

# ZS Sensor Applications Guide

Carrier





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## Introduction

The ZS line of sensors consists of the following thermistor-based temperature sensors. The zone sensors come in a variety of configurations that can include humidity, CO<sub>2</sub>, VOC, and motion sensing.

### Zone Sensors:

ZS Standard



ZS Plus



ZS Pro



ZS Pro with motion sensor



ZS Pro-F



### Duct Sensors:

Temperature sensor



Temperature/humidity sensor



Temperature averaging sensor



**Pipe Sensor:**

Clamp-on temperature sensor



**Immersion Sensor:**

Temperature sensor



**Outdoor Air Sensors:**

Temperature sensor



Temperature/humidity sensor



**Remote Sensor:**

Temperature sensor



ZS Sensors communicate with the HVAC system through the Rnet.

A ZS zone sensor's functionality is determined by:

- The ZS sensor model (Standard, Plus, Pro, Pro-F)
- The sensor's sensing capabilities (temperature, humidity, CO<sub>2</sub>, VOC, or motion)
- The control program that runs the associated equipment

**REQUIREMENTS**

- All ZS Sensors except the ZS Pro with motion sensor require:
  - The i-Vu® v6.0 or later application
  - v6.0 driver (drv\_xxxxxx\_6-00-082 or later). Check *Carrier Control Systems Support Site* <http://www.hvacpartners.com/>, <https://accounts.ivusystems.com/> for the latest driver.
- The ZS Pro with motion sensor requires:
  - The i-Vu® v6.5 or later application
  - v6-00a or later controller driver
  - A BSVI microblock in the control program (even if it is not used)

## This document

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This document describes how to create control programs for ZS sensors in the Snap application. To use this guide, you need a working knowledge of control programs and the Snap application.

See the *ZS Sensors Installation Guide* to mount, wire, and communicate with the sensors.

See the *ZS Sensor User Guide* to use the sensors.

## ZS Sensor screens

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Before you begin to create a control program in the Snap application, decide:

- How you want users to interact with the ZS zone sensors
- What information you want your ZS Pro and ZS Pro-F sensors to display
- Which screens should display what information

The ZS Pro and ZS Pro-F sensors have the following screens that you can assign information to.

**Home Screen:** This is the initial screen that a user sees. It typically displays the zone temperature. We recommend that you keep the Home Screen simple and uncluttered. However, if you assign more than one value to the Home screen, the values cycle from one to the next. Typically, the first item displays for 10 seconds and any other items display for 3 seconds each.

**Information Screen:** This screen displays when the user presses the sensor's  button. The user then taps the button to cycle through the information that you assign to this screen.

**Diagnostics Screen:** This screen displays when the user holds the sensor's  button for at least 3 seconds. The user then taps the button to cycle through the information that you assign to this screen.

**Setpoint Adjustment Screen:** When a user presses the  or  button, this screen displays allowing the user to adjust setpoints. Options that you select in the BACnet Setpoint microblock affect how this screen looks.

To understand what can be displayed on a screen, see:

*Icons and text indicators* (page 15)

*Appendix B: ZS Sensor screen fields* (page 37)

## Creating Snap control programs for ZS Sensors

If a controller supports:

- Only one control program, you can wire up to 5 ZS sensors to its **Rnet** port.
- Multiple control programs, you can wire up to 15 ZS sensors to its **Rnet** port. A control program can use no more than 5 ZS Sensors, so you must use multiple control programs if your Rnet network has more than 5 sensors.

Do the following to create your control program:

*Step 1: Add a Sensor Binder microblock. (page 5)*

*Step 2: Add Analog Sensed Value Input microblocks. (page 6)*

*Step 3: Add Binary Sensed Value Input microblocks. (page 9)*

*Step 4: Add a BACnet Setpoint microblock. (page 11)*

*Step 5: Add a BACnet Time Clock microblock. (page 13)*

*Step 6: Add optional values, status, and icons. (page 14)*

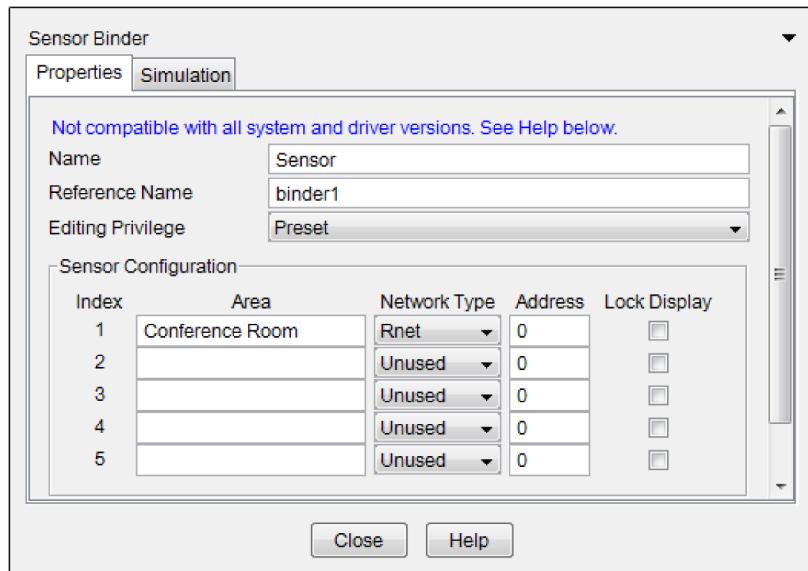
*Step 7: Set the order of information displayed on a sensor. (page 14)*

See the Microblock Reference Help for a full description of each of the above microblocks.

### Step 1: Add a Sensor Binder microblock

From the Snap **Net I/O** microblock menu, add 1  **S BND Sensor Binder** microblock to the workspace to enable communication between microblocks in the control program and up to 5 ZS Sensors. Enter the following information in the Property Editor.

<b>Sensor Configuration</b>	The Index number is a reference number for each sensor that you define in this microblock. ASVI and BSVI microblocks will refer to the sensors by their index number.
<b>Area</b>	Type an intuitive name for the ZS sensor's location. This name will appear in the ASVI, BSVI, and Setpoint microblocks in the i-Vu interface.
<b>Network Type</b>	Select Rnet for each ZS Sensor that you define.
<b>Address</b>	The physical address (0–14) set on the ZS sensor's DIP switches.
<b>Lock Display</b>	Check to lock a ZS Pro or ZS Pro-F sensor's buttons. The sensor's Home screen will display a  icon. The lock can be overridden in the i-Vu interface or at the sensor by a user that knows the override procedure.



## Step 2: Add Analog Sensed Value Input microblocks

From the **Net I/O** microblock menu, add one **ASVI Analog Sensed Value Input (ASVI)** microblock for each type of sensed value (temperature, humidity, CO2, or VOC) that you want to retrieve from the ZS sensor(s). For example, the first ASVI may retrieve temperature, and the second may retrieve humidity, etc. A control program can have only one ASVI for each type of sensed value. Enter the following information in the Property Editor.

**NOTE** If your control program needs to retrieve temperature or humidity values from ZS zone sensors and ZS duct or pipe sensors, use the same ASVI microblock and select the **Zone Temp** or **Zone Humidity** Rnet tag.

**Rnet Tag** The Rnet tag determines which value (Temperature, Humidity, CO2, or VOC) is retrieved from the ZS Sensor. A zone sensor's screen will display:

○ ○  
F or C for Zone Temp

%💧 Zone Humidity

CO2 for Zone CO2

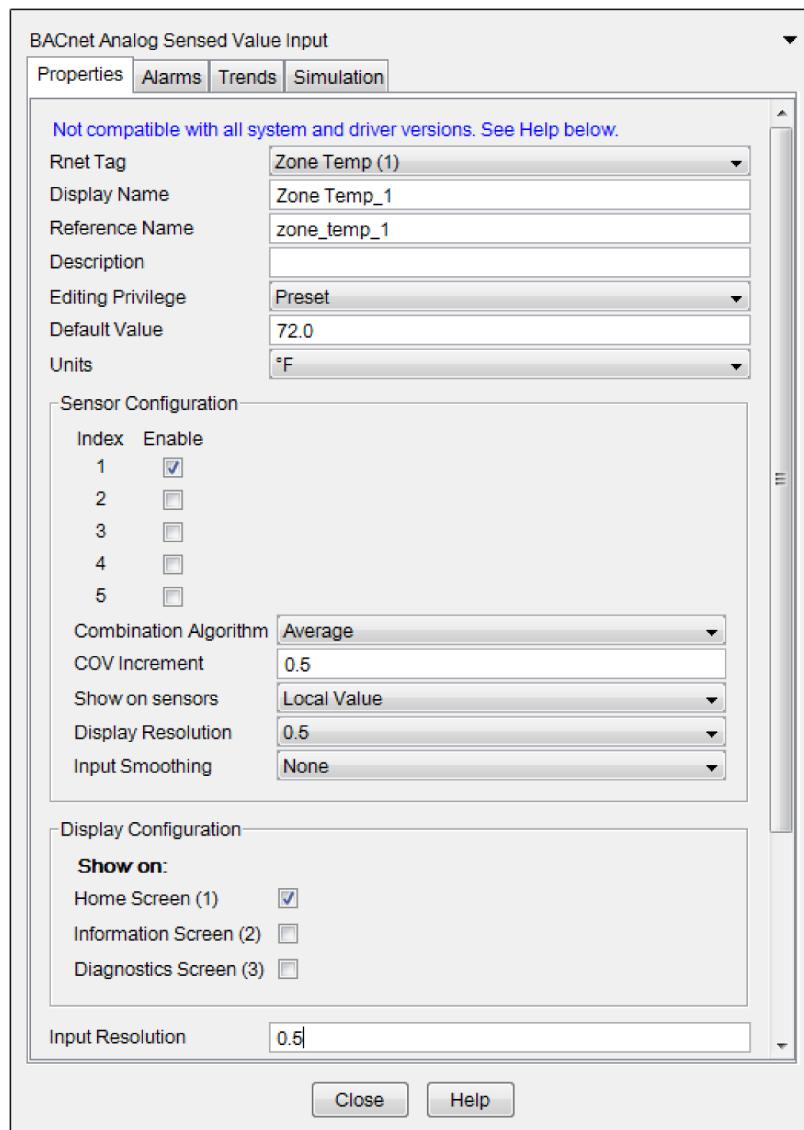
UOC for Zone VOC

**Default Value** The value that the microblock outputs when communication with all enabled sensors fails or during sensor startup.

**Units** The unit of measurement of the microblock's present value. Select from the BACnet engineering units in this dropdown. For some microblocks, you can customize the dropdown by selecting **Options > Preferences > Dropdown Options**.

**Index/Enable** The Index number corresponds to the ZS sensors defined in the Sensor Binder microblock. Check **Enable** for each sensor that you want to include in the combination algorithm used to determine the output value of the microblock.

<b>Combination Algorithm</b>	If using more than 1 sensor, select how the enabled sensors' values are to be combined to determine the microblock's output value. When the calculation is performed, only sensors with a valid value are included.	
<b>COV Increment</b>	To reduce Rnet traffic, you can force the microblock to update its output only when the sensed value changes by more than the <b>COV Increment</b> .	
<b>Show on Sensors</b>	Select <b>Local Value</b> to have each enabled sensor display its individual sensed value, or <b>Calculated Value</b> to have each sensor display the value determined by the <b>Combination Algorithm</b> .	
<b>Display Resolution</b>	Defines the resolution of the value to be displayed on the sensor. For example, 1 displays only integers (example: 74) and 0.5 displays values to the nearest 0.5 (example: 74.5).	
<b>Input Smoothing</b>	If the raw value from the sensor changes frequently, you can select one of the following options to send out an average of several readings on the output wire.	
	<b>Select...</b>	<b>To send out the...</b>
	None	Raw value
	Minimum	Average of the last 2 readings
	Medium	Average of the last 5 readings
	Maximum	Average of the last 9 readings
<b>Show on</b>	Check the zone sensor screen(s) that you want this microblock's value displayed on.	
<b>Input Resolution</b>	<p>The increment by which the microblock updates the value on its output wire in a running system.</p> <p>The <b>Resolution</b> format is used to truncate the microblock's actual value. For example, if you enter a value from:</p> <ul style="list-style-type: none"> <li>• 0.1 to 0.9, the wire displays 1 digit to the right of the decimal</li> <li>• 0.01 to 0.99, the wire displays 2 digits to the right of the decimal</li> <li>• 1 or greater, the wire displays a whole number</li> </ul> <p>The <b>Resolution</b> value determines the increment by which the present value is updated. For example, if you enter:</p> <ul style="list-style-type: none"> <li>• .2, the wire displays 8.4, 8.6, 8.8, ...</li> <li>• .03, the wire displays 5.09, 5.12, 5.15, ...</li> <li>• 10, the wire displays 30, 40, 50, ...</li> </ul>	

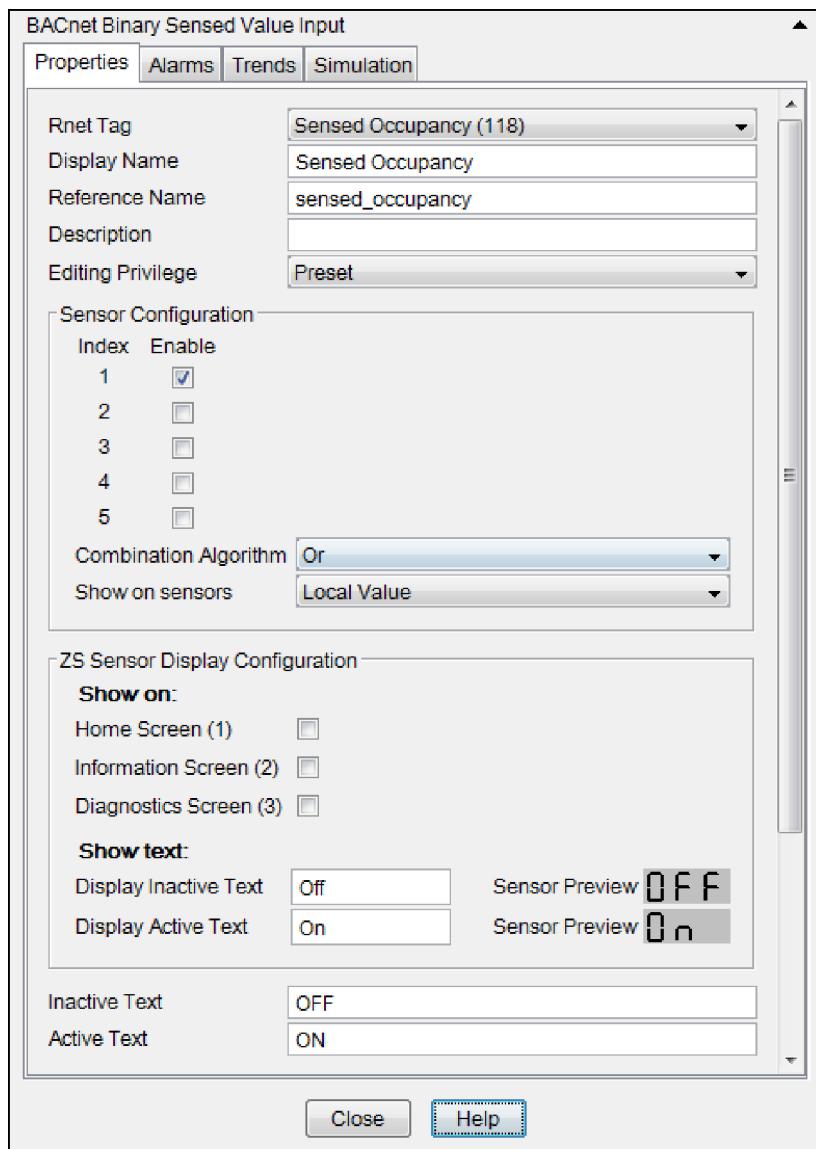


## Step 3: Add Binary Sensed Value Input microblocks if using ZS Pro motion sensor

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From the **Net I/O** microblock menu, add one **BSVI** **Binary Sensed Value Input (BSVI)** microblock that will read a binary value from up to 5 ZS motion sensors, and makes the value available to the control program on an output wire. If the Rnet has more than one ZS motion sensor, the microblock's combination algorithm determines whether the output value is based on a single sensor or all sensors having the same value.

<b>Rnet Tag</b>	All values from a ZS Sensor must have an Rnet tag that defines what type of information this microblock's value represents.  <b>NOTE</b> If the Rnet tag dropdown does not have the tag you want, you can create a custom tag in Snap.
<b>Index/Enable</b>	The Index number corresponds to the ZS sensors defined in the Sensor Binder microblock. Check <b>Enable</b> for each sensor that you want to include in the combination algorithm used to determine the output value of the microblock.
<b>Combination Algorithm</b>	If using more than 1 sensor, select how the enabled sensors' values are to be combined to determine the microblock's output value. Select: <b>And</b> to output 1 if all sensors have a value of 1, otherwise output 0 <b>Or</b> to output 1 if any sensor has a value of 1, otherwise output 0
<b>Show on Sensors</b>	Select <b>Local Value</b> to have each enabled ZS Pro or Pro-F sensor display its individual sensed value, or <b>Calculated Value</b> to have each ZS sensor display the value determined by the <b>Combination Algorithm</b> .
<b>Show on</b>	Check the ZS Pro or Pro-F sensor screen(s) that you want this microblock's value displayed on.
<b>Show text</b>	Enter the text that the ZS sensor's display will show with the microblock's output is off or false (inactive) or when it is on or true (active).
<b>Inactive Text</b>	The <b>Inactive Text</b> your system displays when the microblock's output is off, or false.
<b>Active Text</b>	The <b>Active Text</b> your system displays when the microblock's output is on, or true.



## Step 4: Add a BACnet Setpoint microblock

The BACnet Setpoint microblock allows you to define the setpoint adjustment functionality for a ZS sensor and allows a ZS Pro or Pro-F to display setpoint values that can be edited from the sensor.

From the **Control** microblock menu, add a  **BACnet Setpoint** microblock to determine how the user will interact with the sensor's Setpoint Adjustment screen. Enter the following information in the Property Editor.

<b>Enable Rnet</b>	Check to allow this microblock to communicate its value(s) to and from a ZS sensor.
<b>Setpoint Adjust Limit (+/-)</b>	The maximum amount (degrees) by which the user can adjust the zone's setpoints from a zone sensor if an <b>Adjust setpoint offset</b> option is selected under <b>Sensor Setpoint Adjust Option</b> .
<b>Clear adjustment on transition to unoccupied</b>	ZS Pro and Pro-F sensors - Check to have the Setpoint microblock reset the sensor's setpoint adjustment value to 0 each time the microblock's OCC input changes to false (off) and leave it at 0 when the OCC input changes again to true (on) or when the zone enters a timed local override condition.  If this field is not checked, the Setpoint microblock will not reset the sensor's adjusted value for the next occupied period.  ZS Plus sensor - This field does not apply. The Setpoint microblock cannot reset the sensor's adjusted value.  <b>NOTE</b> The Setpoint microblock does not use adjusted values during unoccupied periods.
<b>Edit Increment</b>	The amount (degrees) that the zone temperature setpoint is adjusted by each press of a ZS Pro sensor's <b>▲</b> or <b>▼</b> button. For a ZS Plus sensor, slider adjustments are read to the nearest increment.
<b>Sensor Setpoint Adjust Option</b>	Select how you want to see and adjust setpoints on a ZS sensor.
<b>Disabled</b>	Prevents editing the setpoints at the sensor.
<b>1. Adjust setpoint offset. Center display=Zone Temp. Show effective setpoints.</b>	Example of sensor display:  Effective cooling setpoint → 74 ° Zone temperature → 74 ° Effective heating setpoint → 68 ° 
<b>2. Adjust base setpoint. Center display=Zone Temp. Show effective setpoints.</b>	Example of sensor display:  Effective cooling setpoint → 75 ° Zone temperature → 75 ° Effective heating setpoint → 69 ° 
<b>3. Adjust setpoint offset. Center display=Offset value. Show effective setpoints.</b>	Example of sensor display:  Effective cooling setpoint → 74 ° Offset value → -2 ° Effective heating setpoint → 68 ° 

<b>4. Adjust setpoint offset.</b> <b>Center display=Offset value. Hide effective setpoints.</b>	Example of sensor display:
	
<b>5. Hospitality mode</b>	Displays only the active effective setpoint or the average of the heating and cooling setpoints if the mode is auto. The effective setpoint is adjustable.
	
<b>Editable</b>	Check under <b>Occupied</b> or <b>Unoccupied</b> to make each setpoint editable on a ZS Sensor.
<b>Show on</b>	Check the sensor screen(s) that you want <b>Occupied</b> , <b>Unoccupied</b> and <b>Effective Setpoints</b> displayed on.
	<b>Home Screen (1):</b> Effective Setpoints are displayed on the Home screen in the following locations:
	
	On the Information or Diagnostics screen, effective setpoints cycle through in the primary value field and show <b>EFF</b> in the Rnet tag field. See <i>Appendix B: ZS Sensor screen fields</i> (page 37).
	<b>Information Screen (2):</b> This screen is accessed by pressing the sensor's  button.
	<b>Diagnostics Screen (3):</b> This screen is accessed by holding the sensor's  button for at least 3 seconds.

**NOTE** To enable/disable the setpoint adjustment functionality of specific sensors on the Rnet, double-click the BACnet Setpoint microblock on the **Logic** page in a running system. On the **Sensor** tab, check/uncheck a sensor's **Allow Setpoint Adjust** checkbox.

## Step 5: Add a BACnet Time Clock microblock

The BACnet Time Clock microblock enables the ZS Sensor's override function and controls its green Occupied LED.

From the **Control** microblock menu, add a  **BACnet Time Clock with TLO and Override Status** microblock to determine how the user can interact with your schedule through the ZS Sensor. Enter the following information in the Property Editor.

<b>Enable Rnet</b>	Check to allow this microblock to communicate its value(s) to and from a ZS sensor.
<b>Allow 'Continuous' Override</b>	Check to allow a user to force a zone into an occupied state for an indefinite amount of time. The override remains in effect until the schedule transitions to occupied or until a user manually clears it by pressing the sensor's  button twice.
<b>Allow Force Unoccupied</b>	Check to allow a user to save energy by forcing the zone into an unoccupied state. To force unoccupied, a user holds a ZS sensor's  button for at least 3 seconds. This override state remains in effect until the schedule transitions to unoccupied or until a user presses the sensor's  button.
<b>Force Unoccupied without Delay</b>	Check to allow a user to force a zone to unoccupied immediately instead of the normal 3-second delay.  <b>NOTE</b> This feature is unavailable if <b>Allow TLO Set During Occupied</b> is checked.
<b>Allow TLO Set During Occupied</b>	Check to allow a user to activate a timed local override while the zone is scheduled occupied. This allows a user to extend the zone's occupied time without the zone having to go unoccupied first.  <b>NOTE</b> This feature is unavailable if <b>Force Unoccupied without Delay</b> is checked.
<b>Timed Local Override</b>	
<b>Increment</b>	Minutes the microblock adds to the zone's occupied time for each press of the zone's local override button or switch.
<b>Maximum Duration</b>	Maximum value (up to 960 minutes) the microblock outputs regardless of additional pulses from the controller's input.
<b>Optional tab - Allow for External Scheduling</b>	See External Scheduling.

During an override, the bottom of the screen will show  and the minutes remaining in the override.



## Step 6: Add optional values, statuses, and icons

Use the following microblocks for optional icons, values, or statuses that you want to display on the sensors. Individual uses are discussed throughout this document. See the Microblock Reference Help for a full description of each microblock.

BACnet Analog Value Parameter  
 BACnet Binary Value Parameter  
 BACnet Multi-State Value Parameter  
 BACnet Analog Value Status  
 BACnet Binary Value Status  
 BACnet Multi-State Value Status

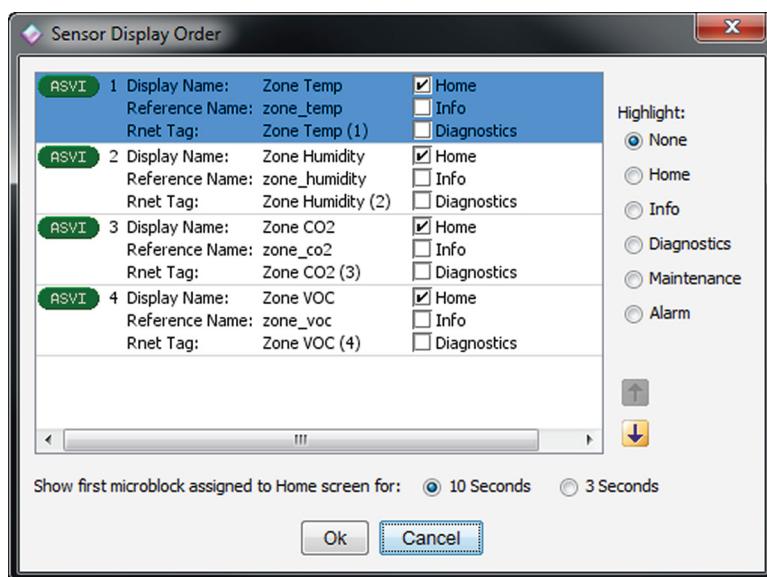
On each microblock's **Rnet** tab, you must check the **Enable Rnet** field to have the microblock communicate values with the ZS Sensors, and you must select the appropriate **Rnet Tag**.

See *Icons and text indicators* (page 15) for instructions on adding specific optional icons.

## Step 7: Set the order of information displayed on a sensor

To program the display order and rotation time of information on each screen, select **Reorder > Sensor Display Order**. In this example, Zone Temp displays on the Home Screen for 10 seconds, then Zone Humidity, Zone CO2, and Zone VOC each display for 10 seconds.

To change the display order, select the microblock(s) you want to move, then click  or .

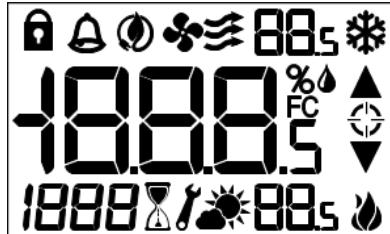


## Icons and text indicators

The following table shows all icons that can display on a ZS Sensor display. The image below the table shows the location of each icon on the sensor's screen. See *Appendix A: Rnet Tags* (page 32) to see which tags are associated with each icon or text indicator.

This item...	Indicates...	Notes
	The temperature is Fahrenheit or Celsius.	Shown for any temperature that has <b>°F</b> or <b>°C</b> selected in the <b>Units</b> field.
	The value shown is percent relative humidity.	Shown for any humidity value that has <b>%RH</b> selected in the <b>Units</b> field.
	The value shown is outside air temperature or humidity.	See <i>Outside air icon</i> (page 16) to program.
	Cooling	See <i>Zone HVAC Modes</i> (page 23) to program.
	Heating	See <i>Zone HVAC Modes</i> (page 23) to program.
	The zone's fan is running.	See <i>Fan status and control</i> (page 21) to program.
	The fan speed.	See <i>Fan status and control</i> (page 21) to program.
	The value(s) in the display, typically setpoints, are editable using the  and  buttons. If the control program specifies that the value is not editable, you will see  without arrows.	For AVP, BVP, or MSVP values, or the Setpoint adjust value from the BACnet Setpoint microblock.
	The sensor is in a timed override.	Automatically generated by the BACnet Time Clock microblock.
	The equipment is running in an energy saving mode defined in the control program.	See <i>Energy saving mode icon</i> (page 17) to program.
	An alarm condition exists. If programmed, the Information screen or Diagnostic Screen may provide details on the alarm.	See <i>Alarm icon</i> (page 17) to program.
	A maintenance condition exists. If programmed, the Information screen or Diagnostic Screen may provide details on the maintenance condition.	See <i>Maintenance icon</i> (page 18) to program.
	The sensor's buttons are locked by the control program or because a user locked them at the sensor.	See <i>Step 1: Add a Sensor Binder microblock</i> (page 5).
<b>OCC</b>	The displayed setpoint is an occupied setpoint.	Automatically generated by the BACnet Setpoint microblock.
<b>UnOCC</b>	The displayed setpoint is an unoccupied setpoint.	Automatically generated by the BACnet Setpoint microblock.

This Item...	Indicates...	Notes
<b>CO2</b>	The value shown is CO2.	Shown for a CO2 Rnet tag.
<b>UOC</b>	The value shown is VOC.	Shown for a VOC Rnet tag.
<b>EFF</b>	The value shown is the effective setpoint.	Automatically generated by the BACnet Setpoint microblock.
<b>EI</b>	Environmental Index	Shown for EI Rnet tag.



#### TIPS

- Rnet Tag numbers seen on a sensor are not intuitive. We recommend that you use the display text to clearly identify a value.

**NOTE** The following letters do not display on a sensor screen: K, M, Q, V, W, X

- We recommend that you limit the information displayed on the Home screen. Use the Information screen or Diagnostic screen to display any values that require display text to describe them.

## Outside air icon



To display this icon with the outside air temperature, humidity, or CO2:

- 1 From the **Sys Out** microblock menu, add a **BACnet Analog Value Status** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select an Outside Air option from the **Rnet Tag** drop-down list.
- 4 Check a **Show on** screen to display the value and icon.

**NOTE** In addition to :

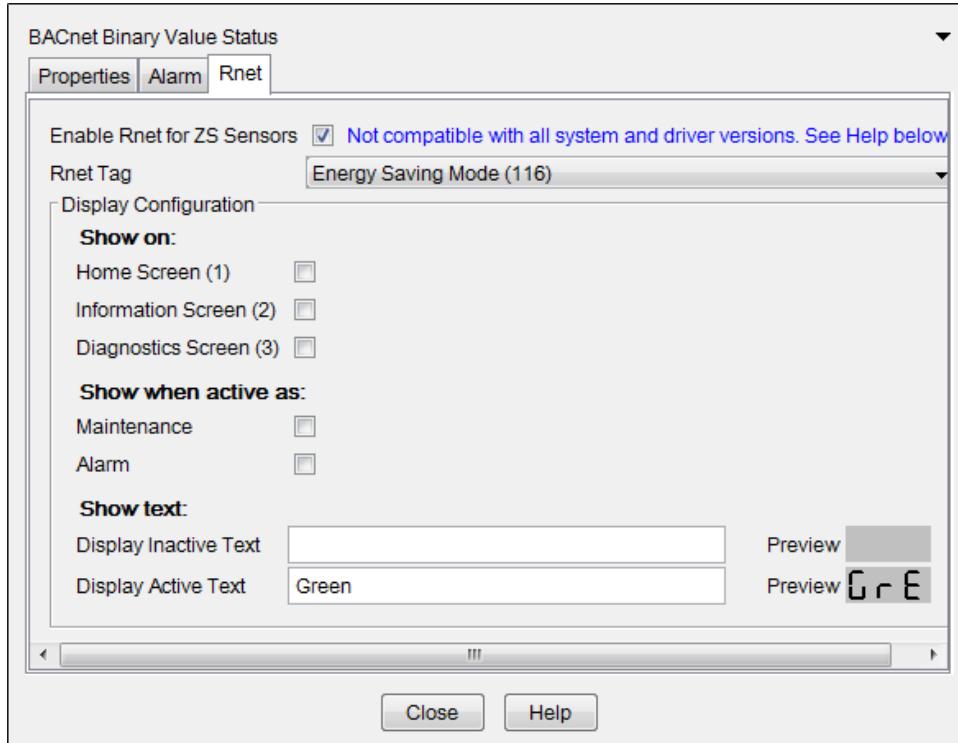
- Temperature shows **F** or **C**.
- Humidity shows **%**.
- CO2 shows **CO2**.

## Energy saving mode icon



- 1 From the **Sys Out** microblock menu, add a **--Stat BACnet Binary Value Status** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select **Energy Saving Mode (116)** from the **Rnet Tag** drop-down list.

In the example below, the lightbulb icon will display on the Home screen when in the Energy Saving mode.



## Alarm icon



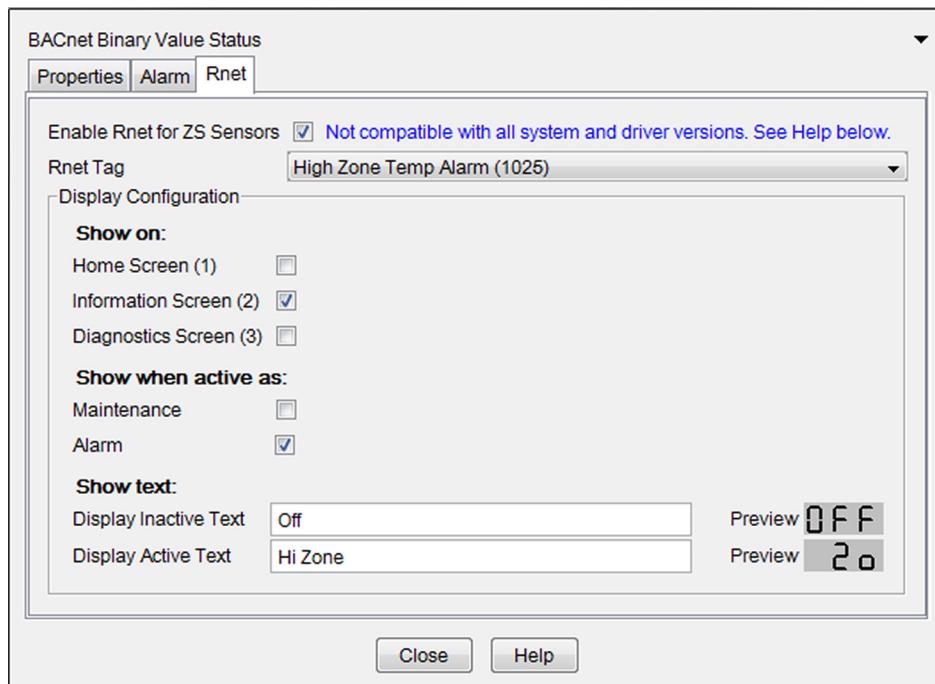
- 1 From the **Sys Out** microblock menu, add a **--Stat BACnet Binary Value Status** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select a pre-defined alarm (1XXX) from the **Rnet Tag** drop-down list.

- 4 Under **Show when active as**, check **Alarm** to display  on the Home screen and any other selected screen.
- 5 Optional: To display details about the active alarm, check a **Show on** screen to display the **Active Text** and Rnet tag.

**NOTE** When active, alarm information will automatically display first on the assigned screen, regardless of the display order you define.

In the example below, the Rnet tag for **High Zone Temp Alarm (1025)** is set to show on the **Information screen**.

Because **Alarm** is checked,  will display on the Home screen. When the user presses the  button, the Information screen will show the icon, the Rnet Tag **1025**, and the Active Text **Hi Zone**.



## Maintenance icon



The  indicates a maintenance condition versus an alarm condition.

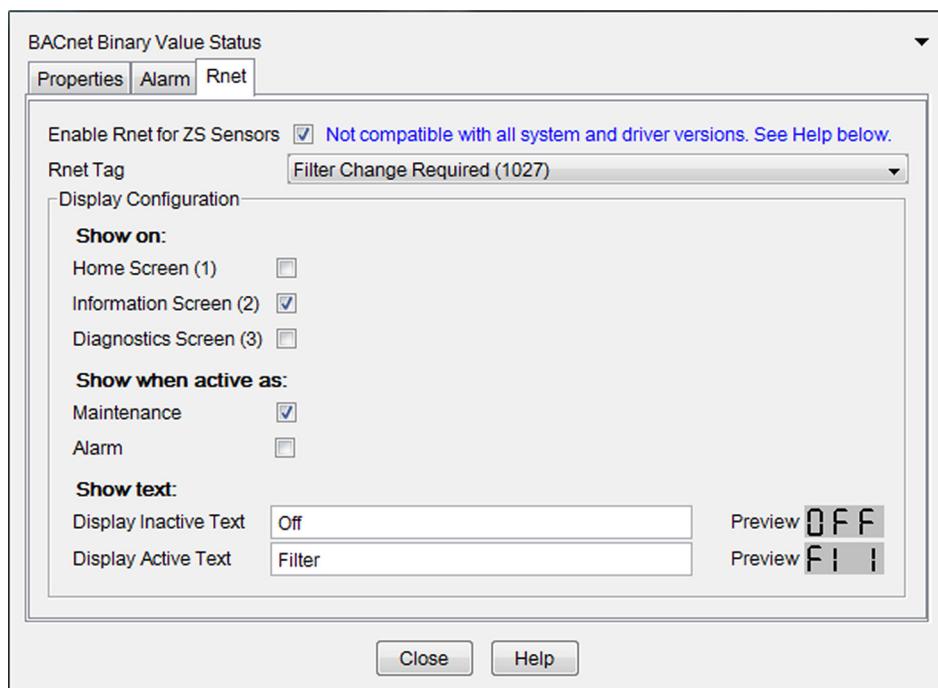
- 1 From the **Sys Out** microblock menu, add a  **BACnet Binary Value Status** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select a pre-defined maintenance condition (1XXX) from the **Rnet Tag** drop-down list.

- 4 Under **Show when active as**, check **Maintenance** to display  on the Home screen and any other selected screen.
- 5 Optional: To display details about the active maintenance condition, check a **Show on** screen to display the **Active Text** and Rnet tag.

**NOTE** When active, maintenance condition information will automatically display first on the assigned screen, regardless of the display order you define.

In the example below, the Rnet tag for **Filter Change Required (1027)** is set to show on the **Information screen**.

Because **Maintenance** is checked,  will display on the Home screen. When the user presses the  button, the Information screen will show the icon, the Rnet tag **1027**, and the Display Active Text **Filter**.



## Programming specific applications

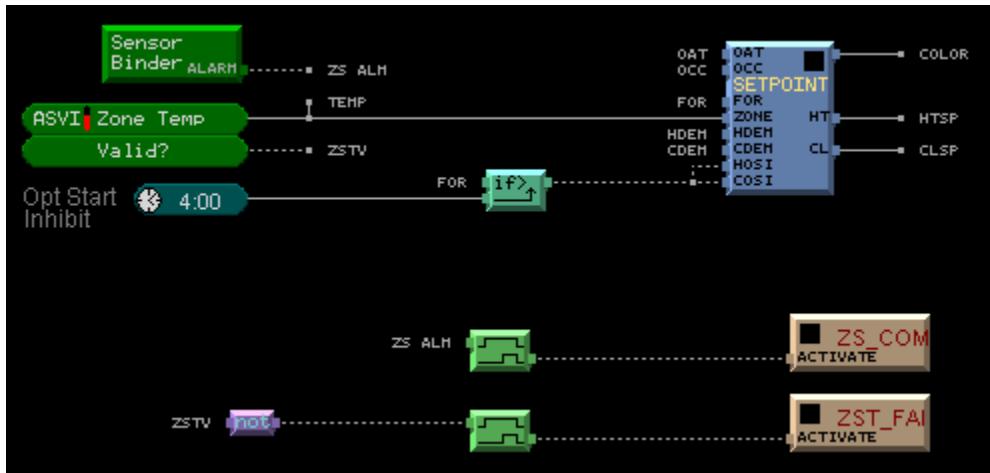
### Generating alarms

You can add logic to a control program to generate an alarm for the following conditions:

- A sensor has stopped communicating
- A sensor is not sending a valid value

#### Alarming for loss of communications

- 1 Tie the Sensor Binder microblock's **Alarm** output to an Alarm microblock. The **Alarm** output will be true when any sensor is in alarm.
- 2 Add a Delay On Make microblock to prevent nuisance alarms during startup or power failure.



#### Alarming for sensed values

- 1 To detect if a sensor's value is no longer valid, do the following:
- 2 Assign only one sensor to an ASVI or BSVI microblock.
- 3 Tie the **Valid** output to a not microblock since the valid output will be false when in alarm.
- 4 Attach an Alarm microblock to notify the user if the sensor in the ASVI or BSVI microblock has gone into error.
- 5 Add a Delay On Make microblock to prevent nuisance alarms during startup or power failure.

See the *Microblock Reference* for details of each microblock's alarming conditions.

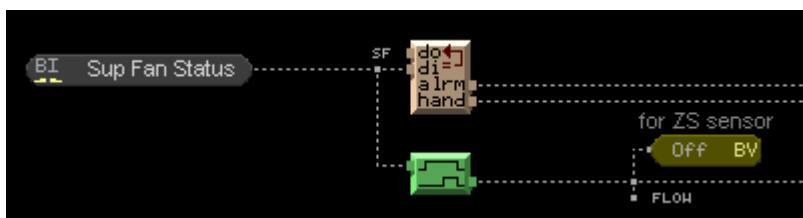
## Fan status and control

A ZS Pro or ZS Pro-F sensor can:

- Show fan status (fan icon when on)
- Show fan speed (1 arrow Low, 2 arrows Medium, 3 arrows High)
- Let the user manually control fan speed

To show  on the Home screen when the fan is on

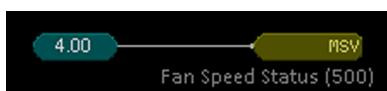
- 1 From the **Sys Out** microblock menu, add a  **BACnet Binary Value Status** microblock.



- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select **Fan Status (100)** from the **Rnet Tag** drop-down list to display  on the Home screen.
- 4 Do not check a **Show on** screen.  displays on the Home screen when active.

To show fan speed  on the Home screen

- 1 From the **Sys Out** microblock menu, add a  **BACnet Multi-State Value Status** microblock.



- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select **Fan Speed Status (500)** from the **Rnet Tag** drop-down list to show the fan speed  (Low),  (Medium),  (High) on the Home screen.
- 4 Do not check a **Show on** screen. The appropriate fan speed icon displays on the Home screen based on the microblock's value.

## ZS Pro-F: To program manual fan speed control using the button

**NOTE** The ZS Pro-F's  button works only when the zone is occupied (green LED is on).

To program the sensor's  button:

- 1 From the **Sys In** microblock menu, add a  **BACnet Multi-State Value Parameter** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select the **Fan Speed Request (600)** from the **Rnet Tag** drop-down list.
- 4 Check **Editable**.
- 5 On the **Properties** tab in the **Rnet Text** fields, type the text that you want to a sensor to show for each fan speed.

### NOTES

- The letters K, M, Q, W, X do not display on a screen.
- If you do not enter text, the sensor will show the Value number for the fan speed.

When a user presses the  button, the screen initially shows the current fan speed. With each press of the button, the display shows one of the following options:

	Auto. The control program determines the speed.
	Low speed
	Medium speed
	High speed

## ZS Pro: To program manual fan speed control using the or button

- 1 From the **Sys In** microblock menu, add a  **BACnet Multi-State Value Parameter** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select the **Fan Speed Request (600)** from the **Rnet Tag** drop-down list.
- 4 Check **Editable**.

- 5 Select **Show on the Information Screen or Diagnostics Screen**.
- 6 On the **Properties** tab in the **Rnet Text** fields, type the text that you want to a sensor to show for each fan speed.

#### NOTES

- The letters K, M, Q, W, X do not display on a screen.
- If you do not enter text, the sensor will show the Value number for the fan speed.

State Text					
		Add	Remove Last		
Value	Enabled	BACnet Text	Alarm/Fault	Rnet Text	Preview
1	<input checked="" type="checkbox"/>	Auto	None	Auto	
2	<input checked="" type="checkbox"/>	Low	None		
3	<input checked="" type="checkbox"/>	Medium	None		
4	<input checked="" type="checkbox"/>	High	None		

When a user goes to the information screen, it will initially show the current fan speed. The user taps the ▲ or ▼ button to cycle through the fan speed options. The screen below shows High speed indicated by the icons and the number 4 (no text was entered for that speed in the Property Editor).



## Zone HVAC modes

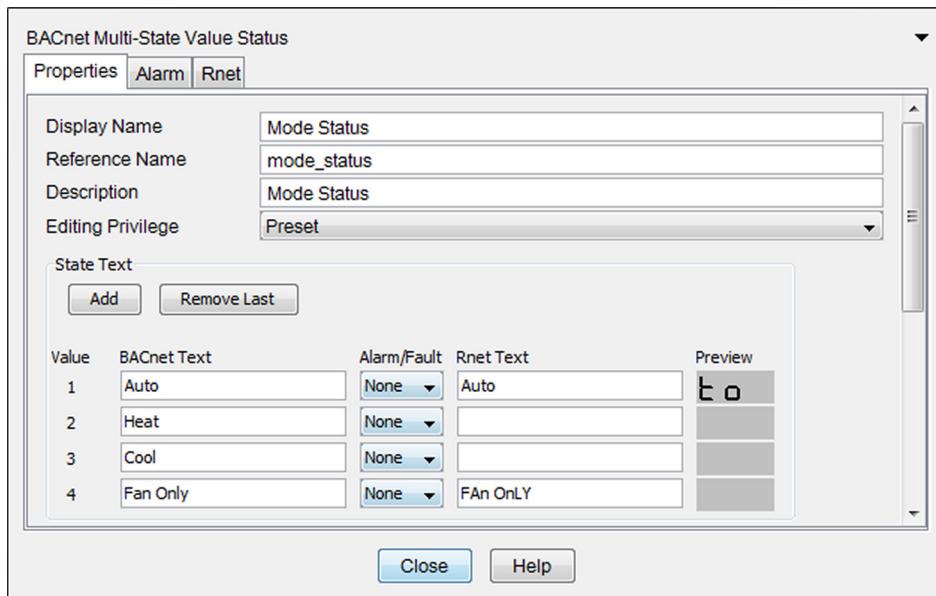
A ZS Pro or ZS Pro-F sensor can:

- Show heating or cooling status
- Let the user manually run heating only, cooling only, or fan only

### To show Heating and Cooling status

- 1 From the **Sys Out** microblock menu, add a  **BACnet Multi-State Value Status** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select **Zone Mode Status (501)** from the **Rnet Tag** drop-down list.

- 4 Do not check a **Show on** screen.  and  display on the Home screen when active.
- 5 Configure the logic going to the MSV microblock so that it generates a **2** when the unit is in heating mode to display , and **3** when the unit is in cooling mode to display . When the logic generates **1** or **4**, neither icon displays.



## ZS Pro-F: To program manual HVAC control (fan only, cooling only, or heating only) using the button

**NOTE** The ZS Pro-F's  button works only when the zone is occupied (green LED is on).

To program the sensor's  button:

- 1 From the **Sys In** microblock menu, add a  **BACnet Multi-State Value Parameter** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select the **Zone Mode Request (601)** from the **Rnet Tag** drop-down list.
- 4 Check **Editable**.
- 5 On the **Properties** tab in the **Rnet Text** fields, type the text that you want a sensor to show for each mode.

### NOTES

- o The letters K, M, Q, W, X do not display on a screen.
- o If you do not enter text, the sensor will show the Value number for the mode.

When a user presses the  button, the screen initially shows the current zone HVAC mode. With each press of the button, the display shows one of the following options:

**Auto** The control program determines the mode.

 Heating only

 Cooling only

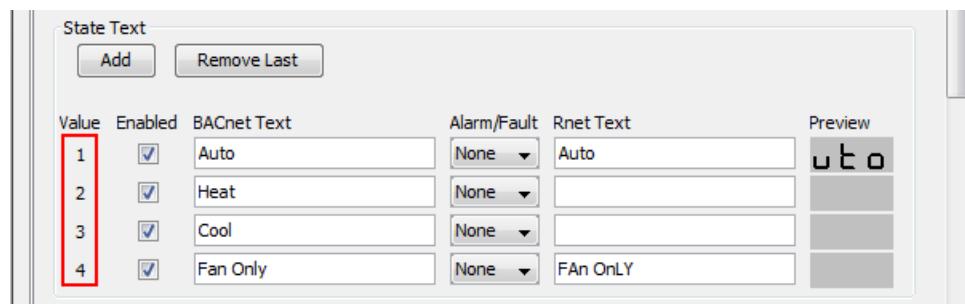
 Fan only

**ZS Pro: To program manual HVAC control (fan only, cooling only, or heating only) using the ▲ or ▼ button**

- 1 From the **Sys In** microblock menu, add a  **BACnet Multi-State Value Parameter** microblock.
- 2 On the Property Editor's **Rnet** tab, check **Enable Rnet**.
- 3 Select the **Zone Mode Request (601)** from the **Rnet Tag** drop-down list.
- 4 Check **Editable**.
- 5 Select **Show on the Information Screen or Diagnostics Screen**.
- 6 On the **Properties** tab in the **Rnet Text** fields, type the text that you want a sensor to show for each mode.

#### NOTES

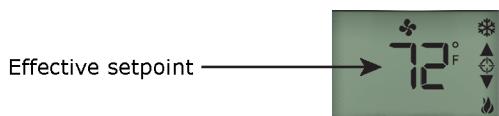
- The letters K, M, Q, W, X do not display on a screen.
- If you do not enter text, the sensor will show the Value number for the mode.



When a user goes to the information screen, it will initially show the current mode. The user taps the ▲ or ▼ button to cycle through the mode options.

## Hospitality Mode

Hospitality mode is typically used for hotel/motel rooms. The Home screen always displays the active effective setpoint or the average of the heating and cooling setpoints if the mode is auto. The effective setpoint is adjustable. The sensor also displays any active status icons.



To use this mode, select **Hospitality mode** on the **Rnet** tab of the BACnet Setpoint microblock.

## Clean room application

This application requires two display sensors, one inside the clean room and one on the outside. While both sensors have temperature sensing ability, only the temperature on the inside of the clean room should be used for control. Both sensors should display the sensed temperature on the inside of the clean room.

You set up this scenario in the Sensor Binder microblock and the ASVI microblock for Zone Temp.

- 1 Define the 2 sensors in the Sensor Binder microblock.

Sensor Configuration					
Index	Area	Network Type	Address	Lock Display	
1	Inside Clean Room	Rnet	0	<input type="checkbox"/>	<input type="checkbox"/>
2	Outside Clean Room	Rnet	1	<input type="checkbox"/>	<input type="checkbox"/>
3		Unused	0	<input type="checkbox"/>	<input type="checkbox"/>
4		Unused	0	<input type="checkbox"/>	<input type="checkbox"/>

- 2 In the Zone Temp ASVI microblock:

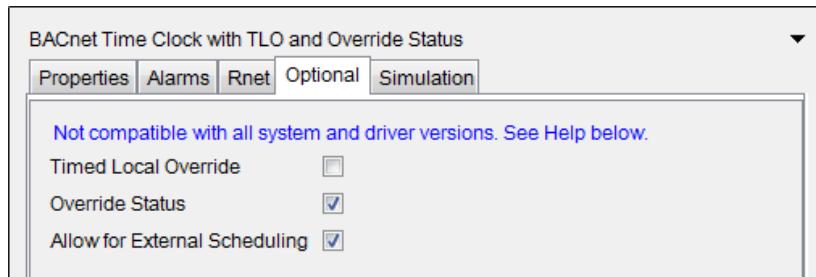
- a) Check **Enable** for the first sensor (Index 1). Only that sensor's temperature value will be used.
- b) Set **Show on sensors** to **Calculated Value**.

Sensor Configuration	
Index	Enable
1	<input checked="" type="checkbox"/>
2	<input type="checkbox"/>
3	<input type="checkbox"/>
4	<input type="checkbox"/>
5	<input type="checkbox"/>
Combination Algorithm	
Average	
COV Increment	
0.5	
Show on sensors	
Calculated Value	
Display Resolution	
4	

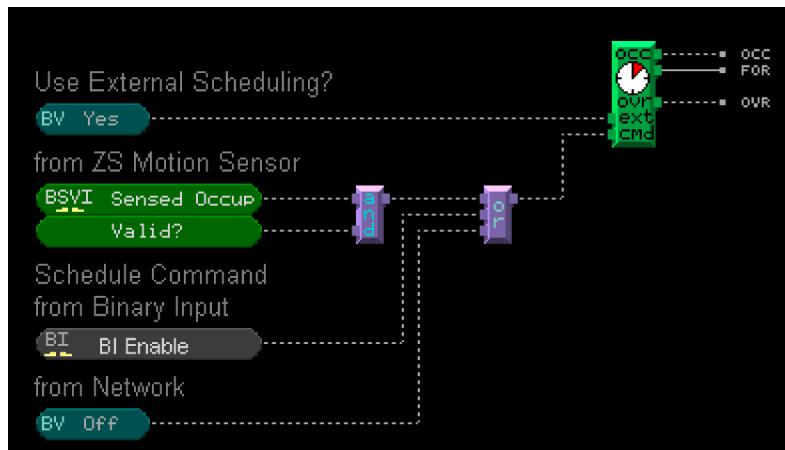
## External Scheduling

The BACnet Time Clock microblock has 2 optional binary inputs that allow you to use an external schedule instead of the built-in scheduling of the i-Vu® system. This method is used with the BSVI to schedule based on sensed occupancy.

Check **Allow for External Scheduling** on the microblock's **Optional** tab to enable the **ext** and **cmd** inputs.



The **ext** input tells the Schedule Microblock to use the external "commanded to" input instead of the internal schedule. When the top BV is on, the **cmd** input determines the schedule status and the sensor's green occupied LED. See example below.



**NOTE** The override and force unoccupied features of the ZS sensors will still work as normal when the Time Clock microblock uses external schedules.

## Setting Setpoint Adjust Limit from an external source

The BACnet Setpoint microblock has an optional analog input called **Setpoint Adjust Limit (-/+)** that takes over the role of the built-in parameter of the same name found on the microblock's **Rnet** tab in the Property Editor. Check **Setpoint Adjust Limit (-/+)** on the **Optional** tab to expose the **SPADJ** input. When this input is activated, the built-in parameter no longer works. For example, if the input value is 3, the user can adjust the zone setpoint up or down 3 degrees from the base. The adjustment applies to the cooling and heating setpoints.

## Modifying temperature display units on ZS Sensors

---

A ZS Pro does not have an **F/C** button like the ZS Pro-F to switch displayed temperature units (°F or °C). To accomplish this through the control program, you can use a BACnet Binary Value Parameter microblock to control the units that a ZS Pro sensor will display. This affects only the display, not the units used in the control program.

- 1 On the BACnet Binary Value Parameter microblock's **Rnet** tab, select **Sensor Temperature Units Display (800)** in the **Rnet Tag** field.
- 2 If you want to be able to change this microblock's value on the ZS Pro, check **Show on the Information Screen** or **Diagnostics Screen**, and check the **Editable** box.
- 3 Type:  
DEG F in the **Display Inactive Text** field  
DEG C in the **Display Active Text** field
- 4 On the **Properties** tab, type the following so that you can recognize them in the i-Vu interface:  
DEG F in the **Inactive Text** field  
Deg C in the **Active Text** field

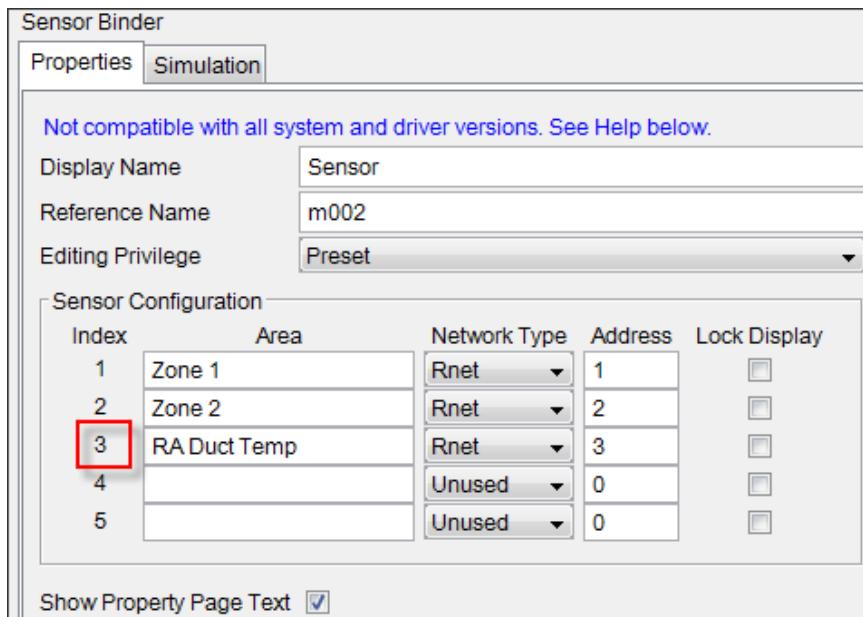


**NOTE** We recommend that you do not use this scheme with a ZS Pro-F sensor. If you do and a user then presses the **F/C** button on the side of the sensor, the units will reverse the effect of the microblock.

## To use values from individual sensors in your control program

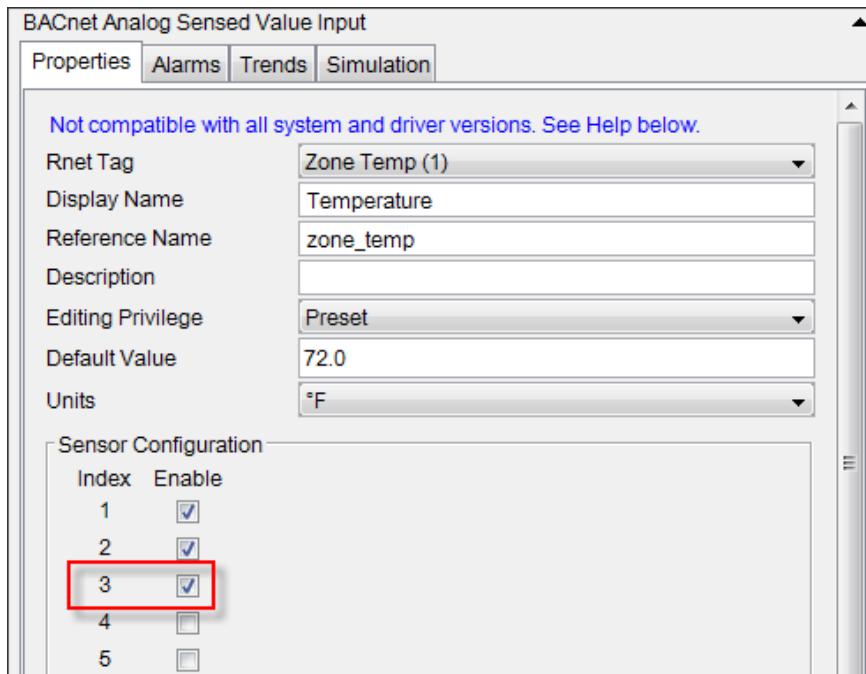
When using multiple ZS Sensors on a single Rnet, an ASVI microblock outputs the average, minimum, or maximum value of the sensors. However, if you need to use the value of just one of the sensors, you can use an Analog Network Input (ANI) microblock that addresses a specific ZS Sensor.

- 1 In the Snap application, select the Sensor Binder microblock and note the **Index** number for the sensor whose value you want to use.



- 2 Verify that the sensor is enabled in the ASVI microblock.

To use values from individual sensors in your control program



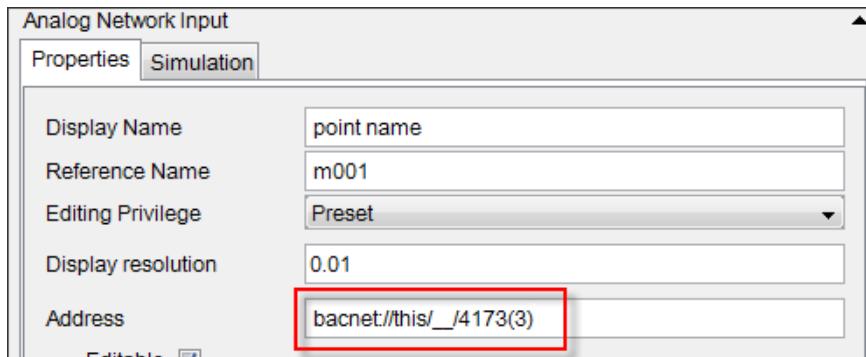
#### NOTES

- To retrieve the temperature from a ZS duct sensor, use an ASVI microblock with the **Rnet tag** set to **Zone Temp**.
- By default, the microblock's **Display Name** and **Reference Name** are based on the Rnet tag, but you can change these if you want. In this example, the Display Name has been changed to **Temperature**.

3 In the ANI microblock, enter the **Address** in the following format, but leave out the ASVI object name. See example of address in the image below.

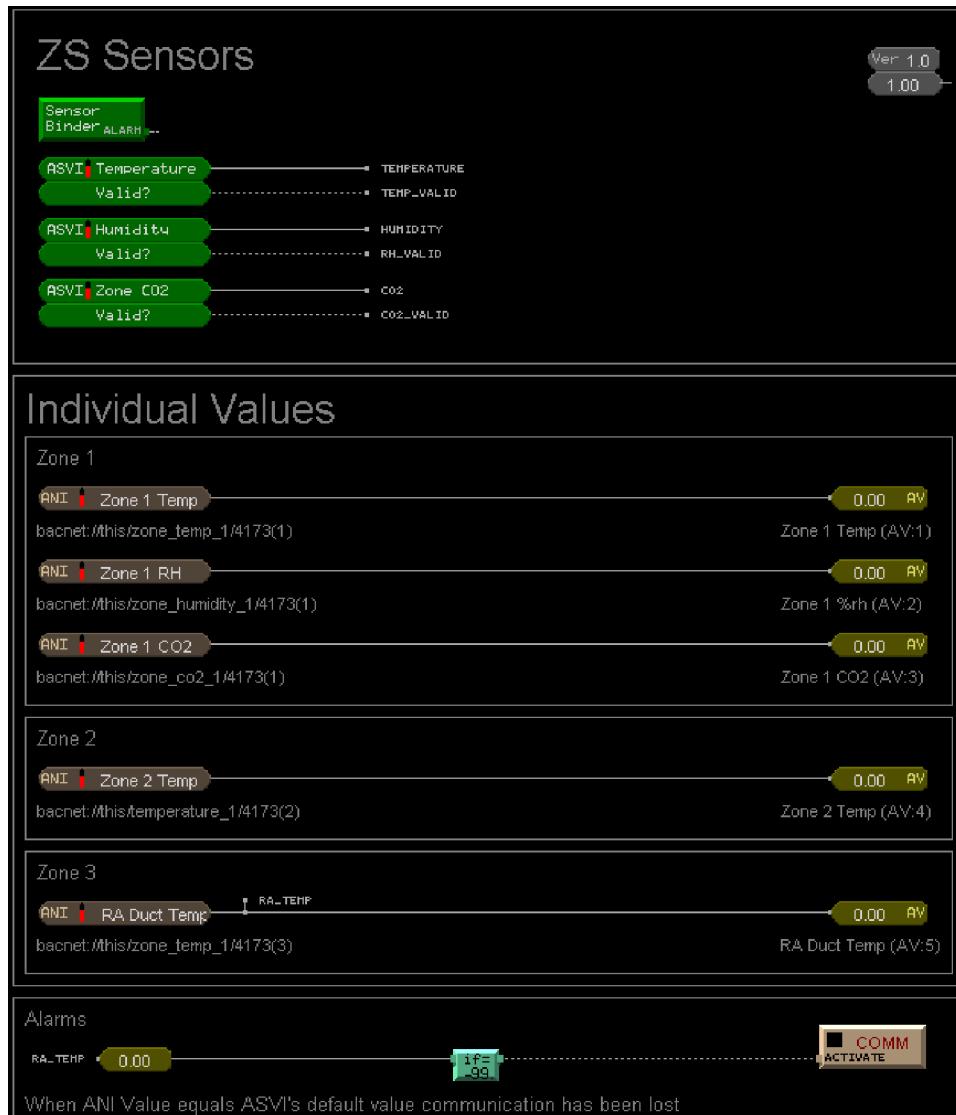
bacnet://device/ASVI object name/4173 (sensor's index number)

Get from the microblock's Properties page in the running system      BACnet property number for sensed value      Get from Sensor Binder microblock



- 4 Select the controller on i-Vu's navigation tree.
- 5 Go to the **Properties** page > **Control Program** tab and expand **Configuration > Unit Configuration**. Ctrl+click on the ZS property name to open the ASVI popup.
- 6 In the popup, on the **Properties** page > **Details** tab, scroll down to the **BACnet Configuration** section to get the **Object Name**.
- 7 On the zone's **Properties** page > **Network Points** tab, enter the Object Name in the ANI's address. For this example, the address would be:  
bacnet://this/zone\_temp\_1/4173(3)

Example program:



## Appendix A: Rnet tags

Rnet tags are numbers that identify types of system values, and determine how a ZS sensor will display the value.

- Some Rnet tags display an icon that indicates the type of information. For example, Rnet tag 100 indicates Fan Status. The sensor will display a fan icon when the microblock is active.



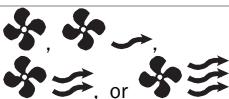
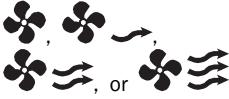
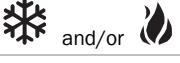
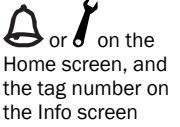
- Rnet tags that do not display an icon will display the actual Rnet tag number in the lower left corner of the sensor's display. For example, Rnet tag 416 indicates Air Flow Setpoint.



See the table below to find out the type of value an Rnet tag number represents.

Rnet tag number...	Indicates this type of value...	And displays...
001	Zone Temp	○ ○ F or C
002	Zone Humidity	%
003	Zone CO2	CO2
004	Zone VOC	UOC
100	Fan Status	
101	Fan Command	The tag number
102	Cool Stage 1	The tag number
103	Cool Stage 2	The tag number
104	Cool Stage 3	The tag number
105	Cool Stage 4	The tag number
106	Heat Stage 1	The tag number
107	Heat Stage 2	The tag number
108	Heat Stage 3	The tag number
109	Heat Stage 4	The tag number
110	Hot Gas Bypass	The tag number
111	Reheat	The tag number
112	Reversing Valve	The tag number
113	Enthalpy Wheel Status	The tag number
114	Dehum Wheel Status	The tag number
115	Filter Status	
116	Energy Save Mode	
117	Occupied Status	The tag number

Rnet tag number...	Indicates this type of value...	And displays...
121	Override Status	
300	Outside Air Temp	 plus  F or C
301	Outside Air Humidity	 plus 
302	Outside Air CO2	 plus 
303	Mixed Air Temp	The tag number
304	Supply Air Temp	The tag number
305	Return Air Temp	The tag number
306	Effective Cooling Setpoint	<b>EFF</b>
307	Effective Heating Setpoint	<b>EFF</b>
308	Air Flow	The tag number
309	Primary Damper Position	The tag number
310	Cooling Stage	The tag number
311	Heating Stage	The tag number
312	Cooling Valve	The tag number
313	Heating Valve	The tag number
314	Reheat	The tag number
315	Secondary Damper Position	The tag number
316	Supply Air Humidity	The tag number
317	Return Air Humidity	The tag number
318	Entering Water Temp	The tag number
319	Leaving Water Temp	The tag number
320	Supply Air Static Pressure	The tag number
321	Return Air Static Pressure	The tag number
322	Building Static Pressure	The tag number
323	OA Dampers	The tag number
324	RA Dampers	The tag number
325	EA Dampers	The tag number
326	SA Dampers	The tag number
327	Economizer	The tag number
328	Time Remaining Until Transition	The tag number
329	Environmental Index	<b>EI</b>
330	Demand Level	The tag number
331	Cooling Airflow	The tag number
332	Cooling Damper Position	The tag number
333	Heating Airflow	The tag number
334	Heating Damper Position	The tag number
400	Heating Setpoint Adjust	The tag number
401	Cooling Setpoint Adjust	The tag number
402	Occupied Heating Setpoint	 plus  OCC
403	Occupied Cooling Setpoint	 plus  OCC
404	Unoccupied Heating Setpoint	 plus  UnOCC

Rnet tag number...	Indicates this type of value...	And displays...
405	Unoccupied Cooling Setpoint	 plus <b>UnOCC</b>
406	Occupied Humidity Setpoint	The tag number
407	Unoccupied Humidity Setpoint	The tag number
408	Occupied CO2 Setpoint	The tag number
409	Unoccupied CO2 Setpoint	The tag number
410	Minimum OA Damper %	The tag number
411	Static Pressure Setpoint	The tag number
412	OA Temp Cooling Lockout	The tag number
413	OA Temp Heating Lockout	The tag number
414	Changeover Temp	The tag number
416	Air Flow Setpoint	The tag number
417	Occupied VOC Setpoint	The tag number
418	Unoccupied VOC Setpoint	The tag number
419	Supply Air Temp Setpoint	The tag number
420	Setpoint Adjust Limit	The tag number
421	Cooling Airflow Setpoint	The tag number
422	Heating Airflow Setpoint	The tag number
500	Fan Speed Status	
501	HVAC Zone Mode Status	
600	Fan Speed Mode Request	
601	HVAC Zone Mode Request	
800	Temperature units (°F/°C) displayed on sensor	The tag number
Rnet tag number...	Indicates this type of alarm...	And displays...
1024	Generic Alarm	
1025	High Zone Temp	"
1026	Low Zone Temp	"
1027	Filter Change Required	"
1028	High Discharge Air Temp	"
1029	Low Discharge Air Temp	"
1030	Supply Fan Failure	"
1031	Supply Fan in Hand	"
1032	Supply Fan Runtime Exceeded	"
1033	Exhaust Fan Failure	"
1034	Exhaust Fan in Hand	"
1035	Exhaust Fan Runtime Exceeded	"

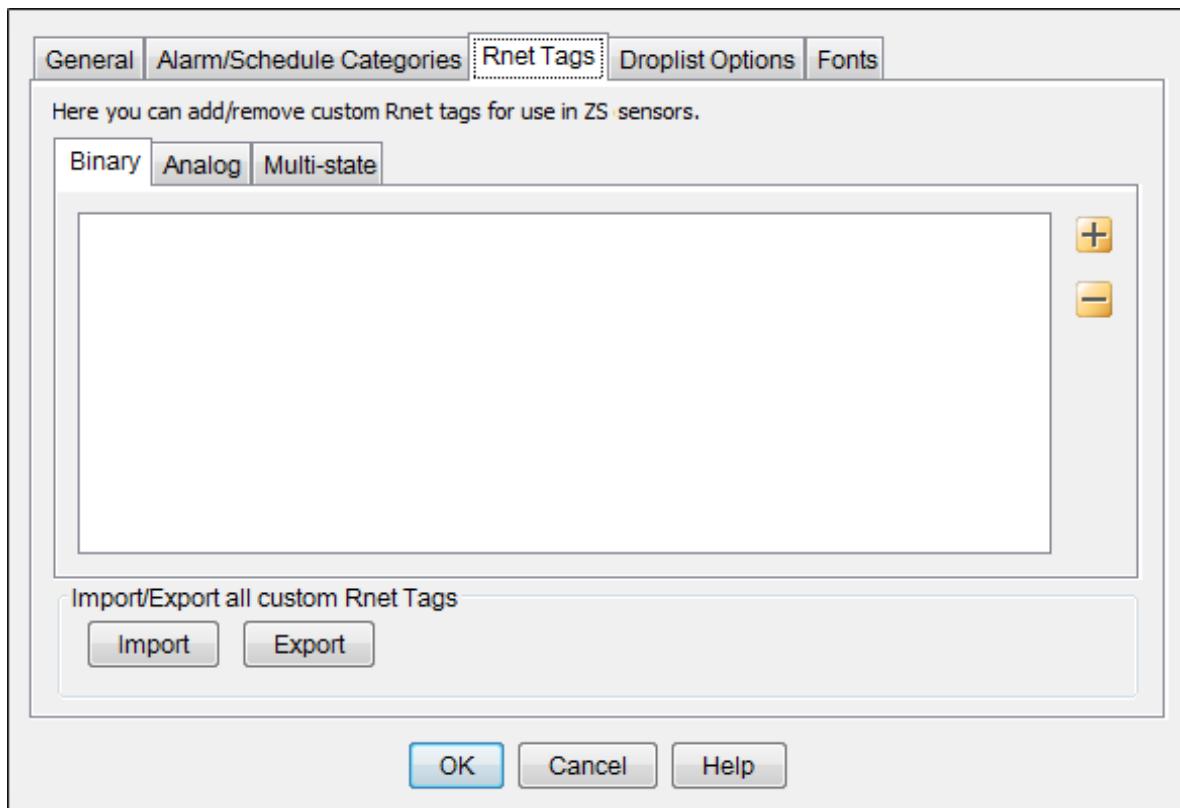
Rnet tag number...	Indicates this type of alarm...	And displays...
1036	Supply Fan VFD Fault	"
1037	Cooling Coil Pump Failure	"
1038	Cooling Coil Pump in Hand	"
1039	Cooling Coil Pump Runtime Exceeded	"
1040	Heating Coil Pump Failure	"
1041	Heating Coil Pump in Hand	"
1042	Heating Coil Pump Runtime Exceeded	"
1043	High Zone CO <sub>2</sub> Concentration	"
1044	High Zone Humidity	"
1045	Low Zone Humidity	"
1046	Smoke Alarm	"
1047	Sensor Failure	"
1048	Freezestat	"
1049	Emergency Shutdown	"
1050	Compressor 1 Runtime Exceeded	"
1051	Compressor 2 Runtime Exceeded	"
1052	OA Damper Failure	"
1053	OA Damper in Hand	"
1054	Enthalpy Wheel Failure	"
1055	Enthalpy Wheel in Hand	"
1056	Enthalpy Wheel Runtime Exceeded	"
1057	Enthalpy Wheel High Discharge Air Temp	"
1058	Enthalpy Wheel Low Discharge Air Temp	"
1059	Enthalpy Wheel High Return Air Temp	"
1060	Enthalpy Wheel Low Return Air Temp	"
1061	Enthalpy Wheel High Exhaust Air Temp	"
1062	Enthalpy Wheel Low Exhaust Air Temp	"
1063	High Supply Air Humidity	"
1064	Low Supply Air Humidity	"
1065	High Mixed Air Temp	"
1066	Low Mixed Air Temp	"
1067	High Return Air Humidity	"
1068	Low Return Air Humidity	"
1069	High Return Air Temp	"
1070	Low Return Air Temp	"

Rnet tag numbers 1100–1999 are custom tags. See *Adding custom Rnet tags* (page 36).

A custom Rnet tag number beginning with...	Indicates...
11xx	A binary tag
13xx	An analog tag
15xx	A multi-state tag

## Adding custom Rnet tags

You add custom Rnet tags in the Snap application. Select **Options > Preferences > Rnet Tags** tab. Do not duplicate tag names or numbers.

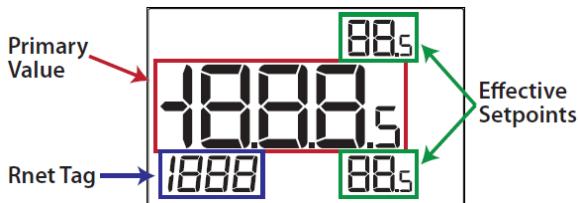


After you create a custom tag number, it automatically appears on the **Rnet Tag** drop-down list for that point type.

If you open a control program with custom Rnet tags on a different machine than the one it was created on, the custom tags automatically appear in the **Rnet Tag** drop-down list.

**NOTE** To copy all custom Rnet tags to another computer, click **Export**, then save the file. On the other computer, click **Import**, then select the exported file.

## Appendix B: ZS Pro and Pro-F Sensor screen fields



### Primary Value Field

The primary value field displays numeric values that are exposed to the ZS sensors or displays text for binary or multi-state value objects.

**Numeric values** - This field can display:

- A negative symbol
- Up to 2 decimal places defined by the **Display Resolution** field in an ASVI or AV microblock. If the resolution is 0.5, a small .5 appears as shown above. Any other resolution that shows a decimal uses the decimals between the large numbers in the Primary Value field.
- Up to 4 significant digits. The maximum value that can be displayed is 1999.5. If the value to be displayed exceeds the maximum value, the primary value field will flash the maximum value to indicate the value is outside of range.

**Display text** - 3 alpha characters can be displayed on the screen in the 888 position of the Primary Value field shown above. Display text can be up to 8 characters, but anything over 3 characters will scroll. The letters K, M, Q, W, X do not display on a screen.

### 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.

### Rnet Tag Field

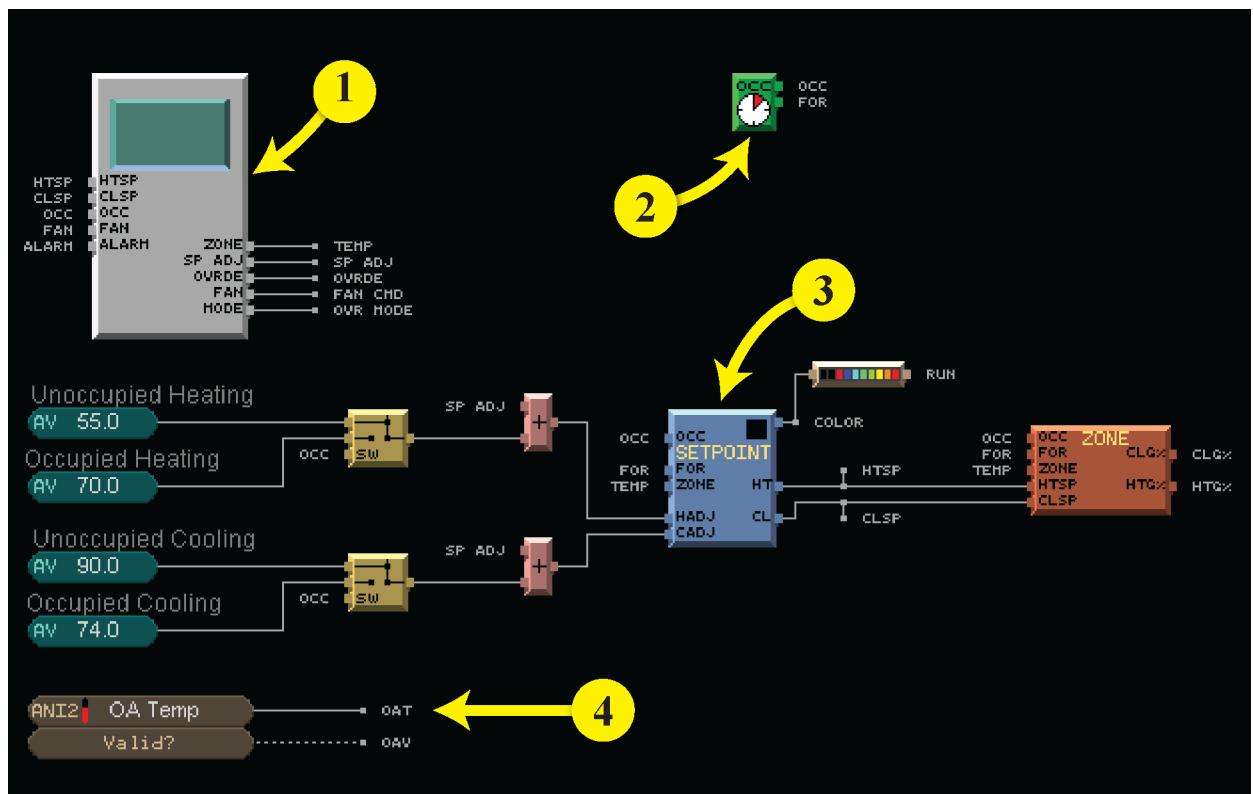
The Rnet tag field displays a text indicator (such as **OCC**) or an Rnet tag number (up to 1999) that defines what is being displayed in the Primary Value field. See:

*Icons and text indicators* (page 15)  
*Appendix A: Rnet tags* (page 32)

## Appendix C: Converting a control program with an RS Pro to a ZS Pro

### Step 1: Update run conditions with ZS sensor microblocks

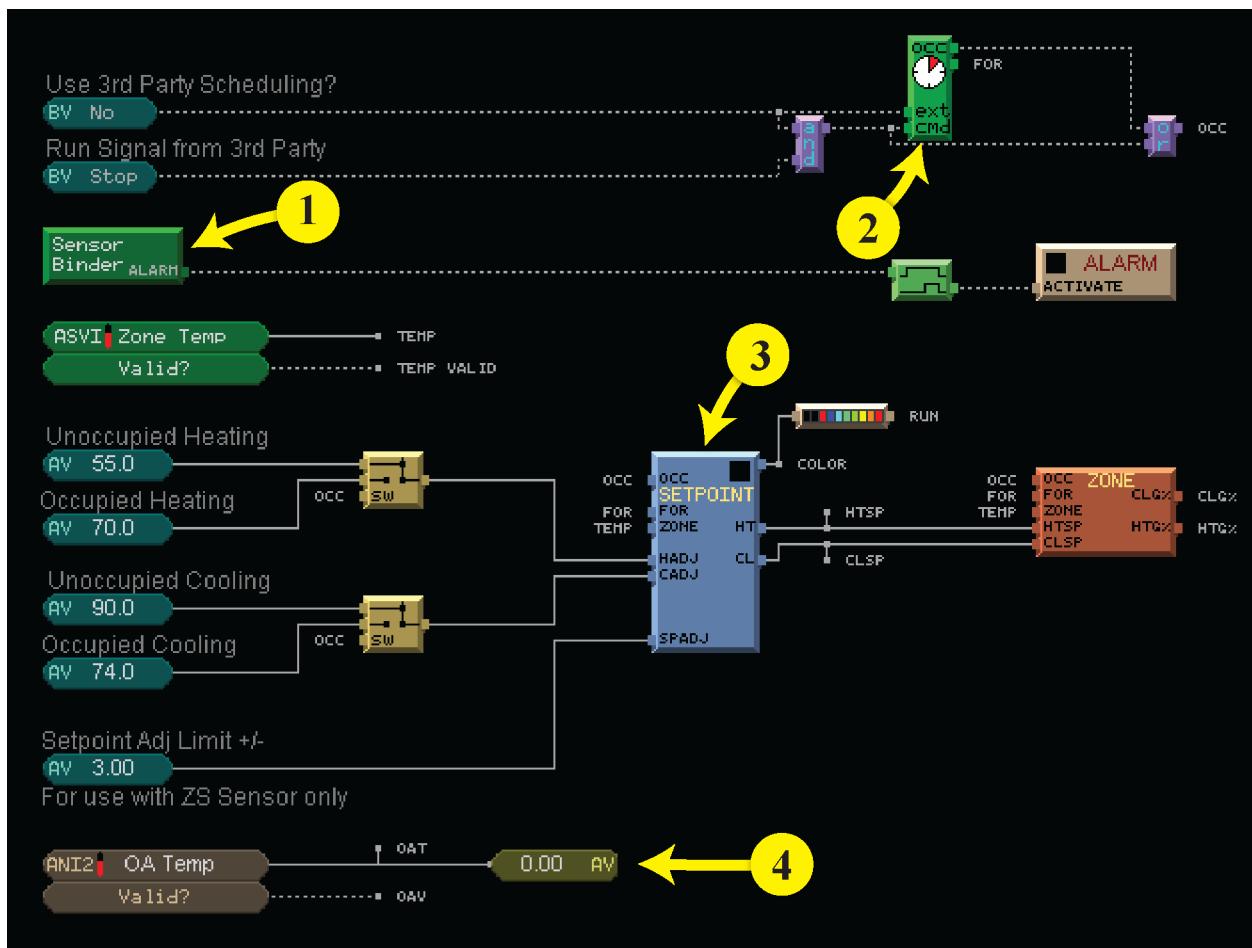
Before



Step	Remove this microblock ...	Add this microblock...
1.	RS Zone Sensor	Sensor Binder and ASVI
2.	Time Clock	BACnet Time Clock with TLO and Override Status
3.	Setpoint	BACnet Setpoint
4.		BACnet Analog Value Status to expose Outside Air Temp to the ZS sensor

See Microblock Reference Help for information on each of the above microblocks.

After

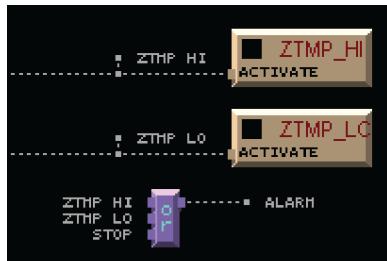


## Step 2: Make Alarm icon display on a ZS Pro

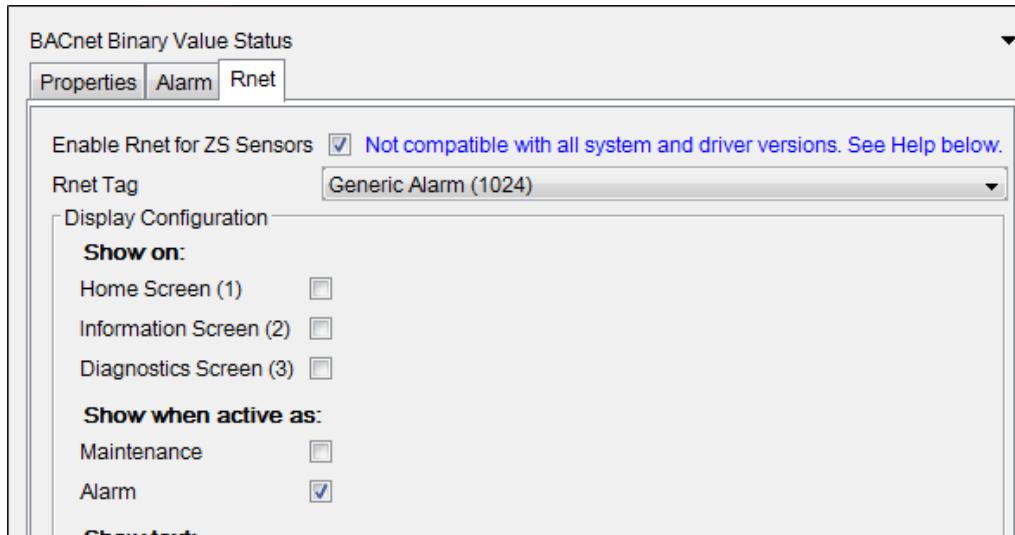
Place a BACnet Binary Value Status microblock and select **Generic Alarm (1024)** in the **Rnet Tag** field. See image below. The setup shown will make the alarm bell icon show on the Home screen when the BV status is active.

**NOTE** To include information about the active alarm on the Information screen, check that screen in the **Show On** field and enter **Display Active Text**.

Before



After

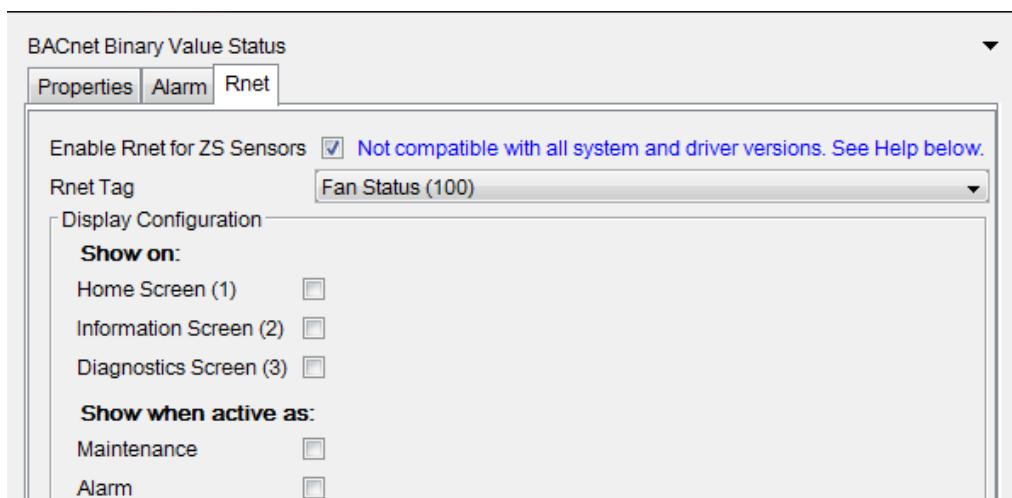
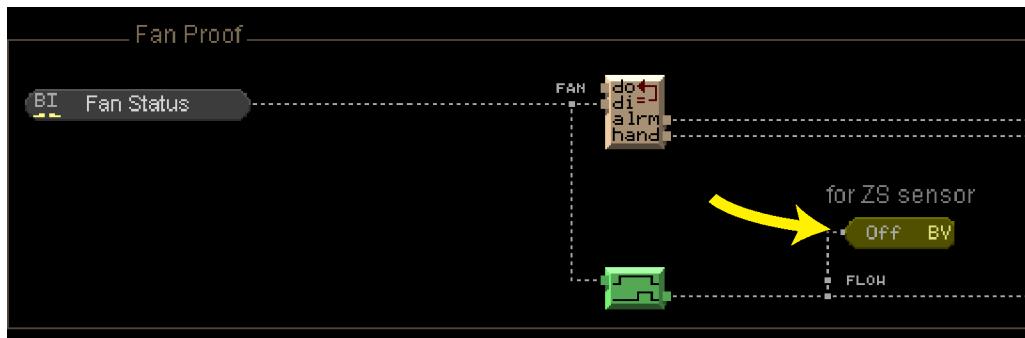


## Step 3: Make Fan icon display on a ZS Pro

Place a BACnet Binary Value Status microblock and select **Fan Status (100)** in the **Rnet Tag** field. See image below. The setup shown will make the fan icon show on the Home screen when the BV status is active.

**NOTE** Do not check the Home screen in the **Show On** field. Checking that option causes the fan status to show up in the rotation of the primary value field, and that is not needed.

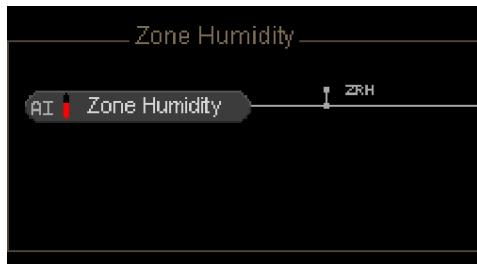
After



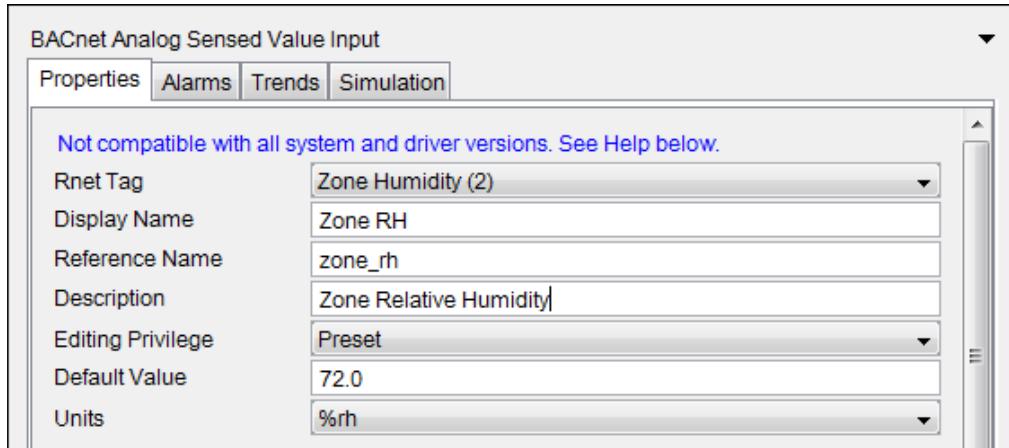
## Step 4: Change sensed zone humidity from an AI to the ZS Sensor

Remove existing AI microblock for sensing humidity. Place an ASVI microblock and select **Zone Humidity (2)** in the **Rnet Tag** field. See image below. See Microblock Reference Help for more information on this microblock.

Before



After



## 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*
6/11/20	Introduction	Added Remote Sensor	X-PM-IM-E-IM
3/3/20	Cover	Updated logos	C-D
8/29/19	Introduction	Added requirement for BSVI microblock in the control program	X-TS-RD-E
1/9/18	Introduction	Topic changed to show new zone sensor design	X-D
1/18/18	Introduction	Major revisions to add a motion sensor to a ZS Pro, duct sensors, pipe sensor, immersion sensor, and outdoor air sensors.	X-O-PK
	Creating Snap control programs for ZS Sensors	Revised this entire section to include Step 3: Add Binary Sensed Value Input microblocks in using ZS Pro motion sensor.	
	External Scheduling	Revised to use BSVI microblock.	
	To use values from individual sensors in your control program	Completely revised this topic for clarification.	
11/1/16	Generating alarms	New topic	X-O-JD-AE
10/21/16	Step 3: Add a BACnet Setpoint microblock	Reworded first paragraph and added note at end of topic regarding enabling/disabling the setpoint adjustment functionality of specific sensors.	X-R-DP-E-JD
10/4/16	Appendix A: Rnet tags	Added Rnet tag 115, Filter Status	X-O-AE-O
12/1/15	To use values from individual sensors in your control program	Wording correction.	C-TS-E-RD

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