Digital Room Sensor Technical Guide
Overview

The OE217 series of Digital Room Sensors are used to sense Space Temperature only or Space Temperature & Space Humidity. See Figure 1. They can be used with the VCM-X E-BUS Controller (OE332-23E-VCMX), RNE Controller (OE332-23E-RNE), and SA E-BUS Controller (OE332-23E-VCMX-SA).

The sensor provides the following useful functions:

- Provides 112 x 64 monochrome Graphical LCD display with LED backlight
- Displays the Current Space Temperature or Cooling/Heating Setpoint on the Main Display Screen
- Displays Outdoor Air Temperature (if controller is configured with OA Temperature Sensor)
- Displays the Current Space Humidity (OE217-01 Model Only)
- Displays Outdoor Air Relative Humidity (OE217-01 Model if controller is configured with OA Humidity Sensor)
- Displays the Current Zone Setpoint Temperature
- Equipped with Push Buttons for changing the Zone Setpoint Temperature
- Equipped with an Override Button for forcing the VCM-X / RNE / SA Controller into Occupied Operation from Unoccupied Operation
- Provides graphics to indicate the Mode of Operation
- Allows connection of a remote 10K Ohm, Type III thermistor temperature sensor (or 4 sensor averaging array). See Connecting a Remote Sensor section in the Appendix on page 11 for details.
- Provides LEDs to indicate Schedule Override, Button Push, and Alarms
- Can display Temperature reading from a Remote Sensor (see Figures 18 & 19, pages 11 & 12 for instructions)
- Can be used with the OE256-01 or OE256-02 CO₂ Sensor (see note in Figure 17, page 10 for instructions)

Both sensors connect to the controllers using various lengths of TSDRSC modular cables connected between the controller and the sensor. The TSDRSC modular cables should not run in conduit with other AC line voltage wiring or with any conductors carrying highly inductive loads.

Figure 1: Digital Room Sensor
BASIC OPERATION

Buttons and LEDs

Sensor Operation

When power is first applied to the OE217-00 Digital Room Sensor, the sensor will display the Current Room Temperature or the Cooling/Heating Setpoint and the current setting of the slide offset. The OE217-01 model will also display Relative Humidity.

NOTE: The sensor readings are not accurate until the controller that the sensor is connected to is done calibrating.

The sensor has 4 buttons—<Display>, <Override>, <Up>, and <Down>. You can also access certain functions by touching the area below the <Display> and <Override> buttons. The sensor has 3 LEDs—one to indicate an Override, one to indicate an Alarm, and one to indicate that a button has been pressed. See Figure 2 for LED and Button Descriptions.

An icon for the current mode of operation will appear in the sensor display. The operation mode icons are a Snowflake for Cooling Mode, a Flame for Heating Mode, a Fan in motion for Vent Mode, and a Moon for Unoccupied Mode. When the unit is in Unoccupied Mode, the screen’s background will turn dark. See Figure 8, page 6 for examples of operation modes.

LED Operation

Refer to Figure 2 below for LED locations.

Alarm LED: The Alarm LED will blink when there is an alarm from the Controller.

Sense LED: The Sense LED will blink when the sensor gets a valid touch.

Override LED: The Override LED is inoperable when in Occupied Mode. In Unoccupied Mode, if you touch the <Override> button, the Override LED will blink, indicating an override request. The Controller will respond by sending the unit into override. The Override LED will then stay on for the duration of the Override. Any time the Unit is in Override, you can request to cancel the override by touching the <Override> button, and the Override LED will blink. The Unit will then cancel the override. The Override LED will then turn off.
Environmental Requirements

The Digital Room Sensor needs to be installed in an environment that does not exceed a temperature greater than 150°F or less than -30°F and does not exceed 90% relative humidity levels (non-condensing).

Indoor Reading Range

The Digital Room Sensor’s Indoor Reading Range is 40°F to 120°F and 0-100% RH (RH is available on the OE217-01 Model). Its temperature reading accuracy is +/- .8°F, and its RH reading accuracy is +/- 3%. Its sensor element is the integral communicating digital sensing device or external Type III Thermistor 10K Ohm @ 77°F.

Outdoor Reading Range

If your Digital Room Sensor is set up to read an Outdoor Air Temperature Sensor, any outdoor air temperature below -40°F will not appear on the Digital Room Sensor’s display.

Important Wiring Considerations

The OE217-00 and OE217-01 Space Sensors connect to the VCM-X Controller, RNE, or SA-E-BUS using various lengths of TSDRSC modular cables connected between the controller and the sensor. The TSDRSC modular cables should not run in conduit with other AC line voltage wiring or with any conductors carrying highly inductive loads. See Figure 17, page 10 for wiring.

Mounting

CAUTION: Do not touch the front face of the sensor while you are plugging in the modular sensor cable. Touching the front face of the sensor while plugging in the cable may prevent proper initialization and keep the buttons on the sensor from working properly.

The Digital Room Sensor is designed to be mounted to a vertical 2” x 4” electrical box recessed in the wall. If the wall cannot be penetrated, a plastic surface mount box such as those made by Wiremold™ may be used to mount the sensor to the wall surface.

The Sensor is mounted by removing the front cover and fastening the housing base to the electrical box using the supplied (2) 6/32” x 1” machine screws. The modular cable is then plugged into the phone jack located on the circuit board that is mounted on the cover. The cover is then placed onto the housing base, and the Allen Screw on the bottom of the base is adjusted to hold the cover in place. A locking screw secures the sensor to the wall. See Figure 3 for Digital Room Sensor dimensions.

Optional Mounting Plate

Included with the Digital Room Sensor is a mounting plate that can be used, if necessary, to cover the sensor sheet rock opening. The mounting plate screws onto the back of the housing base. The mounting plate is then mounted and covers the recessed space in the wall. A locking screw secures the sensor to the wall. See Figure 19, page 12 for dimensions.

Figure 3: Digital Room Sensor Dimensions
Main Sensor Display Screens

There are 3 Main Sensor Display Screens. The first screen displays the Current Room Temperature or Cooling/Heating Setpoint, Operation Mode, Slide Offset, and RH (RH is available on the OE217-01 Model). The second screen displays the Outside Air Temperature and/or Humidity if Outdoor Air Temperature and/or Outdoor Air Humidity is being monitored. The third screen displays the unit information for the controller that the Digital Room Sensor is connected to.

Temperature and Humidity Status Screen

The Main Display Screen displays the current room temperature or Cooling/Heating Setpoint, the humidity in the room (RH is available on the OE217-01 Model), the current setting of the slide offset, and an icon for the current mode of operation once the controller it is connected to is done calibrating.

The different icons shown are a Snowflake for cooling mode, a Flame for heating mode, a Fan in motion for vent mode, and a Moon for unoccupied mode. When the unit is in unoccupied mode, the screen’s background will turn dark. Refer to Figure 8 for operation mode screen examples.

Outside Air Temperature Humidity Status Screen

If the connected controller is receiving an outdoor air temperature and/or humidity broadcast, touching <Display> will first bring up the Outdoor Status Screen.

Figure 5: Outdoor Status Screen

Unit Information Screen

Touching <Display> again will bring up the Unit Information Screen which contains the controller’s address or ID number, screen ID, and software version of the controller connected to the sensor.

Figure 6: Unit Information Screen

Setpoint Adjust Screen

Touching < or > will display the Setpoint Adjust Screen. You can adjust the cooling and heating setpoints from this screen based on the VCM-X controller’s slide offset setpoint. For example, if the connected controller’s Max Slide Offset Setpoint is set for five, you can adjust the setpoint up five degrees and down five degrees.

NOTE: If the VCM-X Controller’s slide offset setpoint is set to Zero, this screen will not appear when you touch < or >.

Figure 7: Setpoint Adjust Screen

Figure 4: Main Display Screen

Figure 5: Outdoor Status Screen

Figure 6: Unit Information Screen

Figure 7: Setpoint Adjust Screen

Figure 8: Operation Mode Screens
Table 1: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors

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<th>Temp (ºF)</th>
<th>Resistance (Ohms)</th>
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<td>93333</td>
</tr>
<tr>
<td>-5</td>
<td>80531</td>
</tr>
<tr>
<td>0</td>
<td>69822</td>
</tr>
<tr>
<td>5</td>
<td>60552</td>
</tr>
<tr>
<td>10</td>
<td>52500</td>
</tr>
<tr>
<td>15</td>
<td>45902</td>
</tr>
<tr>
<td>20</td>
<td>40147</td>
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<tr>
<td>25</td>
<td>35165</td>
</tr>
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<tr>
<td>70</td>
<td>11652</td>
</tr>
</tbody>
</table>

Figure 9: Temperature/Resistance Testing

NOTE: For this test, the sensor must be disconnected from its TSDRSC cable as shown. The meter must be set to measure resistance in ohms. Use Table 1 to determine if the sensor is reading the correct resistance value for the ambient temperature. This resistance value should match the temperature value listed next to the resistance value in the table. The temperature should be measured with an accurate temperature measuring device located in the area where the sensor is currently located.
Sensor Configuration and Test Screens

To access the Sensor Configuration & Test Screens, you first need to access the Unit Information Screen by touching <Display> while at the Main Display Screen.

NOTE: While in the Sensor Configuration & Test Screens, the <Display> button functions as an exit key to return to the previous screen or menu. After a few seconds, however, the sensor will automatically revert to the Main Display Screen. Refer to Figure 10 when reading the instructions that follow.

Pixel Test Screen

To select the first option—Pixels—touch <△> while at the Sensor Configuration & Test Screen (Figure 11). The Pixel Test Screen tests the pixels of the LCD display, allowing you to make the screen white with black characters, black with white characters, or a black or white screen. To exit this screen, touch <Display>.

Sensor Info & LED Test Screen

To select the second option—Info & LEDs—touch <▽> while at the Sensor Configuration & Test Screen (Figure 11). The Sensor Info & LED Test Screen shows the version of software that the sensor is running and allows you to test the LEDs that are used on the controller. Touching <△> will turn the LEDs on and touching <▽> will turn the LEDs off. To exit this screen, touch <Display>.

Figure 10: Digital Room Sensor Buttons

Figure 11: Sensor Configuration & Test Screen

While the Unit Information Screen is being displayed, you can enter the Sensor Configuration & Test Screen options by touching simultaneously below the <Display> and <Override> buttons. (See Figure 10 which shows where to touch to access this option.)
LCD Backlight Test Screens

To select the third option—BACKLT—touch <Override> while at the Sensor Configuration & Test Screen (Figure 11). This option allows you to control when the LCD backlight turns on and off. You can configure the backlight to stay on at all times, remain off at all times, or to come on when any button is touched on the sensor.

To exit this screen, touch <Display>.

Thermistor Averaging Screen

To select the fourth and final option—THRM AVG—while at the Sensor Configuration & Test Screen (Figure 11), touch simultaneously below the <Display> and <Override> buttons. (See Figure 10 which shows where to touch to access this option.)

This option allows you to set the rate—from 1-15 seconds—at which the sensor takes a new temperature reading. Touch <△> to increase the number of seconds and touch <▽> to decrease the number of seconds.

To exit this screen, touch <Display>.

NOTE: The sensor takes the average of the last 10 readings based on the number that is entered in this screen. For example, if you want a 3-second sample, the sensor will take the average of the last 10 readings every 3 seconds over a 30-second span. Therefore, if you have your sensor next to an outside doorway, you would want to enter a higher number for your sample to give a more accurate reading for the room temperature in case the outside door is opened often.
NOTE: If Also Using An OE256-01 Or OE256-02 CO₂ Sensor, The CO₂ Sensor Always Connects To The VCM-X Controller First Using A TSDRSC Cable Of The Required Length. The Digital Room Sensor Then Connects To The CO₂ Sensor With Another TSDRSC Cable. The Total Length Of Cable For Either One Or Both Cables Combined Cannot Exceed 160 Feet. See The CO₂ Sensor Technical Guide For Further Wiring Details.

Figure 17: Digital Room Sensor to HVAC Unit Controller Wiring (VCM-X E-BUS Shown)
Connecting a Remote Sensor

If the job requires this Sensor to be mounted outside of a conditioned space, a remote OE210 Space Sensor or OE231 Return Air Temperature Sensor (or any 2-wire 10K Ohm, Type III thermistor temperature sensor) can be hard-wired to the Digital Room Sensor. Other versions of the space sensors (OE211, OE212, or OE213) with slide adjust and/or override button should not be used as the remote sensor.

Contact AAON Controls for wiring information if a four sensor averaging array will be used as the “remote sensor”.

See Figure 19 for OE231 Return Air Temperature Sensor wiring. See Figure 20 for OE210 Space Sensor wiring.

OE217-00 - Digital Room Temperature Only Sensor

 Disconnect the modular cable from the Digital Room Sensor before performing the following modifications.

If using the OE217-00 Temperature Only version of the sensor, you must first remove the Digital Sensor’s back cover. You will see a loop of wire hanging off of the sensor circuit board. See Figure 21. This is the external thermistor loop wire. Clip the external thermistor loop wire so that the sensor will read the remote temperature input. Be sure to cut the ends of the wire close to the circuit board so that the sensor loop wire ends won’t short between each other. The remote sensor then wires to the remote sensor terminal block on the back of the Digital Room Sensor. If using the OE210 type Space Sensor as the remote sensor, you must clip off the C1 capacitor from the back of the OE210. Be sure to cycle power to begin reading the remote sensor. See Figure 20.

OE217-01 - Digital Room Temperature and Humidity Sensor

Disconnect the modular cable from the Digital Room Sensor before performing the following modifications.

If using the OE217-01 Temperature and Humidity version of the Digital Room Sensor, you only need to wire the remote sensor to the remote sensor terminal block on the digital sensor. DO NOT CLIP OFF OR REMOVE the temperature/humidity sensing element on the Digital Sensor. See Figure 22. When the remote temperature sensor is wired in, it will override the on-board temperature value of the OE217-01 sensor, even though the sensor element remains attached.

If using the OE210 type Space Sensor as the remote sensor, you must clip off the C1 capacitor from the back of the OE210. Be sure to cycle power to begin reading the remote sensor. See Figure 20.
Connecting a Remote Sensor

Figure 19: Attaching the OE210 Space Room Sensor

Remove C1 Capacitor

OE210 Space Temperature Sensor Back View

OE217-00 & OE217-01 Digital Room Sensor Back View

Sensor Shown With Back Cover Removed
Cut Wire Loop As Shown. Make Sure That The Wires Are Cut Close Enough To The Circuit Board So They Can’t Touch Each Other.

WARNING: DO NOT CLIP OFF OR REMOVE THE TEMPERATURE & HUMIDITY SENSING ELEMENT
Optional Mounting Plate

Included with the Digital Room Sensor is a mounting plate that can be used, if necessary, to cover the sensor sheet rock opening. This mounting plate screws onto the back of the housing base. The mounting plate is then mounted and covers the recessed space in the wall. A locking screw secures the sensor to the wall. See Figure 23, below for dimensions.