ZS Sensors

Technical Instructions

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AutomatedLogic

Rev. 2023-11-14

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Contents

What are ZS sensors?

The ZS line of thermistor-based temperature sensors consist of:

- Zone sensors that may optionally sense humidity, CO_2, VOC, or motion
- Duct sensors for sensing temperature, temperature/humidity, or averaging temperature
- A pipe temperature sensor
- An immersion sensor
- Outdoor air sensors for sensing temperature or temperature/humidity

ZS Sensors are wired to the Rnet port of the following Automated Logic® controllers:

- LGR line
- ME line
- SE line
- ZN line
- WebZONE
- Equipment Portal

The following table shows the ZS Sensor models, their features, and the available configurations.

Zone Sensors	Features	Available configurations	Part number **
ZS Standard  	• Local access port • • No user control	Temperature only Temp and humidity Temp and VOC Temp and CO2 Temp, humidity, and VOC Temp, humidity, and CO2 T, RH, CO2, Motion, PM, & TVOC	ZS2-* ZS2-H-* ZS2-V-BNK ZS2-C-* ZS2-HV-BNK ZS2-HC-* CZS-7-HCMPV-*
ZS Plus  	• Slider to make zone warmer or cooler • ⏻ button to override schedule and put zone in an occupied state, or force zone to an unoccupied state • Green LED to indicate occupied state • Local access port	Temperature only Temp and humidity Temp and VOC Temp and CO2 Temp, humidity, and VOC Temp, humidity, and CO2 T, RH, CO2, Motion, PM, & TVOC	ZS2PL-* ZS2PL-H-* ZS2PL-V-BNK ZS2PL-C-* ZS2PL-HV-BNK ZS2PL-HC-* CZSPL-7-HCMPV-*

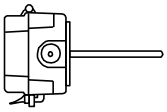
Zone Sensors	Features	Available configurations	Part number **
ZS Pro 	• LCD display • ⏻ button to override schedule and put zone in an occupied state, or force zone to an unoccupied state • ▲ and ▼ buttons to change any editable property, such as setpoint • *i* button to cycle through information defined in control program • Green LED to indicate occupied state • Local access port • Optional motion sensor 	Temperature only Temp and humidity Temp and CO2 Temp, humidity, and CO2 Temp and motion Temp, humidity, and motion Temp, CO2, and motion Temp, humidity, CO2, and motion	ZS2P-* ZS2P-H-* ZS2P-C-* ZS2P-HC-* ZS2P-M-* ZS2P-HM-* ZS2P-CM-* ZS2P-HCM-*
ZS Pro-F 	All of the ZS Pro's features plus: • ❄/🔥 button to turn on heating, cooling, or fan only, or set to auto control. • button to adjust fan speed • **F/C** button to set temperatures to Fahrenheit or Celsius	Temperature only Temp and humidity Temp and CO2 Temp, humidity, and CO2	ZS2PF-* ZS2PF-H-* ZS2PF-C-* ZS2PF-HC-*

** Replace * in part number with **ALC** or **BNK**.
ALC = sensor with the Automated Logic® logo.
BNK = sensor with no logo. Sensors with VOC are only available without a logo.

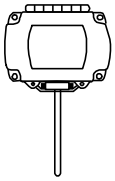
Duct Sensors	Available configurations ***	Part number
Temperature Sensor 	4 in. (10.16 cm) back probe 4 in. (10.16 cm) bottom probe 8 in. (20.32 cm) back probe 8 in. (20.32 cm) bottom probe	ZSD-B-4-6-B ZSD-S-4-6-B ZSD-B-8-6-B ZSD-S-8-6-B
Temperature/Humidity Sensor 	5.3 in. (13.5 cm) back probe 5.3 in. (13.5 cm) bottom probe	ZSD-BH-6-6-B ZSD-SH-6-6-B
Averaging Temperature Sensor 	8 ft (2.44 m) flexible back probe 8 ft (2.44 m) flexible bottom probe 12 ft (3.66 m) flexible back probe 12 ft (3.66 m) flexible bottom probe 24 ft (7.32 m) flexible back probe 24 ft (7.32 m) flexible bottom probe	ZSA-B-8-6-B ZSA-S-8-6-B ZSA-B-12-6-B ZSA-S-12-6-B ZSA-B-24-6-B ZSA-S-24-6-B
Pipe Sensor		
Clamp-on Temperature Sensor 		ZSS-B-2-6-B

Immersion Sensor		
Temperature Sensor 	2 in. (5.08 cm) back probe 2 in. (5.08 cm) bottom probe 4 in. (10.16 cm) back probe 4 in. (10.16 cm) bottom probe	ZSI-B-2-6-B ZSI-S-2-6-B ZSI-B-4-6-B ZSI-S-4-6-B
Outdoor Air Sensor		
Temperature Sensor 	Bottom probe	ZSO-S-2-6-B
Temperature/Humidity Sensor 	Bottom probe	ZSO-SH-3-6-B

*** Back probe:



Bottom probe:



See the *ZS Sensor Application Guide* to configure the control program for the desired user interaction with the sensor.

See the *ZS Zone Sensor User Guide* to for basic user instructions for zone sensors.

Rnet configuration

You can use wireless sensors, ZS sensors, and an Equipment Touch or OptiPoint™ Interface on the same Rnet.

The number of sensors you can use on a controller's Rnet depends on how many control programs it can have (up to 5 sensors per control program). If a controller has:

- Only one control program, the Rnet can consist of up to 5 wireless and/or ZS sensors
- Multiple control programs, the Rnet can consist of up to 15 wireless and/or ZS sensors

WARNING

Using Rnet tags 5, 6, or 7 in a control program that has a ZS Pro or Pro-F version 03.04.02 or earlier in a Sensor Binder microblock will disable the display on the ZS sensor. You must do one of the following to prevent this occurrence:

- Replace the ZS Pro or Pro-F with a newer one (v03.05.02 or later), and then contact Automated Logic® Technical Support for more information.
- Use 2 control programs, if the controller supports multiple control programs, splitting the ZS Pro and wireless sensors between them.

To determine the ZS Pro or Pro-F version, go to the control program's **Logic** page in the WebCTRL® interface, and double-click the Sensor Binder microblock that contains the ZS sensor.

CAUTIONS

- You cannot have RS sensors on the same Rnet with any of the above devices.
- An Rnet can have more than one wireless Pro-F sensor, however, changing the setpoint on one Pro-F will not be reflected on the display of another Pro or Pro-F, possibly causing confusion for the user.

Rnet wiring specifications

The Rnet communicates at a rate of 115 kbps and should be wired in a daisy-chain, star, or hybrid configuration.

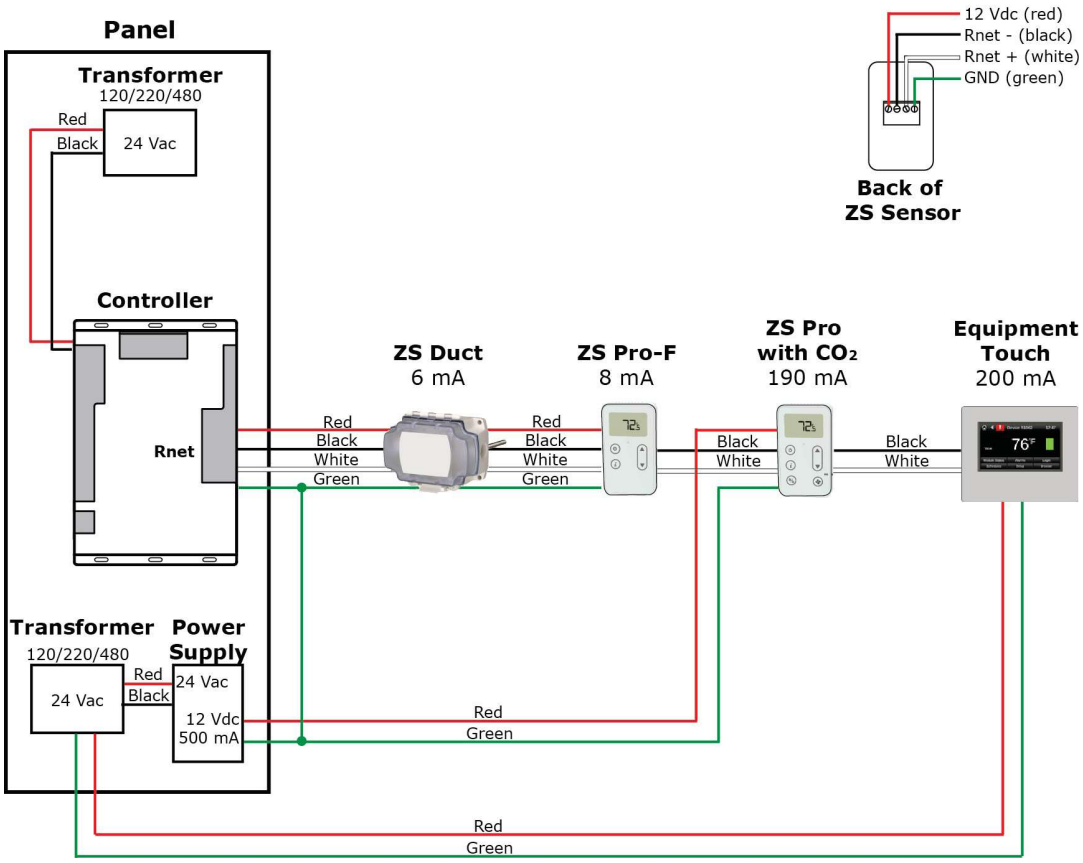
NOTE Use the specified type of wire and cable for maximum signal integrity.

Description	4 conductor, shielded or unshielded, CMP, plenum rated cable
Conductor	22 AWG (7x0096) bare copper
Maximum length	500 feet (152 meters)
Insulation	Low-smoke PVC (or equivalent)
Color Code	Black, white, green, red
Shielding	If shielded, Aluminum/Mylar shield (100% coverage) with TC drain wire
UL temperature rating	32–167 °F (0–75 °C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

Power requirements

See the sensor specifications for power requirements and power supply information.

Sample wiring diagram with external power supply:



CAUTIONS

- If the power required by the sensors on the Rnet exceeds the power supplied by the controller's Rnet port, you will need to provide an external power supply. See:
  - The specifications for each sensor on the Rnet to determine the power required.
  - The specifications in the controller's Technical Instructions to determine the power supplied. The power supplied varies by controller model.

  NOTE A Wireless Adapter, Equipment Touch, or OptiPoint™ Interface must be powered by an external power source. See each device's Technical Instructions for more information.

- Do not share power between controller's power and external 12 Vdc unless both devices are half wave.

ZS zone sensors

ZS Standard

ZS Plus

ZS Pro

ZS Pro with motion sensor

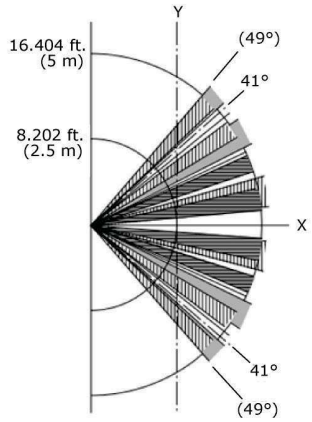
ZS Pro-F

Specifications for ZS zone sensors

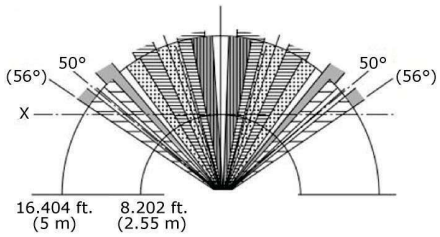
Sensing element accuracy		
Temperature	Temperature only: 32° to 122°F (0° to 50°C): ±0.36°F (0.2°C)	Temperature if humidity is included: 50° to 104°F (10° to 40°C): ±0.54°F (0.3°C)
Humidity	20% to 80%: ±2% typical. Less than 0.5% drift per year.	
CO_2	400 to 1250 PPM: ±30 PPM or 3% of reading, whichever is greater 1250 to 2000 PPM: ±5% of reading plus 30 PPM See *CO_2 sensor installation* (page 9).	
VOC	0 to 2,000 CO2 PPM Equivalent: ±100PPM See *Appendix: VOCs detected* (page 38).	
CO_2 sensor type	Non-Dispersive Infrared (NDIR)	
Motion sensor type	Passive infrared (PIR)	

Motion sensor specifications	Detector distance: Detection range (HxV): Movement speed: Detection object:	16.4 ft. (5 m) 100° x 82° 2.62 to 3.94 ft/s (0.8 to 1.2 m/s) 27.56 x 9.84 in. (700 x 250 mm)

Side View



Top View



Power requirements *	Temperature only ZS Standard or ZS Plus: ZS Pro or Pro-F:	 12 Vdc @ 6 mA 12 Vdc @ 7 mA
	Temperature with humidity ZS Standard or ZS Plus: ZS Pro or Pro-F:	 12 Vdc @ 7 mA 12 Vdc @ 8 mA
	Temperature and VOC ZS Standard or ZS Plus	 12 Vdc @ 60 mA
	Temperature, humidity, and VOC ZS Standard or ZS Plus	 12 Vdc @ 60 mA
	Temperature, humidity, and CO_2 All models	12 Vdc @ 15 mA (idle) to 190 mA (CO_2 measurement cycle)
	Temperature and CO_2 All models	12 Vdc @ 15 mA (idle) to 190 mA (CO_2 measurement cycle)
	* A ZS Pro with motion sensor has the same power requirements as a ZS Pro without a motion sensor.	
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	
Local access port	For local access to start up and troubleshoot the system	
Environmental operating range	32 to 122°F (0 to 50°C), 10 to 90% relative humidity, non-condensing	

Mounting	Standard 4x2-in. electrical box using the 6-32 x 1/2" mounting screws provided	
Overall dimensions	Width: Height: Depth:	2.75 in. (6.98 cm) 4.75 in. (12.06 cm) .86 in. (2.18 cm)
Listed by	FCC CFR 47 PART 15 C (15.247) , CE	

CO2 sensor installation

IMPORTANT Do not install ZS CO_2 sensors in continuous occupancy applications. For a ZS CO_2 sensor to maintain accuracy, it must be installed only in a zone that is unoccupied for at least 4 hours a day with enough air movement during the unoccupied period to return CO_2 to background levels.

A ZS sensor with CO_2 uses Automatic Background Calibration which waits for the lowest value in a 24-hour period that deviates no more than 40PPM for at least 15 minutes, and assigns that value to the 400PPM baseline. This daily Automatic Background Calibration may take up to 21 days to fully calibrate the sensor.

After installation, a ZS sensor with CO_2 must be powered up for one hour before it attains accurate readings.

NOTE Dropping a sensor can upset the calibration, and it may require 21 days to return to our stated accuracy.

Motion sensor installation

The motion sensor on a ZS Pro needs to have a direct line of sight to the occupants in the room.

If the size of the room exceeds the maximum detector range, use multiple sensors to adequately monitor the area.

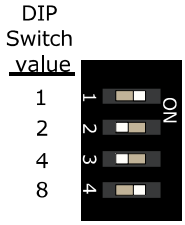
Avoid placing the sensor:

- In a location that has a direct line of sight through an open door to a hallway where the sensor could detect movement of people in the hallway.
- Near air ducts. Rapidly changing air currents from the air ducts could lead to false sensor readings.

To address a ZS zone sensor

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

Use the DIP switches on the back of the ZS zone sensor 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.

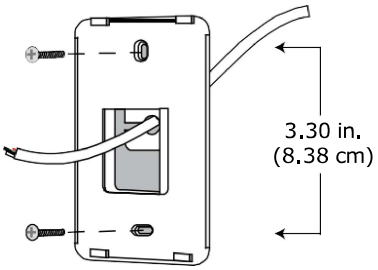


EXAMPLE DIP switches 1 and 4 above are on. Their values (1 + 8) total 9, so the sensor's address is 9.

To wire and mount a ZS zone sensor

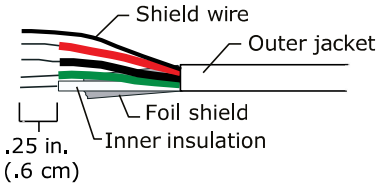
The Rnet communicates at a rate of 115 kbps and should be wired in a daisy-chain, star, or hybrid configuration.

1. Turn off the controller's power.
2. Using a hex screwdriver, turn the setscrew clockwise until it stops turning.
3. Pull out the bottom of the backplate, and then pull off the backplate.
4. Pull the Rnet communication cable through the wire guide in the backplate.



5. Use 2 screws to mount the backplate to the wall or outlet box.

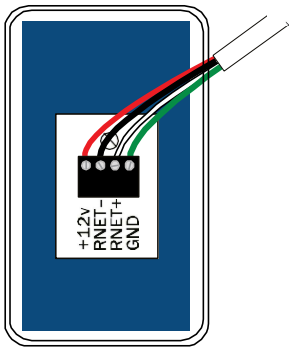
   Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



6. Strip about 0.25 inch (0.6 cm) of the inner insulation from each wire.
7. If wiring 1 cable to the ZS 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.

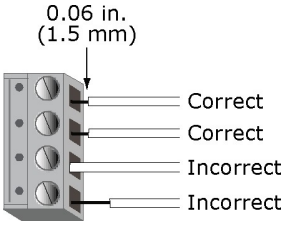
8 Insert the 4 wires into the ZS Sensor's screw terminal connector. If wiring 2 cables, insert like-colored wires into each terminal.



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

Connect this wire...	To this terminal...
Red	+12V
Black	RNET-
White	RNET+
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.



9 Attach the sensor's cover and circuit board to the mounted backplate, inserting the top first.

10 Turn the setscrew counterclockwise until the cover cannot be removed.

11 Connect the other end of the Rnet wiring to the controller's **Rnet** port or to a zone sensor.

NOTES

- Insert the shield wire with the ground wire into the controller's **GND** terminal.
- Use the same polarity throughout the Rnet.

12 Turn on the controller's power.

NOTE Use the same polarity throughout the Rnet.

To communicate through a ZS zone sensor's local access port

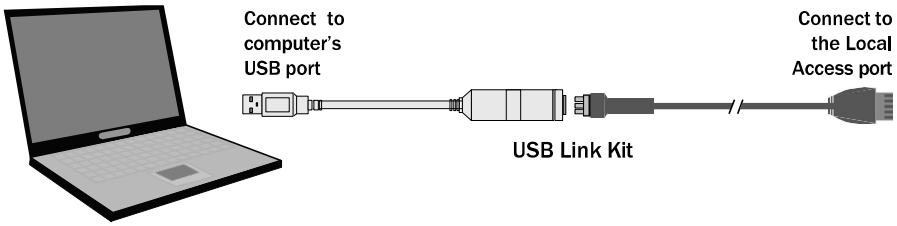
You can connect to the Local Access port of a ZS zone sensor to perform test and balance or to make changes to any device on the network.

PREREQUISITES

- A computer with a USB port
- A USB Link Kit

CAUTION If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

Connect the USB Link Kit to the computer and to the ZS Sensor's Local Access port.



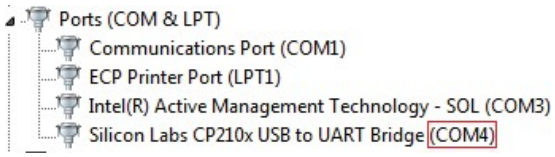
NOTE If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

To set up a Local Access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the Local Access port, you must do the following:

1. On the **System Configuration** tree, select **Connections**.
2. On the **Configure** tab, click **Add**.
3. From the **Type** drop-down list, select **BACnet Local Access**.
4. Optional: Edit the **Description**.
5. Type the computer's **Port** number that the USB cable is connected to.

   NOTE To find the port number, plug the USB cable into the computer's USB port, then select **Start** > **Control Panel** > **System** > **Device Manager** > **Ports (Com & LPT)**. The COM port number is beside **Silicon Labs CP210x USB to UART Bridge**.



6. Set the **Baud** rate to 115200.
7. Click **Accept**.
8. On the **View** tab, click the button next to the BACnet/IP network, then select **BACnet Local Access**.
9. Click **Accept**.
10. On the **Configure** tab, select **BACnet Local Access**, then click **Start**.

    NOTE If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.
11. On the **Network** tree, select the controller that you are connected to.

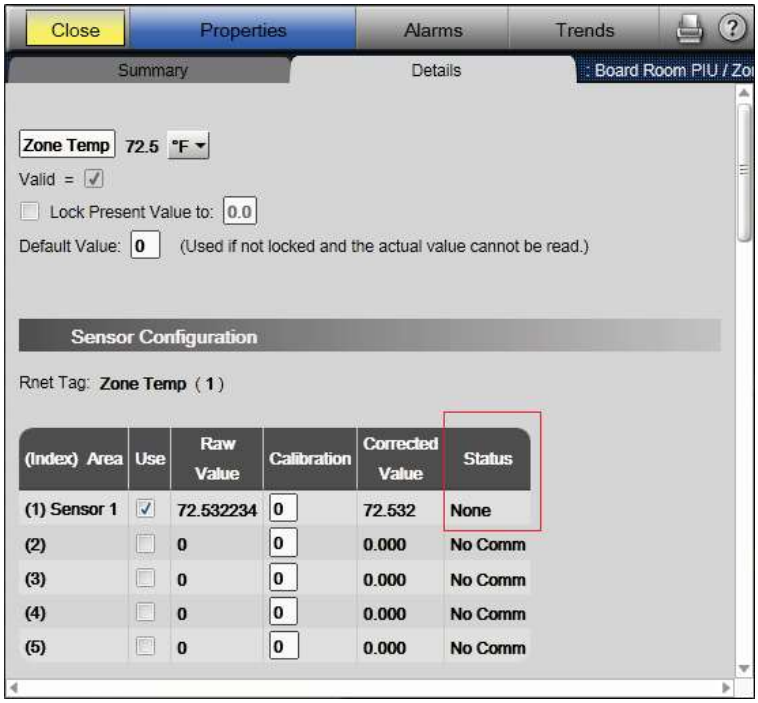
12 Click 

, then select **Manual Command**.

13 Type `rnet here` in the dialog box, then click **OK**.

14 On the **Properties** page, click **Module Status**. If a Modstat report appears, the WebCTRL® application is communicating with the controller.

Troubleshooting a ZS Pro or ZS Pro-F

If display shows...	Then...
Incorrect or missing values	Check for errors in WebCTRL®. On the control program's **Properties** page, select the **Rnet Points** tab. Verify that values coming in from the sensors and those going out to the sensors are expected values. On the control program's **Logic** page, double-click the Sensor Binder and ASVI microblocks to check for problems in the **Status** and/or **Error** columns.  If the **Error** column shows **Resource Allocation**, try formatting the sensor. If the error is not corrected by formatting, the control program engineer should reduce the number of items that the sensor is trying to display.
Nothing	The sensor has no power.
	The sensor is not communicating with the network. Check: • Software/addressing setup • Wiring connections • Controller operating status

If display shows...	Then...
Characters that seem out of place	The sensor may have a memory problem. Try formatting the sensor.
Effective setpoints fields	These fields display the effective setpoint values. They can display a maximum value of 99 or 99.5 if the **Edit Increment** is set to 0.5. If the effective setpoint exceeds this maximum value or if the **Edit Increment** is set to 0.1, the value will flash. **TIP** If you need an Edit Increment of 0.1, put the effective setpoints on the Information screen in the Primary Value field. Hide the effective setpoints on the Home screen by selecting **Sensor Setpoint Adjust Option 4** on the **BACnet Setpoint** microblock's **Rnet** tab.

Attachment

FCC Warning:This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

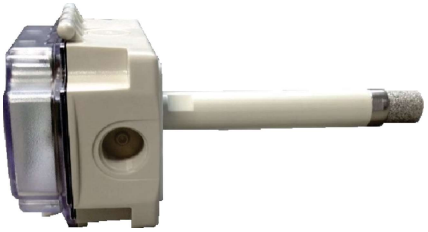
Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

ZS duct sensors

Duct Temperature Sensor

Available with:
- 4 in. (10.16 cm) probe
- 8 in. (20.32 cm) probe
- Back or bottom probe *

Duct Temperature/Humidity Sensor



Available with:
- 5.3 in. (13.5 cm) probe
- Back or bottom probe *

Duct Temperature Averaging Sensor

Available with:
- 8 ft (2.44 m) flexible probe
- 12 ft (3.66 m) flexible probe
- 24 ft (7.32 m) flexible probe
- Back or bottom probe *

* Sensors with back probes (as shown) are to be mounted on the outside of ductwork. Sensors with bottom probes are to be mounted on the inside of ductwork.

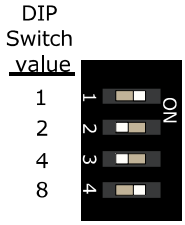
Specifications for ZS duct sensors

Sensing element		
Temperature	Range: Accuracy:	20° to 120°F (-5° to 50°C) ±0.36°F (0.2°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	
Enclosure dimensions	Width: Height: Depth:	5 in. (12.7 cm) 4.15 in. (10.54 cm) 2.5 in. (6.35 cm)
Probe	• Temperature sensor probe: 304 SS 0.25 in. (0.64 cm) diameter Length (4 or 8 in.) specified at time of order • Temperature/humidity sensor probe: ABS with SS filter 1.0 in. (2.5 cm) diameter 5.3 in. (13.5 cm) length • Averaging temperature sensor probe: Bendable aluminum 3/16 in. diameter Length of 8, 12, or 24 ft. specified at time of order	
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	Duct mount with #8 sheet metal screws	
Listed by	FCC Part 15-Subpart B-Class B, CE	

To address a ZS duct sensor

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

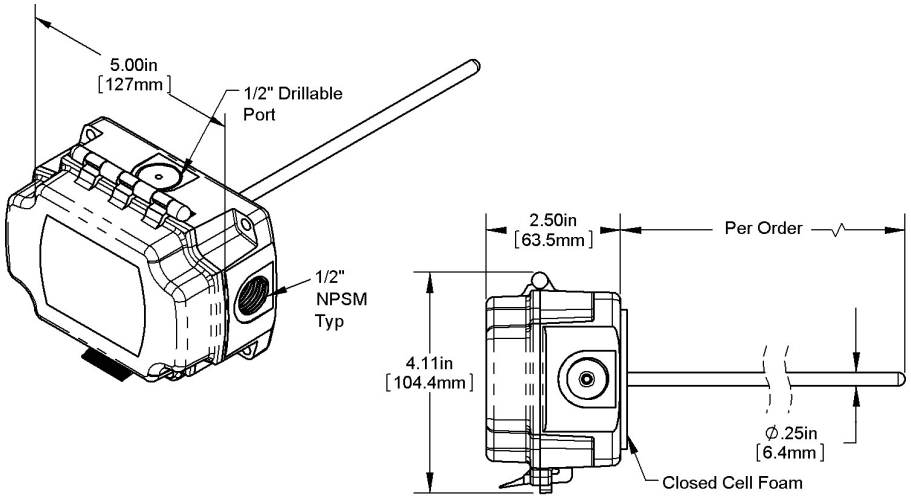
Open the hinged cover on the sensor enclosure, and then use the DIP switches to set an address from 0 to 14. (0 is factory default.) Each DIP switch has the value shown in the figure below. Turn on as many DIP switches as you need so that their total value equals the address.



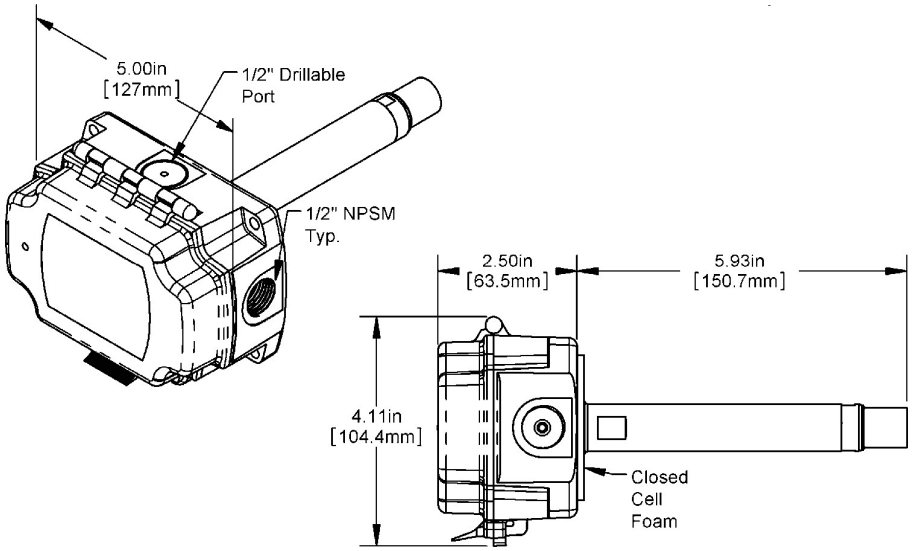
EXAMPLE DIP switches 1 and 4 above are on. Their values (1 + 8) total 9, so the sensor's address is 9.

To mount a ZS duct temperature or temperature/humidity sensor

Temperature sensor



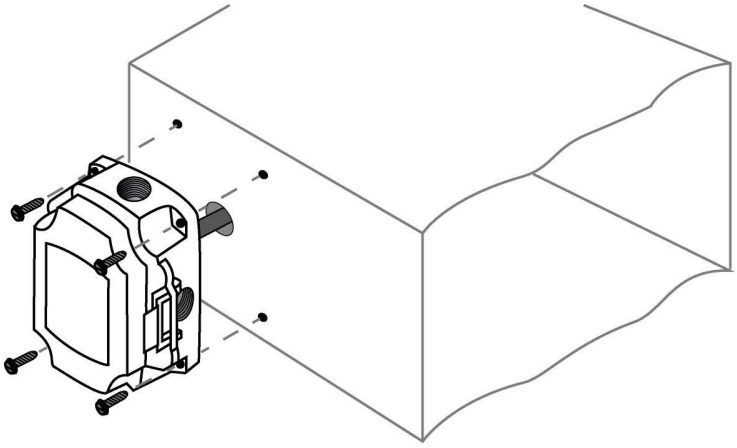
Temperature/Humidity sensor



1. Determine the best location on the duct for the sensor. Mount the sensor:
   - In the middle of the duct away from temperature stratified air, coils, or humidifiers
   - At least 3 duct diameters away from humidifiers.
2. Unlatch and open the hinged door on the sensor's enclosure.
3. Remove the sensor's knockout that is appropriate for your application. When you wire the sensor, you will pull the Rnet communication cable through this hole. See *To wire a ZS duct sensor* (page 21).
4. Close the enclosure door until it latches.
5. If mounting the sensor to the outside of the duct, drill a hole in the duct for the probe, and then insert the probe into the hole.
   - Temperature probe - Drill a .38 in. (.96 cm) hole
   - Temperature/humidity probe - Drill a 1 in. (2.54 cm) hole
6. Push the sensor enclosure against the duct and mark the location of each screw hole in the 4 corners of the enclosure.
7. Remove the sensor, and a drill 1/8 inch pilot screw hole where you made each mark in the previous step.

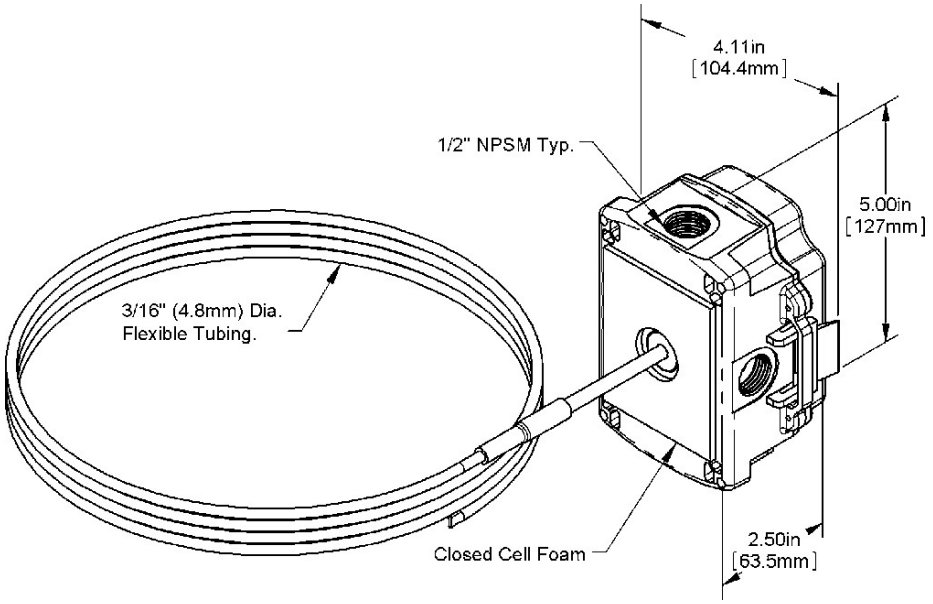
8 Use #8 sheet metal screws to attach the enclosure to the duct.

NOTE You must use a minimum of 2 mounting screws in opposite corners of the enclosure.



9 Tighten the screws so that the foam backing on the enclosure is depressed to prevent air leakage, but do not overtighten or strip the screw threads.

To mount a ZS duct averaging temperature sensor



1 Determine the best location on the duct for the sensor. Mount the sensor in the middle or top of the duct as shown below so that the flexible probe can enter the duct in a convenient place.

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

3 Remove the sensor's knockout that is appropriate for your application. The knockouts for indoor versus outdoor applications are noted inside the enclosure. When you wire the sensor, you will pull the Rnet communication cable through this hole. See *To wire a ZS duct sensor* (page 21).

4 Close the enclosure door until it latches.

5 If mounting the sensor to the outside of the duct, drill a .38 in. (.96 cm) hole in the duct for the sensor probe. Insert the sensor probe into the hole by unrolling it into the duct carefully to avoid kinking it.

6 Push the sensor enclosure against the duct and mark the location of each screw hole in the 4 corners of the enclosure.

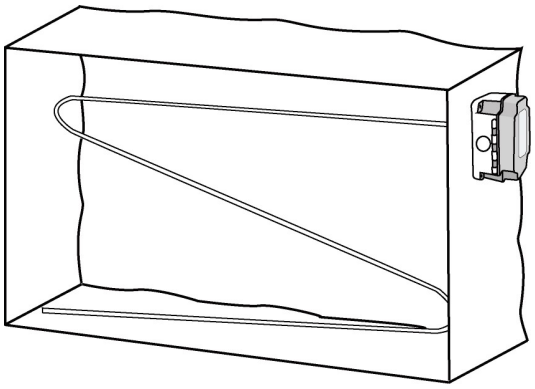
7 Pull the enclosure away from the duct, and a drill 1/8 inch pilot screw hole where you made each mark in the previous step.

8 Push the enclosure against the duct, and then use #8 sheet metal screws to attach the enclosure to the duct.

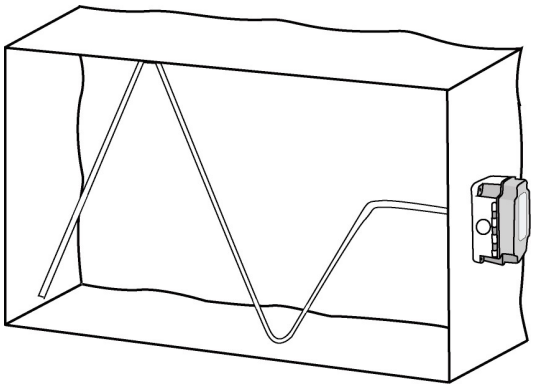
NOTE You must use a minimum of 2 mounting screws in opposite corners of the enclosure.

9 Tighten the screws so that the foam backing on the enclosure is depressed to prevent air leakage, but do not overtighten or strip the screw threads.

10 Serpentine the duct with the sensor probe at least twice across the stratified air in the duct to achieve the best average temperature reading. At the turns, use the provided cable ties to attach the sensor probe to the duct.



Best for vertical stratification



Best for horizontal stratification

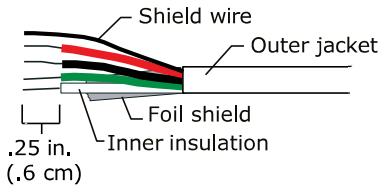
To wire a ZS duct sensor

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.

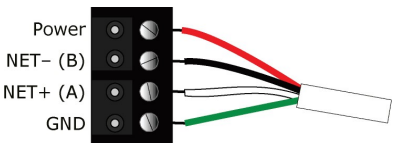
PREREQUISITE The Rnet cable is wired to the controller. The shield wire and the ground wire should be inserted into the controller's GND terminal.

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.

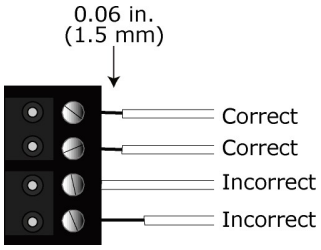
   If wiring 2 cables in a daisy-chain configuration, twist together the shield wires, then wrap the shield wires with tape.
7. Insert the other 4 wires into the sensor's screw terminal connector. If wiring 2 cables, insert like-colored wires into each terminal.



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.

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.

ZS pipe clamp-on temperature sensor

This sensor is primarily used to determine the fluid temperature in a pipe by reading the temperature of the pipe.

Pipe Clamp-on Temperature Sensor

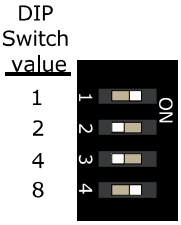
Specifications for ZS pipe temperature sensor

Sensing element	Range: Accuracy:	-40° to 212°F (-40° to 100°C) ±1.3°F (0.72°C)
Sensor	Range: Accuracy:	20° to 120°F (-5° to 50°C) ±0.9°F (0.5°C)
Enclosure material	Polycarbonate, UL94V-0	
Enclosure rating	NEMA 4, IP66, UV rated	
Enclosure dimensions	Width: Height: Depth:	5 in. (12.7 cm) 4.15 in. (10.54 cm) 2.5 in. (6.35 cm)
Sensor pad	1.25" (3.18 cm) diameter copper	
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	.5 in. (1.27 cm) stainless steel worm gear hose clamp	
Listed by	FCC Part 15-Subpart B-Class B, CE	

To address a ZS pipe temperature sensor

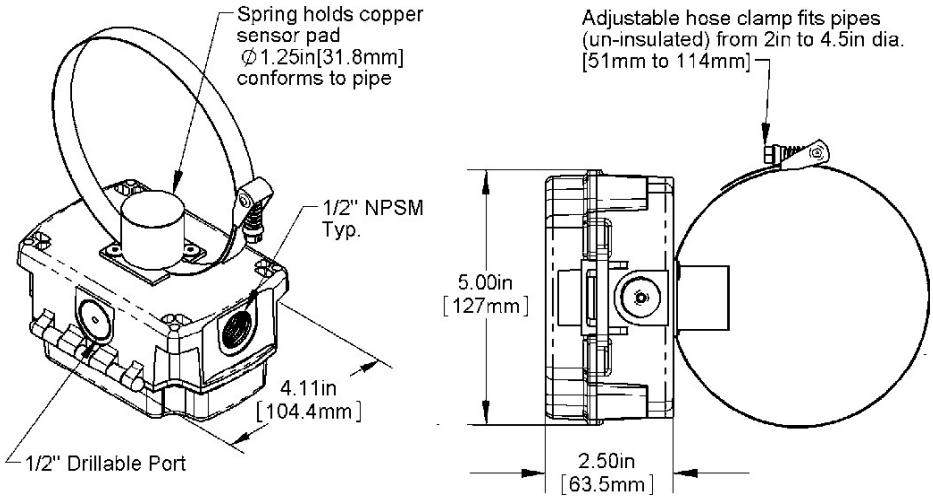
Each ZS Sensor on an Rnet must have a unique address, but addresses do not have to be sequential.

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.

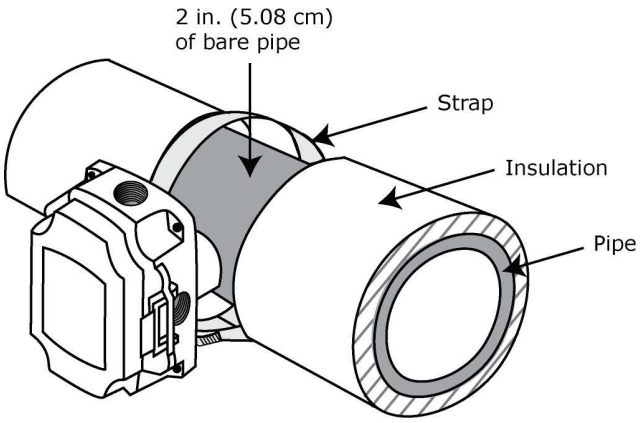
To mount a ZS pipe temperature sensor



1. Unlatch and open the hinged door on the sensor's enclosure.
2. Remove the sensor's knockout that is appropriate for your application. The knockouts for indoor versus outdoor applications are noted inside the enclosure. When you wire the sensor, you will pull the Rnet communication cable through this hole. See *To wire a ZS pipe temperature sensor* (page 25).
3. Close the enclosure door until it latches.
4. If the pipe has insulation, remove a 2 in. (5.08 cm) strip around the circumference of the pipe where the sensor will be located. The copper sensor plate and stainless steel strap must directly contact the metal or plastic pipe. Nothing should be between the copper plate and the bare pipe.
5. Lift up on the clamp screw to release the stainless steel strap from the clamp.
6. Wrap the sensor's strap around the pipe, and then insert the strap into the clamp.

7 Push the clamp screw down against the strap, and then turn the screw to tighten the strap enough so that the sensor does not rotate around the pipe, but only enough so that the foam is compressed no more than 50%.

8 If the pipe does not have insulation, add pipe insulation on either side of the sensor to prevent airflow from affecting the temperature readings. The insulation should:
   - Be at least 1 in. thick, but only cover the sensor enclosure to the door hinge.
   - Extend a minimum of 4 pipe diameters away from the sensor. For example, a 2 in. (5.08 cm) pipe should have 8 in. (20.32 cm) of insulation on each side of the sensor.



To wire a ZS pipe temperature sensor

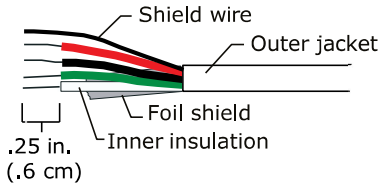
NOTES

- 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.

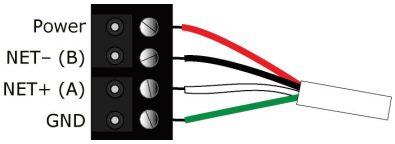
4 Unlatch and open the hinged door on the sensor's enclosure.

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.

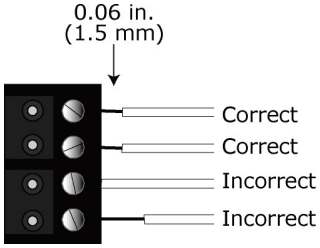
7 Insert the other 4 wires into the sensor's screw terminal connector. If wiring 2 cables, insert like-colored wires into each terminal.



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 immersion temperature sensor

This sensor is primarily used to measure temperature in water pipes, water tanks, or cooling tower sump applications. An immersion sensor is mounted in a thermowell (purchased separately from Automated Logic®).

Immersion Temperature Sensor

Available with:

- 2 in. (5.08 cm) probe
- 4 in. (10.16 cm) probe
- Back or bottom probe

Specifications for ZS immersion temperature sensor

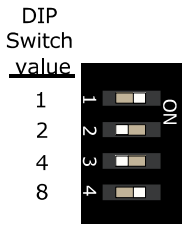
Sensing element	Range: Accuracy:	-40° to 212°F (-40° to 100°C) ±1.3°F (0.72°C)
Sensor	Range: Accuracy:	20° to 120°F (-5° to 50°C) ±0.9°F (0.5°C)
Enclosure material	Polycarbonate, UL94V-0	
Enclosure rating	NEMA 4, IP66, UV rated	
Enclosure dimensions	Width: Height: Depth:	5 in. (12.7 cm) 4.15 in. (10.54 cm) 2.5 in. (6.35 cm)
Probe	304 SS 0.25" (0.64 cm) diameter 2 or 4 in. (5.08 or 10.16 cm) length specified at time of order	
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	Sensor's 1/2 in. NPSM plastic threads are screwed into a thermowell
Listed by	FCC Part 15-Subpart B-Class B, CE

To address a ZS immersion temperature sensor

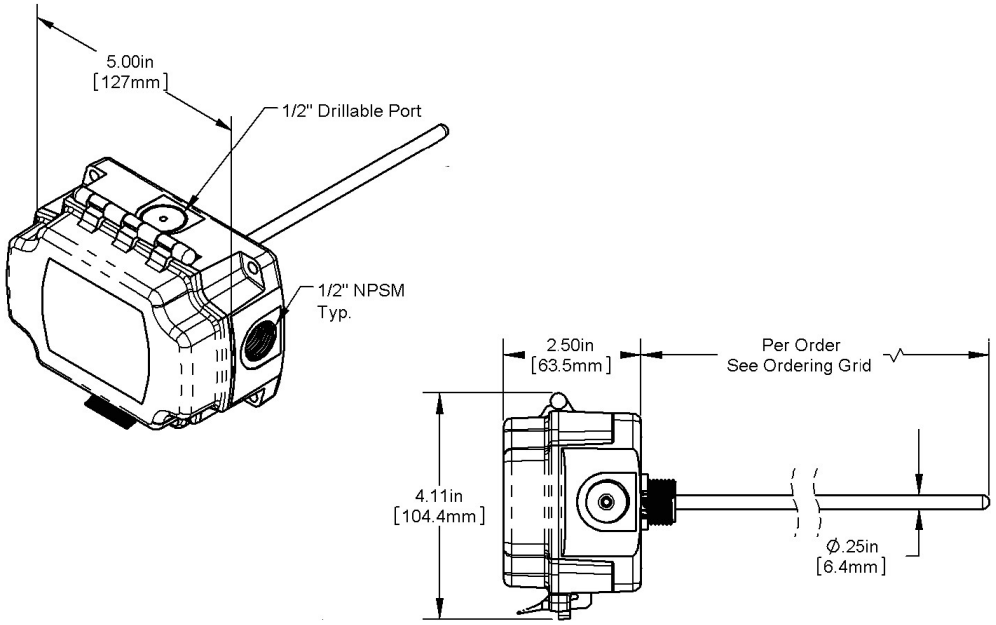
Each ZS Sensor on an Rnet must have a unique address, but addresses do not have to be sequential.

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.

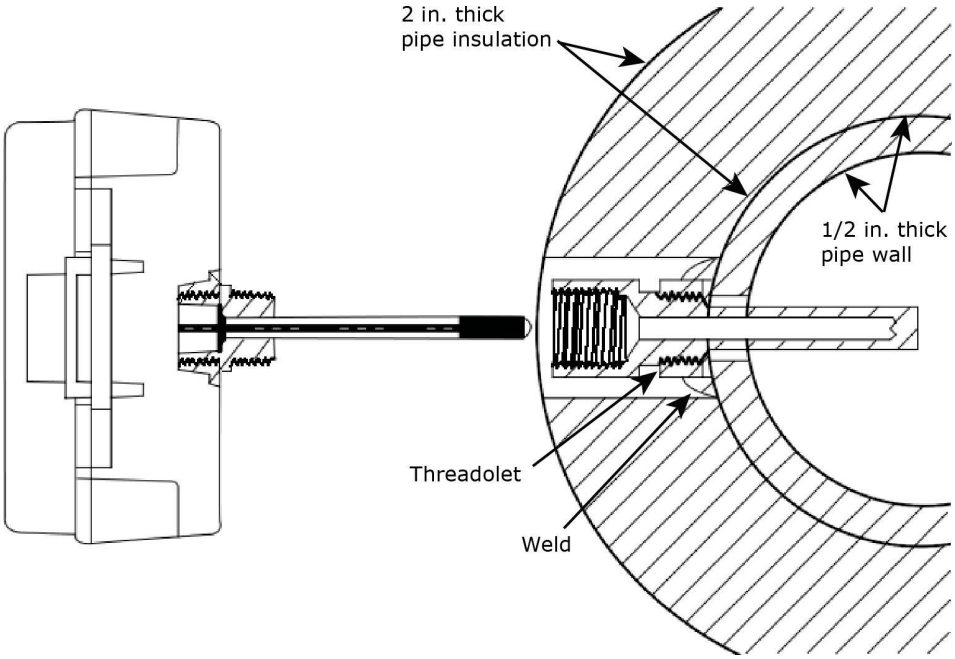


EXAMPLE DIP switches 1 and 4 above are on. Their values (1 + 8) total 9, so the sensor's address is 9.

To mount a ZS immersion temperature sensor



An immersion sensor is mounted in a thermowell (purchased separately from Automated Logic®), a hollow tube closed off on one end and threaded at the other end. A thermowell is permanently installed in pipes, tanks or sumps so that an immersion sensor can be inserted into the thermowell to measure the content's temperature. The temperature is transferred through the wall to the thermowell to the sensor. The thermowell prevents the contents of the pipe from escaping and holds in the pressure of pressurized pipes.



To install the thermowell (typically performed by a pipe fitter)

1. Drill a 3/4 in. hole in the pipe where the thermowell is needed.
2. Weld a Threadolet or Weldolet fitting (not provided) over the hole.
3. Thread sealant such as Teflon tape or pipe dope to the 1/2 in. NPT threads of the thermowell.
4. Insert the thermowell into the threadolet and tighten.

To install the immersion sensor

1. Insert the immersion sensor probe into the thermowell.
2. Screw the sensor's enclosure into the thermowell; hand-tighten until snug.
3. Unlatch and open the hinged door on the sensor's enclosure.
4. Push on the probe until it stops so that the probe is touching the bottom of the thermowell.
5. Close the enclosure door until it latches.