wireless Security

AC-powered Sensor Devices

AC-powered sensor devices support WEP, WPA, and WPA2 encryption standards with LEAP, EAP-FAST, and PEAP authentication.

Battery-powered Sensor Devices

Battery-powered sensor devices support WEP - 128, WPA-TKIP, and WPA2-AES encryption standards.

Network Protocol and Ports

AC-powered Sensor Devices

AC-powered sensors send sensor device data via UDP packets. Ports 1600 and 1640 must be open on the network for data transmission and configuration.

Battery-powered Sensor Devices

Battery-powered sensors send sensor device data via UDP packets. Port 6767 must be open on the network. Packets are small (less than 75 bytes).

Features of SNS AC-powered Sensor Devices

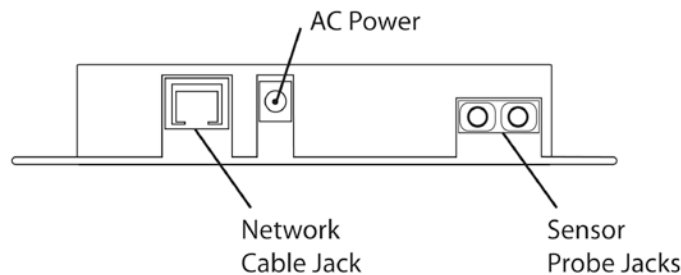
This section contains the following topics:

- [Network, Power, and Probe Connections](#)
- [Service Button](#)
- [Visual and Auditory Interfaces](#)
- [Monitoring Thresholds](#)
- [Operational Sequences](#)

Network, Power, and Probe Connections

Network, power, and probe connections are located on the side of AC-powered sensors, as shown in Figure 2. Dual-probe sensor devices contain two probe jacks.

Figure 2: Network, Power, and Probe Connections on AC-Powered Temperature Sensor (SNSATPD)



Network Connection

The RJ-45 network connection allows you to connect a standard Ethernet cable to the sensor device. The network connection is used during browser-based configuration and if the sensor device is configured to operate on the wired Ethernet network. For details on configuration, see [Configure Sensors for the Network](#) on page 25.

AC-Power Connection

AC-powered sensor devices come with a power supply. Plugging in the power supply and connecting it to the sensor device turns on the sensor device. AC-powered sensor devices must be connected to AC power for normal operation.

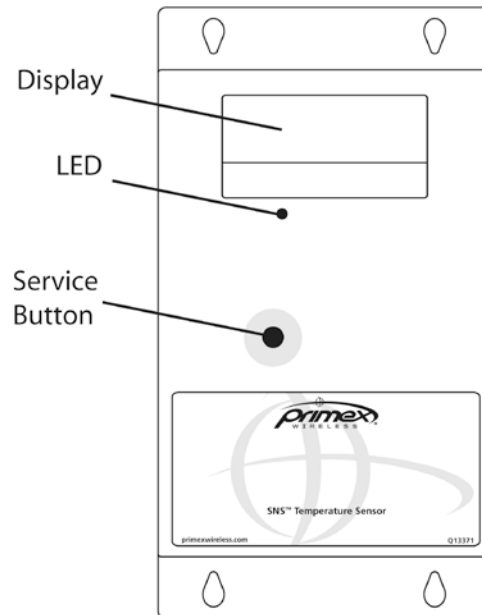
Probe Connection(s)

AC-powered temperature sensor devices have one or two probe connections depending on the sensor device model.

Service Button

The service button is located on the front of AC-powered sensor devices, as shown in Figure 3.

Figure 3: Service Button, Display, and LED on AC-Powered Temperature Sensor (SNSATPD)



The service button has several uses depending on the status of the sensor device.

- To enable browser-based configuration, pressing and holding the service button while plugging in the sensor device causes the device to enter configuration mode.
- During normal operation and discovery and auto-configuration, pushing the service button causes the sensor device to sound the beeper and check in with the AMP.
- During an alarm, pushing the service button cancels the alarm and stops the LED from flashing but does not acknowledge the alarm on the AMP. Pushing the service button during an alarm also does not sound the beeper or cause the sensor device to check in with the AMP.

Visual and Auditory Interfaces

The display and LED, shown in Figure 3, are visual indicators of sensor device status and sensor readings. The sensor device also communicates its status using beeps.

Display

Table 6 describes the display functions for AC-powered sensor devices.

Table 6: AC-powered Sensor Device Display

Item	Description
38.1° F 65%RH	Current reading of probe. For dual probe sensors, the reading alternates between showing the reading of probe 1 and probe 2 every three seconds. Numbers '1' and '2' in the upper left corner of the display indicate which reading is displayed. Before the display changes to show the other probe's temperature, both probe inputs are sampled.
MIN °F 32.0	Latest min and max temperature values. The min and max temperatures on the display are checked every time a new sample is taken. The min and max on the display are a daily min and max and every 24 hours from power up the daily min and max will be cleared and replaced by the first sample of the next 24 hour period.
MAX °F 40.0	

Item	Description
MIN %RH 75.0	Latest min and max relative humidity values. The min and max relative humidity on the display are checked every time a new sample is taken. The min and max on the display are a daily min and max and every 24 hours from power up the daily min and max will be cleared and replaced by the first sample of the next 24 hour period. <i>Temperature and Humidity sensors only.</i>
MAX %RH 60.0	
dIS	One of the probes is disconnected from the device. If the probe was never plugged in since power up, no min or max will be shown until a probe is connected, though the device will continue to check in with the AMP at its normal interval. <i>Temperature sensors only.</i>
LO	Temperature below -40 °C. No temperature sample is taken or stored, though the device will continue to check in with the AMP at its normal interval. If the temperature drops much further below -40 °C the display will change from LO to SHr . <i>Temperature sensors only.</i>
HI	Temperature above 90 °C. <i>Temperature sensors only.</i>
SHr	One of the probe inputs is shorted. No temperature sample is taken or stored, though the device will continue to check in with the AMP at its normal interval. If the probe input was short since power up, no min or max will be displayed until the short is removed. <i>Temperature sensors only.</i>
CON	Device is in configuration mode.
LO AC (Appears instead of MIN/MAX or %RH)	Device is running on backup power. When running on backup power, the device slows its display rate and probe sampling rate down from every three seconds to every 15 seconds to conserve power. To save power, the radio, LED, and buzzer are never turned on in this mode.

LED

The LED has several meanings depending on the status of the sensor device.

- When an alarm is active, the LED on AC-powered sensors flashes once per second. Pushing the service button when the LED is flashing stops the flashing but does not acknowledge the alarm on the AMP.
- When in Find mode, the LED flashes rapidly 3 times per second. For information on Find mode, see the SNS Temperature and Humidity Sensors User Guide.
- When powered up, the LED illuminates briefly.

Beeps

When the service button is pushed during normal operation, the sensor device emits two beeps and activates the radio to contact the AMP. Once a successful exchange with the AMP occurs, the device sounds the following series of beeps:

- 1 beep indicates that the radio booted.
- 2 beeps indicate that the sensor device has connected to network.
- 3 beeps indicate that the sensor device has connected to the AMP. Connecting to the AMP usually takes about 25 seconds assuming a standard wireless connection with WPA2 security.

Buzzer

AC-powered sensor devices are equipped with an alarm buzzer. When an alarm is active, the buzzer sounds continuously, if Enable Audio Alerts is enabled (checked) on the sensor device's Edit Sensor Device page in the AMP. Pushing the service button when the buzzer is sounding silences the buzzer but does not acknowledge the alarm on the AMP.

Monitoring Thresholds

AC-powered sensor devices permit you to set temperature and humidity monitoring thresholds. If the thresholds are exceeded or, depending on the configuration, exceeded for a period of time, the sensor device enters an alarm state. To set monitoring thresholds and download them to the sensor device, you edit sensor device information on the AMP. See the SNS Temperature and Humidity Sensors User Guide for information on editing AC-powered sensor devices, including monitoring thresholds.

Operational Sequences

Turn on the Sensor Device

Plugging in an AC-powered sensor turns the device on. When the device is first powered up, it will turn on all of the LCD digits and the red LED. After 1 second, the display will briefly blank out and the LED will be turned off. The device will then read all of its configuration data out of non-volatile memory. If the device has never checked into an AMP, the default settings will be used. The default settings are:

- Check-in Interval: 1 hour
- Temperature Display: Fahrenheit
- Alarms: None

After the configuration data is loaded, both probes inputs are sampled and the display begins showing the temperature. The device then turns on its radio and proceeds to communicate with the AMP.

Normal Operation

Single probe temperature sensor devices update the probe reading every three seconds. Dual probe temperature sensor devices alternate between showing the temperature of probe 1 and probe 2 every three seconds, while temperature and humidity sensor devices alternate between showing temperature and humidity every three seconds. Before the display changes to show the other reading, both inputs are sampled. The min and max temperatures on the display are checked every time a new temperature sample is taken. The min and max on the display are a daily min and max and every 24 hours from power up the daily min and max will be cleared and replaced by the first sample of the next 24 hour period.

Check-in with the AMP

The sensor device checks in with the AMP at regular intervals (default 1 hour), starting when the device is powered up. If a check in with the AMP fails, the information is stored in non-volatile memory. The non-volatile memory is capable of storing 2046 readings. If the number of failed check-ins exceeds the size of the non-volatile memory, the oldest readings are overwritten. Any data stored in non-volatile memory will be lost if the device loses both AC and backup power.

Pushing the service button during normal operation forces the sensor device to check in with the AMP. When the service button is pressed, the sensor device will emit a series of beeps. The beeps signal the following connection sequence: 1= radio booted, 2 = connected to network, 3 = connected to the AMP (usually takes about 25 seconds to hear the beep assuming a standard wireless connection with WPA2 security).

Configuration Mode

Holding the button down while plugging the device in causes the device to enter configuration mode, regardless of whether it has been configured previously. While in configuration mode, you can perform browser-based configuration. When the device first enters configuration mode, it beeps once. This beep indicates to the user that they can take their finger off the button. While in configuration mode, the device flashes CON for one second and then goes blank for the next second. The sensor device continues to flash CON while in configuration mode. See Configure Sensors for the Network on page 25 for information on configuration.

Handle Alarms

When an alarm is active, the LED on the front of the sensor device flashes once per second and the buzzer sounds continuously, if Enable Audio Alerts is enabled (checked) on the sensor device's Edit Sensor Device page in the AMP.

If an alarm is active (LED is flashing), pushing the button cancels the alarm and stops the LED from flashing, but does not acknowledge the alarm on the AMP. Pushing the button during an alarm also does not sound the beeper or cause the sensor device to check in with the AMP.

The behavior of the sensor device after cancelling an alarm depends on how the device is configured in the sensor device's Edit Sensor Device page:

- If a threshold has been exceeded with High Span Minutes blank and Audio Reset Period set at Indefinite, pushing the button cancels the alarm and an alarm will not occur again until the sensor goes back in range and then out of range again.
- If a threshold has been exceeded with the Audio Reset Period is configured but High Span Minutes is blank, the alarm does not sound again until the Audio Reset Period expires.
- If a Span Minutes has been exceeded, pushing the button cancels the alarm. If the device remains out of range and if an Audio Reset Period is configured, the alarm will not sound again until the Audio Reset Period expires.
- If a Span Minutes has been exceeded, pushing the button cancels the alarm. If an Audio Reset Period is not configured, the alarm sounds again once Span Minutes runs out a second time.

Backup Power

AC-powered sensor devices have an internal super cap that allows the devices to continue to do many of their functions during an AC power outage. It normally takes about 8 hours to fully charge a super cap. Once fully charged, an AC-powered sensor device should be able to run on backup power for up to 4 hours.

All data being collected by the probes is stored in non-volatile memory. This data will be lost if backup power fails. If AC power is restored before backup power fails and the temperature stayed within the set limits, all of the readings will be sent to the AMP as a single check in with the current temperature for the entire duration of the power outage. If a high or low limit is crossed while running on backup power, the data will be saved to non-volatile memory with a timestamp. This

data will be erased in the event that backup power fails. If it does not fail, these archived readings will be sent to the AMP as well as current temperature readings when AC power is restored so that you may see when temperatures went in and out of limits and for what duration. In the AMP Sensor Readings page, archived readings appear with a check mark in the Logged Readings column and have the same Transmit Count as the current reading.

Features of SNS Battery-powered Sensor Devices

This section contains the following topics:

- [On/Off Switch](#)
- [Batteries](#)
- [Programming Cable Connection](#)
- [Probe Connections](#)
- [Service Button](#)
- [Visual and Auditory Interfaces](#)
- [Monitoring Thresholds](#)
- [Operational Sequences](#)

On/Off Switch

Battery-powered sensor devices have on/off switches. The sensor devices must be turned on during configuration and normal operation. As shown in Figure 4, the on/off switch on model SNS2TNS-2 is located inside the sensor device. On this model, moving the switch away from the programming cable connection turns the sensor device on. On model SNS2TPS-2, the on/off switch is located in the battery compartment, as shown in Figure 5. On model, SNS2THS-2, it is on the side (Figure 6).

Figure 4: Inside Model SNS2TNS-2

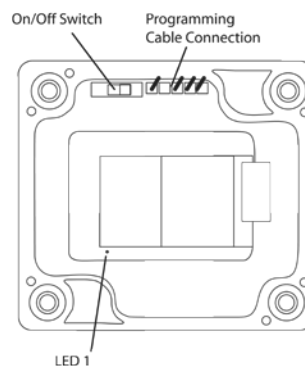


Figure 5: On/Off Switch Model SNS2TPS-2

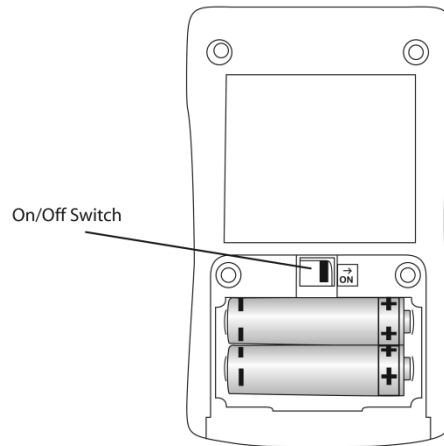
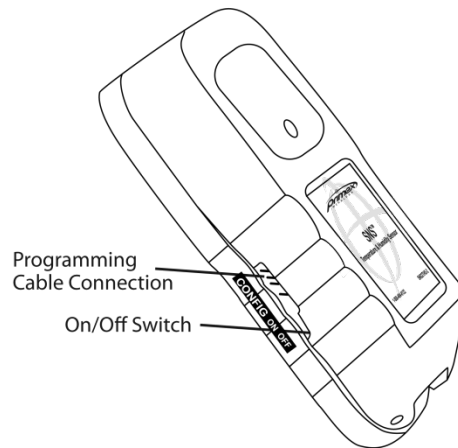


Figure 6: Side of Model SNS2THS-2



Batteries

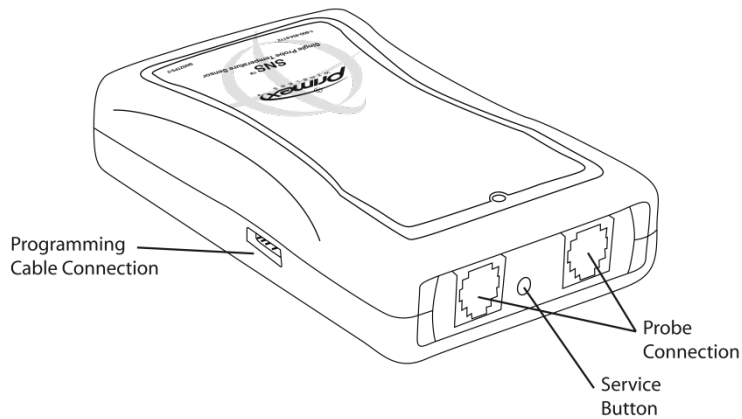
SNS battery-powered sensors use two AA batteries located inside the sensor (Model SNS2TNS-2, Figure 4; Model SNS2TPH-2, Figure 12) or in an externally accessible battery compartment (Model SNS2TPS-2, Figure 5).

Programming Cable Connection

Battery-powered sensor devices come with a USB programming cable for use when configuring the sensor device. The standard USB connector connects to the computer that is running the configuration software utility. The other end of the programming cable connects to the sensor device's programming connection. For information on configuring sensors, see *Configure Sensors for the Network* on page 25.

As shown in Figure 4, Figure 6, and Figure 7, the location of the programming cable connection depends on the sensor model.

Figure 7: Connections and Service Button on Model SNS2TPS-2



Probe Connections

Single and dual external probe sensor devices contain probe jacks on the end of the sensor device, as shown in Figure 7.

Service Button

The service button is located on the side or end of the sensor device, depending on the model (See Figure 7 and Figure 9). As shown in Figure 8, on model SNS2TNS-2, the service button is inside the sensor device. On this model, the service button is activated by swiping the outside of the sensor device with the supplied magnet.

Figure 8: Service Button on Model SNS2TNS-2

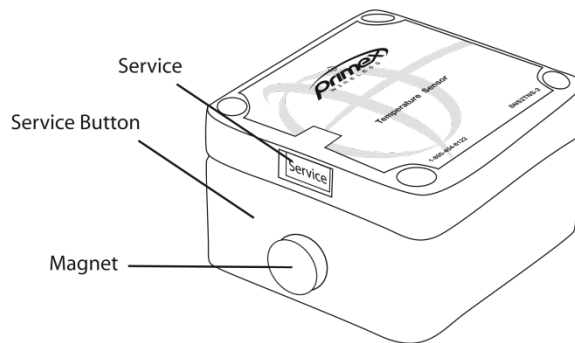
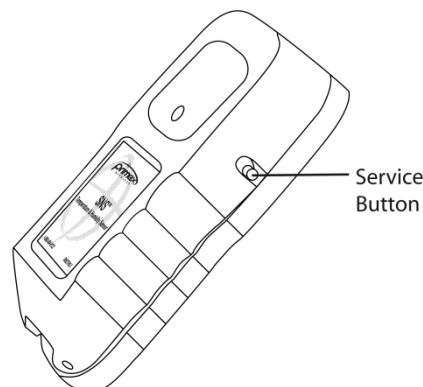


Figure 9: Service Button on Model SNS2THS-2



The service button has several uses depending on the status of the sensor device.

- Activating the service button causes the sensor device to check in with the AMP.
- During an alarm, activating the service button cancels the alarm and stops the LED from flashing but does not acknowledge the alarm on the AMP. Activating the service button during an alarm also does not sound the beeper or cause the sensor device to check in with the AMP.

Visual and Auditory Interfaces

LEDs are visual indicators of sensor device status and sensor readings. The sensor device also communicates its status using beeps.

LEDs

Sensor devices have an LED visible from outside the sensor that indicates sensor status, as shown in Figure 10. Sensor devices also have an internal LED that may be useful for troubleshooting, as shown in Figure 4, Figure 11, and Figure 12.

Figure 10: External Red LED Models SNS2TNS-2, SNS2TPS-2, and SNS2THS-2

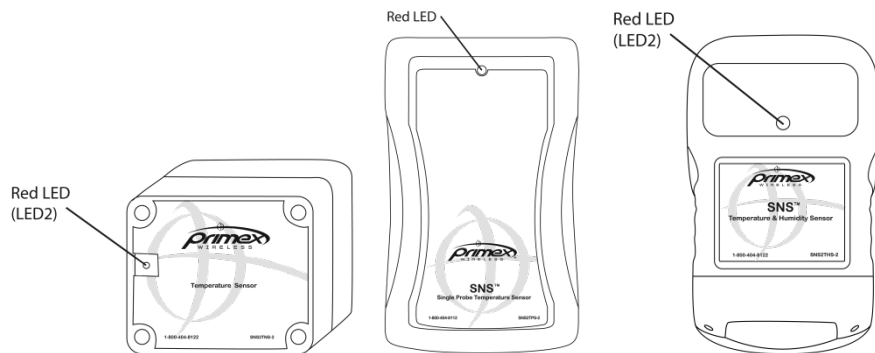


Figure 11: Inside Model SNS2TPS-2

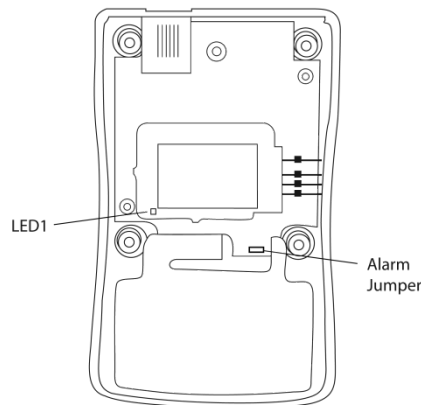
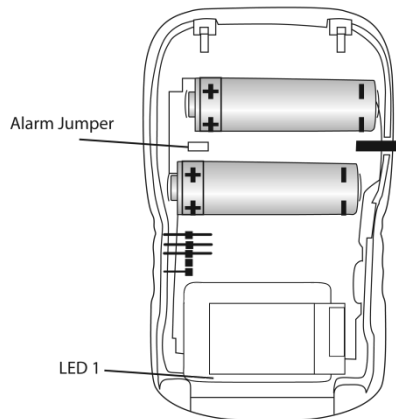


Figure 12: Inside Model SNS2THS-2



The red LED flashes to alert when the sensor device detects that a threshold that is programmed in the device has been exceeded. The red LED also indicates that a transmit attempt has just finished. The internal green LED indicates that the sensor device is connected to a network. When in sensor mode, the green LED will flash when a connection is made. When in setup mode (the programming cable is connected to the sensor), the green LED will remain on continuously when a connection is established. In setup mode, the red LED never comes on.

Beeps

When the service button is pushed, the sensor device beeps.

The sensor device also beeps when monitoring thresholds are set in the sensor device and the device enters (and exits, depending on the configuration) an alarm state. If you do not want to hear alarm beeps, remove the alarm jumper. The alarm jumper is located inside the sensor device, as shown in Figure 4, Figure 11, and Figure 12.

Monitoring Thresholds

During configuration, battery-powered sensor devices permit you to set temperature and humidity monitoring thresholds in the AMP or in both the AMP and the sensor device itself. In order to achieve maximum benefit from SNS battery sensors, careful thought should be given to where alarm thresholds are set as well as the frequency with which sensor devices report readings to the AMP.

If thresholds are set in the AMP, but not in the sensor device, the alarm state is not detected until the sensor device transmits scheduled readings to the AMP and the AMP recognizes that a reading is out of limits. Depending on how frequently the sensor device is configured to transmit readings to the AMP, a period of time may elapse before the AMP creates an alert for the out-of-range condition.

If thresholds are set in the sensor device and these thresholds are exceeded or, depending on the configuration, exceeded for a period of time, the sensor device enters an alarm state and transmits readings to the AMP. However, thresholds set in the sensor device can only be changed on a device-by-device basis through reconfiguration.

Set Monitoring Thresholds to Prevent Loss of Sensitive Assets

If you have sensitive assets such as blood, medications, or tissues, you can set up the sensor devices to report readings as many as 15 times per hour and to generate alerts and send notifications as soon as thresholds are reached.

Be sure that settings are configured both in the sensor device and in the AMP sensor device page.

In this scenario, you will set the sensor's transmit period to a shorter time, and edit the sensor device's reporting period to the same number of minutes as the transmit period.

Note: Shorter transmit periods (more frequent transmissions) shorten battery life and increase network load.

Then, you will use the Battery Sensor Software Configuration utility to set the transmit period in the sensor devices. You will also set the alarm thresholds in the sensor device. If the sensor device detects that a threshold has been exceeded the LED will flash and the sensor will transmit a reading to the AMP, where an alert will be active. See Appendix B: Battery Sensor Configuration Utility on page 57 for instructions on setting these alarm thresholds.

Note: Thresholds configured in the sensor device using the Battery Sensor Software Configuration utility can only be changed using the utility. If you relocate the sensor device, for example, moving it from a refrigerator to a freezer, you will need to reconfigure the device using the utility.

Operational Sequences

Turn on the Sensor Device

Place the on/off switch in the 'on' position to turn on the sensor device.

Normal Operation

When the USB Programmer is not plugged into the sensor and the sensor is powered on, the sensor is in Sensor mode. The sensor spends most of its time in this mode in a very low power state (sleep). When a transmit period is due, it powers up the Wifi radio, attempts to link to the specified wireless network, transmits its data and then goes back to sleep.

The sensor transmits based on a transmit period or entering an alarm state. The sensor will go through following steps in order to connect to a network and deliver data:

1. Associate
2. Authenticate (depends on the type of security)
3. Request IP from DHCP Server (if set to dynamic IP)
4. Request from Name Server IP address of hostname (if a hostname is used for the Destination address and DNS Server specified).
5. Sensor sends UDP packet with sensor data.
6. Host sends UDP acknowledgement packet.

Check-in with the AMP

The sensor will initiate a delivery attempt to the AMP, known as a 'try', repeatedly (typically every 30 seconds) until either an acknowledgement is received from the host or the number of tries has been exhausted. If no acknowledgement is received, the sensor device will stop transmitting and wait for the next transmit period or when an alarm is triggered. The sensor follows this delivery mechanism for both when the transmit period arrives or for alarm attempts.

When specifying the setup parameters for a sensor, you must give careful consideration to the needs of your application and battery life. The more often the sensor transmits data because of the transmit period, alarms, or retries, the shorter the battery life. It is recommended that you use the alarm function to transmit sensor data of concern and extend the transmit period to lengthen the battery life of the sensor. If you plan on using DHCP or DNS, it is best to use local DHCP and DNS servers rather than a DNS Server on the internet. The local servers will give better response times compared to the remote servers and thus conserve battery life.

Setup Mode

If the USB Programmer is connected to the sensor, the sensor is in Setup mode. When in Setup mode and configured properly, the sensor attempts to connect to the network and will remain connected to the network. The sensor will not send sensor data when in this mode.

Handle Alarms

If alarms are configured in the sensor device, pressing the button cancels the alarm on the sensor device.

Change Batteries

The sensor device has a built-in battery meter. This meter is based on a count of the sensor device transmissions. This battery information is only an estimate of the remaining battery life. The Battery Sensor Configuration Utility shows the estimated battery expiration and the estimated battery life percentage in the Status page. Refer to Figure 22: SNS Battery Sensor Configuration Utility Status Tab on page 44 and Table 14: SNS Battery Sensor Configuration Utility Status Tab Fields and Values on page 45.

When changing batteries, be sure to replace both batteries and reset the battery. See Replace Batteries in Battery-powered Sensor Devices on page 49.

Configure Sensors for the Network

Regardless of the type of sensors deployed in your SNS Temperature and Humidity sensor network, each sensor device must be configured with the settings of the wired or wireless network in which it will be used. This section covers the following topics:

- [Select the Configuration Method](#)
- [Edit Default Sensor Profiles](#)
- [Configure AC-powered Sensors using Discovery and Auto-Configuration](#)
- [Set up the Network Connection](#)
- [Configure AC-powered Sensors using Browser-based Configuration](#)
- [Configure Battery-powered Sensors with the Sensor Configuration Utility](#)

Select the Configuration Method

Several methods exist to configure sensor devices. The configuration method you choose depends on several factors such as the type of sensor and the availability of the network at the time of configuration. Table 7 shows the applicability of each method. All methods assume that the sensor is configured with the latest Primex Wireless firmware and that the Default Profile has been set up on the AMP. For information on the Default Profile, see Edit Default Sensor Profiles on page 25.

Table 7: Sensor Configuration Methods

Configuration Method	Supported Sensors	Does NOT Support	Requirements
Discovery and Auto-Configuration	AC-powered Sensors	Battery-powered Sensors	SNS AMP has been installed and you have a network connection available on the same subnet that the AMP is on.
Browser-based Configuration	AC-powered Sensors	Battery-powered Sensors	Direct connection to a laptop. Laptop must be DHCP enabled or use a static IP on the 192.168.1.x network excluding 192.168.1.1 with a subnet mask of 255.255.255.0.
Sensor Configuration Software Tool	Battery-powered Sensors	AC-powered Sensors	Battery-powered sensor configuration utility is installed and you can connect the USB programming cable to the computer. To verify that sensor devices can connect, need to be within range of wireless network with the AMP.

Edit Default Sensor Profiles

The Sensor Device Default Profiles page lists the default sensor profiles that the AMP has available for various sensor models. The Sensor Default Profile includes the network and time interval settings for sensors on your network as well as default ranges that the sensor will monitor. For AC-powered sensors, the default profile is downloaded to the sensors during configuration or when sensors check in with the AMP. For battery-powered sensors, in which the configuration is set

directly in the sensor, the Sensor Default Profile is used to create the AMP information for each device.

The first step in configuring sensors is to edit the Sensor Default Profile for your sensor model. Table 8 shows which default profile to edit for each sensor model.

Note: To edit the Sensor Default Profile, you must be logged in to the SNS AMP as a user with the Sensor Admin role.

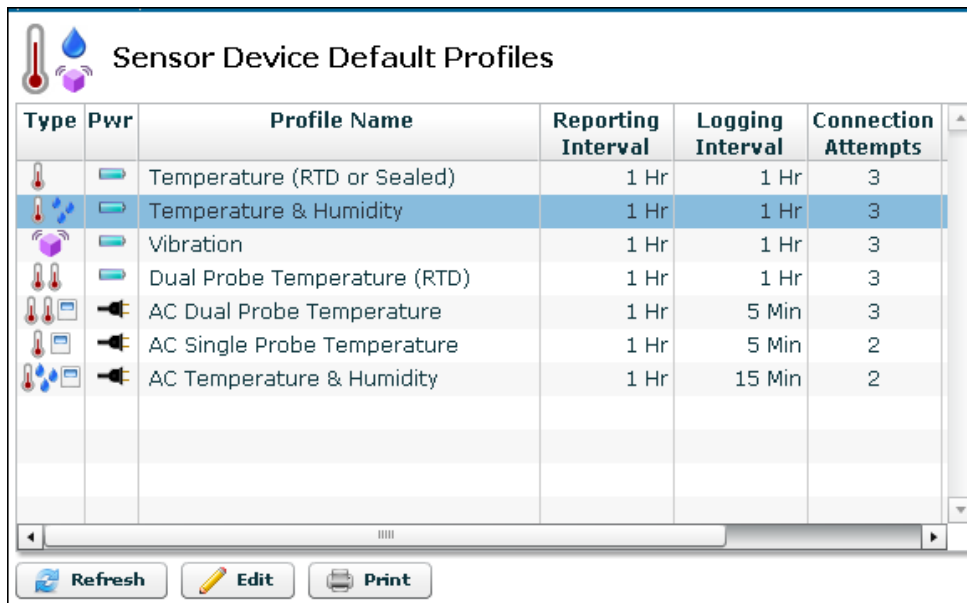
Table 8: Sensor Model Default Profiles

Sensor Model	Default Profile
Single Channel AC-powered Temperature Sensor (SNSATPS, SNSCTPS, SNSGTPS)	AC Single Probe Temperature
Dual Channel AC-powered Temperature Sensor (SNSATPD, SNSCTPD, SNSGTPD)	AC Dual Probe Temperature
AC-powered Temperature and Humidity Sensor (SNSATHX, SNSCTHX, SNSGTHX)	AC Temperature & Humidity
Temperature Sensor, Dual Battery (SNS2TPS-2)	Temperature (RTD or Sealed)
Temperature Sensor, Dual Battery, Dual Channel (SNS2TPD-2)	Dual Probe Temperature (RTD)
Sealed Temperature Sensor, Dual Battery (SNS2TNS-2)	Temperature (RTD or Sealed)
Temperature and Humidity Sensor, Dual Battery (SNS2THS-2)	Temperature and Humidity

Editing the Sensor Device Default Profile

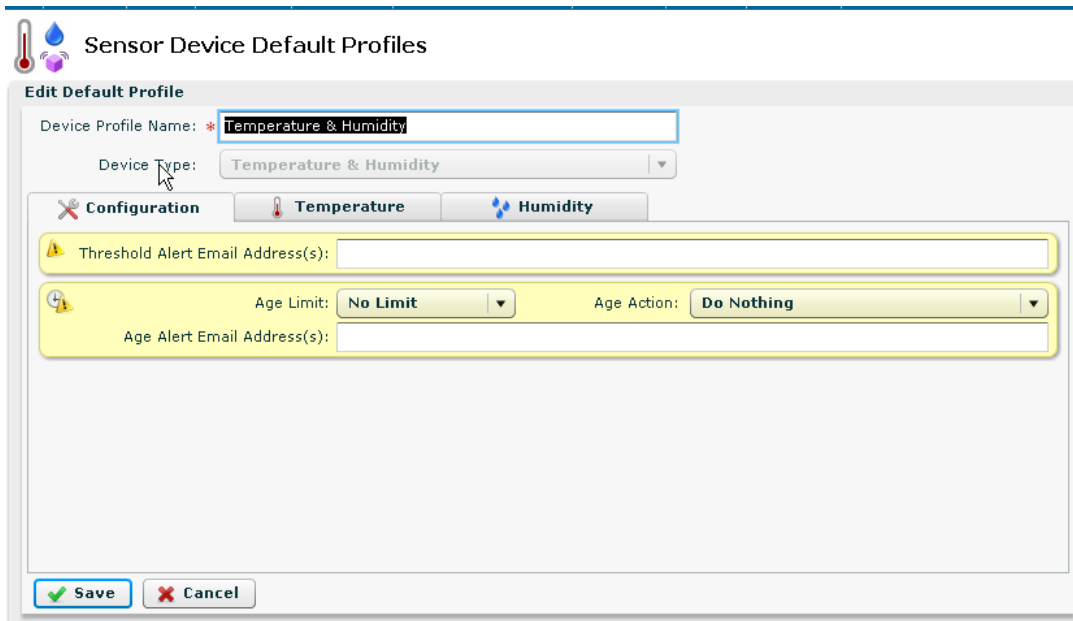
- From the **AMP Dashboard**, select **Sensors > Default Profile**. The Sensor Device Default Profiles page appears.

Figure 13: Sensor Device Default Profiles Page



- To change the settings for the profile, select the profile for your sensor model from the list and click **Edit**. Refer to Table 8 for the default profile for your sensor model. You will see the Edit Default Profile dialog box for the default profile.

Figure 14: Sensor Device Default Profiles Page for the Battery-powered Temperature and Humidity Sensor



3. Enter the profile information on the tabs appropriate to the default profile. For a description of the fields, see Table 9.

Note: If the Network Settings are blank, this means that they have not been set up in the SNS AMP software. For information on configuring the AMP software, refer to the SNS AMP Installation and Administration Guide.

4. Click **Save**. The Sensor Device Default Profiles page reappears.

Sensor Device Default Profile Settings

Table 9 describes the Default Profile settings for all default profiles. The fields you see in the AMP depend on the default profile you are editing.

Table 9: Sensor Device Default Profile Fields and Values

Note: Items marked with an asterisk “*” are mandatory.

Item	Description
*Device Profile Name	The name of the device default profile.
Device Type	The type of sensor device.
Configuration Tab Fields and Values	
Out-of-Range Email Address(s)	Enter one or more email addresses (maximum 500 characters) separated by semi-colons for the AMP to send notifications if conditions monitored by the sensor exceed the specified threshold. High Threshold, Low Threshold, High Span Exceeded, or Low Span Exceeded alerts must be enabled in order for the AMP to send the Out-of-Range notification. This user receives email in addition to anyone whose email address is defined for the specific alerts. Out-of-Range Email notification is generally sent to on-call pager/email, e.g., helpdesk or security.
Enable Audio Alert	Enable (check) the Enable Audio Alert checkbox to instruct the device to sound the buzzer when in an alarm state. (AC-powered sensor devices only)

Item	Description
Audio Reset Period	<p>Interval from the time the alarm is cleared at the device by pressing the service button before the device again displays the alarm if the alarm condition persists. At the end of the Audio Reset Period the LED will begin to flash again if the alarm condition persists, even if Enable Audio Alert is disabled (unchecked).</p> <p>Your choices are: Indefinite 15 or 30 minutes 1, 2, 3, 4 hours <i>(AC Single and Dual Probe Temperature sensor devices only)</i></p>
Not Reporting Limit	<p>Maximum time that the sensor can go without checking in with the AMP before notification is sent. If this setting is exceeded, the AMP generates the Not Reporting alert if this alert is enabled.</p> <p>Your choices are: No Limit; 30 minutes; 1 Hour; 2 Hours; 3 Hours; 4 Hours; 6 Hours; 8 Hours; 12 Hours; 16 Hours; 1 day</p>
Not Reporting Email Address(s)	<p>Enter one or more email addresses (maximum 500 characters) separated by semi-colons for the AMP to send notifications if the Not Reporting Limit is exceeded. The Not Reporting alert must be defined in order for the AMP to send the Not Reporting notification. This user receives email in addition to anyone whose email address is defined for the specific alerts. Not Reporting notification is generally sent to the IT person who can repair, replace or reprogram the sensor device.</p>
Reporting Interval	<p>This field indicates how often the sensor device reports status to the AMP. Your choices are: Every: 4, 5, 10, 15, 20, 30 minutes, 1, 2, 4, 8, 12 hours</p> <p>Note: For battery-powered sensors, this should be the same as the Transmit Period configured in the sensors.</p> <p>Note: AC-powered sensors (and battery-powered sensors with internally configured alarms) also report to the AMP when a threshold or span is exceeded or if the temperature comes back into range. AC sensors also check in with the AMP if power is lost and then restored. All sensors check-in with the AMP if the service button is pushed by the user during normal operation.</p>
Logging Interval	<p>This field indicates how often the sensor device saves its readings, and is separate from the interval at which the device accesses the network to report readings. If the logging interval is enabled in the sensor and set shorter than the reporting (transmit) interval, the sensor device will report multiple readings per check-in, but will check in less frequently for the same amount of data, thus saving the battery life.</p> <p><i>(Battery-powered sensor devices only)</i></p>
Connection Attempts	<p>Choose the number of attempts, 1-5, the device makes to connect to the AMP for its regularly scheduled reporting. If the device fails to connect after this number of attempts, it waits until its next regularly scheduled report time.</p> <p><i>(Battery-powered sensor devices only)</i></p>

Item	Description
Temperature, Temperature 1, and Temperature 2 Tabs Fields and Values	
*Reading Name	Enter a name for the reading from the temperature probe attached to this device in the Reading Name field.
Temperature Units	Choose the units of measure to be used for the temperature reported by this sensor, either Celsius or Fahrenheit
Max. Graph Value	Enter the maximum temperature value you want displayed when data from this sensor is graphed in the Sensor Readings page. You can override these values while viewing the graph and set the graph to auto-scale, but any exports to Excel will always use the configured Max value.
Min. Graph Value	Enter the minimum temperature value you want displayed when data from this sensor is graphed in the Sensor Readings page. You can override these values while viewing the graph and set the graph to auto-scale, but any exports to Excel will always use the configured Min value.
High Temperature Threshold	<p>In the High Temperature Threshold, enter a value in degrees for the temperature (↑) at which the measured temperature exceeds the maximum allowed temperature. Going above this value triggers an alarm. If you configure a high temperature limit but not a span, when the limit is crossed the sensor device notifies the AMP. (AC-powered sensors also begin flashing the red LED and sounding the buzzer, if it is configured to sound.)</p> <p>Note: If you are concerned with exceeding a high threshold, only set the high threshold and leave the low threshold blank. Entering any value in a threshold field causes the sensor to report a reading for that field which unnecessarily drains the battery and may degrade performance of the AMP.</p>
High Span Minutes	The amount of time that the temperature needs to be above the high limit before an alarm is triggered. In the High Span Minutes field, enter a number of minutes to define the high span for this sensor reading. If the temperature remains above the High Temperature value for more than this number of minutes, or the last known reading is older than the high span minutes, a high span event has occurred. The span should not be less than the reporting interval. (AC-powered sensors also begin flashing the red LED and sounding the buzzer, if it is configured to sound.) Leaving this field blank will cause an alarm to trigger immediately when the high threshold is reached.
Low Temperature Threshold	<p>In the Low Temperature field, enter a value in degrees for the temperature (↓) at which the measured temperature falls below the minimum allowed temperature. Dropping below this limit triggers an alarm. If you configure a low temperature limit but not a span, when the limit is crossed the sensor device notifies the AMP. (AC-powered sensors also begin flashing the red LED and sounding the buzzer, if it is configured to sound.)</p> <p>Note: If you are concerned with exceeding a low threshold only set the low threshold and leave the high threshold blank. Entering any value in a threshold field causes the sensor to report a reading for that field which unnecessarily drains the battery and may degrade performance of the AMP.</p>

Item	Description
Low Span Minutes	The amount of time that the temperature needs to be below the low limit before an alarm is triggered. In the Low Span Minutes field, enter a number of minutes to define the low span for this sensor reading. If the temperature remains below the Low Temperature value for more than this number of minutes, or the last known reading is older than the low span minutes, a low span event has occurred. The span should not be less than the reporting interval. (AC-powered sensors also begin flashing the red LED and sounding the buzzer, if it is configured to sound.) Leaving this field blank will cause an alarm to trigger immediately when the low threshold is reached.
Humidity Tab Fields and Values (<i>Temperature & Humidity Sensors Only</i>)	
Reading Name	Enter a name for the reading from the humidity probe in the Reading Name field.
Max. Graph Value	Enter the maximum humidity value you want displayed when data from this sensor is graphed.
Min. Graph Value	Enter the minimum humidity value you want displayed when data from this sensor is graphed.
High Humidity Threshold	In the High Temperature field, enter a value for the humidity (↑) at which the measured humidity exceeds the maximum allowed humidity.
High Span Minutes	In the High Span Minutes field, enter a number of minutes to define the high span for this sensor reading. If the humidity remains above the High Humidity value for more than this number of minutes, or the last known reading is older than the high span minutes, a high span event has occurred. The span should not be less than the reporting interval.
Low Humidity Threshold	In the Low Humidity field, enter a value in degrees for the humidity (↓) at which the measured humidity falls below the minimum allowed temperature.
Low Span Minutes	In the Low Span Minutes field, enter a number of minutes to define the low span for this sensor reading. If the humidity remains below the Low Humidity value for more than this number of minutes, or the last known reading is older than the high span minutes, a low span event has occurred. The span should not be less than the reporting interval.
Network Settings Fields and Values (<i>AC-powered Sensors Only</i>)	
Note: Discovery and Auto-Configuration uses DHCP. After configuring the sensor device, you can edit its settings to assign it a static IP address. If DHCP is not an option, configure sensors using Browser-based Configuration and add the sensor device on the AMP with a static IP address before configuring it.	
*Access AMP Using:	(Device Settings) You may access the AMP via an internal or external IP address. Internal IP address External IP address
AMP Alternate 1	(Optional) Select an alternate access method: Internal or External IP address.
AMP Alternate 2	(Optional) Select an alternate access method: Internal or External IP address.

Item	Description
Message Retries	Sensors use UDP (User Datagram Protocol) to communicate with the AMP server. UDP does not provide guaranteed delivery, so the sensors can be set to retransmit unacknowledged messages from 1 to 4 additional times before giving up and saving the data to report the next time the sensor connects to the network.
Retry Period	Sensors can be configured to wait from 5 to 60 seconds before trying to re-send an unacknowledged message to the AMP. Typically 5 seconds is more than sufficient, but longer wait periods can be used if desired on networks with bursts of high activity.
Wireless Network Settings 1	Each sensor device can be configured to use up to three different wireless network settings, allowing for backups and fail-over scenarios. If using a wireless network, the first network setting is required. Select from the list of networks configured for the AMP.
Wireless Network Settings 2	For the optional, alternate wireless network, select from the list of networks configured for the AMP.
Wireless Network Settings 3	For the optional, alternate wireless network, select from the list of networks configured for the AMP.

Configure AC-powered Sensors using Discovery and Auto-Configuration

Discovery and Auto-Configuration is the preferred method for configuring AC-powered sensor devices. During Discovery and Auto-Configuration, you connect the sensor device to the network. The MAC address of the sensor device is transferred to the AMP, and the AMP downloads the Default Profile as the information by which the device operates as part of the network. If the SNS AMP has been installed and you have a network connection available on the same subnet that the AMP is on, you can use Discovery and Auto-Configuration to configure AC-powered sensors.

Note: **Discovery and Auto-Configuration assumes that sensor devices connect to the network using DHCP. After sensor devices are recognized on the AMP, you can edit the network settings for each sensor device to assign it a static IP address. If DHCP is not an option, configure sensors using Browser-based Configuration and add the sensor device on the AMP with a static IP address before configuring it. Otherwise, when the sensor checks in after being configured, the AMP will see it as an “unknown” new sensor and will use the default profile to configure it, which will wipe out the static IP address configured in the sensor. See the SNS Temperature and Humidity Sensors User Guide for information on editing a sensor device.**

Guidelines

Before you begin be sure that the following items are available:

- Default Profile configured for your network on the AMP. See Edit Default Sensor Profiles on page 25.
- A network connection on the same subnet as the AMP
- Ethernet cable

Configuring AC-powered Sensors Using Discovery and Auto-Configuration (Same Subnet as the AMP)

1. Connect the temperature probe to the sensor in the available Sensor Probe jack.
2. Connect one end of the Ethernet cable to the RJ45 port on the side of the sensor device, as shown in Figure 2. Connect the other end of the Ethernet cable to the network on the same subnet as the AMP.
3. Plug the AC adapter for the sensor device into a power source.
4. Plug the AC adapter into the sensor device. The sensor device will display all the segments and then go blank briefly before displaying the temperature.
5. When the sensor display shows the temperature, push and immediately release the button on the front of the sensor. The sensor will emit a series of beeps. The beeps signal the following connection sequence: 1= radio booted, 2 = connected to network, 3 = connected to the AMP.
6. Check the AMP to confirm that the sensor device has checked in. The sensor device appears in the Sensor Devices list with the MAC address in brackets in the Name column. Double-click on the sensor device in the Sensor Devices list to edit information for the sensor, for example, change the name to something meaningful. Refer to the SNS Temperature and Humidity Sensors User Guide for details on editing sensor device information on the AMP.
7. Disconnect the Ethernet cable from the sensor.
8. The Sensor Default Profile is stored in the sensor's non-volatile memory, so you can unplug and move the sensor device to its installation location.

Note: Verify that the first sensor device you configure checks in with the AMP with the correct settings before configuring additional sensors. The first sensor device does not check in or the settings are not correct, troubleshoot the problem or correct the default profile before configuring additional sensors.

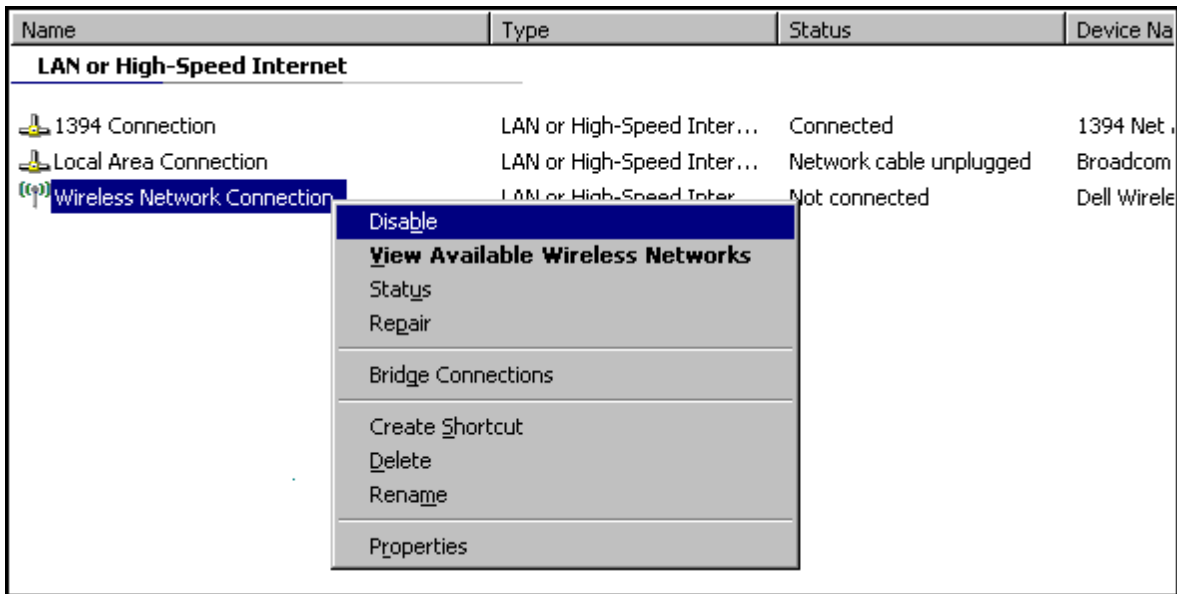
Set up the Network Connection

During Browser-based Configuration, the AC-powered sensor device must communicate with your computer. Follow these steps to prepare your computer to communicate AC-powered sensor devices.

Setting up the Network Connection

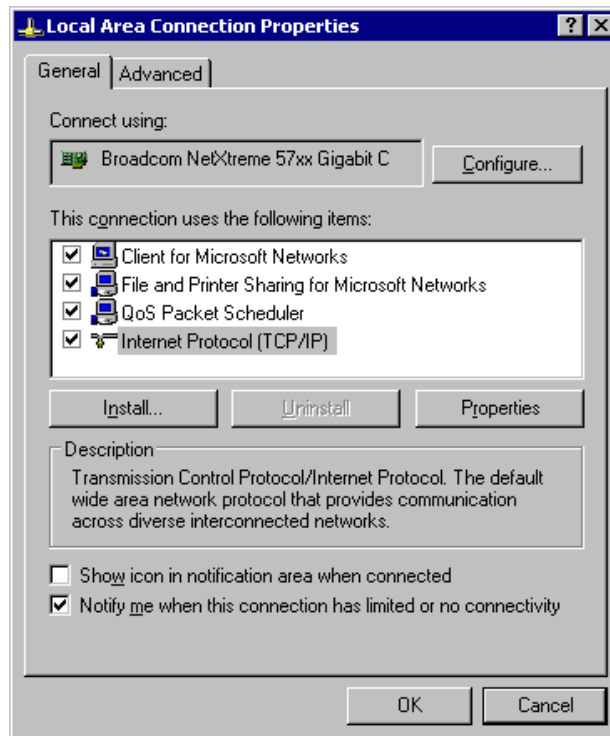
1. From the Windows **Start** button, select **Settings>Control Panel>Network Connections**. A Network Connections window, similar to Figure 15, opens with LAN or High-Speed Internet information.

Figure 15: Network Connections Window



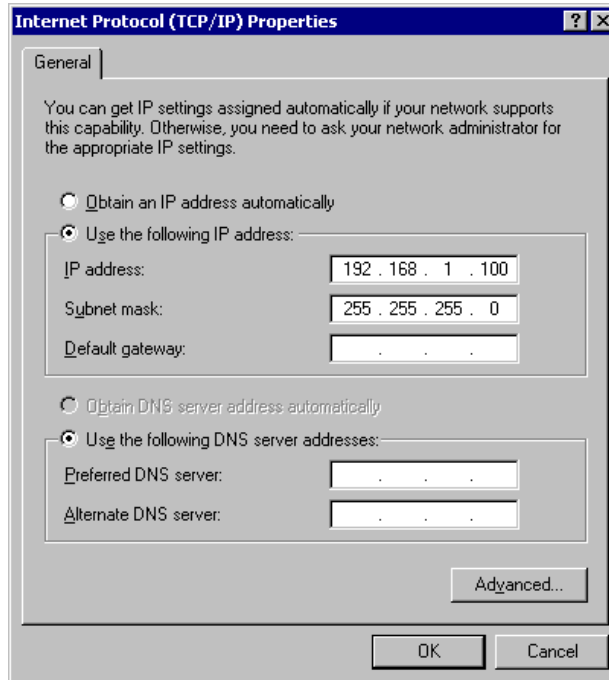
2. If your computer has a wireless network card, right-click the **Wireless Network Connection** item and choose **Disable** on the context menu displayed.
3. Right-click the **Local Area Connection** item and choose **Properties** on the context menu. You will see the **Local Area Connection Properties** dialog box, as shown in Figure 16.

Figure 16: Local Area Connection Properties Dialog Box



- On the **General** tab under “This connection uses the following items” list, select the **Internet Protocol (TCP/IP)** item, and then click the **Properties** button. You will see the Internet Protocol (TCP/IP) dialog box, as shown in Figure 17.

Figure 17: Internet Protocol (TCP/IP) Properties



- Choose the **Use the following IP address** option button, and enter the following information:
 - In the **IP address** field, enter 192.168.1.100.
 - In the **Subnet Mask** field, enter 255.255.255.0.
- Click the **OK** button to accept the IP address changes and return to the Local Area Connection Properties dialog box.
- Again, click the **OK** button to accept the changes, close the dialog box, and return to the Network Connections window.
- Close the Network Connections window.

You are now ready to physically connect the AC-powered sensor device to the computer for browser-based configuration.

Configure AC-powered Sensors using Browser-based Configuration

In the event that you cannot connect the sensor to the network on the same subnet as the AMP, for example, if you are configuring sensors for use in a newly constructed building without a network, or you are configuring the sensors at a maintenance facility not on the network, you can use Browser-based Configuration to configure AC-powered sensors. When a sensor is configured using Browser-based Configuration, you connect the sensor to a laptop and use the sensor’s web server to enter information for the sensor to connect to the SNS AMP. Later, when the network is available and the AMP is installed, you connect the sensor to the network and force it to check in with the AMP.

Note: During this check in, the Default Profile on the AMP will overwrite the settings that you have configured, so before beginning Browser-based Configuration, you first set up the Default Profile on the AMP.

For additional information on the Browser-based Configuration Tool, see Appendix A: Browser-based Configuration Tool on page 54.

Important

- Do not change the Port settings.
- Be sure that the Default Profile on the AMP has been configured for your network.
- When opening the sensor web configuration page, you may need to disable your laptop or PC's wireless radio to avoid connecting to other devices with this address.
- Obtain the following network information for use when configuring devices for the wireless network.
 - Wireless network settings: SSID, Security Type, Security Key
 - Static IP Address, if not using DHCP. If using Static IP, you will need the IP Address, Subnet Mask, and Gateway. When using Static IP, you must specify the IP address of the NTP server numerically. For example, you must enter 10.10.39.100, not ntp.primewireless.com.

Note: If you are not familiar with the network settings, contact your network administrator.

Configure the Sensor

While in configuration mode, you will use the SNS Configuration Screen, Figure 18, to configure the device for your wireless network.

Configuring an AC-powered Sensor

1. Connect the temperature probe(s) to the sensor in the available Sensor Probe jack(s).
2. Connect an Ethernet cable between the sensor's Ethernet port, shown in Figure 2, and the PC Ethernet port.
3. Plug the AC adapter into a power source.
4. Hold down the blue button on the front of the sensor while connecting the AC adaptor to the sensor. Release the button when the sensor displays "Con", indicating that it is in Configuration Mode. When the PC recognizes the sensor, the sensor beeps.
5. Open a browser on the PC and browse to the sensor device's web address at <http://192.168.1.1>. Wait 30 to 60 seconds for the sensor device to establish a connection with the PC.
6. When prompted for a login, enter:
Username = admin
Password = admin
The SNS Configuration page appears, as shown in Figure 18.

Figure 18: SNS Browser-based Configuration Page: Configuring the Sensor for the Network

MAC: 00:1e:b3:00:02:56
Hardware: 1.3
Micro FW: 1.6
Radio FW: 2.1.47

Device Name:

AMP Gateways

IP Address 1:	<input type="text"/>	Port:	<input type="text" value="1600"/>
IP Address 2:	<input type="text"/>	Port:	<input type="text" value="1600"/>
IP Address 3:	<input type="text"/>	Port:	<input type="text" value="1600"/>

Wired Network Settings

Use DHCP

IP Address:

Subnet Mask:

Gateway:

Wireless Network Settings

SSID:

Use DHCP

IP Address:

Subnet Mask:

Gateway:

Security Type:

Security Key:

Radius Server

Radius Server:

Radius Username:

Radius Password:

Submit Configuration

Other Actions

Micro Firmware Upload Radio Firmware Upload Site Survey

Change Password Reset Device Config Exit Config Mode

7. On the Configuration page, enter your **network settings** in the fields provided. Table 10 describes the network settings.
8. Click the **Submit Configuration** button to apply the settings.
9. When the screen indicates that configuration is finished, click **Return to Main** and **Exit Config Mode**. The sensor will beep three times.
10. Disconnect the Ethernet cable from the sensor and PC.
11. Quickly depress then release the blue button (once) on the front panel of the sensor. The unit will quickly “beep” two times.
12. After approximately 45 seconds, another beep indicates connection with the SNS AMP.

If this is a new sensor, the sensor will download the Default Profile. If it's an existing sensor, then the sensor checks for configuration changes on the AMP and updates thresholds, reporting intervals, and other settings.

You can now use the AMP to view the readings reported by the sensor and adjust the sensor's reporting thresholds. For more information, refer to the SNS Temperature and Humidity Sensors User Guide.

Table 10: Network Settings Fields and Values

Item	Description
Device Information	<p>The following information about the device you're accessing is displayed in the top left corner of the main page.</p> <p>Icon: The icon displayed represents the type of device you're accessing. The icon of a thermometer means the device is a temperature sensor.</p> <p>MAC: A twelve (12) character hexadecimal Media Access Control (MAC) address which is a globally unique identifier of the 802.11 wireless radio in the device.</p> <p>Hardware: The version number of the device hardware you're accessing.</p> <p>Micro FW: The version number of the firmware currently installed in the microcontroller of the device you're accessing.</p> <p>Radio FW: The version number of the firmware currently installed in the radio of the device you're accessing.</p>
Device Name	<p>Enter a device name in the Device Name field. This is the name that will be displayed for the device when it's accessed by Primex Wireless's AMP software.</p>
AMP Gateways	<p>Use the IP address and port fields to specify up to three AMP gateways you want this device to use.</p> <p>IP Address 1 is the default AMP gateway your device will use. If the AMP gateway at IP Address 1 is not available, the device will next attempt to use the AMP gateway at IP Address 2 followed by the AMP gateway at IP Address 3.</p>
Wired Network Settings	<p>In addition to wireless networking, Primex Wireless devices have an RJ-45 connector and can be put on the network via regular network cabling. The following controls specify how this device should connect to a wired network.</p> <p>Use DHCP: Enable (check) the Use DHCP checkbox to instruct the device to use DHCP to assign an IP address to the device.</p> <p>IP Address: Enter an IP address in the IP Address field if you want to assign a fixed IP address to the device. Note: Leave this field blank if you've checked the Use DHCP checkbox.</p> <p>Subnet Mask: The subnet mask for your network. This entry must be blank, or a valid IPv4 subnet mask. Note: Leave this field blank if you've checked the Use DHCP checkbox.</p> <p>Gateway: The IP address of the gateway for your network. This entry must be blank, or a valid IPv4 address. Note: Leave this field blank if you've checked the Use DHCP checkbox.</p>

Item	Description
Wireless Network Settings	<p>The following controls specify how this device should connect to a wireless network.</p> <p>SSID: The Service Set Identifier (SSID) is a code which identifies a wireless network.</p> <p>Use DHCP: Enable (check) the Use DHCP checkbox to instruct the device to use DHCP to assign an IP address to the device.</p> <p>IP Address: Enter an IP address in the IP Address field if you want to assign a fixed IP address to the device. Note: Leave this field blank if you've checked the Use DHCP checkbox.</p> <p>Subnet Mask: The subnet mask for your network. This entry must be blank, or a valid IPv4 subnet mask. Note: Leave this field blank if you've checked the Use DHCP checkbox.</p> <p>Gateway: The IP address of the gateway for your network. This entry must be blank, or a valid IPv4 address. Note: Leave this field blank if you've checked the Use DHCP checkbox.</p> <p>Security Type: A selection from the list of supported security modes, or the None selection if the network is an open network with no security.</p> <p>Security Key: A security key from 0 to 64 characters. If WEP is selected, the Security Key must be a Hexadecimal Pre Shared Key. If WPA or WPA2 is selected, the Security Key must be an ASCII Passphrase as long as it is from 8 to 63 characters long. If it is 64 characters long, the key must be a hexadecimal Preshared key.</p> <p>Note: Leave this field blank if you've selected the None selection for the Security Type.</p>
Radius Server	<p>The following controls specify how this device connects to a Radius server.</p> <p>Radius Server: Select the type of Authentication to be used.</p> <p>Radius Username: A 1 to 40 character username used to log in to the RADIUS server. Leave this field blank if you've selected "None" as the Radius Server.</p> <p>Radius Password: A 1 to 40 character password used to log in to the RADIUS server. Leave this field blank if you've selected "None" as the Radius Server.</p>

Configure Battery-powered Sensors with the Sensor Configuration Utility

Battery-powered sensors must be configured using the Sensor Configuration Utility. The following tasks are involved in configuring battery-powered sensors:

- Install the Sensor Configuration Utility on your laptop. The Primex Wireless Sensor Configuration Utility can be found on the SNS Resource CD shipped with your product. Please install the Primex Wireless Configuration Utility before continuing. For installation instructions and additional information about the Sensor Configuration Utility, see Appendix B: Battery Sensor Configuration Utility on page 57.
- Connect the sensor to the laptop and use the Sensor Configuration Utility to upload network settings to the sensor.
 - Name and save configuration settings for each type of sensor that you will be configuring.
 - After configuring the first sensor of each type, check that the sensor can check into the AMP and troubleshoot any connection issues, updating the configuration settings if necessary. You can then configure additional sensors of each type using the saved settings.
 - Perform the configuration steps in the order below. Complete all procedures.
- View and edit each battery-powered sensor on the AMP using the AMP Sensors module.
- Later, after you install the sensor device in its permanent location, you verify that it is on the network by forcing it to check in with the AMP.

Configuring Network Settings for Battery-powered Sensors

1. Turn on the sensor. Ensure that the sensor device is on for at least 5 seconds. For the location of the On/Off switch, see Features of SNS Battery-powered Sensor Devices on page 18.
2. Plug the USB Programming cable into the computer. The computer may display a pop-up message stating that new hardware has been found.
3. Start the SNS Sensor Configuration Utility.

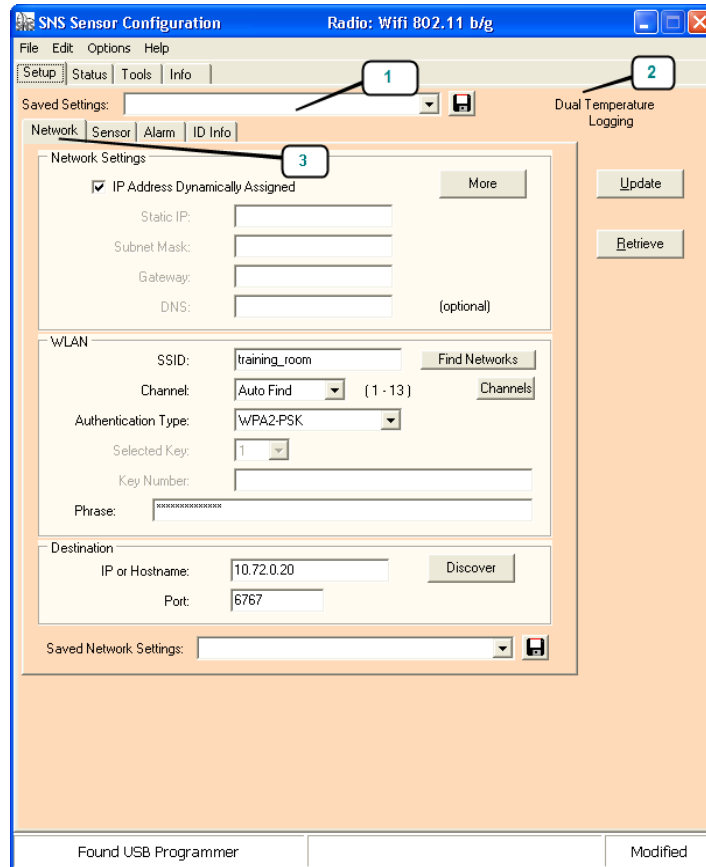
Note: The software will not work properly unless the USB Programmer is plugged into the computer before the software is launched.
4. Connect the USB Programming cable to the sensor device. The USB Programming port is in different locations on each sensor model, as shown in Figure 4, Figure 6, and Figure 7.



IMPORTANT: Do not connect the USB Programmer into the sensor's configuration port unless the USB Programmer is connected to a computer USB port.

5. In the SNS Sensor Configuration Utility, click the **Retrieve** button to identify the type of sensor. The Sensor Configuration Utility will identify the sensor and adjust the number and type of fields for the specific type of sensor. You will see a message stating that the sensor parameters have been retrieved and the type of sensor in the upper right of the Setup tab.
6. In the **Setup** tab, select the **Network** tab, as shown in Figure 19. The Setup tab shows either the current settings of the sensor or the edited settings. The settings information can be saved.

Figure 19: SNS Battery Sensor Configuration Utility Network Settings



7. Enter the parameters for the network settings. The settings are described in Table 11.

Table 11: SNS Battery Sensor Configuration Utility Network Settings

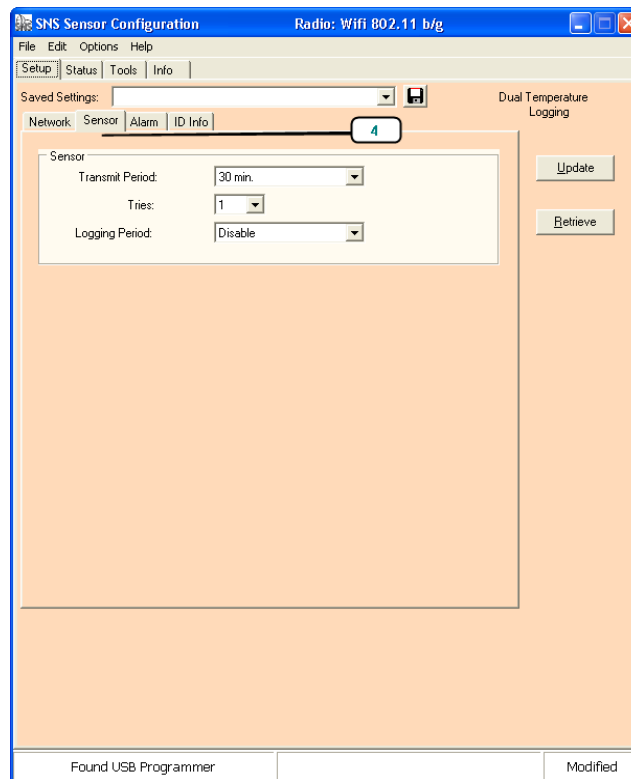
Item	Description
Update	Click the button to send the settings to the sensor.
Retrieve	Click the button to gather the settings from the sensor.
Saved Settings (1)	Enter the name to describe the settings for a particular sensor device type or select a name to recall previous saved settings. The setup parameters are saved for a particular sensor type and cannot be applied directly to another sensor type.
Sensor Type (2)	The utility displays the current sensor type in the upper right corner of the Setup tab.

Item	Description
<p>Network Tab / Network Settings (3)</p>	<p>IP Address Dynamically Assigned: Check the box if the network will assign an IP address automatically. Uncheck the box if the IP parameters will be manually assigned. If unchecked, then the Static IP, Subnet Mask and Gateway fields will have to be entered.</p> <p>Static IP: IP address assigned to the sensor. (ex: 192.168.1.55)</p> <p>Subnet Mask: Subnet mask assigned to the sensor. (ex: 255.255.255.0)</p> <p>Gateway: Gateway IP address assigned to the sensor. (ex: 192.168.1.1)</p> <p>DNS: IP address of the Name Server (ex. 192.168.1.254)</p> <p>More: The Utility displays the “More Network Parameters” window. These are advanced parameters read from the sensor as a result of the Retrieve operation. Described in Table 21: Advanced Options Window on page 67, these parameters are settable through the Advanced Options menu option and when an Update operation is performed.</p>
<p>Network Tab / WLAN</p>	<p>SSID: Identifier of the wireless channel.</p> <p>Find Networks: Click this button to display a list of available wireless networks. From the popup window you can select a network from a list of available networks. If a network is selected, the utility will populate the SSID, Channel and Security fields in the Setup tab. Clicking Find Networks selects AutoFind in the Channel field.</p> <p>Channel: The channel number of the wireless network. The AutoFind option will cause the sensor to search for up to 3 predefined channels (1, 6, and 11). Note: The Channel AutoFind feature defaults to search for channels 1, 6 and 11. These channels are settable in the SNS Sensor Configuration Utility INI file. See Appendix B: Battery Sensor Configuration Utility on page 57. Note: Do not set the Channel Auto Find search channels to more than 3 channels. This will have an effect on sensor range and battery life.</p> <p>Channels Button: The Channels button is displayed only when the Channel field is set to “Auto Find”. The utility will display the “Select Auto Find Channels” window. Select the channel you use or the 3 that you use. Channels 1, 6, and 11 are most commonly used. Setting all channels will increase battery use due to increased scanning.</p> <p>Authentication Type: The current Authentication type: None, WEP-128, WPA2-PSK, WPA-TKIP.</p> <p>Selected Key: (WEP-128 only) The selected key number (1 – 4).</p> <p>Key Number: (WEP-128 only) The WEP key as 26 character hexadecimal number.</p> <p>Phrase: (WPA2-PSK) Password phrase or 64 character ASCII-Hex key. If 64 characters are given the sensor will treat the entry as the security key, otherwise the sensor will generate the key internally from the password phrase.</p>
<p>Network Tab / Destination</p>	<p>IP or Hostname: IP address of the destination host (AMP). The sensor will deliver its information to this address (ex: 64.39.28.22)</p> <p>Port: The port number of the destination host. The default is 6767, which is required for sensor operation. Do not change this.</p> <p>Discover Button and Window Not currently in use.</p>
<p>Saved Network Settings</p>	<p>If you plan to use the same wireless network settings for more than one sensor device, enter a name into the Saved Network Settings field and click the Save button to save the current network settings. You can later apply the network settings to other sensors or create other network settings files and then recall them by selecting the down arrow and selecting the desired network.</p>

Configuring Sensor Parameters

1. Select the **Sensor** tab (4), as shown in Figure 20.

Figure 20: SNS Battery Sensor Configuration Utility Sensor Settings



Enter the parameters for the Sensor tab. The settings are described in

2. Table 12.
3. Click the Alarm tab, shown in Figure 21. The fields in the Alarm tab are specific to the type of sensor device you are configuring.
4. How you use the Alarm tab depends on whether you are setting alarms in the sensor device or on the AMP. See Features of SNS Battery-powered Sensor Devices on page 18 for suggestions about when to configure alarms directly in the sensor.
 - To set alarms on the AMP, clear all data and remove checks from any boxes in the **Alarm** tab. With no alarms set in the Alarms tab, when the sensor reports readings to the AMP, the AMP will send notification if the readings are out of range.
 - To set alarms in the sensor device, enter settings in the Alarm tab. Settings are described in Table 13.

Note: Any alarms programmed directly in the sensor can only be removed or modified by reprogramming the sensor.

Figure 21: SNS Battery Sensor Configuration Utility Alarm Tab for a Temperature Humidity Sensor and for a Single Probe Temperature Sensor

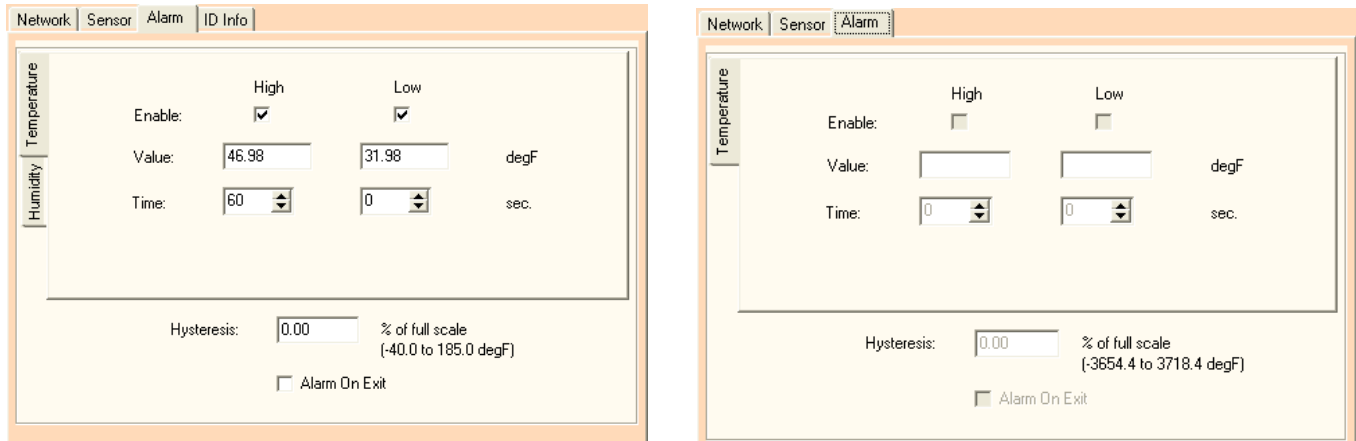


Table 12: SNS Battery Sensor Configuration Utility Sensor Tab Fields and Values

Item	Description
Transmit Period	Select the desired Transmit Period of the sensor. This defines how often the sensor uploads readings to the AMP. At the end of the transmit period, the sensor uploads the readings regardless of whether they have changed. The Transmit Period you select depends upon how you are using the temperature and humidity sensors. Generally, 1 hour is sufficient. The shorter the selected time, the shorter the life of the battery will be. To find out how long the battery will last at the selected Transmit Period, view the Est. Expired field in the Status page.
Tries	The number of transmission attempts for the given Transmit Period. If the sensor receives an acknowledgement for the try, the sensor will stop transmitting; otherwise the sensor will continue to transmit every 30 seconds until the number of attempts is exhausted. The recommended number of tries is 3.
Logging Period	This is the frequency with which the sensor will log readings in its log buffer. If the Logging Period is shorter than the Transmit Period, the sensor will upload multiple readings during each transmission. Note: This field is for future use and is currently disabled.

Table 13: SNS Battery Sensor Configuration Utility Alarm Tab Fields and Values (All Sensor Device Types)

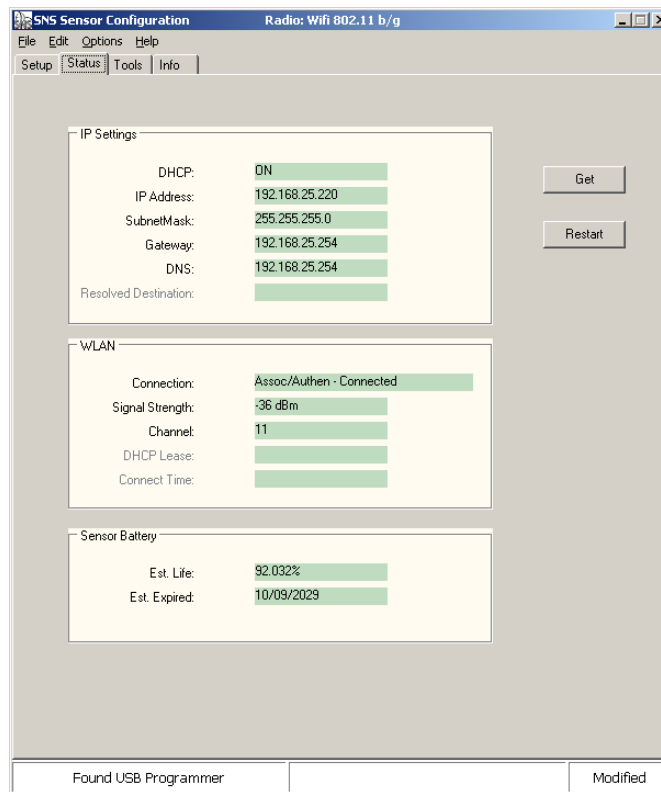
Item	Description
Enable	Enable either the High or Low alarms.
Value	Enter value for either the High or Low threshold in the units shown, e.g. degrees Fahrenheit or Relative Humidity.
Time	Enter the number seconds the current value has to be above for the high alarm and below for the low alarm before the alarm is triggered. This is the same as the Span settings on the AMP and should not be less than the transmit period (reporting interval).
Hysteresis	Enter a value as a percentage of full scale that the current value must fall below the high threshold or rise above the low threshold before the alarm is retriggered. Note: This field is used only for alarms configured in the sensor and is not supported on the AMP.

Item	Description
Alarm On Exit	Check this box if it is desired to trigger an alarm when the value falls below the high threshold or rises above the low threshold after the alarm time has expired.

Saving and Verifying the Configuration

1. Enter a name for the saved settings in the **Saved Settings** field. Click the **Save** icon. This will save your settings for this type of sensor.
2. Click the **Update** button. The utility will configure the sensor with the settings presented in the Setup tab and reboot the sensor device. You will see a pop-up when configuration is complete.
3. Go to the **Status** tab, as shown in Figure 22 and described in Table 14. The fields will populate to confirm the network settings or click **Get** to get the latest status information. The Connection field should show Assoc/Authen Connected and the Rcv IP Address. The signal strength should be approximately -65dBm.

Figure 22: SNS Battery Sensor Configuration Utility Status Tab



4. Go to the **Tools** tab, as shown in Figure 23. Click **Contact Destination Host**. The result should show "Success".
5. (Optional) Use the **Info** tab, Figure 37, to obtain the sensor device MAC address.

Figure 23: SNS Battery Sensor Configuration Utility Tools Tab

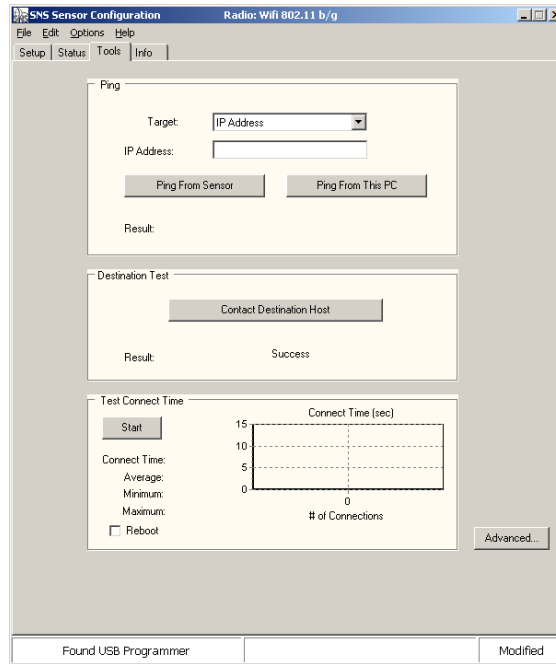


Table 14: SNS Battery Sensor Configuration Utility Status Tab Fields and Values

Item	Description
IP Settings	<p>DHCP: Off = static IP address information is being used; On = the IP settings have been successfully assigned; Failed = the sensor could not obtain the IP settings.</p> <p>IP Address: current IP address. If “0.0.0.0”, then no IP address has been assigned.</p> <p>Subnet Mask: current assigned subnet mask.</p> <p>Gateway: current assigned gateway address.</p> <p>DNS: current assigned Name Server address.</p> <p>Resolved Destination:</p>
WLAN	<p>Connection: “Failed” = the sensor has failed to connect to a wireless network. “Associated - not Connected” = the sensor has associated with the network but has not connected. “Authenticated - not Connected” = security settings have been authenticated but has not connected. “Assoc/Authen – Connected” = sensor has associated and authenticated to the network and connected successfully to the network.</p> <p>Signal Strength: signal strength of the last communications. The signal strength can vary from reading to reading. Multiple samples should be taken to determine the signal strength.</p> <p>Channel: This is the channel found during the Channel Auto Find feature or the channel set in the Setup page. If the sensor cannot find a channel when in Auto Find mode, the utility will display “none”.</p>
Sensor Battery	<p>Est. Life: Estimated percentage remaining of the battery.</p> <p>Est. Expired: Estimated date when the battery should be changed. (Dependant on the Transmit Period and the number of alarms)</p>
Get button	Re-acquires the status information.
Restart button	Causes the sensor to reboot, reconnect to the network and re-acquire the status information.

Forcing the Sensor to Check in with the AMP

1. Disconnect the USB Programming cable from the sensor.
2. Force the sensor to check in with the AMP using the service button. For the location of the service button, see Features of SNS Battery-powered Sensor Devices on page 18.
3. Log into the SNS AMP server as a user with the role of Sensor Admin. See the SNS Temperature and Humidity Sensors User Guide for information on using the AMP Sensors module.
4. Check the AMP Sensor Devices page to confirm that the sensor device has checked in. Sensors that are checking in for the first time appear in the Sensor Devices list with the serial number in brackets in the Name column.
5. Double-click on the sensor device in the Sensor Devices list to view and edit information for the sensor. By default, the information for the sensor will be the information in the Default Sensor Profile for that type of sensor.

Configuring Additional Battery-powered Sensors using Saved Settings

1. Turn on the sensor.
2. Plug the USB Programming cable into the computer. The computer may display a pop-up message stating that new hardware has been found.
3. Start the **SNS Sensor Configuration Utility**.
4. Connect the USB Programming cable to the sensor.
5. In the SNS Sensor Configuration Utility, click the **Retrieve** button to identify the type of sensor. This will connect the software with the sensor.
6. In the **Setup** tab, select the **Network** tab, as shown in Figure 19.
7. Use the **Saved Settings** drop-down box to select the configuration settings for the type of sensor you are configuring.
8. Click **Update**.
9. Force the sensor to check in with the AMP as described above.

Install SNS Sensor Devices and Accessories

Once sensor devices are configured, they are ready for installation in their permanent locations. Although not required, installing a thermobuffer with external probe sensor devices helps ensure that sensor readings more closely approximate the temperature of the assets you are monitoring.

Install SNS Temperature and Humidity Sensors

Specifics of the installation depend on the monitored unit.

Installing Sensor Devices

1. For sensor devices with probes, in the monitored unit, locate an existing access hole, drill a new access hole for insertion of the probe, or route the cable through the rubber door gasket.
2. Route the external probe through the access hole.
3. (Optional) Install a thermobuffer. See *Install a Thermobuffer* on page 47.
4. Mount sensor and dress cable. All SNS AC-powered temperature and humidity sensor devices come with self-adhesive hook-and-loop mounting tape. Alternatively, the sensor device's base plate has four holes that may be used to mount it with screws.

Note: **The operating range of the AC-powered temperature sensor device is 32° - 95°F (0° - 35°C). If you're monitoring temperatures in a freezer, the sensor device must be mounted outside the freezer.**

5. Ensure that sensor device is powered on.
6. Activate sensor using the Service button.
7. Log into the AMP and verify that sensor device has checked in and is reporting within expected ranges.

Install a Thermobuffer

In many environments, normal daily use of refrigerators or freezers results in routinely opened doors, occasionally for prolonged periods when restocking. This may cause air temperature to change drastically and then recover just as quickly when the door closes. Temperature sensors respond to this quick change and can give readings inconsistent with the actual temperature of stored goods.

The Primex Wireless **SNSGRP SNS Thermobuffer**, shown in Figure 24, is used with SNS temperature sensors to simulate the actual temperature of contents within coolers or freezers and limit impact of fluctuating air temperature. This helps provide a higher degree of measurement accuracy and reduces risk of potential material spoilage. When a thermobuffer is in use, fluctuations are minimized so you can rely on the AMP threshold exceeded alerts and do not need to define span exceeded alerts.

The thermobuffer features a plastic bottle that can be filled with food grade glycol to delay the temperature spikes found during the replacement of materials or while servicing refrigerators, freezers or walk-in coolers. Whether protecting vaccines, food, medications or other temperature sensitive materials, the thermobuffer can help provide a more consistent measurement of your investments.

Note: The thermobuffer is compatible with the ¼ in. thermistor probe and the standard 4 in. RTD probes.

Figure 24: SNS Thermobuffer



Installing a Thermobuffer

1. Fill the thermobuffer with food grade glycol, 3/4 - 7/8 full, allowing room for fluid expansion.
2. Insert the sensor probe through the grommet on the bottle cap with the tip of the probe fully submersed in the glycol fluid.
3. Tighten the sensor grip with a wrench to secure the sensor in place.
4. Set the thermobuffer on a shelf, adhere it to a wall with hook-and loop mounting tape, or attach it to a shelf with standard zip ties. Avoid placing the thermobuffer in direct contact with the sides of the storage unit.

Maintain Sensor Devices

SNS Temperature and Humidity Sensors require very little maintenance. This section contains the following topic:

- [Replace Batteries in Battery-powered Sensor Devices](#)

Replace Batteries in Battery-powered Sensor Devices

Battery-powered sensors use two AA batteries. Batteries are located inside the sensor device (Model SNS2TNS-2, Figure 4; Model SNS2TPH-2, Figure 12) or in an externally accessible battery compartment (Model SNS2TPS-2, Figure 5). When replacing batteries, it is important to reset the battery meter.

Resetting the Battery Meter

1. Turn off the sensor. Make sure the USB Programming Cable is disconnected from the sensor.
2. Engage the service button by either pressing the service button or using a magnet with some sensors.
3. Turn the sensor on while the service button is engaged.
4. Wait four seconds.
5. Release the service button. The battery meter has been reset.

To confirm that the battery meter has been reset, reconnect the USB Programming Cable to the sensor and view the estimated battery life in the battery sensor configuration utility Status tab. The utility should indicate 100 %.

NOTE: When replacing the batteries in a dual battery SNS sensor always make sure you replace both batteries together.

Troubleshoot Sensors

This section contains the following topics:

- [Troubleshooting AC-powered Sensors](#)
- [Troubleshooting Battery-powered Sensors](#)

Troubleshooting AC-powered Sensors

Table 15 contains troubleshooting information for AC-powered sensors. Many of the troubleshooting suggestions given below for battery-powered sensors apply to AC-powered sensors as well.

Table 15: Troubleshooting AC-powered Sensors

Problem	Resolution
Cannot access the AMP.	Check wireless signal and network interface (wired/wireless) using the browser-based configuration tool. Refer to Appendix A: Browser-based Configuration Tool on page 54.
No monitoring data on the AMP.	Check wireless signal and network interface (wired/wireless) using the browser-based configuration tool. Refer to Appendix A: Browser-based Configuration Tool on page 54. Defective sensor

Troubleshooting Battery-powered Sensors

Overview

The SNS Sensor Configuration Utility can be used to help troubleshoot sensor issues with connecting to a wireless network. The troubleshooting suggestions below assume you have the SNS Sensor Configuration Utility installed on your computer and that you know how to use it.

When the programming cable is connected to the sensor, the sensor goes into “setup mode”. The sensor continuously attempts to connect to the wireless network and will stay connected until the programming cable is disconnected, or the sensor setup has changed.

The sensor is in “sensor mode” when the programming cable is not connected and the sensor power switch is turned on. In “sensor mode”, the sensor remains in a low power state. When ready to transmit, the sensor will turn on, connect, transmit a UDP packet, and then go back to the low power state.

General Troubleshooting Suggestions

1. The sensor will not work reliably with signal strengths below about -65 dBm. If the signal strength is smaller than that, the sensor may work marginally or not at all. Obviously the better the signal strength, the better the chance the sensor has at delivering a sensor packet.
2. The signal strength will vary from sample to sample. You should take multiple samples to determine the signal strength. Signal strength is available in the Status tab and the Available Networks window (press the “Find Networks” button in the Setup tab).

3. The red LED on the main sensor board indicates that a transmit attempt has just finished. The green LED on the radio module indicates that radio module is connected to a network. When in sensor mode, the green LED flashes when a connection is made. When in setup mode (the programming cable is connected to the sensor), the green LED remains continuously on when a connection is established. In setup mode the red LED never comes on. In sensor mode the red LED flashes at the end of the transmit cycle.
4. In sensor mode, it can take up to 5 seconds for the transmit cycle to complete. This is from when the service button is pressed to when the red LED is flashed.
5. If the connect time to the network is long (over 4 seconds), the sensor will not be able to connect to the network. If you suspect the connect time to the network is long, use a PC to connect to the network and then measure the connection that a PC takes to verify the connection time.
6. Some access points will move between three channels (typically 1, 6 and 11). The SNS Sensor will work with these access points with the Channel AutoFind feature but the channels that are used must match the channels the sensor is configured for.

Troubleshooting Specific Symptoms

The list of symptoms includes:

- Cannot connect to the wireless network
- Can connect to the network but cannot obtain a dynamic IP address
- Can connect to the network but host is not receiving UDP packets
- Battery Meter indicates a lower battery life than expected
- SNS Sensor Configuration Utility cannot find the sensor
- SNS Sensor Configuration Utility Says Sensor is Off
- Loss of Data When Backup Power Fails

Cannot connect to the wireless network

1. Verify that the network exists.
2. Verify signal strength. Use the built in sensor signal strength meter. Use a signal strength meter like a PC running "Network Stumbler". Determine if adequate signal strength exists at that location.
3. Verify network settings.
4. Make sure the network settings do not exclude 802.11b. Also make sure the router or Access point accept connections of 1 Mega baud.
5. Turn off auto modes in the router or Access Point. The sensor does not support WPA2-PSK TKIP. There are some routers and Access Points where the sensor will connect if the network is set to WPA2-PSK AES and TKIP. Set the Access Point to WPA2-PSK AES.
6. If the sensor was previously connected at one location, but will not connect at the new location, temporarily move the sensor to the previous location and verify operation. It is also possible that a setting at the sensor or on the network has changed.

Can connect to the network but cannot obtain a dynamic IP address

1. Verify your network settings.
2. Verify that you are connected to the right network.

3. Use the “Ping From Sensor” function in the utility to ping an address that should be available from the network (verify that the address is ping-able).
4. Use the “Ping From PC” function in the utility to see if your PC can ping an address on that network (your PC must be connected to that network for this to work).
5. Use the “Ping From PC” function in the utility (if this PC is connected) to see if you can ping the sensor when it is in setup mode. Go to the Status tab to determine the sensor’s IP address.
6. Use a static IP address temporarily and connect to the network. Determine if sensor packets are being received by the host.
7. Make sure the DHCP Server has not exhausted the number of assignable IP addresses.
8. It is possible the DHCP Server is taking too long to respond to the request.

Can connect to the network but host is not receiving UDP packets

1. Verify your network settings.
2. Verify that you are connected to the right network.
3. Verify that the Destination IP address is correct.
4. If using the broadcast address, verify that the network can support broadcasts. Most routers by default will not route broadcast traffic.
5. If the host will respond to ping requests, use the “Ping From Sensor” function in the utility to have the sensor ping the host. Use the “Ping From PC” feature if this PC is connected or a PC on the network and ping the host. Also, try pinging the sensor when the sensor is in setup mode.
6. Is the host ready to receive the sensor packets? Is the host configured to listen for the UDP packets? Is the host software running? Is firewall software installed at the host that would prevent the UDP traffic? Is there anything on the network that would restrict packets from being routed (like MAC filtering)?
7. Use the “Contact Destination Host” function from the Tools tab.
8. If using a hostname for the destination address:
 - Make sure the DNS address is correct (whether set as static or obtained through the DHCP server).
 - Is the hostname being resolved in setup mode? (Use the SNS Sensor, go to the Status tab and examine the Resolved Destination field.)

AMP Battery Meter Icon Indicates a Lower Battery Life than Expected

Some possible causes of low battery life:

1. The transmission count was not reset when the batteries were last changed.
2. The transmit period is too short.
3. The service button was pressed a lot for this sensor.
4. There were many alarms for this sensor.
5. There were many tries for the sensor.

SNS Sensor Configuration Utility Cannot Find the Sensor

1. Make sure the programming cable is plugged into the sensor.
2. Does the red LED in the programming cable flash when doing an operation?
3. Disconnect the programming cable from sensor and connect again.
4. Disconnect the programming cable from sensor and then disconnect the cable from the PC. Wait 30 seconds. Plug cable back into PC and into sensor.
5. Reboot your computer.
6. Use an externally powered USB Hub. Your computer may not be supplying enough power through the USB port.

SNS Sensor Configuration Utility Says Sensor is Off

1. If the utility gives the following error “Sensor is possibly powered off!” disconnect the USB Programming cable from the sensor, turn on the sensor, wait 5 seconds and connect the USB Programming cable.
2. Be sure that you are turning the sensor on. See Features of SNS Battery-powered Sensor Devices on page 18 for the location of the On/Off switch.

Long Connect Time

In some networks, one of the optional components of the connect time may take too long to perform on a consistent basis. If the average connection time is too long, it is important to try isolating the cause. To isolate the cause, try temporarily turning off one of the options and then re-measuring the average connection time. For example, try setting the dynamically assigned IP address as the static address temporarily, or try using a Destination IP address instead of the hostname address temporarily.

Loss of Data When Backup Power Fails

All data being collected by the probes is stored in non-volatile memory. This data will be lost if backup power fails. If AC power is restored before backup power fails and the temperature stayed within the set limits, all of the readings will be sent to the AMP as a single check-in with the current temperature for entire duration of the power outage. If a high or low limit is crossed while running on backup power, the data is saved to EEPROM with a timestamp.

This data is erased in the event that backup power fails. If backup power does not fail, these archived readings are sent to the AMP as well as current temperature readings when AC power is restored. This provides a view of when temperatures went in and out of limits and for what duration.

Appendix A: Browser-based Configuration Tool

All AC-powered sensors have a built-in web server that allows you to log into and configure the device through a browser when attached directly to the computer via a network cable. With this utility you can specify the address of the destination host and wired or wireless network parameters. The utility also provides some tools for diagnosing problems. Opening the utility and using it to configure AC-powered sensors are covered in Configure Sensors for the Network on page 25. This section describes other actions that can be performed using the Browser-based Configuration tool.

Action Buttons

These buttons act on the data entered on the browser-based Configuration Tool main window:

- Submit Configuration Button
- Micro Firmware Upload Button
- Radio Firmware Upload Button
- Site Survey Button
- Change Password Button
- Reset Device Config Button
- Exit Config Mode Button
- Test Configuration

Submit Configuration Button

Click the **Submit Configuration** button to accept your changes and store your settings in the device's onboard memory.

Micro Firmware Upload Button

Clicking the **Micro Firmware Upload** button displays the Micro Firmware Upload page. You use this page to upload a new version of the firmware to the microcontroller. For more information on updating sensor device firmware, refer to the SNS Temperature and Humidity Sensors User Guide.

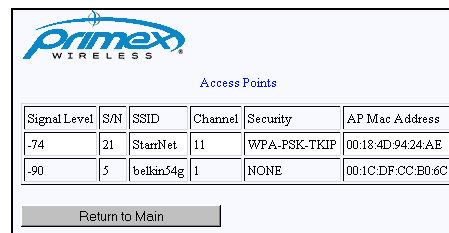
Radio Firmware Upload Button

Clicking the **Radio Firmware Upload** button displays the Radio Firmware Upload page. You use this page to upload a new version of the firmware to the 802.11 wireless radio. For more information on updating sensor device firmware, refer to the SNS Temperature and Humidity Sensors User Guide.

Site Survey Button

Clicking the **Site Survey** button displays the Site Survey page. You use this page to view a list of all wireless access points recognized by your device.

Figure 25: Site Survey Page



Access Points

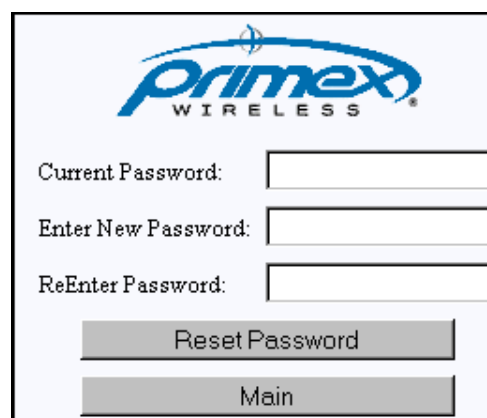
Signal Level	S/N	SSID	Channel	Security	AP Mac Address
-74	21	StarNet	11	WPA-PSK-TKIP	00:18:4D:94:24:AE
-90	5	belkin54g	1	NONE	00:1C:DF:CC:E0:6C

Return to Main

Change Password Button

Clicking the Change Password button displays the Change Password page. You use this page to change the password used to log into this device.

Figure 26: Change Password Page



Primex
WIRELESS

Current Password:

Enter New Password:

ReEnter Password:

Reset Password

Main

Changing the Device Login Password

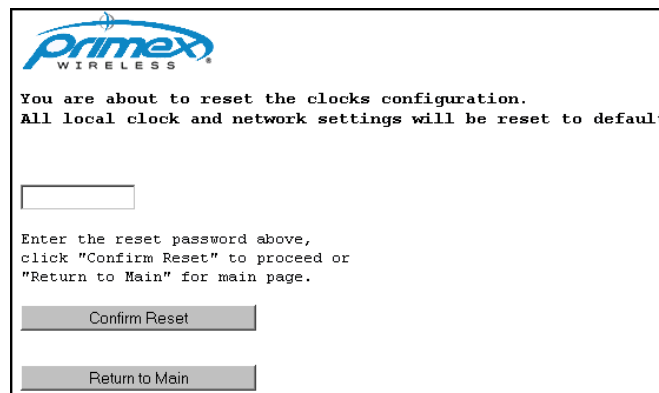
Follow these steps to change your device's login password.

1. Enter the current password in the **Current Password** field.
2. Enter the new password in the **Enter New Password** field.
3. Enter the new password in the **Re-enter New Password** field.
4. Click the **Reset Password** button.

Reset Device Config Button

Clicking the Reset Device Config button displays the Reset Device Config page. You use this page to reset all device settings to their default state.

Figure 27: Reset Device Config Page



primex
WIRELESS

You are about to reset the clocks configuration.
All local clock and network settings will be reset to default

Enter the reset password above,
click "Confirm Reset" to proceed or
"Return to Main" for main page.

Confirm Reset

Return to Main

Resetting the Device Settings

Follow these steps to reset all device settings to their default state.

1. Enter the device password in the field.
2. Click the Confirm Reset button.

Test Configuration

Test Configuration forces the device to use the configured network settings and provides feedback on each setting. When you click Test Configuration, the device will attempt to do the following:

- Make a wireless connection via the configured access point
- Get an IP from DHCP server on network
- Perform a UDP discovery of the configured AMP

Failure points along this path can better help with connection problems, separating those problems related to incorrect/incomplete settings from those relating to network or access point issues.

Manage Logs

Manage Logs allows the collection and viewing of device logs. Manage Logs can be used in conjunction with Test Configuration to troubleshoot device configuration and network issues. Manage Logs permits you to enable logging, view log files, and delete log files. With logs enabled, four sets of logs are collected, one per connection attempt.

Exit Config Mode Button

Clicking the Exit Config Mode button displays the Exit Config Mode page. You use this page to exit the device configuration mode.

Appendix B: Battery Sensor Configuration Utility

The SNS Sensor Configuration Utility configures and reads the settings in the SNS battery-powered sensors. The SNS sensors supported are Single Temperature, Dual Temperature, and Temperature and Humidity. With this utility you can specify the address of the destination host, the wireless network parameters, transmit period of the sensor, and alarm information. The utility also provides some tools for diagnosing problems. Using the utility to configure battery-powered sensors is covered in Configure Battery-powered Sensors with the Sensor Configuration Utility on page 39.

This section covers the following topics:

- [Installing the Configuration Utility](#)
- [User Interface](#)

Installing the Configuration Utility

Before beginning, review the system requirements.

- USB programming cable
- Windows XP, 2000, 2003, Vista, or 7
- A computer with a USB port

Installing the Primex Wireless SNS Sensor Configuration Utility

1. Install the program on your computer by double-clicking on the provided install file Setup.exe, whose icon looks like Figure 28.

Figure 28: Install Icon for the Battery Sensor Configuration Utility



2. Wait for the Welcome to the InstallShield window to appear.
3. On the Welcome to the InstallShield window, click Next to continue. The next window details release information for the Primex Wireless SNS Sensor Configuration.
4. Read through this release information, and click Next to continue. The Customer Information window opens.

Figure 29: Customer Information Window



Primex Wireless SNS Sensor Configuration - InstallShield Wizard

Customer Information

Please enter your information.

User Name:
[Text Box]

Organization:
[Text Box]

Install this application for:

Anyone who uses this computer. (all users)

Only for me ()

InstallShield

< Back Next > Cancel

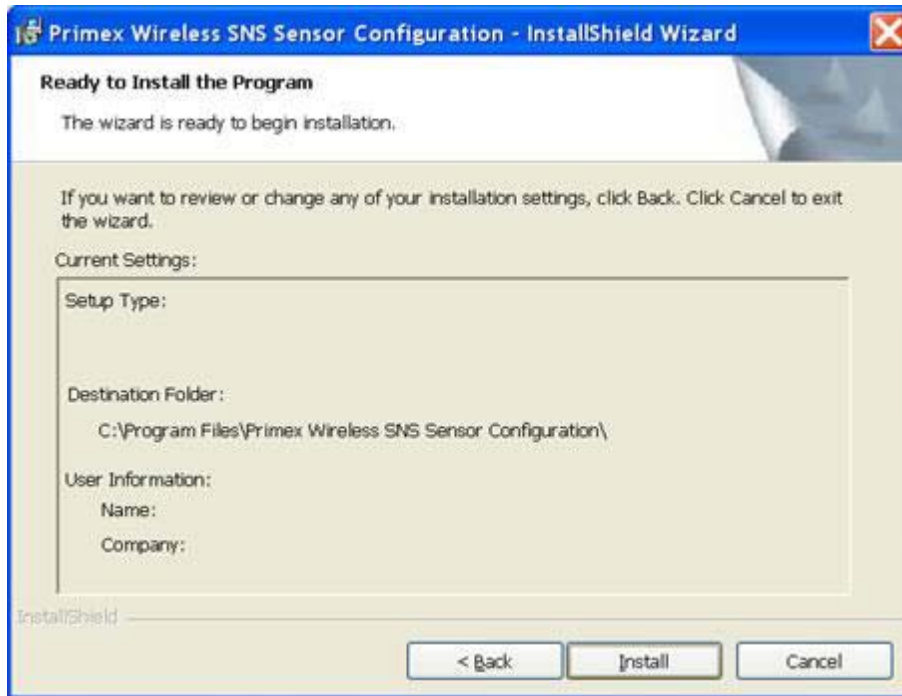
5. Enter your username and organization in the appropriate boxes (optional) and choose if the utility will be accessed by any user, or just the current user.
6. Click Next to continue. The Destination Folder window appears, identifying the installation path where the Primex Wireless SNS Sensor Configuration files will be stored.

Figure 30: Destination Folder Window



7. If you need to change the install path, click Change and follow the directions to search for and/or type in a new path. When finished, click Next. The Ready to Install the Program window appears.

Figure 31: Ready to Install the Program Window



8. Review the information, and click Install to start the installation.
9. Click Finish when the completion window appears.

First Time Running after Install

Note Be sure to install the software before plugging the USB programmer into the USB port of your computer.

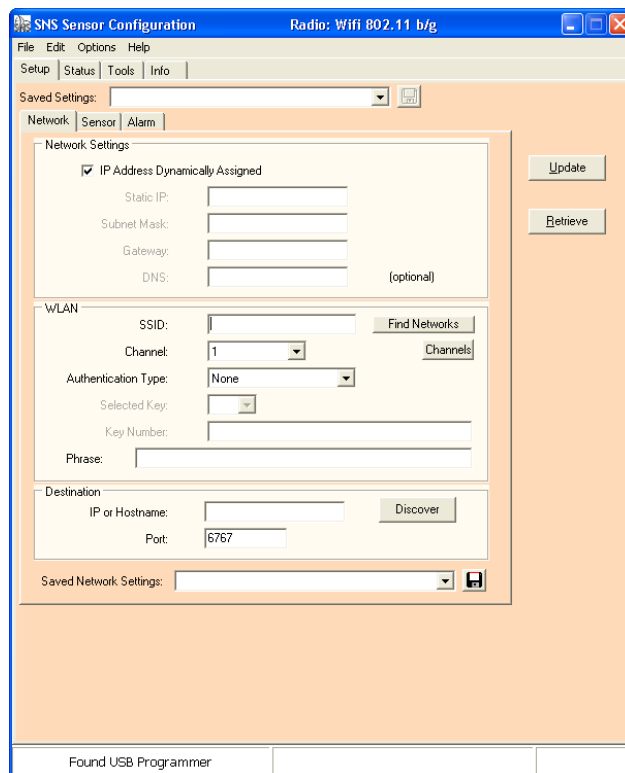
1. After installing the software, insert the USB Programmer into the USB port of your computer.
2. Start the software by double clicking on the following icon on the desktop.

Figure 32: USB Port Icon for Sensor Configuration



The Sensor Configuration window opens, and the left frame of the status bar (the very lower left of the program window) should say “Found USB Programmer” as shown in Figure 33.

Figure 33: Sensor Configuration Window after Installation



User Interface

The SNS Sensor Configuration has four main tabs: Setup, Status, Tools, and Info. The Setup tab contains subtabs for configuring the sensor for the network and reporting parameters. For more on the Setup tab, see Configure Battery-powered Sensors with the Sensor Configuration Utility on page 39. When selecting the Status and Info tabs, the utility automatically extracts the information

from the sensor when the windows are entered. With the Setup and Tools tabs, the interaction with the sensor is initiated by the user.

Note: The configuration tabs/pages may look different depending on the type of sensor connected.

Alarm Tab

In addition to receiving sensor alerts on the AMP, you can program some battery-powered sensors with alarms by connecting the USB programming cable to the sensor. If the sensor has alarms programmed and an alarm occurs, the sensor LED flashes as described in Features of SNS Battery-powered Sensor Devices on page 18.

Alarms programmed in sensors cannot be modified from the AMP. Any alarms programmed directly in the sensor can only be removed or modified by reprogramming the sensor.

You use the SNS Battery-powered Sensor Configuration Utility Alarm tab to program alarms in battery-powered sensors. The utility will display the Alarm Tab window if the sensor supports alarms. If the sensor has more than one I/O point that supports the alarm function, then the utility displays the alarms settings in individual tab windows. A name will be given for the I/O point, for example, Temperature 1, and displayed on the tab at the side of the window for each I/O point

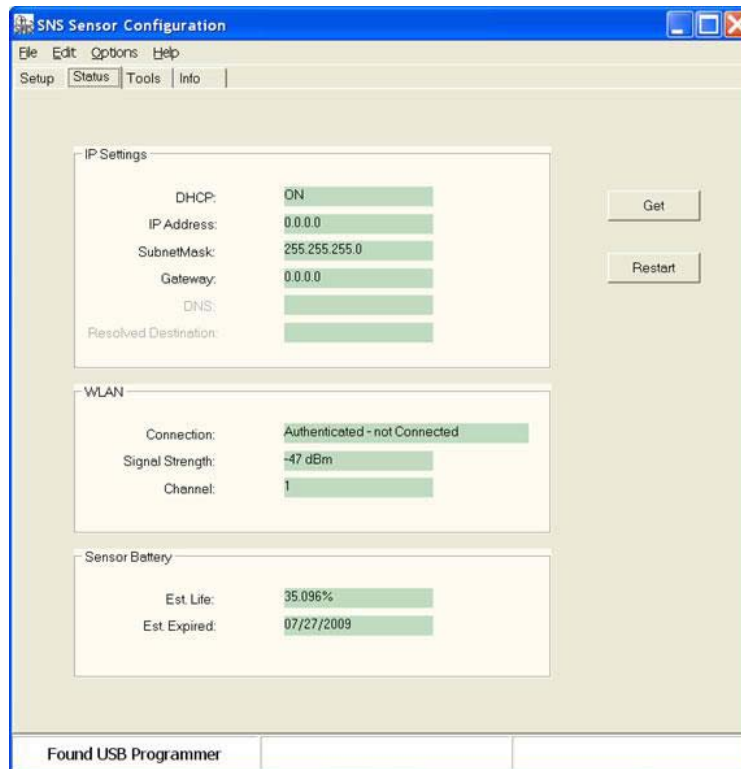
Figure 34: Alarm Tab for Dual Temperature Sensor

The settings for dual temperature sensor are similar to the single temperature sensor. The difference is that there are two separate probes to set alarms for, Temperature 1 and Temperature 2. Set thresholds as desired.

Status Tab

The Status tab, Figure 35, shows the current state of the IP settings, connection status, signal strength, and battery life parameters. Fields in the Status tab are described in Table 14: SNS Battery Sensor Configuration Utility Status Tab Fields and Values on page 45.

Figure 35: Status Tab



Tools Tab

The Tools tab, shown in Figure 36 and described in Table 16, has several methods for testing the sensor connection.

Figure 36: Tools Tab

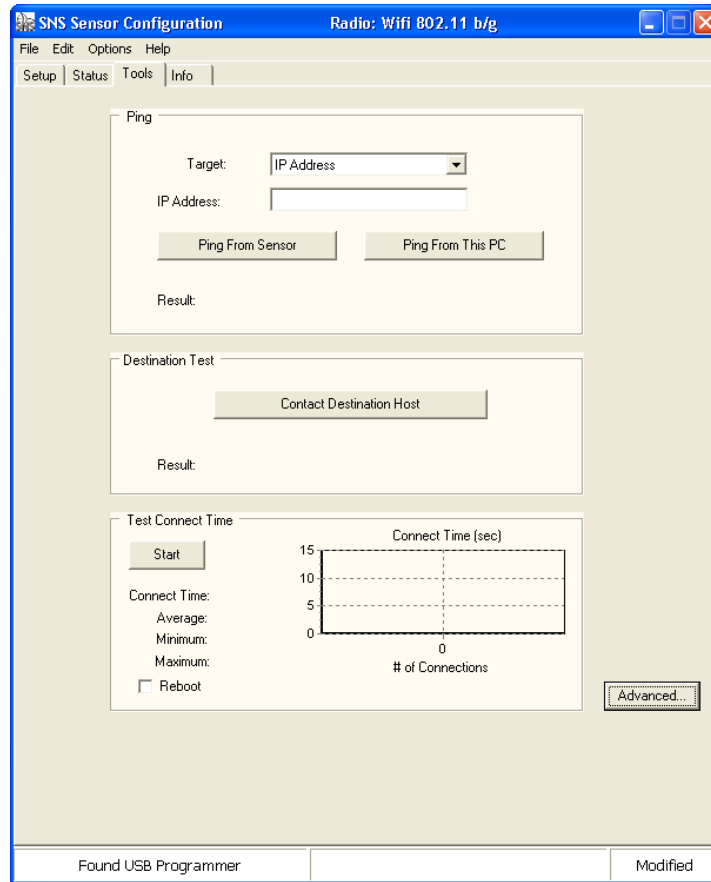


Table 16: Tools Tab Fields and Values

Item	Description
Ping	<p>Target: Select whether to ping the destination (AMP), gateway, or other address specified in the IP Address field.</p> <p>IP Address: Address of the entity specified in the Target drop-down.</p> <p>Ping from Sensor: When the Ping button is pressed, the sensor uses either the IP address in the IP Address field or the current address in the Destination IP field in the Setup tab and pings that specified address. Once the ping operation is complete, the utility indicates either failed or success, and specifies the IP address in the Result field.</p> <p>Ping from PC: When the Ping button is pressed, the sensor uses either the IP address in the IP Address field or the current address in the Destination IP field in the Setup tab and pings that specified address from the local PC. Once the ping operation is complete, the utility indicates either failed or success, and specifies the IP address in the Result field.</p>
Destination Test	<p>The Utility will instruct the sensor to send a special packet to the Destination Address. If the Destination responds with an acknowledgement, the Utility will indicate success otherwise the Utility will display “Failed” in the Result field. Use the Contact Destination Host function to confirm that the sensor is sending packets to the Destination. Note: the Destination must be capable of responding with an acknowledgement in order for this function to work.</p>

Item	Description
Test Connect Time	The "Test Connect Time" function tests how well the sensor connects to the network. Consistent connection performance is essential for longevity of sensor battery life. This test will give an indication of how well the sensor connects to the network thus giving an indication about battery life. If the average connection time is above 6 seconds, the sensor battery will be exhausted before the battery meter indicates. Refer to Table 17 for the components of connect time.
Start	Press the Start button to start the test. The utility will repeatedly attempt to connect to the network with one second between connection attempts. The utility will show a count of connection attempts, the last connect time, the average, minimum and maximum connect times. The utility will show the history of connect attempts as a bar graph. Each bar graph is the number of seconds for the attempt. The utility will show a grey bar (at full scale) for failed connection attempts. Failed connection attempts are not factored in the statistics.

Table 17 lists the components of the Connect Time.

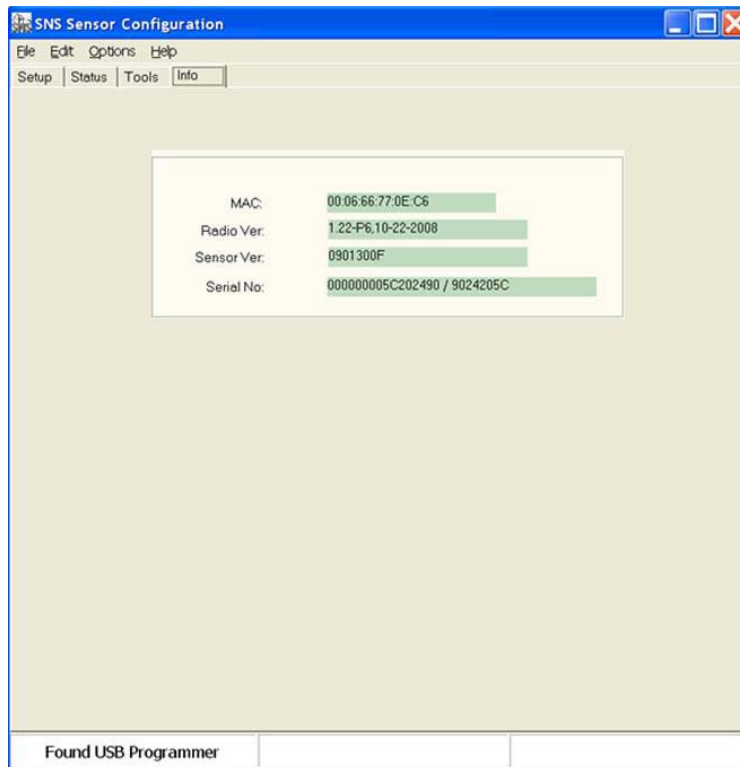
Table 17: Tools Tab / Connect Time Components

Description	Option	802.11 b (Seconds)	802.11 g (Seconds) Cache/Noncache
Sensor Startup	No	2	0.1
Auto Find Channel	Yes	1	0.1
Associate / Authentication	No	<1	<1
DHCP Lookup	Yes	<1	<1
DNS Lookup	Yes	<1	<1

Info Tab

The Info tab, Figure 37, shows the MAC address, firmware version and the serial number of the sensor.

Figure 37: Info Tab



Menu Options

File

Figure 38: File Menu Window

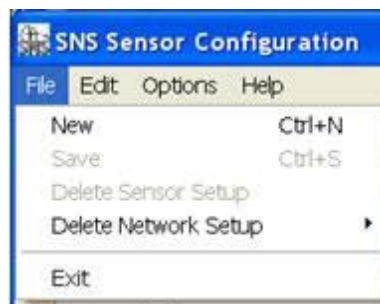


Table 18: File Menu

Item	Description
New	The SNS Sensor Configuration Utility clears the current settings.
Save	SNS Sensor Configuration Utility saves the current settings to the name given in the Saved Settings field.

Item	Description
Delete Sensor Setup	SNS Sensor Configuration Utility presents a list of all the saved settings. You can select which saved settings to delete.
Delete Network Setup	SNS Sensor Configuration Utility presents a list of all the saved network settings. You can select which saved network settings to delete.
Exit	The SNS Sensor Configuration Utility closes the program.

Edit

Figure 39: Edit Menu Window



Table 19: Edit Menu

Item	Description
Cut / Copy / Paste	The SNS Sensor Configuration Utility provides the standard Windows Cut/Copy/Paste to and from the clipboard.

Options

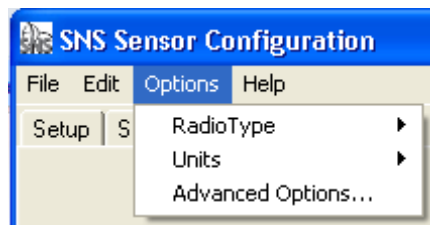


Table 20: Options Menu

Item	Description
Radio Type	None –Sensor has no radio. DO NOT USE FOR SNS BATTERY SENSORS. Wifi 802.11b/g –Sensor has 802.11b or 802.11g radio Digi XBee Zigbee –Sensor has a Digi XBee radio. DO NOT USE FOR SNS BATTERY SENSORS. Digi XBee 900/2.4 --Sensor has a Digi XBee radio. DO NOT USE FOR SNS BATTERY SENSORS. Other –Sensor has a radio that is unknown or not defined yet in the utility. DO NOT USE FOR SNS BATTERY SENSORS.
Units / Temperature	Select the temperature to display the temperature alarm points (Celsius or Fahrenheit).

Item	Description
Advanced Options	Opens the Advanced Options window which contains parameters that are set every time an Update operation is applied to the sensor. Advanced Options are described in Table 21.

Advanced Options

Figure 40: Advanced Options Window

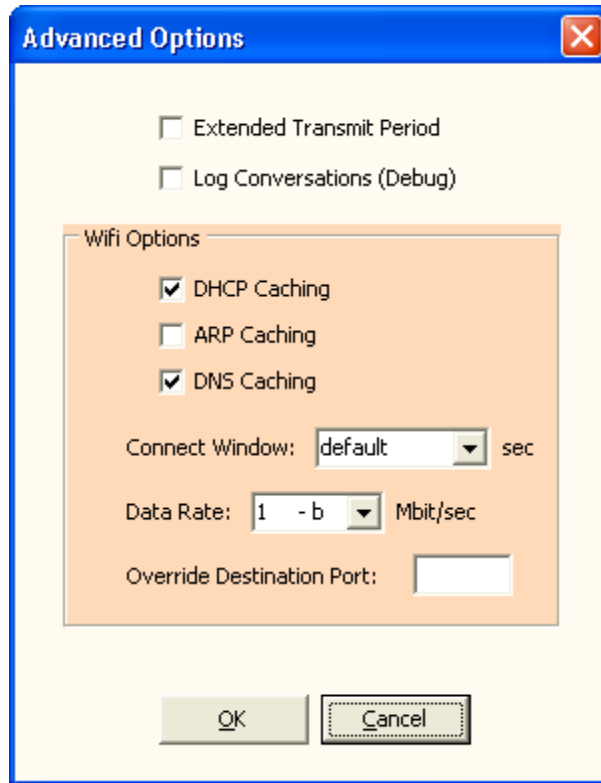


Table 21: Advanced Options Window

Item	Description
Extended Transmit Period	Adds 30 sec., 1 min., and 2 min. as additional options for the Transmit Period. These additional periods are meant to be used for testing, evaluation and demonstration of the sensor and can have a severe impact on the battery life of the sensor.
Log Conversations (Debug)	When this option is selected, the utility will capture the conversation between the utility and the sensor and place it in a file called OutputLog.txt in the folder where utility resides.
DHCP Caching	When checked, the sensor will cache it's IP address assigned from the DHCP server until the DHCP lease time has expired or the sensor is power cycled. When unchecked, the sensor will request an IP address every attempt to contact the host. Default is unchecked.
ARP Caching	When checked, the sensor will store and keep a list of IP/MAC relationships. When unchecked, the sensor will rebuild the IP/MAC relationships every attempt to contact the host.

Item	Description
DNS Caching	When checked, the sensor will cache the IP address that results from the DNS lookup of the Destination hostname. The sensor will keep the destination IP address until either the DHCP lease time expires or the sensor is powered cycled. When unchecked, the sensor will request a DNS lookup of the Destination hostname at every attempt to contact the host. Set only if DNS caching and Dynamic IP are enabled.
Connect Window	The Connect Window is the amount of time in seconds that the sensor will attempt to associate and authenticate to an access point or a wireless router (this includes the time to obtain an IP address from a DHCP server). The default is 5 seconds and the Connect Window can be set to 3 seconds to 8 seconds.
Data Rate	The default data rate is 1 Mbit/sec and can be set from 1 to 54 Mbit/sec. The lower the data rate the longer range the sensor will have. 1, 2, 5.5 and 11 are 802.11b data rates. All other data rates are 802.11g data rates. Note: an access point or wireless router may be configured to exclude 802.11b data rates.
Override Destination Port	Leave blank to not use this feature. If a number (1 to 65535) is placed in this field, the utility will force the Destination Port to be this entered number. Use this feature to force the Destination Port be another value other than the default 6767.
Digi XBee 900 Radio Address (Not shown in Figure 40)	Set the Digi Xbee 900 radio address to a subset of the sensor serial number.

Help

Figure 41: Help Menu Window



Table 22: Help Menu

Item	Description
About	The SNS Sensor Configuration Utility presents a window that shows the version number of the utility.

Status Bar

The status bar is located at the bottom of the utility window, and has a left, middle, and right panel.

Figure 42: Status Bar Window

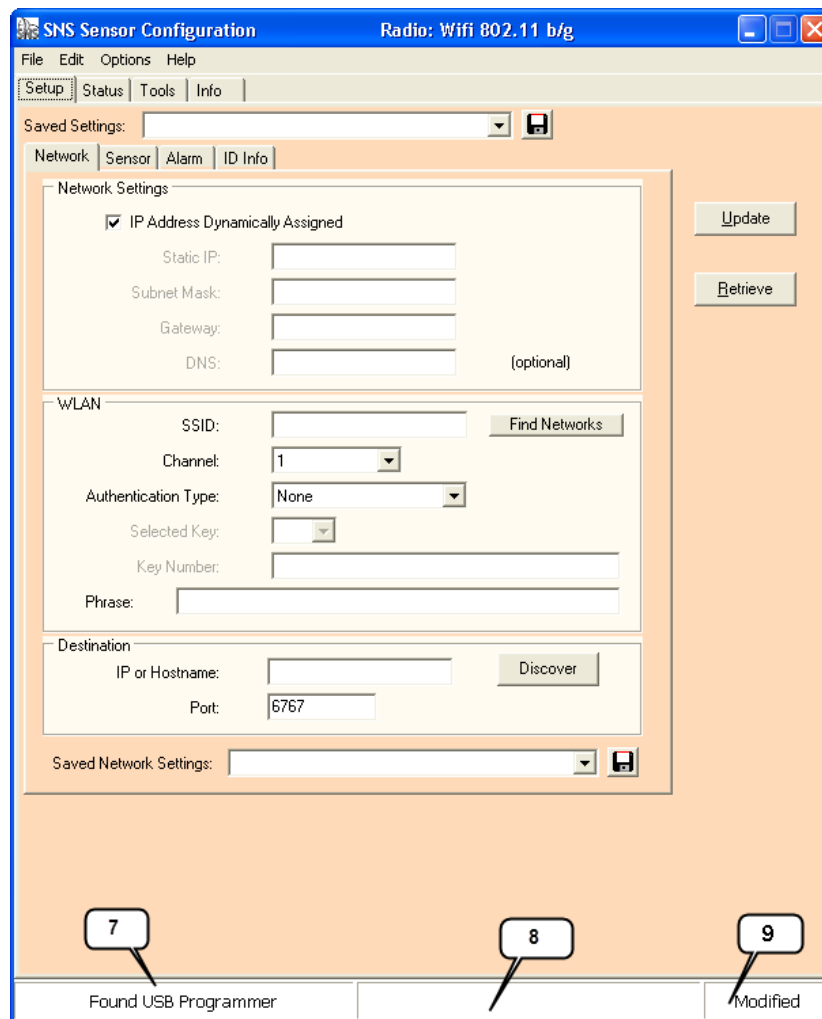


Table 23: Status Bar Panels

Item	Description
Left Panel (7)	The utility shows the USB Programmer status in this panel: Found USB Programmer or Looking for USB Programmer.
Middle Panel (8)	The utility shows progress messages of the different actions: Update, Retrieve, Status and Info.
Right Panel (9)	The utility shows “Modified” message in this panel when the parameters in the Setup page have been modified and need saving in order not to lose the parameters.

SNS_Sensor_Cfg.INI

The SNS Sensor Configuration Utility stores all its program information in an INI text file called SNS_Sensor_Cfg.INI. Use a text editor to edit this file. Also restart the SNS Sensor Configuration Utility if you make changes to the INI file. The following is description of the user changeable parameters.

Override Maximum Number of Tries

MaxNumTries=5. Sets the maximum number of tries in the Sensor Tries field. (default max is 5)

Auto Find Channels

[Settings] ChannelMask=1,2,3,4,5,6,7,8,9,10,11 The ChannelMask parameter under the “Settings” section defines the default channels that are used when a Setup gets created. Edit this parameter to specify the channels for the sensor to search for. [*template*]

ChannelMask=1,2,3,4,5,6,7,8,9,10,11 The utility will use the ChannelMask parameter value in the “Settings” channel to create the value in the *template* section. If you want to override the definition for a particular setup, then edit this field.

Note: **Do not set the Channel Auto Find search channels to more than 3 channels. This will have an effect on sensor range and battery life.**

Appendix C: Regulatory Compliance

FCC Compliance

Pursuant to FCC 15.21 of the FCC rules, changes not expressly approved by Primex might cause harmful interference and void the FCC authorization to operate this product.

FCC radio frequency interference

This equipment has been tested and found to comply with the limits for a Class B analog device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiver's antenna.
- Increase the distance between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC radiation exposure limits

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This is to comply with FCC RF exposure requirements in section 1.1307.