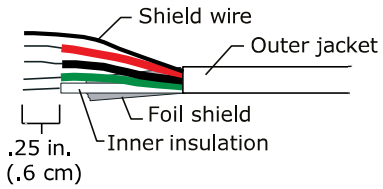
To wire a ZS immersion temperature sensor

NOTES

- Do not drill into the sensor's watertight enclosure which will violate the NEMA and/or IP rating.
- Use caulk or Teflon tape for your conduit entries to maintain the appropriate NEMA or IP rating for your application.
- For outdoor or wet applications, conduit entry should be from the bottom of the enclosure.

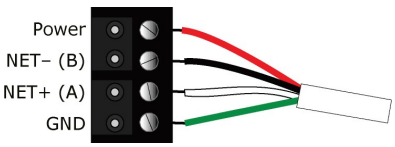
PREREQUISITE The Rnet cable is wired to the controller. The shield wire and the ground wire should be inserted into the controller's GND terminal.

1. Turn off the controller's power.
2. Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



3. Strip about 0.25 inch (0.6 cm) of the inner insulation from each wire.
4. Unlatch and open the hinged door on the sensor's enclosure.
5. Pull the Rnet communication cable through the knockout hole.
6. If wiring 1 cable to the sensor, cut the shield wire off at the outer jacket, then wrap the cable with tape at the outer jacket to cover the end of the shield wire.

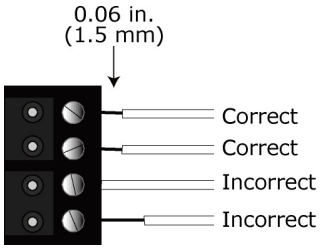
   If wiring 2 cables in a daisy-chain configuration, twist together the shield wires, then wrap the shield wires with tape.
7. Insert the other 4 wires into the sensor's screw terminal connector. If wiring 2 cables, insert like-colored wires into each terminal.



Automated Logic® recommends that you use the following Rnet wiring scheme:

Connect this wire...	To this terminal...
Red	Power
Black	NET-
White	NET+
Green	GND

CAUTION Allow no more than 0.06 inch (1.5 mm) bare communication wire to protrude. If bare communication wire contacts the cable's foil shield, shield wire, or a metal surface other than the terminal block, the device may not communicate correctly.



8 Close and latch the sensor's door.

9 Turn on the controller's power.

NOTE Use the same polarity throughout the Rnet.

ZS outdoor air temperature sensors

ZS outdoor sensors measure temperature or temperature/humidity.

Outdoor Temperature Sensor

Bottom probe only

Outdoor Temperature/Humidity Sensor

Specifications for ZS outdoor air sensors

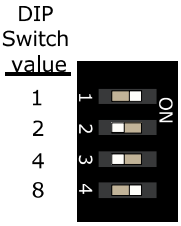
Sensing element		
Temperature	Range: Accuracy:	-40° to 158°F (-40° to 70°C) ±1.3°F (0.72°C)
Humidity	Range: Accuracy:	10% to 90% ±2.0% typical at less than 0.5% drift per year. Calibrated at 73.4°F (23°C).
Sensor		
Temperature	Range: Accuracy:	20° to 120°F (-5° to 50°C) ±0.9°F (0.5°C)
Humidity	Range: Accuracy:	10% to 90% ±2.0% typical at less than 0.5% drift per year. Calibrated at 73.4°F (23°C).
Enclosure material	Polycarbonate, UL94V-0	
Enclosure rating	NEMA 4, IP66, UV rated	
Probe	• Temperature sensor probe: Vented polycarbonate shield, .5 in. (1.27 cm) OD 1.2 in. (3.05 cm) • Temperature/humidity sensor probe: ABS with SS filter 1.0 in. (2.5 cm) diameter 2.4 in. (6.1 cm) length	

Enclosure dimensions	Width: 5 in. (12.7 cm) Height: 4.15 in. (10.54 cm) Depth: 2.5 in. (6.35 cm)
Sensing element shield	Vented polycarbonate shield 0.5 in. (1.27 cm) outside diameter 1.2 in. (3.05 cm) long with 1/2 in. NPT threads
Power requirements	12 Vdc @ 6 mA
Power supply	The 4-conductor Rnet cable from a controller supplies power to the Rnet, but the amount of power varies by controller. If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, you will need to use an external power supply. Use the above power requirements to calculate the power required and the size of the external power supply. **NOTE** The controller and the external power supply must share a common ground.
Communication	115 kbps
Mounting	3/16 in. holes
Listed by	FCC Part 15-Subpart B-Class B, CE

To address a ZS outdoor air temperature sensor

Each ZS Sensor on an Rnet must have a unique address, but addresses do not have to be sequential.

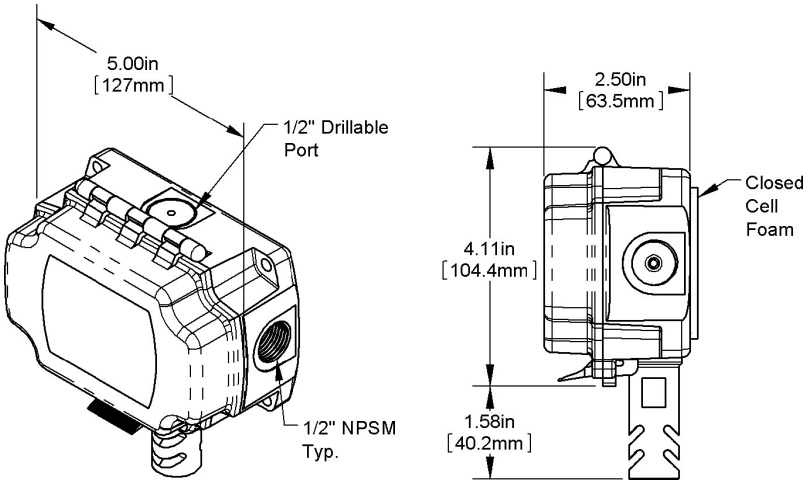
Open the hinged cover on the sensor enclosure, and then use the DIP switches to set an address from 0 to 14. (0 is factory default.) Each DIP switch has the value shown in the figure below. Turn on as many DIP switches as you need so that their total value equals the address.



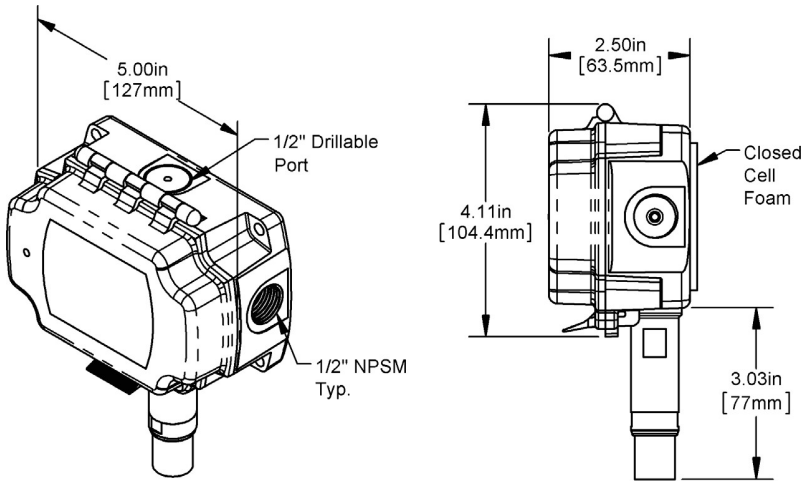
EXAMPLE DIP switches 1 and 4 above are on. Their values (1 + 8) total 9, so the sensor's address is 9.

To mount a ZS outdoor air temperature sensor

Outside Air Temperature sensor

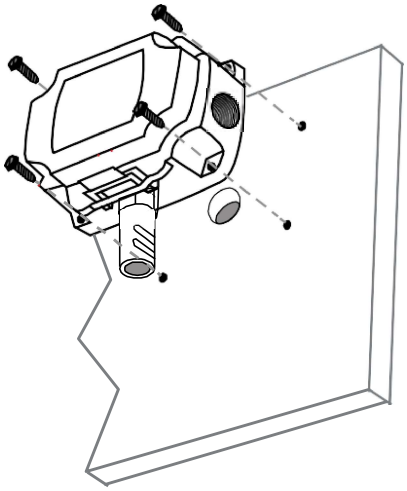


Outside Air Temperature/Humidity sensor



1 Determine the best location for the sensor. Mount the sensor:
   - In the shade, never in the sunlight or you will have higher than expected temperature readings by as much as +30%.
   - Away from building windows, doors, or vents.
   - At least one foot below the eave to prevent measurement of trapped heat under the eave.
   - At least four feet about ground level.

2 Drill the mounting holes and mount as shown below with the probe pointing down. Tighten the mounting screws enough to ensure that the foam backing compresses to about 50% of its thickness to create a seal against the wall surface.



3 Unlatch and open the hinged door on the sensor's enclosure.

4 Route the Rnet cable into the back of the enclosure, and then connect the wiring as described in *To wire a ZS outside air sensor* (page 35).

5 After wiring the sensor, caulk the wiring hole.

6 Close the enclosure door until it latches. Secure with provided cover screws.

To wire a ZS outdoor air sensor

NOTES

- Do not drill into the sensor's watertight enclosure which will violate the NEMA and/or IP rating.
- Use caulk or Teflon tape for your conduit entries to maintain the appropriate NEMA or IP rating for your application.

PREREQUISITE The Rnet cable is wired to the controller. The shield wire and the ground wire should be inserted into the controller's GND terminal.

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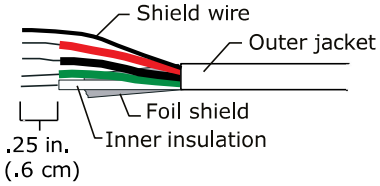
2 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



3 Strip about 0.25 inch (0.6 cm) of the inner insulation from each wire.

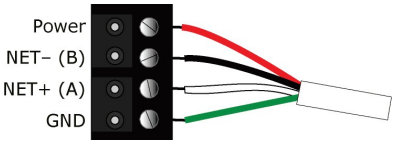
4 Unlatch and open the hinged door on the sensor's enclosure.

5 Pull the Rnet communication cable through the knockout hole.

6 If wiring 1 cable to the sensor, cut the shield wire off at the outer jacket, then wrap the cable with tape at the outer jacket to cover the end of the shield wire.

If wiring 2 cables in a daisy-chain configuration, twist together the shield wires, then wrap the shield wires with tape.

7 Insert the other 4 wires into the sensor's screw terminal connector. If wiring 2 cables, insert like-colored wires into each terminal.



Automated Logic® recommends that you use the following Rnet wiring scheme:

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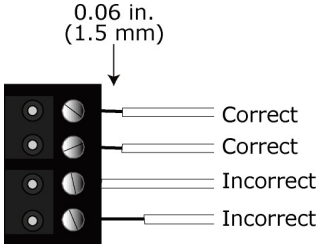
Black	NET-
White	NET+
Green	GND

CAUTION Allow no more than 0.06 inch (1.5 mm) bare communication wire to protrude. If bare communication wire contacts the cable's foil shield, shield wire, or a metal surface other than the terminal block, the device may not communicate correctly.



8 Close and latch the sensor's door.

9 Turn on the controller's power.

NOTE Use the same polarity throughout the Rnet.

Humidity filter maintenance

The temperature/humidity sensor has a sintered filter that protects the humidity sensor from various airborne particles. The filter can become dirty and may need periodic cleaning. Symptoms of a dirty filter are that the humidity sensor is slow to respond or consistently reports incorrect values.

To clean the filter:

1 Gently unscrew the filter from the probe.

2 Rinse the filter in warm soapy water, and then rinse in clean water. You can use a nylon brush if needed.

3 Gently screw the clean filter all the way into the probe. Hand tighten only.

To format a ZS Sensor

Formatting a sensor clears its flash memory. Do either of the following to format a sensor:

- Download the controller that the sensor is connected to.
- Do the following:
  a) Remove the wiring connector from the sensor.
  b) Note the current position of the DIP switches.
  c) Set all DIP switches to the ON position.
  d) Reattach the wiring connector to format.
  e) After approximately 3 seconds, remove the wiring connector.
  f) Set the DIP switches back to their original position.
  g) Reattach the wiring connector.

NOTE If you move a sensor from one controller to another controller that has a different control program, format the sensor.

Appendix: VOCs detected

VOC families that can be detected by our sensors are:

- CO, CH4, LPG
- Alcohols
- Ketones (solvents). Examples are Acetone and Methyl Ethyl Ketone (MEK).
- Organic Acids. Examples are Lactic acid, Acetic acid, Formic acid, Citric acid, and Oxalic acid.
- Amines. Amines are derivatives of ammonia. See http://en.wikipedia.org/wiki/Category:Amines.
- Aliphatic hydrocarbons. These are flammable with little or no odor. Examples are hexane, paraffin, methane, and acetylene.
- Aromatic Hydrocarbons. These are flammable with a discernable odor. Examples are benzene, furan, pyridine, toluene, asphaltene, and picric acid.

Over 10,000 specific chemicals are listed as VOCs, but some of the more common chemicals are:

- Dipropylene glycol
- Ethanol
- Ethyl Alcohol
- Eucalyptol
- Formaldehyde
- Heptane
- Hydrocarbons
- Isobutane
- Isobutene
- Isoprene
- Limonene
- Methane
- Methoxyethanol
- Methoxyethoxyethanol
- Methylcyclohexane
- Methylethylketone
- Methyl methacrylate
- Naphthalene
- Nonanal
- Organic Chloramines
- Pentane
- Phenol
- Pinene
- Propane
- Siloxanes
- Tetrachloroethene
- Tetrachloroethylene
- Toluene
- Trichloromethane
- r (1-methylethyl)cyclopropane
- Xylene

Many things contain these chemicals. For example, cigarette smoke contains benzene and carbon monoxide. Propane (R290/LPG) is commonly used in contemporary refrigerant blends. Most of the above chemicals can be found in cleaners, disinfectants, perfumes, polishes, plastics, glues and lubricants.

Below 1000 ppm = Safe
1000-1500 ppm = Warning
Over 1500 ppm = Poor air quality

Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
3/1/19	Specifications for ZS zone sensors	Motion sensor specifications – Detector distance: Changed 16.4 in. to 16.4 ft.	X-O-MW-E
8/24/18	Rnet configuration	Added OptiPoint™ Interface and revised wording of first half of topic.	X-D
	Power requirements	Added OptiPoint™ Interface	
7/9/18	Power requirements	On the drawing, removed the power of the controller's Rnet port. Added first bullet under CAUTIONS.	X-O-RS-E
	ZS zone sensors - Specifications	Changed description of Power supply spec.	
	CO2 sensor installation	Added paragraph regarding one hour after installation to attain accurate readings.	
3/6/18	Specifications for ZS zone sensors	Changed Sensing element accuracy for Humidity from 10% to 90%: ±1.8% typical to 20% to 80%: ±2% typical.	X-O-AR-O
	Appendix: VOCs detected	New topic.	X-O-RS-E
1/8/18	What are ZS sensors? Power requirements ZS zone sensors Specifications for ZS zone sensors To wire and mount a ZS zone sensor	Changed topics to show new zone sensor design.	X-D
8/10/17	What are ZS sensors?	Added product part numbers in this topic.	A-O-F-AR
7/26/17	Rnet configuration	Changed version 3.3.11 to 3.4.02 and changed v03.05.03 to 03.05.02. Also changed version number on graphic to v03.05.02.	X-TS-AP-F
5/31/17	Specifications for: ZS pipe clamp-on sensor ZS immersion sensor ZS outdoor air sensors	Corrected specification for Sensing element. Removed Environmental operating range specification.	X-O-AR-E
5/10/17	Troubleshooting a ZS Pro or ZS Pro-F	Added Effective Setpoints Fields descriptions.	X-TS-EE-BR
1/30/17	Specifications for ZS zone sensors	Added CO_2 sensor type.	X-TS-JM-F
1/19/17	Entire document	Major revisions to add a motion sensor to a ZS Pro, duct sensors, pipe sensor, immersion sensor, and outdoor air sensors.	X-D
3/8/16	Specifications	Added drift statement to Humidity specification.	X-TS-EE-F
4/27/15	Entire document	New look, no content changes.	A-D
2/27/15	CO_2 sensor installation	New topic.	X-TS-RB-BR
11/11/14	Power requirements	Made corrections to wiring diagram.	X-TS-JM-O

Date	Topic	Change description	Code*
7/22/14	Specifications	Revised the following specifications: Sensing element accuracy Environmental operating range Added following statement to Power supply specification: "The controller and the external power supply must share a common ground."	X-O-MW-E-SV
	Rnet configuration	Removed BACview® devices and added Equipment Touch.	X-D
	Power requirements	Removed table for power requirements and power supply. Added statement to see Specifications. Revised drawing to remove BACview and add Equipment Touch.	X-O-SV-O X-D-LZ
	Rnet wiring specifications	Removed mention of BACview.	X-D

* For internal use only