



# HIGH TEMPERATURE BULLET PROBE TRANSMITTER SENSOR

Installation & Operation Instructions

Phone: 1-888-967-5224  
Website: workaci.com

## GENERAL INFORMATION

The ACI High Temperature Bullet Probe Series sensors and transmitters are single point sensors that output 4-20 mA with an optional voltage signal output of 1-5VDC or 2-10VDC signal to BAS or controller. All ACI/TT and TTM temperature transmitters can be powered from either an unregulated or regulated 8.5 to 32 VDC power supply.

### For optimal temperature measurement, follow these tips:

- Do not install on external walls.
- Avoid air registers, diffusers, vents, and windows.
- Eliminate and seal all wall and conduit penetrations. Air migration from wall cavities may alter temperature readings.
- Do not install near heat sources (lamps, radiators, direct sunlight, copiers, chimney walls, walls concealing hot-water pipes).

## MOUNTING INSTRUCTIONS

ACI's High Temperature Series sensor comes with two enclosures: one for transmitter and a second for the bullet probe sensor. The transmitter needs to be mounted in environments with ambient temperatures between -40 to 85 °C (-40 to 185 °F) - see **SPECIFICATIONS** (p. 4). The high temperature bullet probe operates between -40 to 395 °C (-40 to 743 °F).

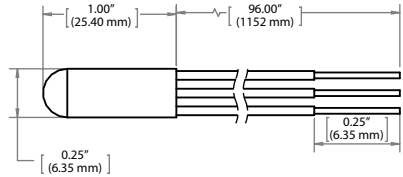
### TRANSMITTER ENCLOSURE

Attach the base directly to the wall by first drilling pilot holes for the mounting screws. Alternatively, you may refer to the dimensions listed (**FIGURE 2, 3**) measure out.

### SENSOR ENCLOSURE - ON WALL

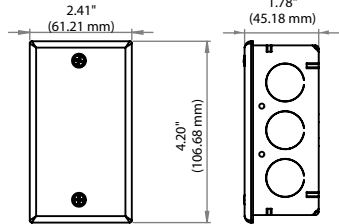
Remote Probe sensors may be mounted using a 1/4" steel mounting clip (included) on walls or with cable ties (appropriate temperature rated) along pipes. To fix the probe on a wall, ACI recommends a height of 48-60" (1.2-1.5 m) off the ground and at least 1.5' (0.5 m) from the adjacent wall. Slide the sensor probe through the mounting clip - see **FIGURE 4** (p. 2). Drill a 1/4" screw through the socket and tighten to the wall.

## FIGURE 1: BULLET PROBE DIMENSIONS

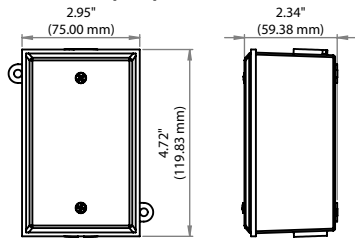


## FIGURE 2: ENCLOSURE DIMENSIONS

### GALVANIZED (-GD)

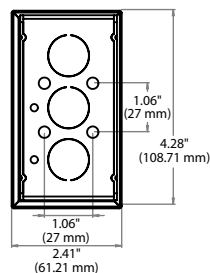


### BELL BOX (-BB)

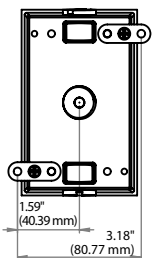


## FIGURE 3: MOUNTING DIMENSIONS

### -GD Enclosure



### -BB Enclosure

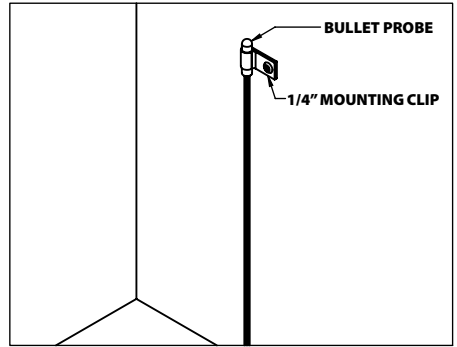


## MOUNTING (Continued)

### SENSOR ENCLOSURE - ON PIPE

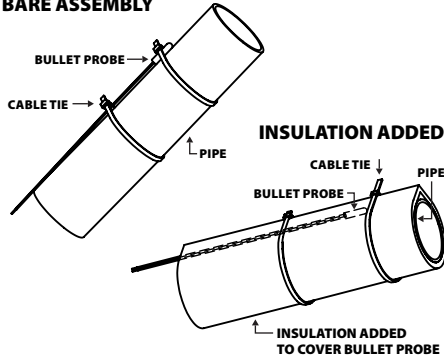
For best accuracy and increased thermal conduction between the pipe and the sensor, ACI recommends to clean the pipe with an emery cloth or file, before applying thermal grease. Be sure to insulate the probe (from the effects of the ambient air) after tightly fastening to the pipe - see **FIGURE 5** (below, left). Use cable ties to mount the sensor probe and wires on the pipe. Refer to **Wiring Instructions** (p. 2-3) to make necessary connections.

## FIGURE 4: MOUNTED ASSEMBLY



## FIGURE 5: BULLET PROBE ON PIPE

### BARE ASSEMBLY



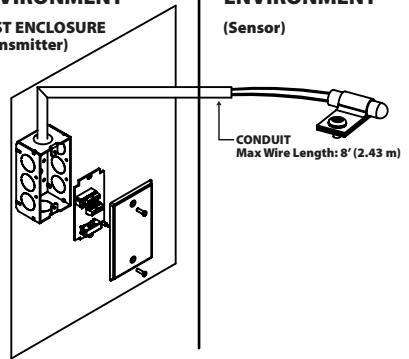
## FIGURE 6: FULL INSTALLATION

### AMBIENT TEMP ENVIRONMENT

#### FIRST ENCLOSURE (Transmitter)

### HOT TEMP ENVIRONMENT

#### (Sensor)



## WIRING INSTRUCTIONS

### PRECAUTIONS



- Transmitter is powered by 24 VDC only.
- Remove power before wiring. NEVER connect or disconnect wiring with power applied.
- When removing the shield from the sensor end, make sure to properly trim the shield to prevent any chance of shorting
- When using a shielded cable, ground the shield ONLY at the controller end. Grounding both ends can cause a ground loop.
- If the 24 VDC power is shared with devices that have coils such as relays, solenoids, or other inductors, each coil must have an MOV, DC Transorb, Transient Voltage Suppressor (ACI Part: 142583), or diode placed across the coil or inductor. The cathode, or banded side of the DC Transorb or diode, connects to the positive side of the power supply. Without these snubbers, coils produce very large voltage spikes when de-energizing that can cause malfunction or destruction of electronic circuits.

# WIRING INSTRUCTIONS

(Continued)

Open the cover of the enclosure. ACI recommends 16 to 26 AWG twisted pair wires or shielded cable for all transmitters. Twisted pair may be used for 2-wire current output transmitters or 3-wire for voltage output. Refer to **FIGURE 4** (p. 3) for wiring diagrams. All wiring must comply with local and National Electric Codes. All ACITT and TTM temperature transmitters can be powered from either an unregulated or regulated 8.5 to 32VDC power supply. The TT and TTM DO NOT support an AC input. All TT and TTM temperature transmitters are reverse polarity protected. After wiring, attach the cover to the enclosure.

**Note:** All RTD's are supplied with (2) or (3) flying lead wires. ACI's transmitters are supplied with a 2 pole terminal block for RTD sensor connections. When wiring a 3 wire RTD, connect the (2) common wires (same color) together into the same terminal block.

The minimum voltage at the transmitter power terminal is 8.5V after load resistor voltage drop.

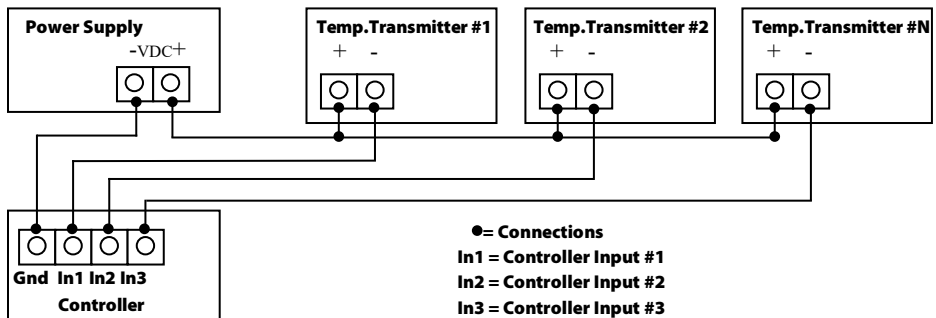
- 249 Ω load resistor (1-5 VDC output) = 13.5 V min supply voltage
- 499 Ω load resistor (2-10 VDC output) = 18.5 V min supply voltage

**Note:** Adding extra wire length between the sensor and transmitter board may affect accuracy.

## FORMULA FOR NUMBER OF TRANSMITTERS

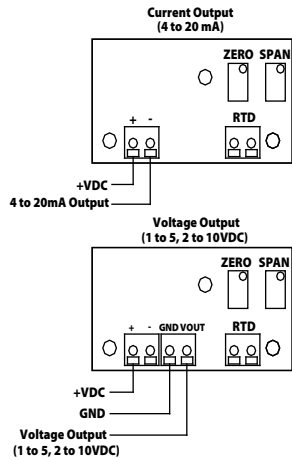
Several transmitters may be powered from the same supply as shown in **FIGURE 5**. Each transmitter draws 25mA; refer to the following equation to obtain the number of transmitters:  $[# \text{ Transmitters}] = [\text{Current}] / (25 \text{ mA})$ .

**FIGURE 5: MULTIPLE TRANSMITTER CONNECTIONS**

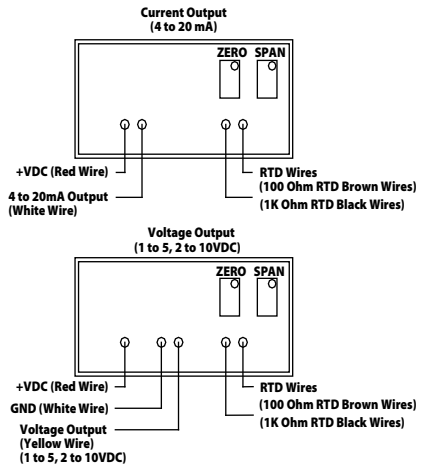


**FIGURE 4: WIRING DIAGRAMS**

## STANDARD UNITS



## POTTED UNITS



# TROUBLESHOOTING

PROBLEM	
<b>No Reading</b>	<ul style="list-style-type: none"> <li>No power to board - check voltage at power terminal - should be between +8.5 and 32 VDC.</li> </ul>
<b>Reading too Low</b>	<ul style="list-style-type: none"> <li>RTD wires shorted. Disconnect sensor wires from terminal block and check with ohmmeter. Reading should be close to either 100 Ω or 1000 Ω.</li> <li>RTD Improper range of transmitter (too low). Check current or voltage (model dependent) - should be between 4-20 mA, 1-5 V, or 2-10 V.</li> </ul>
<b>Reading too High</b>	<ul style="list-style-type: none"> <li>RTD opened. Disconnect sensor wires from terminal block and check with ohmmeter. Reading should be close to either 100 Ω or 1000 Ω.</li> <li>Improper range of transmitter (too high). Check current or voltage (model dependent) - should be between 4-20 mA, 1-5 V, or 2-10 V.</li> </ul>
<b>Reading is Inaccurate</b>	<ul style="list-style-type: none"> <li><b>Sensor check:</b> Disconnect sensor wires from terminal block and check with ohmmeter. Compare the resistance reading to the Temperature vs Resistance curves located on ACI's website.</li> <li><b>Transmitter check:</b> Make sure sensor wires are connected to terminal block. Determine that the proper output is being transmitted based on predetermined span:               <ol style="list-style-type: none"> <li>Go to ACI Website, Span to Output Page: <a href="http://www.workaci.com/content/span-output">http://www.workaci.com/content/span-output</a></li> <li>Enter the low end of the span</li> <li>Enter the high end of the span</li> <li>Click on the output of the transmitter. This will generate a span to output chart.</li> <li>Measure output of transmitter.</li> <li>Compare measured output to calculated output</li> </ol> </li> </ul>
<b>RF Interference</b>	<ul style="list-style-type: none"> <li>Input power must be clean. Use twisted wires or shielded cable. RF resistant power supply. Use a shielded cable to connect the sensor - connect the shield to ground. Encase the board in a RF shielded enclosure.</li> </ul>

## WARRANTY

The ACI Bullet Probe Series sensors and transmitters are covered by ACI's Five (5) Year Limited Warranty, which is located in the front of ACI'S SENSORS & TRANSMITTERS CATALOG or can be found on ACI's website: [www.workaci.com](http://www.workaci.com).

## W.E.E.E. DIRECTIVE

At the end of their useful life the packaging and product should be disposed of via a suitable recycling centre. Do not dispose of with household waste. Do not burn.

# PRODUCT SPECIFICATIONS

SENSOR NON-SPECIFIC	
<b>Storage Temperature Range:</b>	-40 to 85 °C (-40 to 185 °F)
<b>Operating Humidity Range:</b>	10 to 90% RH, non-condensing
<b>Lead Length   Conductor Size:</b>	8' (2.44 m)   24 AWG (0.20 mm <sup>2</sup> )
<b>Lead Wire Insulation   Conductor Material:</b>	<b>HIGHTT:</b> Fiberglass Braided Insulation with Mica Tape   27% Nickel Plated Copper
<b>Probe Material   Probe Diameter</b>	316 Stainless Steel   0.250" (6.35 mm)
<b>Compression Fitting:</b>	316 Stainless Steel
<b>Enclosure Specifications:</b>	<b>"-GD" Enclosure:</b> -40 to 199 °C (-40 to 390 °F); Galvanized Steel; NEMA 1 (IP10) <b>"-BB" Enclosure:</b> -40 to 85 °C (-40 to 185 °F); Aluminum; NEMA 3R (IP 14)
TRANSMITTER	
<b>Transmitter Supply Voltage   Supply Current:</b>	+8.5 to 32 VDC (Reverse Polarity Protected)   25 mA minimum <b>250 Ω Load (1-5 VDC):</b> +13.5 to 32 VDC   <b>500 Ω Load (2-10 VDC):</b> +18.5 to 32 VDC
<b>Output Signals:</b>	<b>Current:</b> 4-20 mA (2-Wire Loop Powered)   <b>Voltage:</b> 1-5VDC or 2-10VDC (3-Wires)
<b>Calibrated Transmitter Accuracy   Linearity:</b>	<b>T. Spans &lt; 260 °C (500 °F):</b> +/- 0.2%   <b>T. Spans &gt; 260 °C (500 °F):</b> +/- 0.5%
<b>Transmitter Operating Temperature Range:</b>	-40 to 85 °C (-40 to 185 °F)
<b>Operating Humidity Range:</b>	0 to 90%, non-condensing
<b>Calibrated Temperature Spans:</b>	<b>Min. T. Span:</b> 28 °C (50 °F)   <b>Max T. Span:</b> 426 °C (800 °F)
<b>Temp Drift</b>	<b>T. Span &lt; 38 °C (100 °F):</b> +/- 0.04%   <b>T. Span &gt; 38 °C (100 °F):</b> +/- 0.02%
<b>Warm Up Time   Drift</b>	10 Minutes   +/- 0.1%
<b>Connections   Wire Size</b>	Screw Terminal Blocks (Non-Polarity Sensitive)   16AWG (1.31 mm <sup>2</sup> ) to 26AWG (0.129mm <sup>2</sup> )
<b>Terminal Block Torque Rating</b>	0.5 Nm nominal
PROBE	
<b>Sensor Type   Sensor Curve   Sensing Points:</b>	Platinum RTD   PTC (Positive Temperature Coefficient)   One
<b>DIN Standard   Temp Coefficient</b>	DIN EN 60751 (IEC 751)   3850 ppm / °C
<b>Response Time</b>	15 Seconds nominal
<b>Sensor Output @ 0°C (32°F):</b>	<b>A/100-3W-HT-D-xx:</b> 100 Ω nominal   <b>A/1K-3W-HT-D-xx":</b> 1 KΩ nominal
<b>Sensor Tolerance Class   Accuracy:</b>	+/- 0.12% Class B   <b>Class B Tolerance Formula:</b> +/- °C = (0.30 °C + (0.005 *  t ))
<b>Sensor Operating Temperature Range:</b>	<b>HIGHTT:</b> -40 to 395 °C (-40 to 743 °F)



# NOTES

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