



BULLET PROBE SERIES TEMPERATURE TRANSMITTER

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

Installation & Operation Instructions

GENERAL INFORMATION

The ACI 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. eg: lamps, radiators, direct sunlight, copiers, chimney walls, walls concealing hot-water pipes.

MOUNTING INSTRUCTIONS

ACI's Bullet Probe Temperature Series Transmitter comes with probe sensor and an enclosure for the transmitter. 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 bullet probe operates between -40 to 150 °C (-40 to 302 °F).

SENSOR MOUNTING

Bullet Probe sensors may be mounted using a 1/4" mounting clip (ACI Item #108169) on walls or with cable ties along pipes. The sensor should be mounted in an area where air circulation is well mixed and not blocked by obstructions. 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 2** (middle). Drill a 1/4" screw through the socket and tighten to the wall.

To fix the BP sensor along a pipe, use cable ties to mount the sensor probe and wires on the pipe - see **Figure 3** (bottom).

FIGURE 1: BULLET PROBE DIMENSIONS

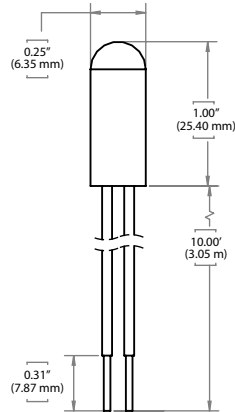


FIGURE 2: BULLET PROBE ON WALL

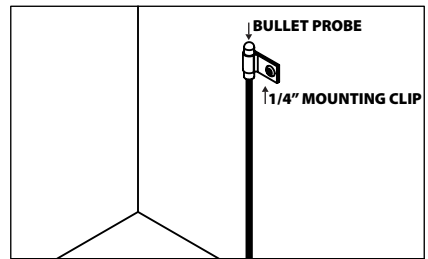
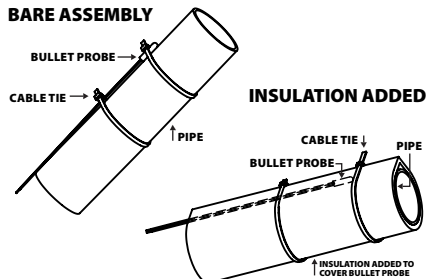


FIGURE 3: BULLET PROBE ON PIPE BARE ASSEMBLY



MOUNTING INSTRUCTIONS (Continued)

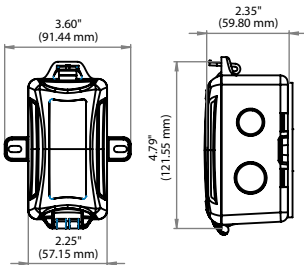
For best accuracy and increased thermal conduction between the pipe and the sensor, ACI recommends to clean the pipe with an emery cloth or file, before applying thermal grease. Be sure to insulate the probe (from the effects of the ambient air) after tightly fastening to the pipe.

TRANSMITTER ENCLOSURE MOUNTING

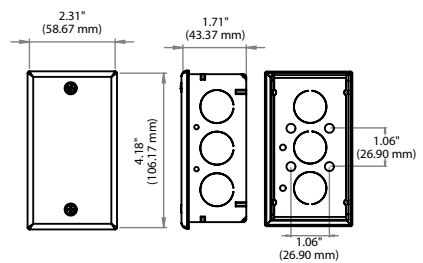
Attach the base directly to the wall by first drilling pilot holes for the mounting screws. Alternatively, refer to the dimensions listed in **FIGURE 4** (below).

FIGURE 4: TRANSMITTER ENCLOSURE DIMENSIONS

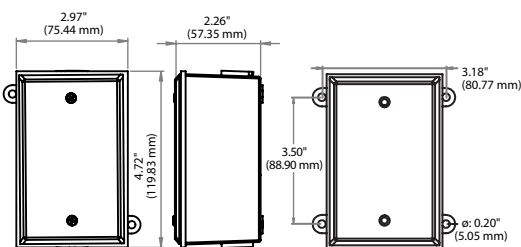
PLASTIC BOX (-PB)



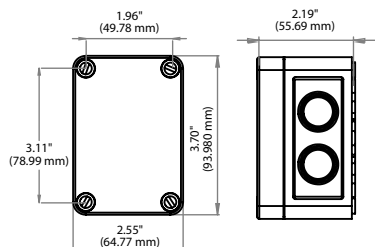
GALVANIZED ENCLOSURE (-GD)



BELL BOX (-BB)



NEMA -4X (-4X)



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 6** (bottom) for wiring diagrams. All wiring must comply with local and National Electric Codes. All ACI TT 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 - see **FIGURE 5** (right).

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

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

FIGURE 5: 3 WIRE RTD

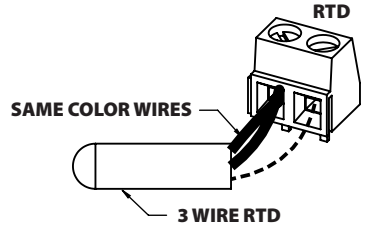
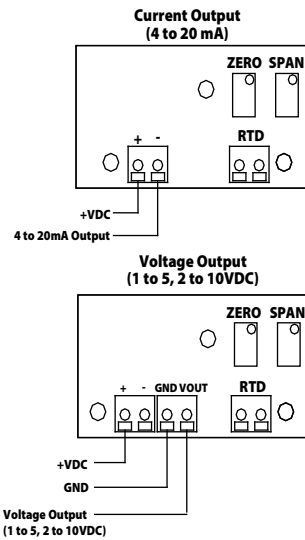
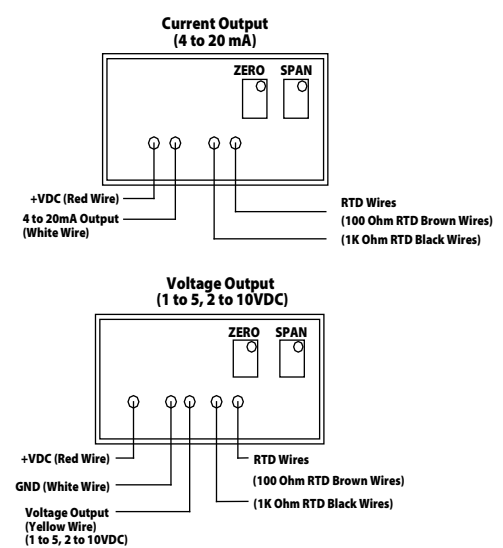


FIGURE 6: WIRING DIAGRAMS

STANDARD UNITS



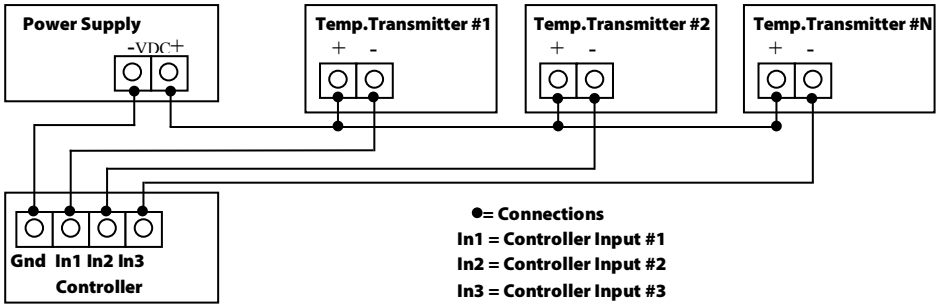
POTTED UNITS



FORMULA FOR NUMBER OF TRANSMITTERS

Several transmitters may be powered from the same supply as shown in **FIGURE 7** (p. 4). Each transmitter draws 25mA; refer to the following equation to obtain the number of permissible transmitters: **[# Transmitters] = [Current] / (25 mA)**.

FIGURE 7: MULTIPLE TRANSMITTER CONNECTIONS



TROUBLESHOOTING

TEMPERATURE PROBLEM

No Reading

- No power to board - check voltage at power terminal - should be between +8.5 and 32 VDC.

Reading too Low

- RTD wires shorted. Disconnect wires from terminal block and check with ohmmeter. Reading should be close to 100 Ω or 1 KΩ.
- RTD Improper range of transmitter (too low). Check current or voltage - should be between 4-20 mA, 1-5 V, or 2-10 V.

Reading too High

- RTD opened. Disconnect sensor wires from terminal block and check with ohmmeter. Reading should be close to 100 Ω or 1 KΩ.
- Improper range of transmitter (too high). Check current or voltage - should be between 4-20 mA, 1-5 V, or 2-10 V.

Reading is Inaccurate

- **Sensor check:** 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.
- **Transmitter check:** Make sure sensor wires are connected to terminal block. Determine that the proper output is being transmitted based on predetermined span:
 1. Go to ACI Website, Span to Output Page: <http://www.workaci.com/content/span-output>
 2. Enter the low end of the span
 3. Enter the high end of the span
 4. Click on the output of the transmitter. This will generate a span to output chart.
 5. Measure output of transmitter.
 6. Compare measured output to calculated output

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.

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	
Storage Temperature Range:	-40 to 80 °C (-40 to 176 °F)
Operating Humidity Range:	5 to 95% RH, non-condensing
Lead Length Cable Diameter Conductor Size:	10' (3.05 m) or 20' (6.1 m) 0.106" nominal (2.69 mm) 22 AWG (0.65mm)
Lead Wire Insulation Wire Rating:	FEP/FEP Teflon Unshielded Cable UL CL2P or CL3P; CMP C(UL) US 150 °C, FT-6
Conductor Material:	Tin Plated Copper
Enclosure Specifications: (Operating Temperature, Material, Flammability, NEMA/IP Ratings):	"-GD" : Galvanized Steel, -40 to 85 °C (-40 to 185 °F), NEMA 1 (IP10) "-PB" : ABS Plastic, -30 to 85 °C (-22 to 185 °F), UL94-HB, Plenum Rated "-BB" : Aluminum, -40 to 85 °C (-40 to 185 °F), NEMA 3R (IP 14) "-4X" : Polystyrene Plastic, -40 to 70 °C (-40 to 158 °F), UL94-V2, NEMA 4X (IP 66)
SENSOR	
Sensor Type Sensor Curve Sensing Points:	Platinum RTD PTC (Positive Temperature Coefficient) One
Sensor Output @ 0°C (32°F):	A/TT100/TTM100: 100 Ω nominal A/TT1K/TTM1K: 1 KΩ nominal
RTD Tolerance Class Accuracy:	+/- 0.06% Class A (Tolerance Formula: +/- °C = (0.15 °C + (0.002 * t)) where t is the absolute value of temperature above or below 0 °C in °C)
Din Standard Temperature Coefficient:	DIN EN 60751 (IEC 751) 3850 ppm / °C
Sensor Stability:	+/- 0.03% after 1000 Hours @ 300 °C (572 °F)
Response Time (63% Step Change):	8 Seconds nominal
Sensor Operating Temperature Range:	-40 to 200 °C (-40 to 392 °F)
Probe Diameter Probe Material:	0.250" (6.35mm) 304 Stainless Steel
TRANSMITTER	
Transmitter Supply Voltage Supply Current:	+8.5 to 32 VDC (Reverse Polarity Protected) 25 mA minimum 250 Ω Load: +13.5 to 32 VDC 500 Ω Load: +18.5 to 32 VDC
Maximum Load Resistance:	(Terminal Voltage - 8.5 V) 0.020 A
Output Signals:	Current: 4-20 mA (2-Wire) Voltage: 1-5 VDC or 2-10 VDC (3-Wires)
Calibrated Accuracy Linearity¹:	T. Spans < 500 °F (260 °C): +/- 0.2%
Thermal Drift²:	T. Spans < 100 °F (38 °C): +/- 0.04%/°F T. Spans > 100 °F (38 °C): +/- 0.02%
Min./Max. Calibrated Temperature Spans:	Min. T. Span: 50 °F (28 °C) Max T. Span: 400 °F (204 °C)
TTM100/TTM1K Certification Points:	3 Pt. NIST: 20, 50, & 80% of span 5 Pt. NIST: 20, 35, 50, 65, & 80% of span
Warm Up Time Warm Up Drift:	10 Minutes +/- 0.1%
Transmitter Operating Temperature Range:	-40 to 185 °F (-40 to 85 °C)
Transmitter Operating Humidity Range:	0 to 90%, non-condensing
Connections Wire Size:	Screw Terminal Blocks 16 AWG (1.31 mm ²) to 26 AWG (0.129 mm ²)
Terminal Block Torque Rating:	0.37 ft-lb (0.5 Nm) nominal

Note: Transmitter's calibrated at 71°F (22°C) nominal | **Note:** Thermal Drift is referenced to 71°F (22°C) nominal calibration temperature



NOTES

NOTES



NOTES

NOTES



