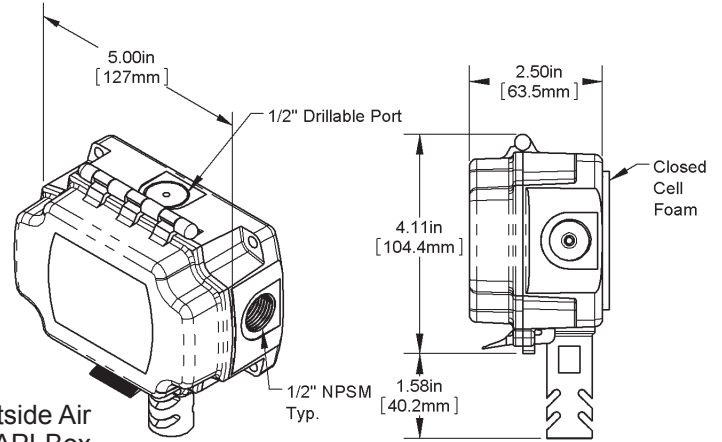
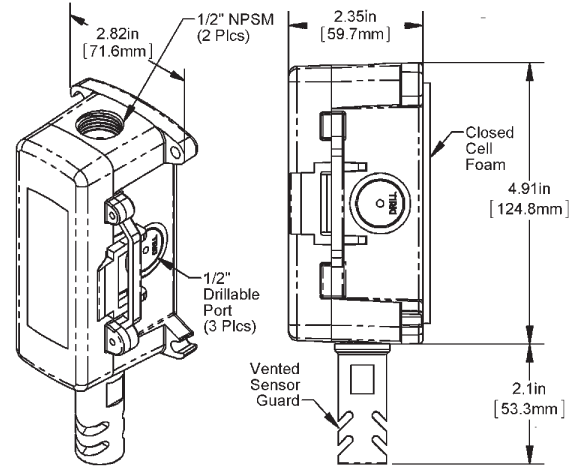


## Overview and Identification

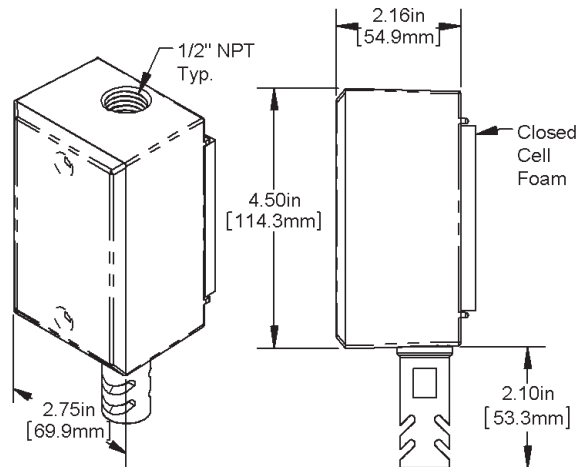
The outside air temperature transmitter is designed to handle the harshest outside environments. The probe and enclosure are made to protect the sensor from impediments such as rain, sleet, snow or bird droppings. The 4 to 20mA output transmitters comes with a 1K $\Omega$  (385) RTD or 10K-2 thermistor sensor. 10K-2 thermistor sensor. A 0 to 5VDC or 0 to 10VDC output is also available with the 10K-2 thermistor sensor. Special high accuracy RTD matched transmitters (M) are available which match the sensor to the transmitter for improved accuracy. Enclosure mounting styles come in plastic or metal for both NEMA 3R and NEMA 4 applications and are all UV rated.



**Fig. 1:** Outside Air Sensor in a BAPI-Box (-BB) Enclosure



**Fig. 2:** Outside Air Sensor in a BAPI-Box 2 (-BB2) Enclosure



**Fig. 3:** Outside Air Sensor in a Weatherproof (-WP) Enclosure

Specifications subject to change without notice.

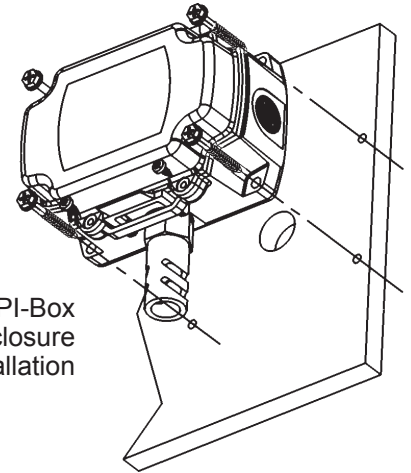
## Mounting

Outside Air (OSA) sensor placement is critical to good performance. The OSA sensor must be mounted in the shade away from building windows, doors or vents. They should never be in direct sunlight or you will have higher than expected temperature readings by as much as +30%. The ideal shaded location in the Northern hemisphere is on the North side of the building. In the Southern hemisphere the South side of the building is ideal.

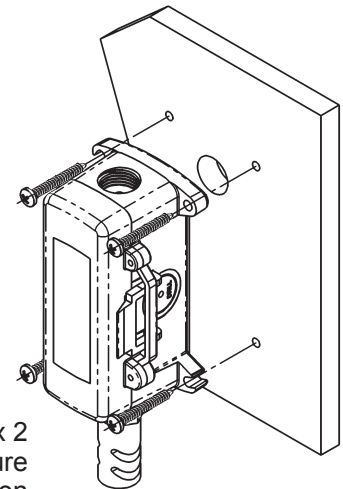
The sensor shield and probe should always point down and mounted between four feet above the ground/roof and one foot minimum below the eave. (Note: Four feet keeps the sensor above the ground or roof top radiation and one foot under the eave prevents measurement of trapped heat from under the eave.)

Drill the mounting holes and mount as shown in the figs 4-6. Snug up the mounting screws to ensure that the foam backing compresses to about 50% of its thickness to make a gasket type seal against the wall surface.

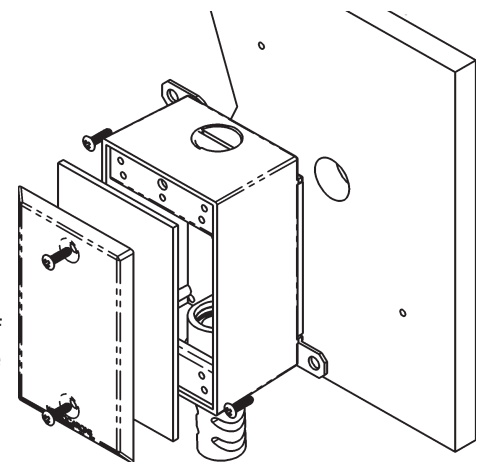
Route the wires into the box and terminate with sealant filled connectors to prevent water from attacking the connection, thereby preventing costly callbacks. Best practice is to caulk the wiring hole after the wiring is installed. Close the cover of the enclosures and secure with provided cover security screws.



**Fig. 4:** BAPI-Box (-BB) Enclosure Installation



**Fig. 5:** BAPI-Box 2 (-BB2) Enclosure Installation

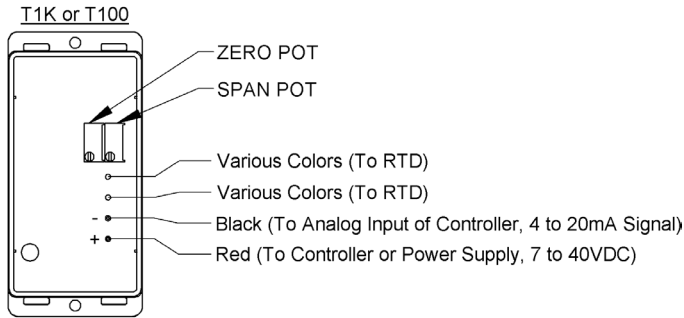


**Fig. 6:** Weatherproof (-WP) Enclosure Installation

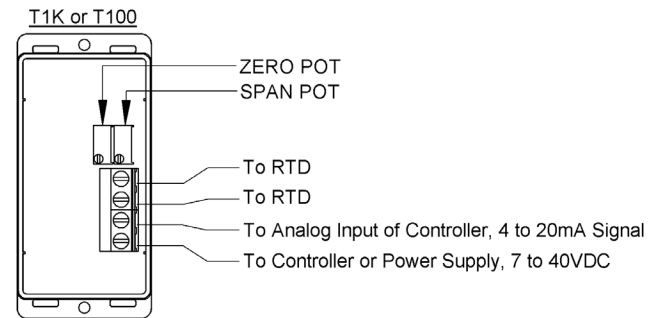
Specifications subject to change without notice.

## Wiring & Termination

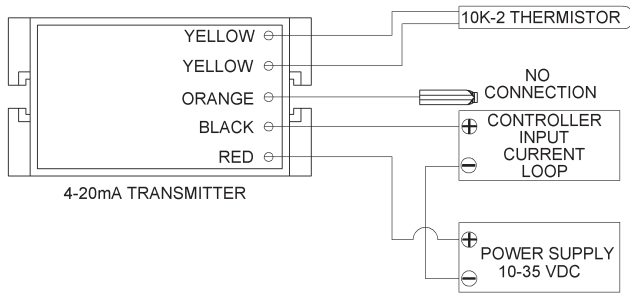
BAPI recommends using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs. All wiring must comply with the National Electric Code (NEC) and local codes. Do NOT run this device's wiring in the same conduit as high or low voltage AC power wiring. BAPI's tests show that inaccurate signal levels are possible when AC power wiring is present in the same conduit as the sensor wires.



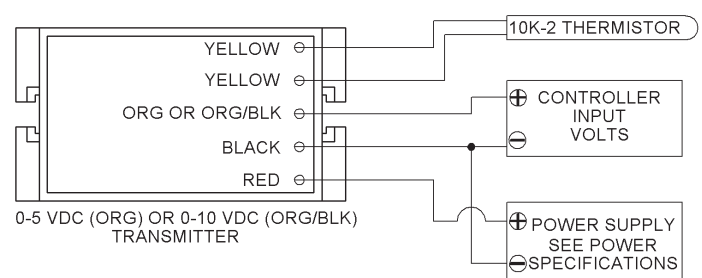
**Fig. 7:** Typical RTD 4 to 20mA Transmitter with Flying Leads



**Fig. 8:** Typical RTD 4 to 20mA Transmitter with Terminals



**Fig. 9:** Typical Thermistor 4 to 20mA Transmitter



**Fig. 10:** Typical Thermistor Voltage Transmitter

## Diagnostics

### Possible Problems:

- Unit will not operate.
- The reading is incorrect in the controller.

### Possible Solutions:

- Measure the power supply voltage by placing a voltmeter across the transmitter's (+) and (-) terminal. Make sure that it matches the drawings above and power requirements in the specifications.
- Check if the RTD wires are physically open or shorted together and are terminated to the transmitter.
- Determine if the input is set up correctly in the controllers and BAS software.
- For a 4 to 20mA current transmitter measure the transmitter current by placing an ammeter in series with the controller input. The current should read according to the "4 to 20mA Temperature Equation" shown below.
- For a voltage transmitter, measure the signal with a volt meter (Orange or Orange/Black to Black). The signal should read according to the "Voltage Temperature Equation" shown below.

#### Voltage Temperature Equation

$$T = T_{Low} + \frac{(V \times T_{Span})}{V_{Span}}$$

T	= Temperature at sensor
T <sub>Low</sub>	= Low temperature of span
T <sub>High</sub>	= High temperature of span
T <sub>Span</sub>	= T <sub>High</sub> - T <sub>Low</sub>
V <sub>Low</sub>	= Low transmitter voltage usually=(0, 1 or 2v)
V <sub>High</sub>	= High transmitter voltage usually=(5 or 10v)
V <sub>Span</sub>	= V <sub>High</sub> - V <sub>Low</sub>
V	= Signal reading in volts

#### 4 to 20mA Temperature Equation

$$T = T_{Low} + \frac{(A - 4) \times (T_{Span})}{16}$$

T	= Temperature at sensor
T <sub>Low</sub>	= Low temperature of span
T <sub>High</sub>	= High temperature of span
T <sub>Span</sub>	= T <sub>High</sub> - T <sub>Low</sub>
A	= Signal reading in mA

Specifications subject to change without notice.



# Outside Air (OSA) Temperature Transmitters

**BA/T1# -O Temperature Sensor**

*Installation & Operations*

20920\_ins\_OSA\_Active

rev. 08/31/20

## Specifications

### RTD Transmitter

Power Required: ....7 to 40VDC  
 Transmitter Output: 4 to 20mA, 850Ω@24VDC  
 Output Wiring: .....2 wire loop  
 Output Limits: .....<1mA (short), <22.35mA (open)  
 Span: .....Min. 30°F (17°C), Max 1000°F, (555°C)  
 Zero: .....Min. -148°F (-100°C), Max 900°F (482°C)  
 Zero & Span Adjust: 10% of span  
 Accuracy: .....±0.065% of span  
 Linearity: .....±0.125% of span  
 Power Output Shift: ±0.009% of span  
 RTD Sensor: .....2 wire Platinum (Pt), 385 curve  
 Transmitter Ambient: -4 to 158°F(-20 to 70°C)  
 0 to 95% RH, Non-condensing

### Thermistor Transmitter

Supply Voltage:  
 10 to 35 VDC ..... 0 to 5 VDC or 4 to 20 mA Outputs  
 15 to 35 VDC ..... 0 to 10 VDC Output  
 12 to 24 VAC..... 0 to 5 VDC Outputs  
 15 to 24 VAC..... 0 to 10 VDC Output  
 Transmitter Output... 4 to 20mA, 700Ω@24VDC  
 0 to 5VDC, 0 to 10VDC, 10KΩ min  
 Output wiring ..... 2 & 3 wire (see Wiring detail)  
 Transmitter Limits .....-40°F to 185°F,(-40°C to 85°C)  
 Accuracy .....±1.015°C, from (0 to 65°C)  
 Linearity .....±0.065°C, from (0 to 65°C)  
 Resolution.....Span/1024  
 Thermistor Sensor.... 10K-2 Thermistor,10KΩ @77°F  
 Transmitter Ambient.. 32 to 158°F, (0° to 70°C)  
 0 to 95% RH, Noncondensing

### Thermistor: 10K-2, Thermal resistor

Accuracy .....(Std) ±0.36°F, (±0.2°C)  
 Accuracy .....(High) ±0.18°F, (±0.1°C), [XP] option  
 Stability .....< 0.036°F/Year, (<0.02°C/Year)  
 Heat Dissipation .....2.7 mW/°C  
 Probe Range .....-40° to 221°F (-40° to 105°C)  
 Wire Colors:  
 Standard: .....Yellow/Yellow (no polarity)  
 High Acc. [XP]: .....Yellow/Yellow (no polarity)

### RTD: Resistance Temp Device (Continuous)

Platinum (Pt)..... 100Ω and 1KΩ @0°C, 385 curve,  
 Pt Accuracy.....(Std) 0.12% @Ref, or ±0.55°F, (±0.3°C)  
 Pt Accuracy.....(High) 0.06% @Ref, or ±0.277°F,  
 (±0.15°C), [A]option  
 Pt Stability.....±0.25°F, (±0.14°C)  
 Pt Self Heating.....0.4 °C/mW @0°C  
 Pt Probe Range .....-40° to 221°F, (-40 to 105°C)  
 Wire Colors:.....General color code (other colors possible)  
 1KΩ, Class B .....Orange/Orange (no polarity)  
 1KΩ, Class A .....Orange/White (no polarity)  
 100Ω, Class B .....Red/Red (no polarity)  
 100Ω, Class A.....Red/Red-w/black stripe (no polarity)

### Sensitivity: Approximate @ 32°F (0°C)

Thermistor ..... Non-linear – Go to bapihvac.com  
 click “Resources” and “BAPI  
 Sensors Overview”

RTD (Pt) ..... 3.85Ω/°C for 1KΩ RTD  
 0.385Ω/°C for 100Ω RTD

### Lead Wire: 22awg stranded

**Insulation:** Etched Teflon, Plenum rated

**Probe:** Vented polycarbonate shield, ½” OD

**Probe Length:** 1.2” with ½” NPT threads

**Wall Gasket:** 1/4” Closed cell foam (impervious to mold)

### Enclosure Types: (Part number designator in bold)

J-Box: ..... **-JB**, w/ eight ½” knock-outs  
 Weatherproof: .. **-WP**, w/ two ½” FNPT entries, (Bell box)  
 BAPI-Box: ..... **-BB**, w/ four ½” NPSM & one ½” drill-out  
 BAPI-Box 2: ..... **-BB2**, w/ three ½” NPSM & three ½” drill-outs

### Enclosure Ratings: (Part number designator in bold)

J-Box: ..... **-JB**, NEMA 1  
 Weatherproof: .. **-WP**, NEMA 3R, IP14  
 BAPI-Box: ..... **-BB**, NEMA 4, IP66, UV Rated  
 BAPI-Box 2: ..... **-BB2**, NEMA 4, IP66, UV Rated

### Enclosure Material: (Part number designator in bold)

J-Box: ..... **-JB**, UL94H-B  
 Weatherproof:.... **-WP**, Cast Aluminum, UV rated  
 BAPI-Box: ..... **-BB**, Polycarbonate, UL94V-0, UV rated  
 BAPI-Box 2: ..... **-BB2**, Polycarbonate, UL94V-0, UV rated

### Ambient (Enclosure): 0 to 100% RH, Non-condensing

J-Box ..... **-JB**, -40°F to 212°F, (-40° to 100°C)  
 Weatherproof ... **-WP**, -40°F to 212°F, (-40° to 100°C)  
 BAPI-Box ..... **-BB**, -40°F to 185°F, (-40° to 85°C)  
 BAPI-Box 2 ..... **-BB2**, -40°F to 185°F, (-40° to 85°C)

### Agency

RoHS  
 PT=DIN43760, IEC Pub 751-1983,  
 JIS C1604-1989

Specifications subject to change without notice.