



## FEATURES

- 10K ohm thermistor transmitter (100K option)
- Transmits thermistor data with unique ID
- Integrated 100mw, 900 MHz SSFH radio for long range performance
- Optional 2.4 GHz radio
- Range Indoor: Up to 1300 feet
- Range Outdoor: Up to 1 mile with standard antenna
- Battery lasts up to 5 years with 5 minute transmit rate
- Very small (3.25" X 3.25" X 1.375") ABS Enclosure
- Complies with part 15 of the FCC rules
- CRC-16 error checked Status, ID and thermistor data
- Conformal coated
- External ¼ wave antenna



## DESCRIPTION

The Point Sensor Thermistor 900 wireless transmitter is a battery operated 10K ohm thermistor interface with a microprocessor controlled 900 MHz. FCC certified radio transmitter. The Point Sensor Thermistor 900 has an on board time of day clock that allows it to spend most of the time in a low power quiescent state. At predetermined time intervals the clock will wake up the onboard microprocessor and thermistor data is read from a 12-bit analog-to-digital converter. This information is combined with a unique serial ID, CRC-16 error check and transmitted in a very short data packet that results in a very short transmitter on-time. This architecture allows the Point Sensor Thermistor 900 to consume very little energy and a battery life of up to 2 years.

The Point Sensor Thermistor 900 electronics are coated with a conformal material that provides a moisture barrier against condensation. Submersion in water is not recommended. An internal reed switch permits a user to activate the service switch with a magnet. A quick swipe of a magnet across the "Service" label will activate the service switch. When you perform this operation, a data transmission occurs immediately and a special mark is introduced in the ID field of the transmitted data packet to indicate which sensor is in service or installation. The Sensor is shipped with the transmitter turned off (anytime the Sensor is to be shipped the transmitter should be turned off or must be placed in a shielded container to prevent interference that might cause shipping problems). The sensor is started by sliding the On/Off Switch towards the SMA antenna connection. The Point Sensor Thermistor-900 sensor can be turned off by sliding the On/Off switch away from the SMA antenna connection.

Transmission rate	Preprogrammed at factory (5 minutes default)
Shelf life with battery installed	10 Years in quiescent mode
Dimensions (enclosure)	3.25 W X 3.25 H X 1.375 D (inches)
Weight	4.7 oz.
Operating Temperature	-40° to 85° C
Humidity	0% to 90% non-condensing
Input	10Kohm thermistor
Battery life with transmissions	2 years with TX period of 5 minutes
Battery	(2) 3.6vdc Lithium thionyl chloride
FCC Certified	FCC ID: OUR9XSTREAM

# Point Sensor Thermistor

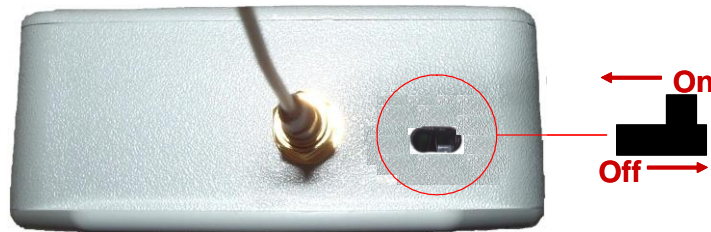
## Installation and Operation Instructions

The Point Sensor Thermistor wireless sensor transmits a 12-bit Thermistor value and a unique serial number to a 900 MHz receiver. The Point Sensor Thermistor 900 is enclosed in a high impact ABS enclosure for direct surface mounting in the environment to be measured. The Point Sensor Thermistor is battery operated. Transmission times are preprogrammed at the factory (default rate is every 5 minutes).

**Application:** Apply the sensor to the surface to be monitored with double-sided adhesive tape or with screws through the flanges.

**Start/Stop Function:** The sensor is started when the On/Off switch is moved towards the SMA antenna connector. The Sensor has an internal reed switch (indicated as "Service" on product label). Momentarily placing a magnet next to this switch will cause the device to transmit a special installation status mark in the data packet immediately after the magnet is removed. The immediate transmission of temperature, ID and installation status mark will occur anytime the reed switch is activated. The Point Sensor Temp-900 may be placed in a quiescent state (no transmission) by sliding the On/Off switch away from the SMA antenna connector.

**Battery:** Two 3.6 Volt lithium thionyl chloride batteries power the wireless sensor. The device will transmit data for as long as 2 years at a transmission rate of once every 5 minutes. The electronic components are completely covered with a water resistant coating to protect from condensation. The user can replace the batteries.



**FCC ID: OUR9XSTREAM  
MADE IN USA**

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES; OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESERED OPERATION

## Wireless Thermistor Sensor Data Format

The Point Six Wireless 900 MHz wireless analog transmitters require a compatible receiver with the ability to receive, error check and provide RS232 and RS422/485 interface. This document describes the data format provided by the **Point Transceiver** 900 MHz. Receiver.

The transmit packet consists of 13 bytes of data:

### **“Thermistor” (57/56)**

IDSSSSSSSSSSSSSSSSSSAAAACCCCKK<CR>

*Note: All fields are in ASCII Hex*

#### **“ID”**

This field is the device type and mode indicator, the 57 or 56 indicates that this is a Thermistor analog transmitter; 56 indicates the transmitter is in service mode.

#### **“SSSSSSSSSSSSSSSSSS”**

This field is the 64 bit unique serial number of the Thermistor sensor.

#### **“AAAA”**

This is the analog data field. This field is 16 bits stored MSB first (bits 15-8) and LSB last (bits 7-0) from left to right. This is a value of 0-32767 for 0-fullscale. Conversion is dependant on thermistor type and termination specified (default termination is 10,000 Ohm.)

#### **“CCCC”**

This field is the CRC-16 error check as was originally received and checked. This CRC is over the first 11 bytes of the packet starting with the device type and ending with but not including CRC-16.

#### **“KK”**

This field is the mod 256 sum of all the binary data values as represented by the ASCII hex values in the response but does not include the <CR>.

## Linearizing Thermistors

### Computing Normalized Resistance

Need to convert the raw binary as received from the A/D converter to a normalized resistance. The binary value is given as a signed 16 bit number. The possible range of this number is from 0 to 32767. The following equation is used to compute the normalized resistance.

$$R_{\text{norm}} = R_{\text{div}} / ( 32767 / B_{\text{in}} - 1) / R_{\text{nominal}}$$

Where:

- $R_{\text{norm}}$  is the computed normalized resistance.
- $R_{\text{div}}$  is the value of the divider resistor
- $R_{\text{nominal}}$  is the Thermistor resistance at 0 degrees C.
- $B_{\text{in}}$  is the binary value provided by the A/D converter.

### Computing temperature from the normalized resistance

The following equation uses the Steinhart-Hart Equation to compute temperature using the normalized resistance as the input.

$$T_k = 1 / (a + b(\ln R_{\text{norm}}) + c(\ln R_{\text{norm}})^2 + d(\ln R_{\text{norm}})^3)$$
$$T_c = T_k - 273.15$$

Where:

- $T_k$  is the resulting temperature in degrees K
- $T_c$  is the resulting temperature in degrees C
- a, b, c, d are fitting constants provided by the manufacture.
- $R_{\text{norm}}$  is the normalized resistance read from the thermistor.

### Thermistor Being Used

Vendor: Thermometrics  
Part Number: RL0503-5820-97-MS  
<http://www.thermometrics.com/>

### Thermistor Parameters

$R_{\text{div}}$ : 10,000 ohms  
 $R_{\text{nominal}}$ : 10,000 ohms at 25 degrees C

Fitting constants

- a: 3.3539264E-03
- b: 2.5609446E-04
- c: 1.9621987E-06
- d: 4.6045930E-08