

Overview and Identification

The BAPI Thermobuffer Temperature Sensor is used to simulate the refrigerator contents rather than the refrigerator air temperature. The fluid-filled chamber allows for slower reaction to abrupt temperature changes, yet still maintains long-term accuracy if the change remains permanent. It eliminates the temperature spikes due to frequent refrigerator or freezer door opening and decreases false alarms.

The Thermobuffer comes in three buffer sizes 1", 2" and 4" and is designed to save valuable shelf space by mounting to the wall or by hanger in a refrigerator or freezer. The buffer chamber is machined in 304 Stainless Steel or aluminum and accommodates a variety of temperature sensors or transmitters to interface with all BAS systems.

The unit is available with multiple thermistors or RTDs as shown in the specifications. The mounting enclosure styles come in NEMA 4 plastic or hanging bracket with the buffers available in stainless steel or aluminum to fit any application.

This instruction sheet is specific to the sensor with the BAPI-Box, BAPI-Box 2 or Hanging Bracket. For units with a BAPI-Box Crossover enclosure, please refer to instruction sheet "37718_ins_thermobuffer_passive_bbx.pdf" which is available on the BAPI website or by contacting BAPI.

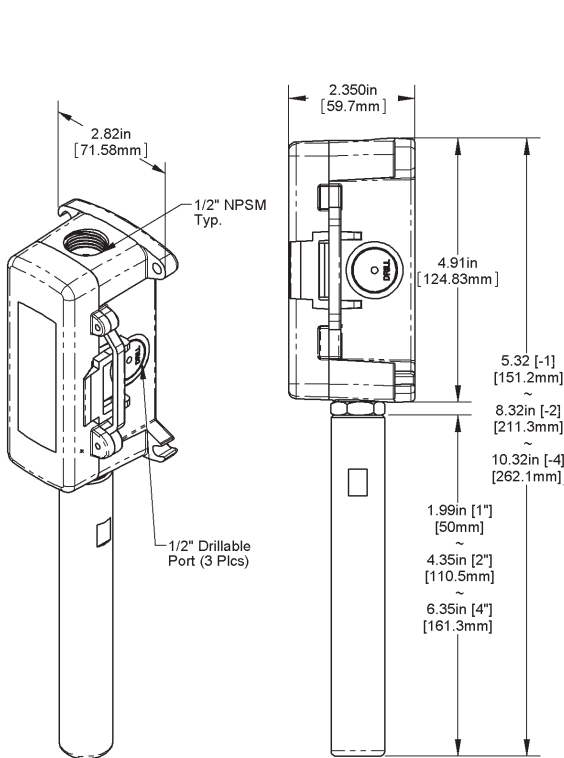


Fig 1: BAPI-Box 2 (BB2) Enclosure

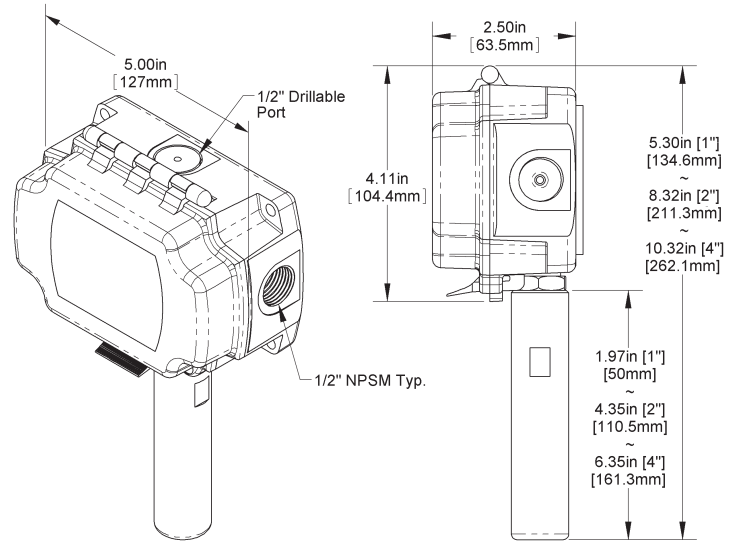


Fig 1: BAPI-Box (BB) Enclosure

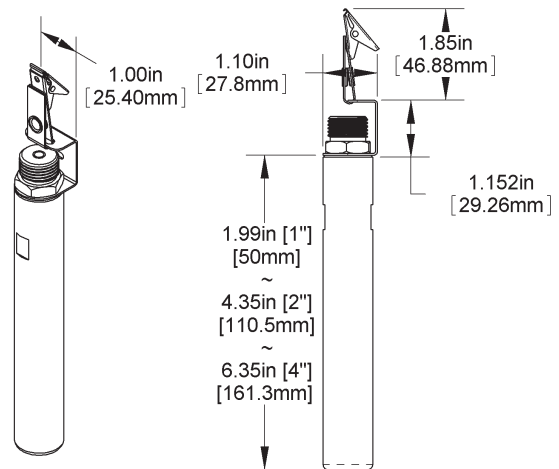


Fig 3: Hanging Bracket Unit

Specifications subject to change without notice.

Assembly & Installation

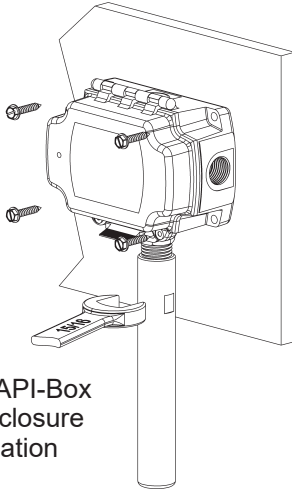


Fig 4: BAPI-Box (BB) Enclosure Installation

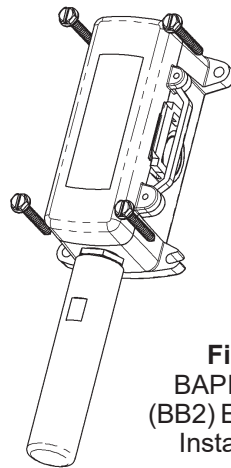


Fig 5: BAPI-Box 2 (BB2) Enclosure Installation

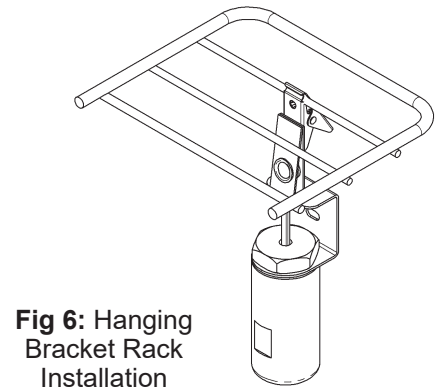


Fig 6: Hanging Bracket Rack Installation

1. Fill the buffer chamber with the appropriate amount of customer provided glycol to the amount as dictated by table 1.
2. Wrap the probe threads with Teflon tape with at least 4 wraps so a water tight seal is established.
3. Insert the probe into the buffer chamber and screw in for a secure water tight fit.
4. Towel off excess fluid which may leak out during assembly and check for leaking. If the assembly leaks, a 15/16ths wrench may be used to snug up the probe to the buffer chamber. More tape may also be needed. The use of food safe silicon may also be used.
5. Select a location on a wall or hanging from a wire rack near the contents you wish to monitor.
6. Mount the thermobuffer with the buffer chamber facing down (Probe on top). Any other orientation is not recommended due to leaking concerns.
7. We recommend BAPI-Box surface mounting be positioned over the refrigerator wireway hole using the rear BAPI-Box knock out. Pull the wiring into the unit and terminate using sealant filled connectors. Best practice is to caulk the wiring hole after the wiring is installed. Secure with mounting screws and ensure that the foam backing compresses to about 50% of its thickness to make a gasket type seal against the surface.

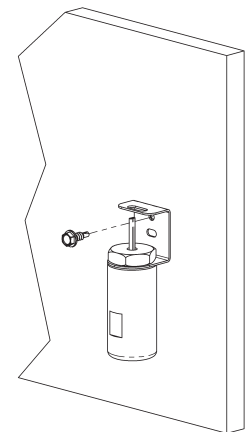


Fig 7: Hanging Bracket Wall Installation (Customer Provided Screws)

Table 1:	
Buffer Size	Recommended Fluid Fill
1" Buffer	0.17 Fluid oz (5mL)
2" Buffer	0.67 Fluid oz (20mL)
4" Buffer	1.00 Fluid oz (30mL)

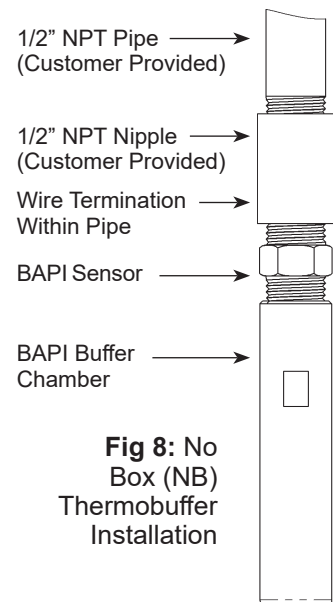


Fig 8: No Box (NB) Thermobuffer Installation

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.

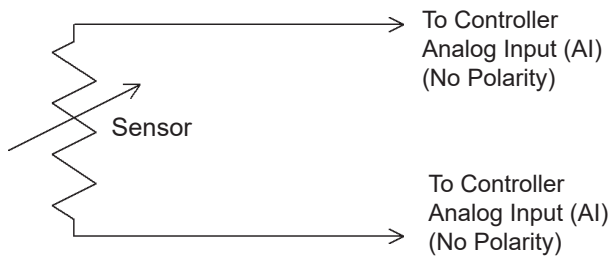


Fig. 9: Two Wire Termination for Thermistor or RTD

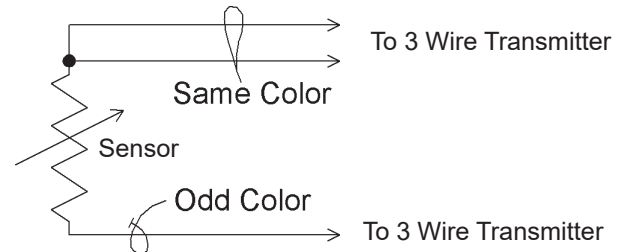


Fig. 10: Three Wire Termination for RTD

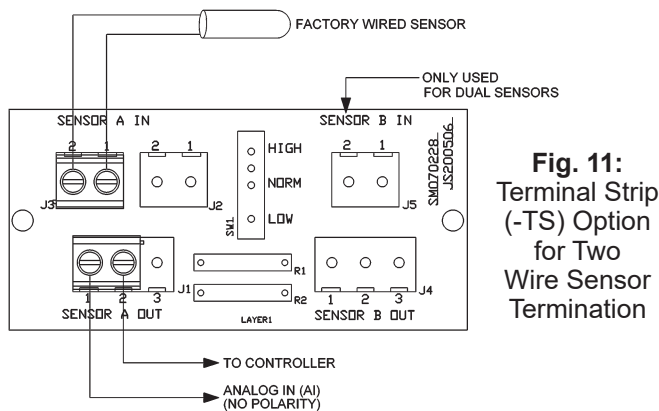


Fig. 11: Terminal Strip (-TS) Option for Two Wire Sensor Termination

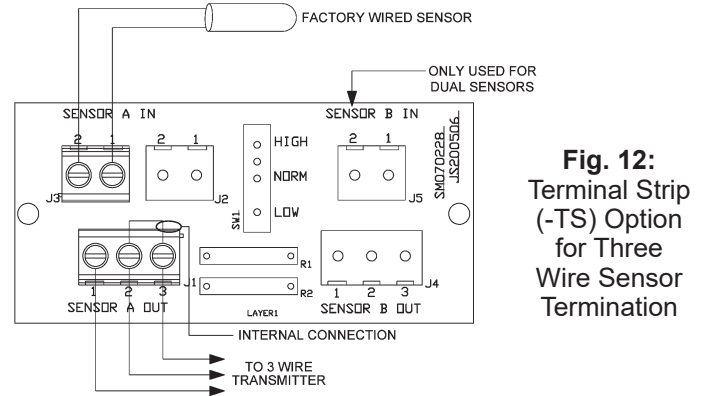


Fig. 12: Terminal Strip (-TS) Option for Three Wire Sensor Termination

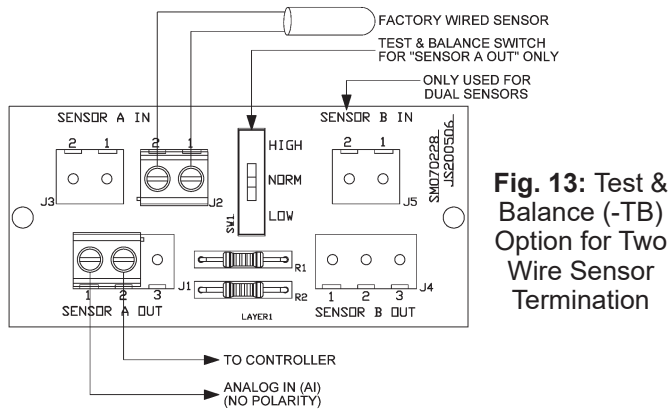


Fig. 13: Test & Balance (-TB) Option for Two Wire Sensor Termination

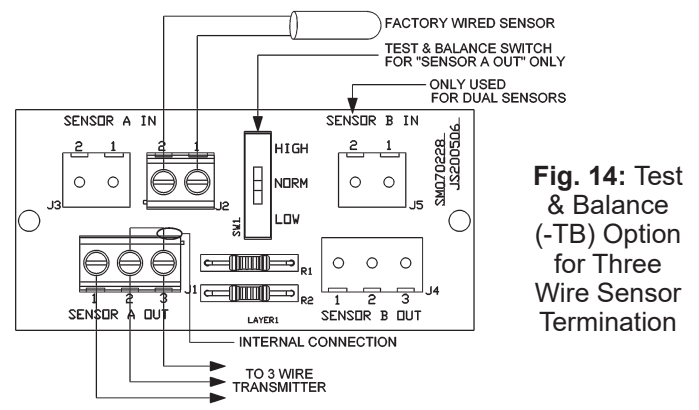


Fig. 14: Test & Balance (-TB) Option for Three Wire Sensor Termination

TEST AND BALANCE SWITCH:

For units with a Test and Balance Switch, the Norm position allows the real sensor at be monitored at "Sensor A Out". The High position forces the "Sensor A Out" to a very hot reading and the Low position forces "Sensor A Out" to a very cold reading (see Table at right).

Sensor Type	Low Temp (40° F) Resistance Value	High Temp (105° F) Resistance Value
1000Ω RTD	1.02KΩ (41.20°F)	1.15KΩ (101.5°F)
3000Ω Thermistor	7.87KΩ (39.8°F)	1.5KΩ (106.8°F)
10K-2 Thermistor	30.1KΩ (34.9°F)	4.75Ω (109.1°F)
10K-3 Thermistor	26.7KΩ (35.9°F)	5.11KΩ (108.4°F)
10K-3(11K) Thermistor	7.32KΩ (43.7°F)	3.65Ω (105.2°F)

Specifications subject to change without notice.



Thermobuffer Temperature Sensors

Installation and Operation Instructions

19817_Ins_thermo_buffer

rev. 02/10/21

Diagnostics

Possible Problems:

Controller reports higher or lower than actual temperature

Possible Solutions:

- Confirm the input is set up correctly in the front end software
- Check wiring for proper termination & continuity (shorted or open)
- For units with a Test & Balance Switch, verify that it is in the center position.
- Disconnect wires and measure the sensor resistance and verify that the sensor resistance is correct as compared to the temperature/resistance table for that sensor. The temperature/resistance tables are available on the BAPI website at www.bapihvac.com in the "Resource Library" under "Sensor Specs". If the measured resistance varies by more than 5% from the table, call BAPI technical support.

Specifications

Sensor: Passive

Thermistor NTC, 2 Wire
 RTD PTC, 2 or 3 Wire

Thermistor:

Temp. Output Resistance
 Accuracy (Std) $\pm 0.36^{\circ}\text{F}$, ($\pm 0.2^{\circ}\text{C}$)
 Accuracy (High) $\pm 0.18^{\circ}\text{F}$, ($\pm 0.1^{\circ}\text{C}$)
 Stability $< 0.036^{\circ}\text{F}/\text{Year}$, ($< 0.02^{\circ}\text{C}/\text{Year}$)
 Heat dissipation $2.7 \text{ mW}/^{\circ}\text{C}$
 Temp. Drift $< 0.02^{\circ}\text{C}$ Per Year
 Probe range -40° to 221°F (-40° to 105°C)

RTD: Platinum 1K, 1K[375], 1K[A]

1K $1\text{K}\Omega$ @ 0°C , $3.85\Omega/^{\circ}\text{C}$ Curve
 1K[375] $1\text{K}\Omega$ @ 0°C , $3.75\Omega/^{\circ}\text{C}$ Curve
 1K[A] $1\text{K}\Omega$ @ 0°C , $3.85\Omega/^{\circ}\text{C}$ Curve,
 High Accuracy RTD

Accuracy 0.12% @Ref, or $\pm 0.55^{\circ}\text{F}$, ($\pm 0.3^{\circ}\text{C}$)
 Accuracy 1K[A] 0.06% @Ref, or $\pm 0.277^{\circ}\text{F}$ ($\pm 0.15^{\circ}\text{C}$)
 Range -40° to 221°F , (-40 to 105°C)

RTD: Extreme Temperature Platinum 1K[1]

1K[1] $1\text{K}\Omega$ @ 0°C , 385 Curve
 Range -328° to 32°F , (-200 to 0°C)

RTD: Nickel 1K[NI]

1K[NI] $1\text{K}\Omega$ @ 70°F , $2.95\Omega/^{\circ}\text{F}$ JCI Curve
 Range -40° to 221°F (-40 to 105°C)

RTD: All RTDs

Stability $\pm 0.25^{\circ}\text{F}$, ($\pm 0.14^{\circ}\text{C}$)
 Self Heating $0.4 \text{ }^{\circ}\text{C}/\text{mW}$ @ 0°C

Wire: 22 AWG Stranded, 2 or 3 Wires

Insulation: Etched Teflon or FEP-Jacketed; PTFE for 1K[1]

Wiring to Probe:

1K[1] Extreme Temp Probe - PTFE Jacketed Cable

Probe: 304 Stainless Steel (SS), 0.25" OD

Probe Process Connection:

304 SS Double threaded $\frac{1}{2}$ " NPT

Probe Length: Probe tip to thread start

1" 0.75"
 2" 3.5"
 4" 5.5"

Buffer Chamber Dimensions:

1" Buffer $2.75"$ H x $1"$ Dia
 2" Buffer $5.1"$ H x $1"$ Dia
 4" Buffer $7.1"$ H x $1"$ Dia

Liquid Fill: Food Grade Glycol (Customer provided)

1" Buffer 5 mL
 2" Buffer 20 mL
 4" Buffer 30 mL

Buffer Chamber Construction:

M304 Machined 304 Stainless Steel, 0.7" core
 MAL Machined Aluminum, 0.7" core

Mounting:

BAPI-Boxes 4 extension tabs (ears), $7/16"$ hole
 Hanging Bracket.. SS bracket w/ $1/8"$ holes or $3/8"$ spring clip

Enclosure Type:

No Box Intended for direct $\frac{1}{2}$ " NPT pipe mount
 BAPI-Box: Four $\frac{1}{2}$ " NPSM ports & one $\frac{1}{2}$ " drill-out
 BAPI-Box 2: Three $\frac{1}{2}$ " NPSM ports & three $\frac{1}{2}$ " drill-outs
 Hanging Bracket.. Intended to hang from shelving

Enclosure Rating:

No Box No rating
 BAPI-Boxes NEMA 4, IP66
 Hanging Bracket.. No rating

Enclosure Material:

BAPI-Boxes Polycarbonate, UL94V-0, UV rated
 Hanging Bracket.. 304 Stainless Steel bracket and clip

Environmental Op. Range: 0 to 100% RH, Non-condensing

Standard Temp Sensor Units:
 BAPI-Box and BAPI-Box 2: -40°F to 185°F (-40° to 85°C)
 No Box: -40°F to 212°F (-40° to 100°C)
 Hanging Bracket: -40°F to 122°F (-40° to 50°C)
 Temp Transmitter Units: -4 to 158°F (-20 to 70°C)
 Extreme Temp Sensor Units: -328 to 32°F (-200 to 0°C)

Agency:

RoHS, CE (Thermistors $10\text{K}\Omega$ or smaller)
 Pt= DIN43760, IEC Pub 751-1983,
 JIS C1604-1989

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