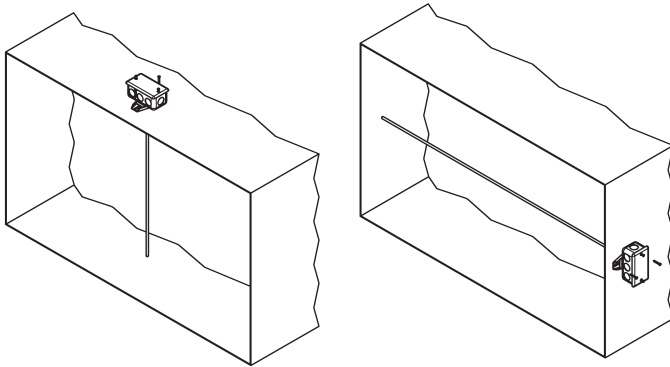


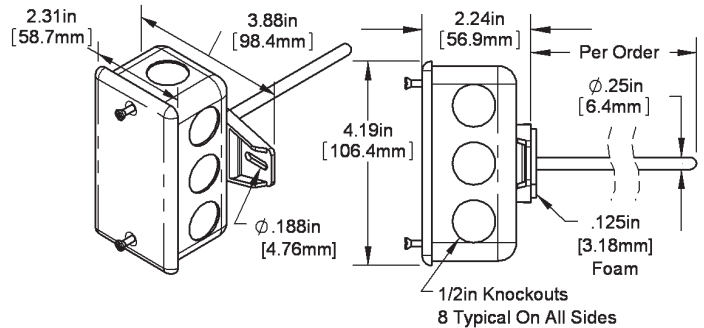
### Overview

The **BA/T#-RA** is a rigid, stainless steel, averaging, duct mounted 4-20mA or Voltage temperature transmitter probe. It comes in a variety of probe lengths and optional mounting enclosures shown below. The 4-20mA transmitter can be ordered with 100Ω (385), 1KΩ (385) RTDs or 10KΩ type 2 thermistor sensors. A 0-5VDC or 0-10VDC transmitter is also available with the 10KΩ type 2 thermistor sensor. Special high accuracy RTD matched transmitters (**M**) are available which match the sensor to the transmitter for improved accuracy.

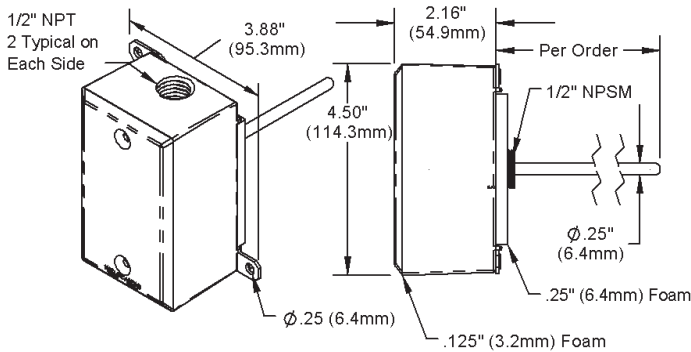
### Identification



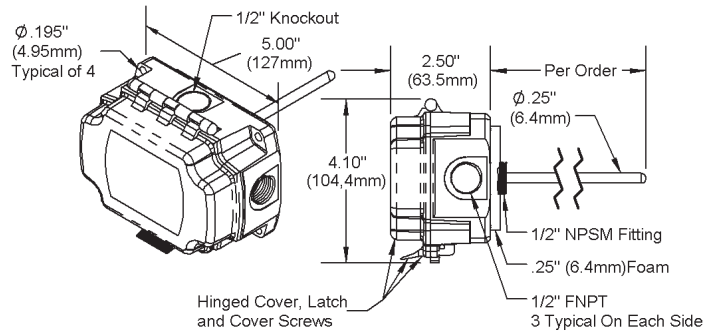
**Fig 1:** Typical Duct Mount Applications - Top Mount (left) and Side Mount (right).



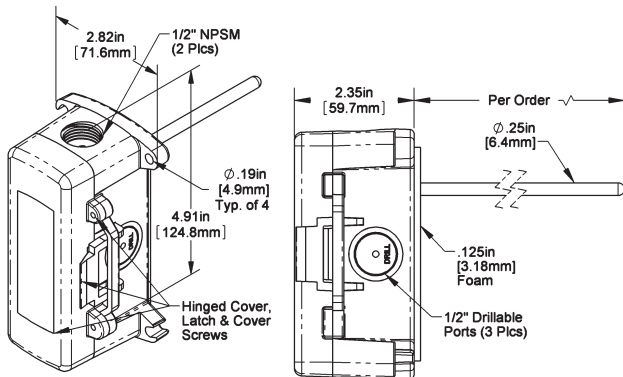
**Fig 2:** Duct Unit with J-Box (Standard)



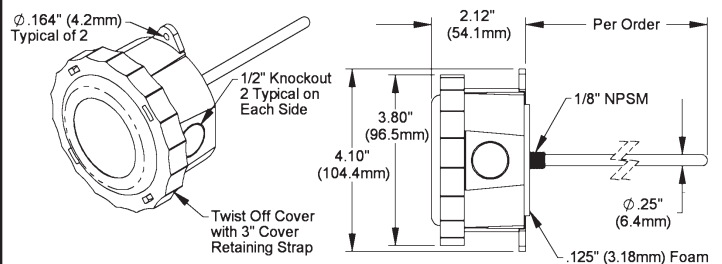
**Fig 3:** Duct Unit with Weatherproof (WP) Enclosure



**Fig 4:** Duct Unit with BAPI-Box (BB) Enclosure



**Fig 5:** Duct Unit with BAPI-Box 2 (BB2) Enclosure

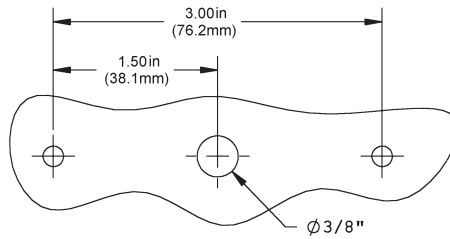


**Fig 6:** Duct Unit with Weather Tight (EU) Enclosure

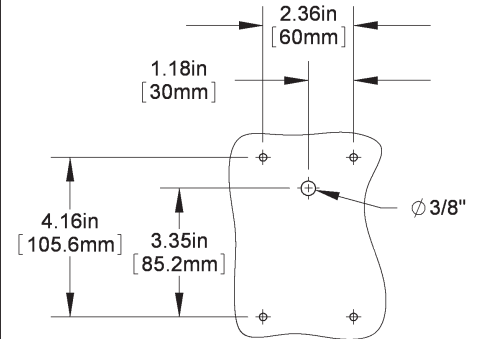
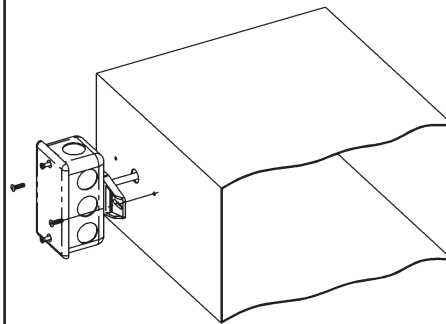
Specifications subject to change without notice.

### Mounting

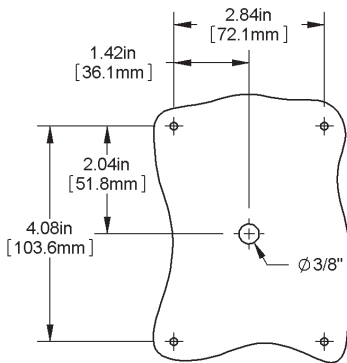
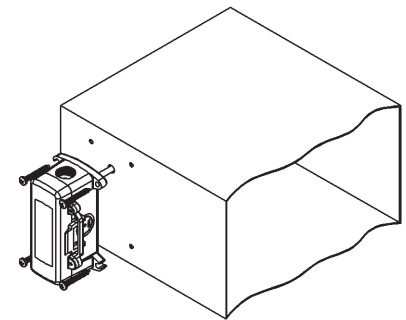
1. Place the sensor in the middle of the duct going through temperature stratified air, to achieve the best temperature reading. (See Fig. 1)
2. Drill the probe hole as depicted below for the enclosure being used. (**Handy Box, BB, BB2, WP, EU**). Insert the probe into the duct.
3. Mount the enclosure to the duct using BAPI recommended #8 screws through a minimum of two opposing mounting tabs provided. Weatherproof (WP) enclosures will require assembly of the mounting tabs on opposite corners. A 1/8 inch pilot screw hole in the duct makes mounting easier through the mounting tabs. Use the enclosure tabs to mark the pilot hole locations.
4. Snug up the sensors so that the foam backing is depressed to prevent air leakage but do not over-tighten or strip the screw threads.



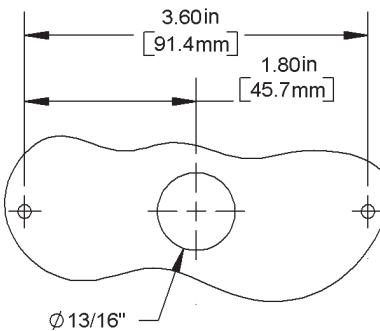
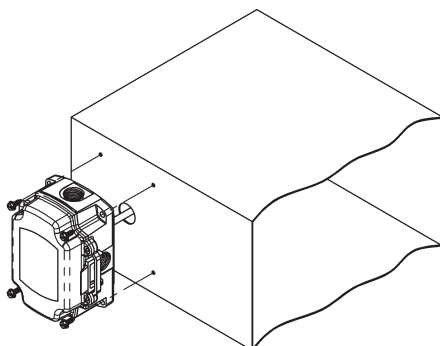
**Fig 7:**  
Junction Box or No-Box (NB)  
Mounting Holes



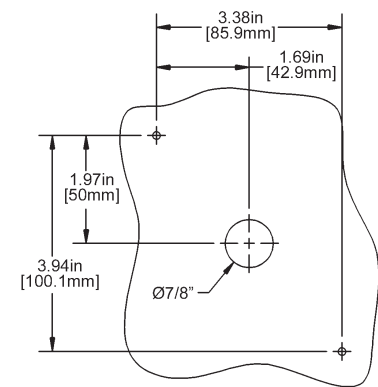
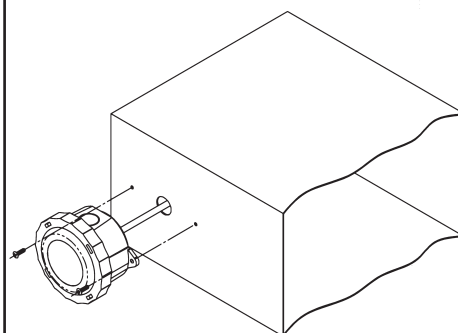
**Fig 8:** BAPI-Box 2 (BB2)  
Enclosure Mounting Holes



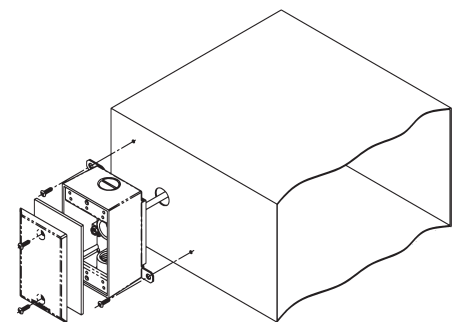
**Fig 9:** BAPI-Box (BB) Enclosure  
Mounting Holes, Rotate 90° for  
Horizontal Mounting



**Fig 10:**  
Weather Tight (EU or EUO)  
Enclosure Mounting Holes



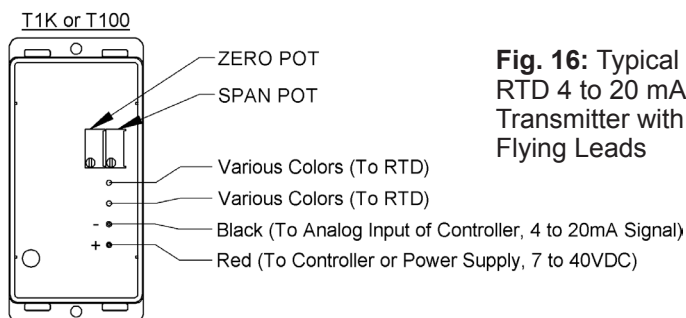
**Fig 11:**  
Weatherproof (WP) Enclosure  
Mounting Holes



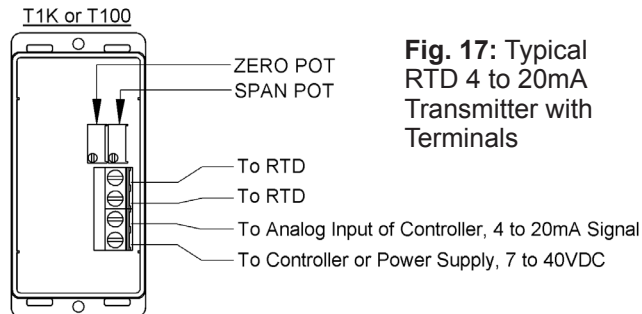
Specifications subject to change without notice.

### Wiring & Termination

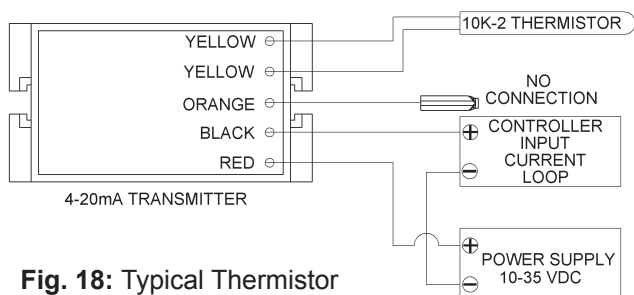
BAPI recommends using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs. All wiring must comply with the National Electric Code (NEC) and local codes. Do NOT run this device's wiring in the same conduit as high or low 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.



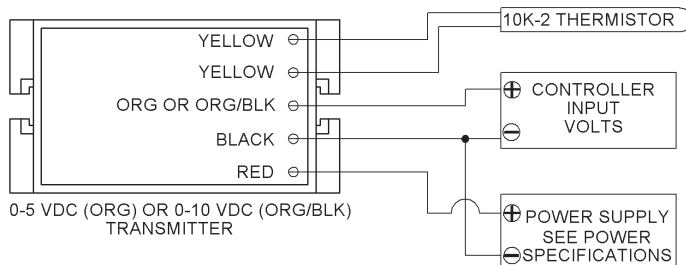
**Fig. 16:** Typical RTD 4 to 20 mA Transmitter with Flying Leads



**Fig. 17:** Typical RTD 4 to 20mA Transmitter with Terminals



**Fig. 18:** Typical Thermistor 4 to 20mA Transmitter



**Fig. 19:** Typical Thermistor Voltage Transmitter

### Diagnostics

#### Possible Problems:

- Unit will not operate.

#### 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.
- Measure the physical temperature at the temperature sensor's location using an accurate temperature standard. Disconnect the temperature sensor wires and measure the temperature sensor's resistance with an ohmmeter. Compare the temperature sensor's resistance to the appropriate temperature sensor table on the BAPI web site.

- The reading is incorrect in the controller.

- 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.



### 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 5 & 0 to 10VDC, 10KΩ min
Output Wiring:	2 & 3 wire (See wiring detail on pg. 3)
Transmitter Limits:	-40 to 185°F, (-40 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

<b>Thermistor:</b>	10K-2, Thermal Resistor (Bare Sensor)
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)

<b>RTD:</b>	Resistance Temp Device (Bare Sensor)
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)

<b>Sensitivity:</b>	Approximate @ 32°F (0°C)
Thermistor:	Non-linear - (See www.bapihvac.com, click "Sensor Specs")
RTD (Pt):	3.85Ω/°C for 1KΩ RTD 0.385Ω/°C for 100Ω RTD
<b>Lead Wire:</b>	22awg stranded
<b>Insulation:</b>	Etched Teflon, Plenum rated
<b>Probe:</b>	Rigid Stainless Steel, 0.25"OD
<b>Probe Length:</b>	12", 2' or 4' per order
<b>Duct Gasket:</b>	1/4" Closed cell foam (impervious to mold)
<b>Mounting:</b>	Extension tabs (ears), 3/16" holes
<b>Enclosure Types:</b>	(Part number designator in bold)
J-Box:	<b>-JB</b> , w/ eight 1/2" knock-outs
Weatherproof:	<b>-WP</b> , w/ two 1/2" FNPT entries, (Bell box)
BAPI-Box:	<b>-BB</b> , w/ four 1/2" NPSM & one 1/2" drill-out
BAPI-Box 2:	<b>-BB2</b> , w/ three 1/2" NPSM & three 1/2" drill-outs
Weather Tight:	<b>-EU, EUO</b> , w/ two 1/2" knock-outs
<b>Enclosure Ratings:</b>	(Part number designator in bold)
J-Box:	<b>-JB</b> , NEMA 1
Weatherproof:	<b>-WP</b> , NEMA 3R, IP14
BAPI-Box:	<b>-BB</b> , NEMA 4, IP66, UV Rated
BAPI-Box 2:	<b>-BB2</b> , NEMA 4, IP66, UV Rated
Weather Tight:	<b>-EU</b> , NEMA 4, IP66
Weather Tight:	<b>-EUO</b> , NEMA 4, IP66, UV rated
<b>Enclosure Material:</b>	(Part number designator in bold)
J-Box:	<b>-JB</b> , UL94H-B
Weatherproof:	<b>-WP</b> , Cast Aluminum, UV rated
BAPI-Box:	<b>-BB</b> , Polycarbonate, UL94V-0, UV rated
BAPI-Box 2:	<b>-BB2</b> , Polycarbonate, UL94V-0, UV rated
Weather Tight:	<b>-EU</b> , ABS Plastic, UL94V-0
Weather Tight:	<b>-EUO</b> , ASA (Geloy) Plastic, UL94V-0, UV rated
<b>Ambient (Encl.)</b>	0 to 100% RH, Non-condensing
J-Box	<b>-JB</b> , -40°F to 212°F, (-40° to 100°C)
Weatherproof	<b>-WP</b> , -40°F to 212°F, (-40° to 100°C)
BAPI-Box	<b>-BB</b> , -40°F to 185°F, (-40° to 85°C)
BAPI-Box 2	<b>-BB2</b> , -40°F to 185°F, (-40° to 85°C)
Weather Tight	<b>-EUO, EU</b> , -40°F to 185°F, (-40° to 85°C)
<b>Agency</b>	RoHS PT=DIN43760, IEC Pub 751-1983, JIS C1604-1989

### Related Products

<b>BA/SFC1000-100</b>	Sealant filled crimp connectors (100 connectors)
<b>BA/SFC2000-100</b>	Sealant filled crimp twist on wire nuts (100 nuts)

Specifications subject to change without notice.