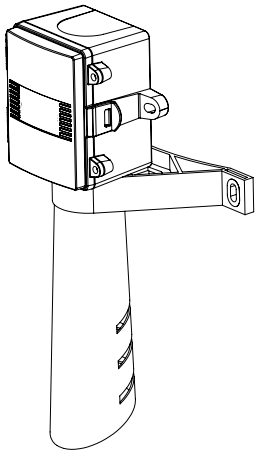# Outside Air Network Humidity/Temperature Sensor with Sun and Windshield

Installation Instructions

INTRODUCTION

The outside air network humidity/temperature sensor uses a highly accurate and reliable Thermoset Polymer based capacitance humidity sensor and temperature sensor, that is field replaceable, to monitor humidity and temperature levels and transmit values via BACnet® or Modbus communication to a building automation system. A hinged, gasketed weatherproof Polycarbonate enclosure with sun and wind shield provides ease of installation and protection from the elements.

BEFORE INSTALLATION

Read these instructions carefully before installing and commissioning the humidity/temperature sensor. Failure to follow these instructions may result in product damage. Do not use in an explosive or hazardous environment, with combustible or flammable gases, as a safety or emergency stop device or in any other application where failure of the product could result in personal injury. **Follow electrostatic discharge precautions during installation and do not exceed the device ratings.**

MOUNTING

Select a suitable mounting spot on an exterior wall where the sensor is best protected from direct exposure to sunlight, wind, etc. preferably on a north facing wall. Do not mount the sensor near opening windows, supply/exhaust air louvres or other known air disturbances. Avoid areas where the sensor is exposed to vibrations or rapid temperature changes.

The sensor provides a connection hole for 22.7 mm (0.895") conduit on the back side of enclosure. Run a length of conduit through exterior wall and seal. Use 18-22 AWG shielded wiring for all connections and do not locate the device wires in the same conduit with wiring used to supply inductive loads such as motors. Make all connections in accordance with national and local codes.

The sensor installs directly on an exterior wall using the two integrated mounting holes provided on the mounting brakcet. Select the best mounting technique based on the exterior wall material. The two mounting holes are suitable for a #10 size screw (not supplied). The sensor shroud must be pointing down. See Figure 1.

The enclosure has a hinged cover with a latch. Open the cover by pulling slightly on the latch on the right side of the enclosure. At the same time pulling on the cover, as illustrated in Figure 2.

Feed conduit through the provided hole in the back of the enclosure and secure with a lock nut as shown in Figure 2. It is recommended that weatherproof conduit or cable gland fittings be used. The E style enclosure includes a cable gland fitting as shown in Figure 3.

Make wiring connections as per the "wiring" illustrations on Page 2.

Swing door closed until securely latched. For added security, two screws are provided that may be installed in the integrated screw tabs. See Figure 4.
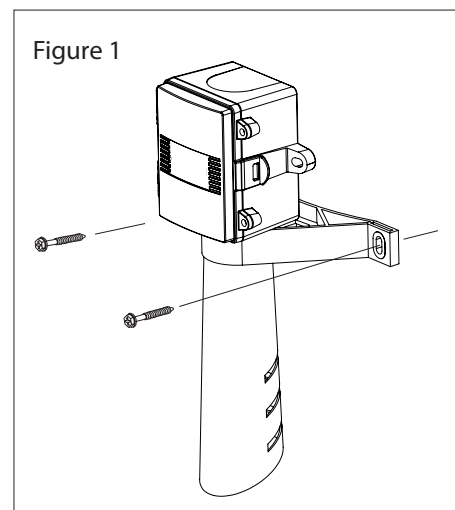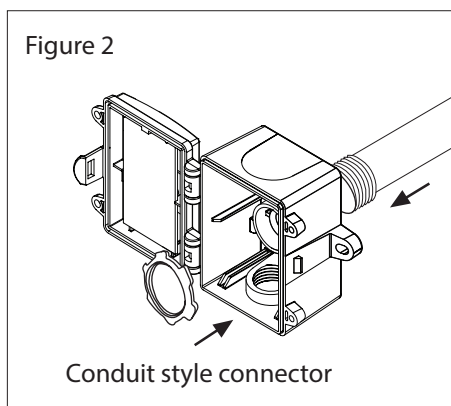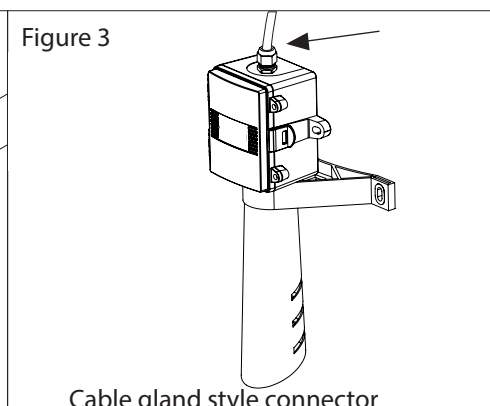
Figure 1

Figure 2

Conduit style connector

Figure 3

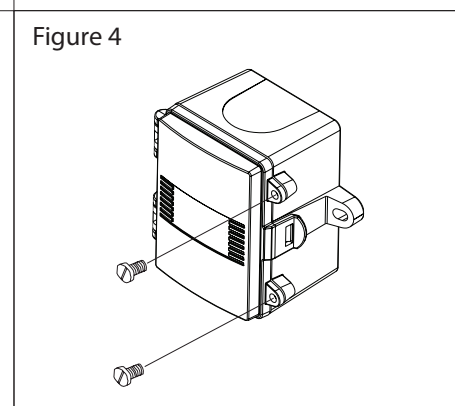Cable gland style connector

Figure 4

WIRING

Deactivate the 24 Vac/dc power supply until all connections are made to the device to prevent electrical shock or equipment damage. Use 14-22 AWG shielded wire for all connections and do not locate the device wires in the same conduit with wiring used to supply inductive loads such as motors. Pull at least six inches of wire into the enclosure and complete the wiring connections according to the wiring diagram. Make all connections in accordance with national and local codes.

Figure 5
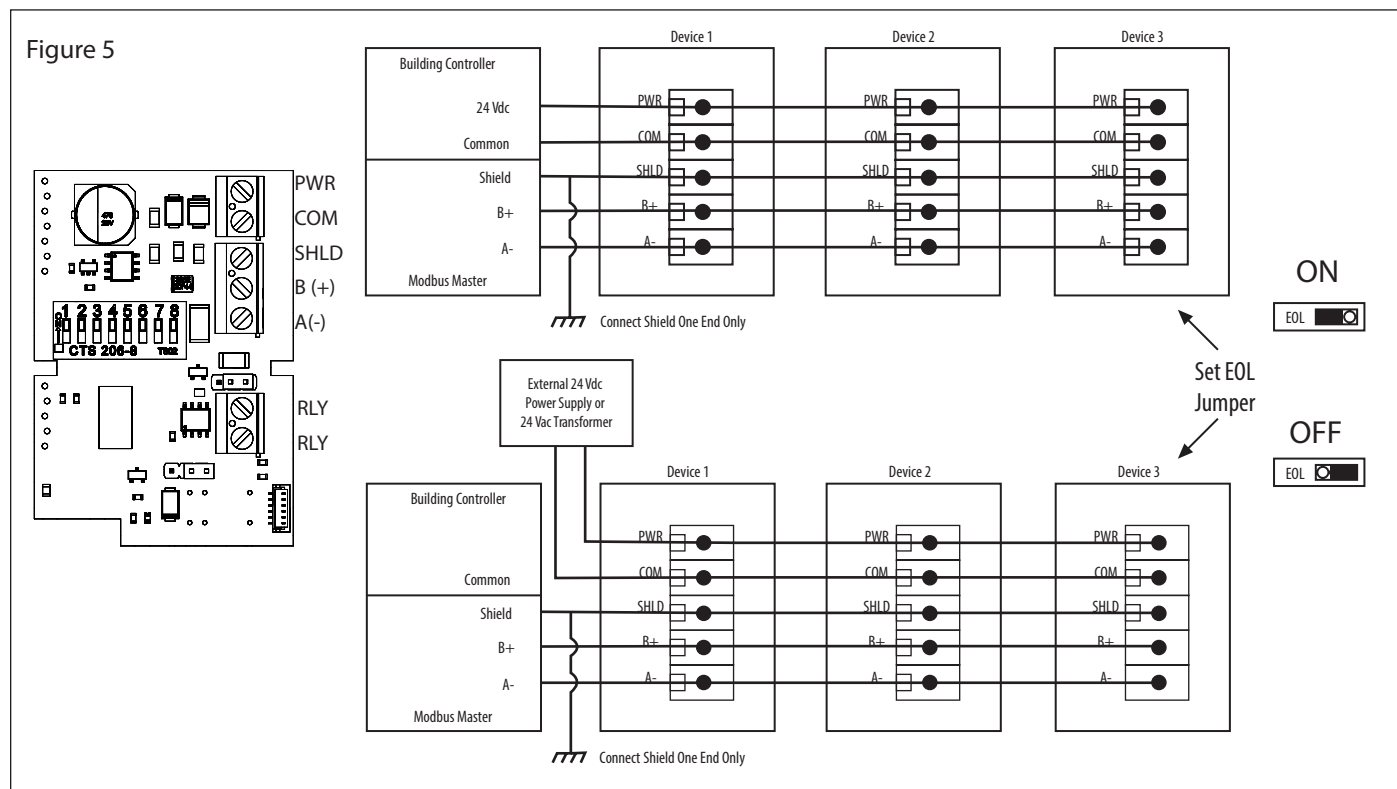
Connect the plus DC or the AC voltage hot side to the PWR terminal and the power supply common is connected to the COM terminal. The device has a half-wave power supply so use caution when wiring multiple devices to that the circuit ground point is the same on all devices and the controller. Use caution if 24 Vac power is used and one side of the transformer is earth grounded. In general, the transformer should NOT be connected to earth ground when using devices with an RS-485 network connection. The device is reverse voltage protected and will not operate if connected backwards.

Connect the RS-485 network with twisted shielded pair to the terminals marked A-, B+, and SHLD (shield) as shown in Figure 5. The positive wire connects to B+ and the negative wire connects to A- and the cable shield must be connected to the SHLD terminals of each device. If the device is connected to the end of the network, an end-of-line (EOL) termination resistor (121 Ω) should be installed in parallel with the A- and B+ terminals. This device includes a network termination jumper and will connect the resistor correctly on the PCB. Simply move the PCB jumper to the EOL position as shown in Figure 5 and no external resistor is required. The ground wire of the shielded pair should be connected to earth ground at the end of the network and the master is not grounded. Do not run bus wiring in the same conduit as line voltage wiring.

A network segment is a single shielded wire loop run between several devices (nodes) is a daisy chain configuration. The total segment length should be less than 1220 meters (4000 feet) and the maximum number of nodes on one segment is 127. Nodes are any device connected to the loop and include controllers, repeaters and sensor such as the Network Humidity/Temperature Sensor but does not include the EOL terminators. To install more devices, or to increase the network length, repeaters will be required for proper communication. The maximum daisy chain length (segment) depends on transmission speed (baud rate), wire size and number of nodes. If communication is slow or unreliable, it may be necessary to wire two daisy chains to the controller with a repeater for each segment.

Figure 6
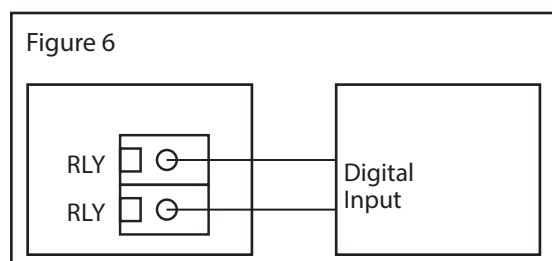
An optional alarm NO relay output is available on the RLY terminals. The relay output is completely isolated. The relay contacts may be connected to a controller Digital Input (DI) for status monitoring or used to directly control an alarm or ventilation fan. Do not exceed the device contact ratings. In some cases, a separate control relay may be used between the relay output and a large fan for example. See Figure 6.

The relay can be set to activate on either humidity or temperature. This parameter and the setpoint value can only be set over the BACnet or Modbus networks. Please refer to Page 5 to access the network setup guides.

NETWORK COMMUNICATION - MODBUS

The device parameters must be set before connection to the network and will ensure that each device has a unique Modbus address. The local DIP switch is used to set the Modbus address (1-255) as shown in Figure 7.

The factory default network configuration is:
        Baud Rate: Auto Baud Rate Detection (9600, 19200, 38400, 76800 and 115200)
        Parity: None
        Stop Bits: 1
        CRC: A001 (CRC-16 reverse)
        Delay: 0 (minimum)

Note that the Modbus network configuration may be customized at the factory if required. For example, the parity and stop bit parameters may be factory configured to suit specific applications.

The humidity/temperature sensor operates as a slave. It will not communicate unless a master is connected to the network and sends a request for information, then the slave will answer. If the device does not communicate properly, first check that the communication wires are not reversed. Then check that the slave address has a unique setting for the network segment it is connected to. Finally, verify that the device baud rate, parity bit, stop bit and RTU mode CRC polynomial are correct for the network it is connected to.

Figure 7

DIP Switch Position								Modbus Address
128	64	32	16	8	4	2	1	
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	3
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	4
↓	↓	↓	↓	↓	↓	↓	↓	↓
ON	ON	ON	ON	ON	ON	ON	OFF	254
ON	ON	ON	ON	ON	ON	ON	ON	255

NETWORK COMMUNICATION - BACNET®

The device parameters must be set before connection to the network and will ensure that each device has a unique MAC address and Device Instance for startup. On startup, the MAC address is appended to the Device Object : Vendor Identifier to create the unique Device Instance (Device Object : Object Identifier). Once connected to a network, the Device Object : Object Identifier can be written to any unique value via BACnet and then the MAC address will no longer be appended to the value. All parameters are saved in memory. The DIP switch is used to set the BACnet address (0-127). Slide the appropriate DIP switch(es) to the "ON" position as shown in Figure 8.

Figure 8

DIP Switch Position							BACnet® Address
64	32	16	8	4	2	1	
OFF	OFF	OFF	OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	OFF	OFF	ON	2
OFF	OFF	OFF	OFF	OFF	ON	OFF	3
↓	↓	↓	↓	↓	↓	↓	↓
ON	ON	ON	ON	ON	ON	ON	126
ON	ON	ON	ON	ON	ON	ON	127

Note that the BACnet network baud rate may be 9600, 19200, 38400, 57600, 76800 or 115200 and is auto-detected on startup.

The RH/T Sensor operates as a slave. It will not communicate unless a master is connected to the network and sends a request for information, then the slave will answer. If the device does not communicate properly, first check that the communication wires are not reversed. Then check that the slave address has a unique setting for the network segment it is connected to. Ensure the device object name and object identifier are unique on the entire BACnet network, not just on the MS/TP sub-net. Both of these properties are writable.

Ensure the application software is not set to poll the devices too frequently. For example, if the software is polling the devices every 500 mS, the network could be heavily congested with the network traffic and may not operate reliably. A slower polling rate such as 5 to 10 seconds will usually produce better results on a typical network segment.

Use care when setting the MS/TP MAC address and the device object Max_Master property since both can have a significant effect on the network efficiency. Some MAC address and Max_Master combinations will operate more efficiently than others. MAC addresses should be selected sequentially, starting at the lowest possible value. For example, on a five node segment, the MAC addresses should be set to 1, 2, 3, 4 and 5. In this case, if the Max_Master property value is left at the 127 default, then there will be a lot of wasted time on the network polling for masters that are not present. In this example, the five RH/T nodes should be set such that Max_Master is equal to 5. The Max_Master value initially defaults to 127 so that any master can be found when the device first starts.

SPECIFICATIONS

RELATIVE HUMIDITY
Accuracy .... ±2, 3, or 5 %RH (5 to 95 %RH)
Range.. 0-100 %RH
Resolution .... 0.01 %RH
Hysteresis .... ±0.8 %RH @ 25°C (77°F)
Response Time .... 8 seconds typical
Stability .... <0.25 %RH/year

TEMPERATURE SENSOR
Sensor Accuracy............................. ±0.2°C (±0.4°F) @ 0 to 70°C (32 to 158°F)
Probe Sensing Range .... -40 to 50°C (-40 to 122°F), 5 to 95 %RH non-condensing
Resolution .... 0.01°C/°F
Response Time .... 2 seconds
Stability .... <0.03°C/year

NETWORK COMMUNICATION
Hardware .... MS/TP, 2-wire RS-485
Software.. BACnet® or Modbus
Baud Rate .... 9600, 19200, 38400, 57600, 76800, or 15200
Address Range................................ **BACnet®:** 0 to 127
                                            Modbus: 1 to 255

OPTIONAL RELAY
Contacts.. 0.5 A @ 125 Vac / 1 A @ 24 Vdc
Setpoint .... **Relative Humidity:** 1 to 90 %RH or
                                            Temperature: 5 to 40°C (40 to 100°F)

GENERAL
Power Supply .... 24 Vac/dc ±10% typical, 28 Vac/dc maximum
Consumption .... 22 mA @ 24 Vdc, 70 mA @ 24 Vac
Operating Environment .... -40 to 50°C (-40 to 122°F)
Wiring Connection........................ Screw terminal block (14 to 22 AWG)
Enclosure .... **A:** Polycarbonate, UL94-V0, IP65 (NEMA 4X)
                                            E: Same as A, with cable gland fitting
Dimensions...................................... 82.5mm W x 76.2mm H x 52.0mm D (3.25" x 3.0" x 2.05")
Country of Origin............................Canada

The RH and Temperature sensor PCB can be field replaced by removing filter at end of Duct Probe.
Accessory Part# HRMPB00 - Probe Replacement RH/T Module.

DIMENSIONS

82.5 mm
3.25"

69.8 mm
2.75"

132 mm
5.19"

52.0 mm
2.05"

76.2 mm
3.00"

0.5" NPT

92.0 mm
3.62"

38.0 mm
1.5"
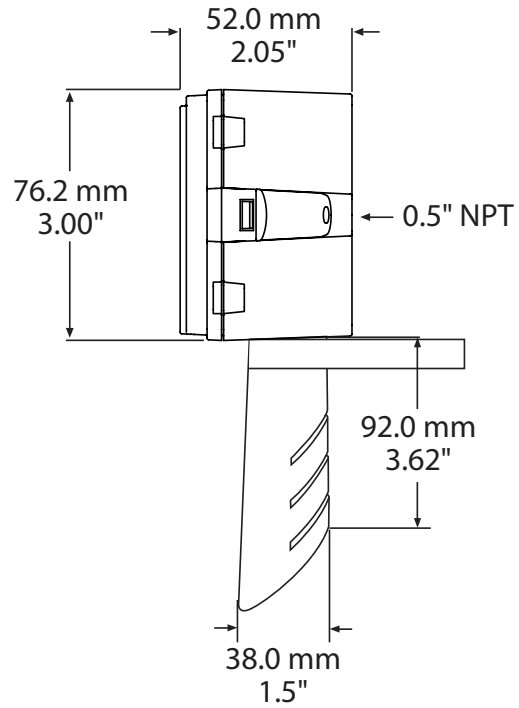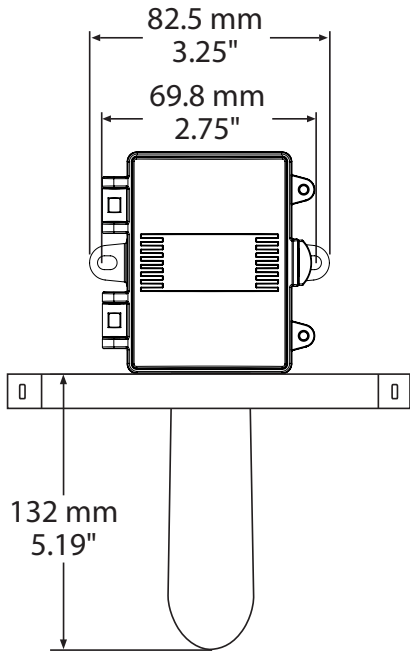
NETWORK SETUP GUIDE

The network setup guide describes the implementation of the BACnet® or Modbus protocol. It is intended to assist control system programmers who may need to add support to their systems to communicate with this device.

BACnet® and Modbus setup guide downloads are available online.

BACnet® PROTOCOL
https://downloads.greystoneenergy.com/SG/SG-HNXXXBAC.pdf

MODBUS PROTOCOL
https://downloads.greystoneenergy.com/SG/SG-HNXXXMOD.pdf