Installation and Operation Instructions
RH Duct and Outside Series
Combination Units and NEMA Rated Enclosures

PLEASE READ INSTRUCTIONS CAREFULLY BEFORE INSTALLATION!

GENERAL INFORMATION

The RH Duct and Outside transmitter is a Relative Humidity transmitter that can be powered with either an AC or DC supply voltage. The transmitter can also include an optional temperature sensor for monitoring the space temperature.

All units are shipped from the factory set up with a 4-20 mA output. The RH Duct and Outside transmitter is field selectable with a 4-20 mA, 0-5 VDC, or 0-10 VDC output signal that is equivalent to 0 to 100% RH.

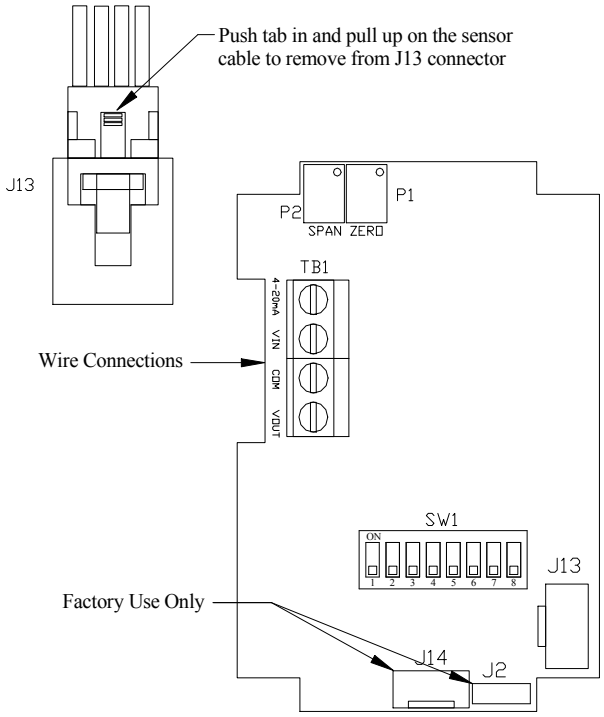

Figure #1

MOUNTING INSTRUCTIONS

IMPORTANT: RH Stainless Plates and some NEMA 4X configurations include a Black Rubber Cap that fits over the sensor filter. This Cap should be placed on the sensor filter during wet/wash down processes. The Cap must be removed for normal operation.

Aluminum Bell Box Mounting Configuration

Attach the mounting lugs to the rear of the aluminum enclosure using the screws provided. The mounting lugs should be on opposite sides and ends. Refer to **Figure #2** for mounting lug locations.

For a Duct configuration, drill a 1 1/4" diameter hole in the duct where the transmitter is to be mounted. Insert the probe into the hole and attach the transmitter to the duct using the mounting lugs and screws provided.

For an Outside configuration, the transmitter should be mounted under an eave, shield, or in an area out of the elements or direct sunlight. The probe should point down when mounting the outside transmitter. Refer to **Figure #3** for the proper mounting position. Attach the transmitter to the wall using the mounting lugs and screws provided.

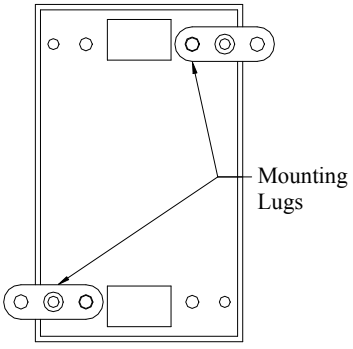

Figure #2

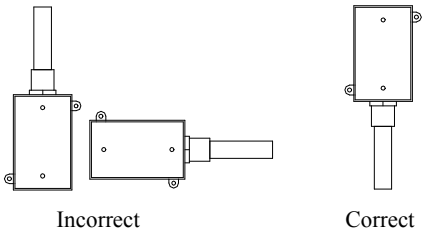

Figure #3

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MOUNTING INSTRUCTIONS CONTINUED

NEMA 4X Mounting Configuration

The NEMA 4X enclosure can be mounted using the knockout holes molded in the base or the corner mounting holes. Corner hole mounting is required to maintain the NEMA 4X rating. The corner mounting holes are located behind the screws that hold the cover on. Refer to **Figure #4** for the corner mounting hole locations.

For a Duct configuration, drill a 1 1/4" diameter hole in the duct where the transmitter is to be mounted. Remove the cover and insert the probe into the hole. Attach the transmitter to the duct using the screws provided.

For an Outside configuration, the transmitter should be mounted under an eave, shield, or in an area out of the elements or direct sunlight. The probe should point down when mounting the outside transmitter. Refer to **Figure #5** for the proper mounting position. Attach the transmitter to the wall using the screws provided.

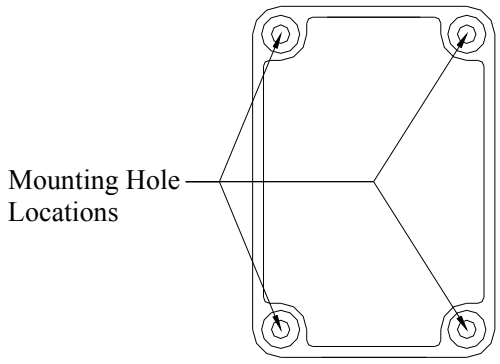


Figure #4

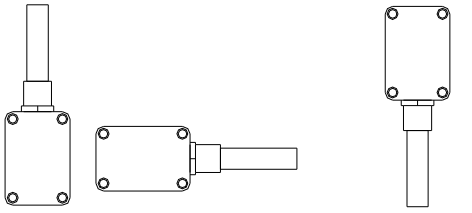


Figure #5

Stainless Steel Plate Configuration

The RH stainless steel plate should be placed away from areas of excessive moisture, corrosive fumes, vibration, windows and direct sunlight. The unit should be mounted to an inside wall, approximately 4 to 6 feet above the floor. The Stainless Steel plate was designed to mount over a standard 2" x 4" single gang junction box using the mounting hardware provided. Refer to the wiring instructions (***Figure #6)*** to make the necessary connections.

WIRING INSTRUCTIONS

A 16 to 22 AWG shielded cable is recommended for all transmitters. Twisted pair may be used for 2-wire current output transmitters. The connections to the temperature sensor should be made with wire nuts or crimp style connectors. Refer to **Figure #6** for wiring diagram.

Caution:

- **It is recommended that you use an isolated UL-listed Class 2 transformer when powering the unit with 24 VAC. Failure to wire the devices with the correct polarity when sharing transformers may result in damage to any device powered by the shared transformer.**
- **Remove power before wiring. Never connect or disconnect wiring with power applied.**
- **When using shielded cable, ground the shield only at the controller end. Grounding both ends can cause a ground loop.**

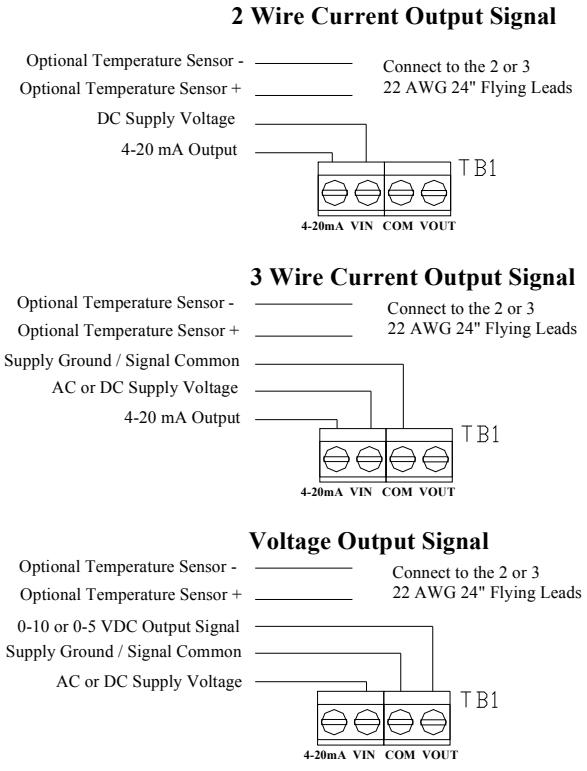


Figure #6

OUTPUT SELECTIONS

Switches 6, 7, and 8 are used to set the output. Refer to **Figure #7** for switch settings.

Output Selection Switches (SW1)

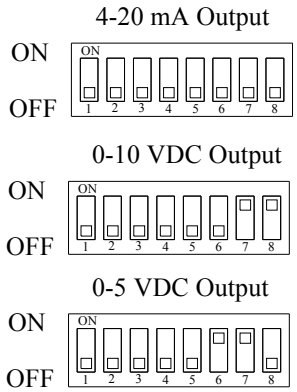


Figure #7

REVERSE ACTING OUTPUT

The output can be changed to reverse acting mode. The output range stays the same but the corresponding RH value is opposite.

Example: Direct Acting (DA)
0-10V output mode,
0V = 0% RH and 10V = 100% RH
Reverse Acting (RA)
0-10V output mode,
0V = 100% and 10V = 0%

To change the transmitter to reverse acting or back to direct acting, set switch 4 ON to put the unit in setup mode. After switch 4 is on, switch 2 will put the unit in direct/reverse acting mode. When switch 2 is set to ON, the output can be used to show if the unit is in direct or reverse acting mode. For direct acting the output will be 1V for 0-5V, 2V for 0-10V, and 7.2mA for 4-20mA. For reverse acting the output will be 4V for 0-5V, 8V for 0-10V, and 16.8mA for 4-20mA.

With switches 2 and 4 ON, each time switch 5 is set to ON the output will change to reverse acting or direct acting.

To reset the unit to the default setting, toggle both switches 5 and 6 ON then OFF while both switches 2 and 4 are ON.

When all calibration is completed, remember to place the switches back into the positions that correspond to the output needed as shown in **Figure #7**.

RH CALIBRATION INSTRUCTIONS

Note: This is only a single point calibration. All transmitters are factory calibrated to meet/exceed published specifications. Field adjustment should not be necessary.

The dipswitch allows the user to calibrate the sensor through the software. Setting switch 4 ON will put the transmitter into setup mode allowing the increment and decrement to work. Once in setup mode, the output will change to 50% (2.5V for 0-5V, 5V for 0-10V, 12mA for 4-20mA). Each increment or decrement step will cause the output to change by 0.1V for 0-5V, 0.2V for 0-10V, and 0.32mA for 4-20mA in setup mode. This can be used to show the user how far offset the transmitter is. To see the starting point again set switch 1 ON. This will show the 50% output again. When the unit is out of setup mode the output will go back to RH output.

Increment RH Output
This will shift the RH output linearly up in 0.5% steps. Switch 4 must be set to ON first. After switch 4 is on, each time switch 5 is set ON the RH output will increase by 0.5%. The increase goes into effect each time switch 5 is set to ON.

Decrement RH Output
This will shift the RH output linearly down in 0.5% steps. Switch 4 must be set to ON first. After switch 4 is on, each time switch 6 is set ON the RH output will decrease by 0.5%. The decrease goes into effect each time switch 6 is set to ON.

Reset RH Output
This will reset the RH output back to the original calibration. Switch 4 must be set to ON first. After switch 4 is on, toggle switches 5 and 6 ON then OFF. After 5 and 6 are OFF slide switch 4 OFF.

When all calibration is completed, remember to place the switches back into the positions that correspond to the output needed as shown in **Figure #7**.

Note: Potentiometers P1 (Zero) and P2 (Span) in Figure #1 are not used for RH sensor calibration. They are used for factory use only!

TEST INSTRUCTIONS

Test mode will make the transmitter output a fixed 0%, 50%, or 100% value. The sensor will not affect the transmitter output. This is used for troubleshooting or testing only.

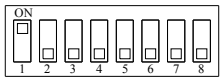
Switches 1, 2, and 3 are used for test mode. The output will be a fixed 0%, 50%, or 100% signal that corresponds to the output selected with switches 6, 7, and 8. Refer to **Figure #8** for switch settings.

Test Selection Switches (SW1)

0% RH Output

ON

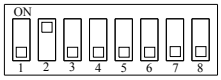
OFF



50% RH Output

ON

OFF



100% RH Output

ON

OFF

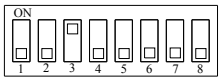


Figure #8

RH CONVERSION FORMULAS

To convert output signal to percent RH:

4-20 mA
((mA signal) -4) / 0.16 = percent RH
Example: 12mA output signal
(12-4) / 0.16 = 50% RH

0-5 VDC
(VDC signal) / 0.05 = percent RH
Example: 1.25vdc output signal
1.25 / 0.05 = 25% RH

0-10 VDC
(VDC signal) / 0.10 = percent RH
Example: 7.50vdc output signal
7.50 / 0.10 = 75% RH

TROUBLESHOOTING

Problem:

No Reading

- Check that you have the correct supply voltage at the power terminal blocks.
- Check that wiring configurations and all DIP switch settings are as in **Figures #6 and #7**.
- Verify that the terminal screws are all connected tightly and that all of the wires are firmly in place.

Erratic Readings

- Verify that all of the wires are terminated properly.
- Make sure that there is no condensation on the board.
- Check that the input power is clean. In areas of high RF interference or noise, shielded cable may be necessary to stabilize signal.

Inaccurate Readings

- If you suspect that the transmitter is not reading within the specified tolerance, please contact the factory for further assistance.

PRODUCT SPECIFICATIONS

Supply Voltage	4-20mA Output: 250 Ohm Load 15 - 40 VDC / 18 - 28 VAC	**RH Measurement Range**	0 - 100% RH
	4-20mA Output: 500 Ohm Load 18 - 40 VDC / 18 - 28 VAC (500 Ohm Load Max)	**RH Accuracy @ 77°F (25°C)**	± 1% over 20% span (between 20 to 90%) ± 2%, 3%, or 5% from 10 to 95%
	0-5 VDC Output: 12 - 40 VDC / 18 - 28 VAC (4K Load Minimum)	**Repeatability**	0.5% RH
	0-10 VDC Output: 18 - 40 VDC / 18 - 28 VAC (4K Load Minimum)	**Operating Humidity Environment**	0 to 100% RH
Supply Current	Voltage Output: 8mA Max Current Output: 24mA Max	**Operating Temp. Environment**	-40 to 140°F (-40 to 60°C)
RH Output	2-Wire, 4 - 20 mA	**Storage Temp. Range**	-40 to 160°F (-40 to 71°C)
	3-Wire, 0 - 5VDC, 0 - 10VDC, or 4-20mA		

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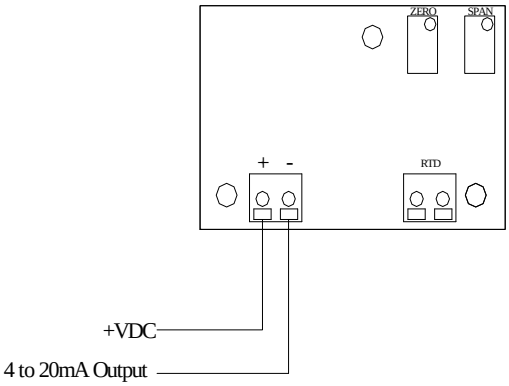
Installation and Operation Instructions
A/TT100, A/TT1K
A/TTM100, A/TTM1K

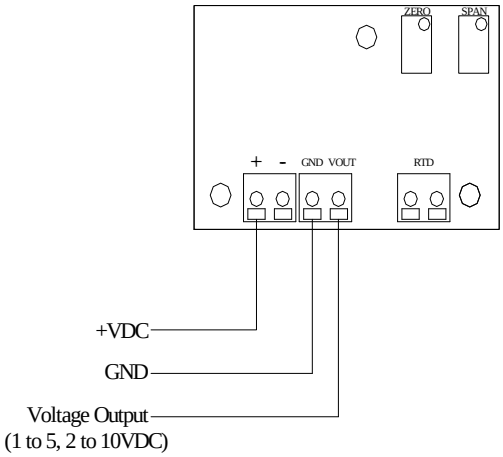
READ THESE INSTRUCTIONS BEFORE YOU BEGIN INSTALLATION

Standard Units

Current Output
(4 to 20 mA)

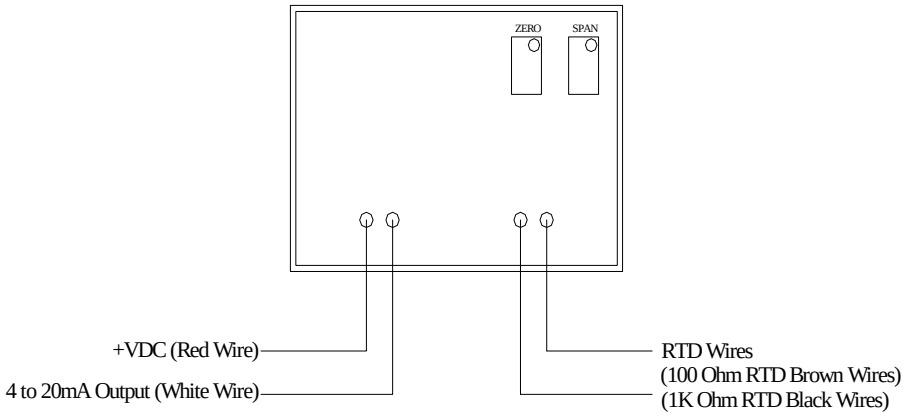


Voltage Output
(1 to 5, 2 to 10VDC)

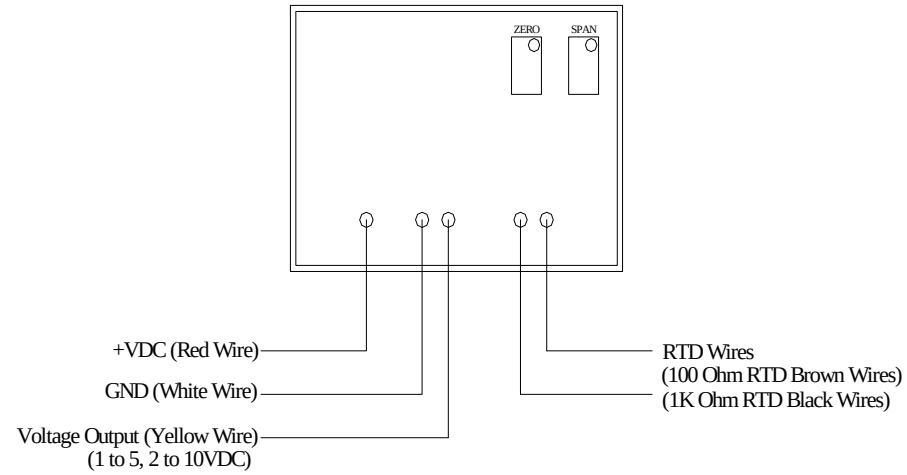


Potted Units

Current Output
(4 to 20 mA)



Voltage Output
(1 to 5, 2 to 10VDC)



The A/TT and TTM DO NOT support an AC input.
All ACI/TT and TTM temperature transmitters can be powered from either an unregulated or regulated 8.5 to 32VDC power supply**. The minimum voltage at the transmitter power terminal is 8.5V after load resistor voltage drop.**
249 ohm load resistor (1-5VDC output) = 13.5V minimum supply Voltage
499 ohm load resistor (2-10VDC output) = 18.5V minimum supply Voltage
Several transmitters may be powered from the same supply as shown below.

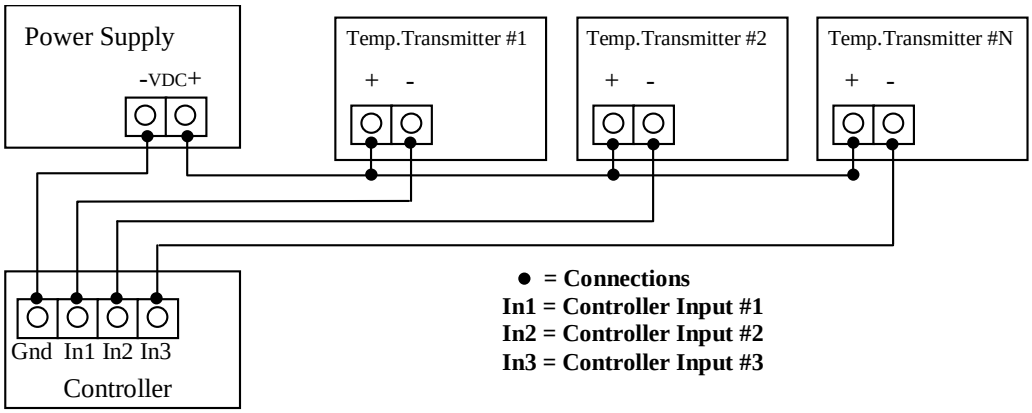
Each transmitter could draw 25mA. To determine the number of transmitters use the following formula:

$$N=I/25mA$$

where: *N* = number of transmitters
I = current available from power supply
25mA = maximum current draw of transmitter

e.g., If I = 1.5A then:
N = 1.5/25mA
N = 60

Therefore a 1.5A power supply will safely power up to 60 transmitters.



All A/TT and TTM temperature transmitters are reverse polarity protected.

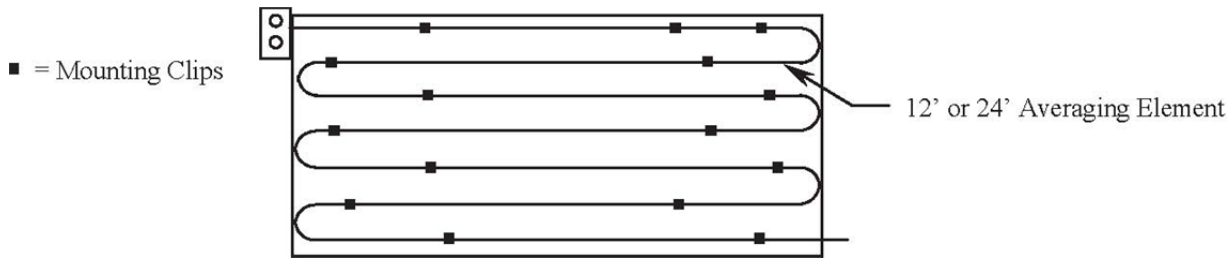
Room Temperature Transmitters

This unit is suitable for either drywall or junction box mounting. First, remove the cover of the housing and mount the base of the Room unit to the wall, using the (2) 6/32" x 1" screws that are provided. Once the base is mounted to the wall, make all of the proper connections and then place the cover back onto the unit. Now tighten the cover down, using the (2) Allen screws located in the bottom of the housing. The Room transmitter is provided with a two pole terminal block for power and a two pole terminal block for the RTD, which allows for easy wiring of the unit.

Duct & Duct Averaging Temperature Transmitters

Duct Temperature Sensors - Drill a 3/8" hole in the duct and insert the probe through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in the flange and tighten until the unit is held firmly to the duct.

Duct Averaging Sensors – Drill a 3/8" hole in the duct and insert the averaging element through the hole until the foam pad is tight to the duct. Now insert (2) screws through the mounting holes in the flange and tighten until the unit is held firmly to the duct. The sensor should then be strung in a criss-cross pattern throughout the duct (see Figure #2) using the mounting clips provided, in a pattern that covers the greatest surface area of the duct, to insure that there is no stratification. When bending the copper tubing, be careful that you use a gradual bend and that you DO NOT kink the copper tubing.



Immersion Temperature Transmitters
The ACI Immersion type transmitters are provided with a 2.5", 4" or 8" 304 series stainless steel thermowell. The thermowell has a 1/2" external or process NPT threads and 1/2" internal or instrument NPT threads. All of the ACI thermowells will accept a probe diameter of 0.250".

Strap-On Temperature Transmitters
The ACI Strap-On transmitters are provided in a junction box with an adjustable 2" to 5" pipe clamp. The unit should be mounted on the bottom side of the pipe to ensure good temperature transfer. In hot water applications (over 150°F) it is recommended that the transmitter be remote located so as not to exceed the operating temperature of the transmitter. Extra straps may be ordered for larger diameter pipes.

Outside Air Temperature Transmitters
The ACI Outside Air transmitters are provided in two parts including a weatherproof enclosure and a 2" X 4" junction box. The sensors will be mounted in the weatherproof enclosure and mounting hardware is provided. The transmitter will be provided in the 1 gang junction box and should be mounted on an inside wall so as not to exceed the operating temperature limits of the transmitter. This sensor should be mounted on either the North side of the building or anywhere out of direct sunlight with the sensor probe pointed downward. Weatherproof Aluminum Bell Boxes and NEMA 4X Polycarbonate enclosures are available upon request.

Stainless Plate Temperature Transmitters
The ACI Stainless Plate temperature transmitters are mounted on the back of a 2" x 4" stainless plate. The sensor is covered with a 1/8" foam insulation, which allows the sensor to sense the actual room temperature and ignore any heat produced by the transmitter or drafts from within the wall. All mounting screws are provided.

Troubleshooting

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 - check with ohmmeter - should be close to either 100 Ω or 1000 Ω. Improper range of transmitter (too low) - check current - should be between 4 and 20mA.
Reading too High	RTD opened - check with ohmmeter - should be close to either 100 Ω or 1000 Ω. Improper range of transmitter (too high) - check current - should be between 4 and 20mA.
RF Interference	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.