



E-BUS Digital Room Sensor Technical Guide



EBUS DIGITAL ROOM SENSOR TECHNICAL GUIDE

REVISION AND DATE	CHANGE
Rev. 01P, November 2019	Previous version
Rev. Q, October 2022	Incorporates additional E-BUS LCD Room Sensor (Temperature and Humidity), updated formatting, updated labels

EBUS DIGITAL ROOM SENSOR PARTS REFERENCE

PART DESCRIPTION	PART NUMBER
E-BUS Digital Room Temperature Sensor with LCD Display - Temperature Only	ASM01819
E-BUS Digital Room Temperature Sensor with LCD Display - Temperature & Humidity	ASM01820 / ASM07291
E-BUS Digital Room Temperature Sensor (No LCD Display) - Temperature & Humidity	ASM02221
E-BUS CO ₂ Sensor - Wall Mounted	ASM01829
E-BUS CO ₂ Sensor - Duct-Mounted	ASM01831
Duct Temperature Sensor - 12 in.	G051250
VCCX2 Controller	ASM01698
Pressure Dependent/Independent VAV/Zone BACnet Controller	ASM02426 / ASM02427



www.aaon.com

**This manual is available for download from
www.aaon.com/library**

AAON, Inc.
2425 South Yukon Ave.
Tulsa, OK 74107-2728
www.aaon.com
Factory Technical Support Phone: 918-382-6450
Controls Support Phone: 866-918-1100

All rights reserved. © October 2022 AAON, Inc.
AAON P/N: G042540, Rev. Q
AAON® is a registered trademark of AAON, Inc., Tulsa, OK.
It is the intent of AAON to provide accurate and current product information. However, in the interest of product improvement, AAON reserves the right to change pricing, specifications, and/or design of its product without notice, obligation, or liability.

TABLE OF CONTENTS

GENERAL INFORMATION	1
Features.....	1
MOUNTING AND WIRING	2
Requirements and Considerations.....	2
WIRING	3
E-BUS Digital Room Sensor to VCCX2 Controller	3
Wall Mounted Digital CO ₂ Sensor to AAON Unit Controller	4
E-BUS Digital Room Sensor to VAV/Zone Controller.....	5
BASIC OPERATION	6
Buttons and LEDs	6
SENSOR SCREENS	7
LCD Display Screens.....	7
Sensor Configuration and Test Screens	9
APPENDIX A - REMOTE SENSOR	11
Connecting a Remote Sensor.....	11
APPENDIX B - MOUNTING PLATE	13
Dimensions	13
APPENDIX C - TROUBLESHOOTING	14
Troubleshooting the Temperature Only Sensor	14

FIGURES

Figure 1: E-BUS Digital Room Sensors	1
Figure 2: Dimensions (ASM01820 shown).....	2
Figure 3: E-BUS Digital Room Sensor Wiring to Controller	3
Figure 4: Wall Mounted E-BUS CO ₂ Sensor Wiring	4
Figure 5: E-BUS Digital Room Sensor to VAV/Zone Controller Wiring	5
Figure 6: E-BUS Digital Room Sensor Components.....	6
Figure 7: Home Screen	7
Figure 8: Outdoor Status Screen	7
Figure 9: Unit Information Screen	7
Figure 10: Setpoint Adjust Screen.....	7
Figure 11: Operation Mode Screens	8
Figure 12: Sensor Configuration and Test Screen	9
Figure 13: Pixel Test Screen	9
Figure 14: Sensor Info & LED Test Screen	9
Figure 15: Backlight Screen	9
Figure 16: Temperature Averaging Screen.....	10
Figure 17: Display Options Screen	10
Figure 18: Address Screen	10
Figure 19: Duct Temperature Sensor Wiring	11
Figure 20: Connecting the ASM02227 Standard Room Sensor.....	12
Figure 21: Wire Clipping Instructions for the E-BUS Digital Room Temperature Sensor with LCD Display - Temperature Only (ASM01819)	12
Figure 22: E-BUS Digital Room Temperature Sensor Temperature and Humidity Sensing Element.....	12
Figure 23: Mounting Plate Dimensions	13
Figure 24: Temperature/Resistance Testing (ASM01819).....	14

TABLES

Table 1: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors	15
--	----

Features

Overview

The E-BUS Digital Room Sensors are used to sense space temperature and space humidity. See **Figure 1, this page**.

- The ASM01819 is the space temperature sensor only model.
- The ASM01820 and ASM07291 are a combination space temperature and space humidity sensor model with an LCD display, front LEDs, and buttons.
- The ASM02221 is a combination space temperature and space humidity sensor that does not have an LCD display, front LEDs, or buttons.

Any of the sensors can be used with the VCCX2 Controller and connect to the controller using various lengths of E-BUS cables connected between the controller and the sensor. The E-BUS cables should not run in conduit with other AC line voltage wiring or with any conductors carrying highly inductive loads.

The ASM01819 model can be used with the VAV/Zone Controller. It is either hard-wired or connected via E-BUS cable.

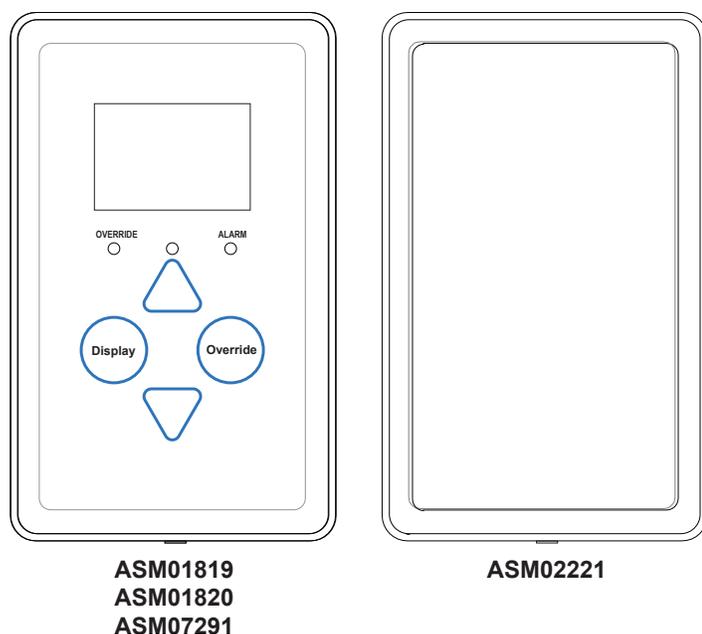


Figure 1: E-BUS Digital Room Sensors

The ASM01819, ASM01820, and ASM07291 sensors provide the following useful functions:

- Provides 112 x 64 monochrome Graphical LCD display with LED backlight
- Displays the current space temperature
- Displays outdoor air temperature (if controller is configured with an outdoor air temperature sensor)
- Displays the current space humidity (ASM01820 and ASM07291 only)
- Displays outdoor air relative humidity (ASM01820 and ASM07291 if the controller is configured with an outdoor air humidity sensor)
- Displays the current zone setpoint temperature
- Equipped with buttons for changing the zone setpoint temperature
- Equipped with an override button for forcing the VAV/Zone Controller or VCCX2 Controller into Occupied Mode
- Provides graphics to indicate the mode of operation
- Allows connection of a remote 10K Ohm, Type III thermistor temperature sensor (or four sensor averaging array).
- Provides LEDs to indicate schedule override, button push, alarms, and communications
- Can display temperature reading from a remote temperature sensor

MOUNTING AND WIRING

Requirements and Considerations

Environmental Requirements

The E-BUS 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 95% relative humidity levels (non-condensing).

The E-BUS Digital Room Sensor's indoor reading range is 40°F to 120°F and 0-95% RH (RH is available on the ASM01820 and ASM07291 models). Its temperature reading accuracy is +/- 0.8°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 at 77°F.

Mounting

The E-BUS 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 should be mounted at least 5 ft. above the floor.

The sensor is mounted by removing the front cover and fastening the housing base to the electrical box using the supplied mounting screws. The E-BUS cable is then plugged into the E-BUS connector located on the circuit board. The cover is then placed onto the housing base, and the screw on the bottom of the base is adjusted to hold the cover in place.

CAUTION: Do not touch the front face of the sensor while you are plugging in the E-BUS 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.

Mounting Plate

A mounting plate is included with the E-BUS Digital Room Sensor. The plate screws onto the back of the housing base. The mounting plate is then mounted and covers the recessed space in the wall.

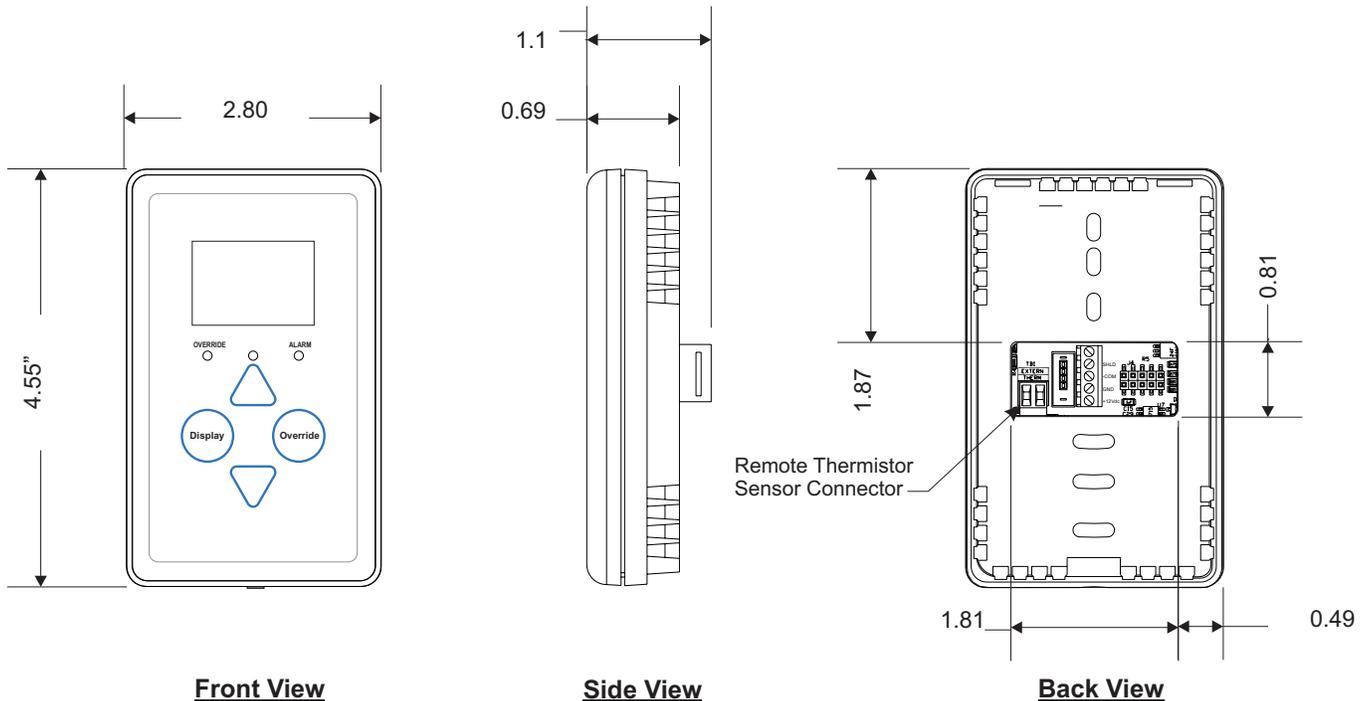


Figure 2: Dimensions (ASM01820 shown)

WIRING

E-BUS Digital Room Sensor to VCCX2 Controller

The E-BUS Digital Room Sensor connects directly to the VCCX2 Controller with an E-BUS cable when only the sensor is used.

See **Figure 3, this page**, for wiring details.

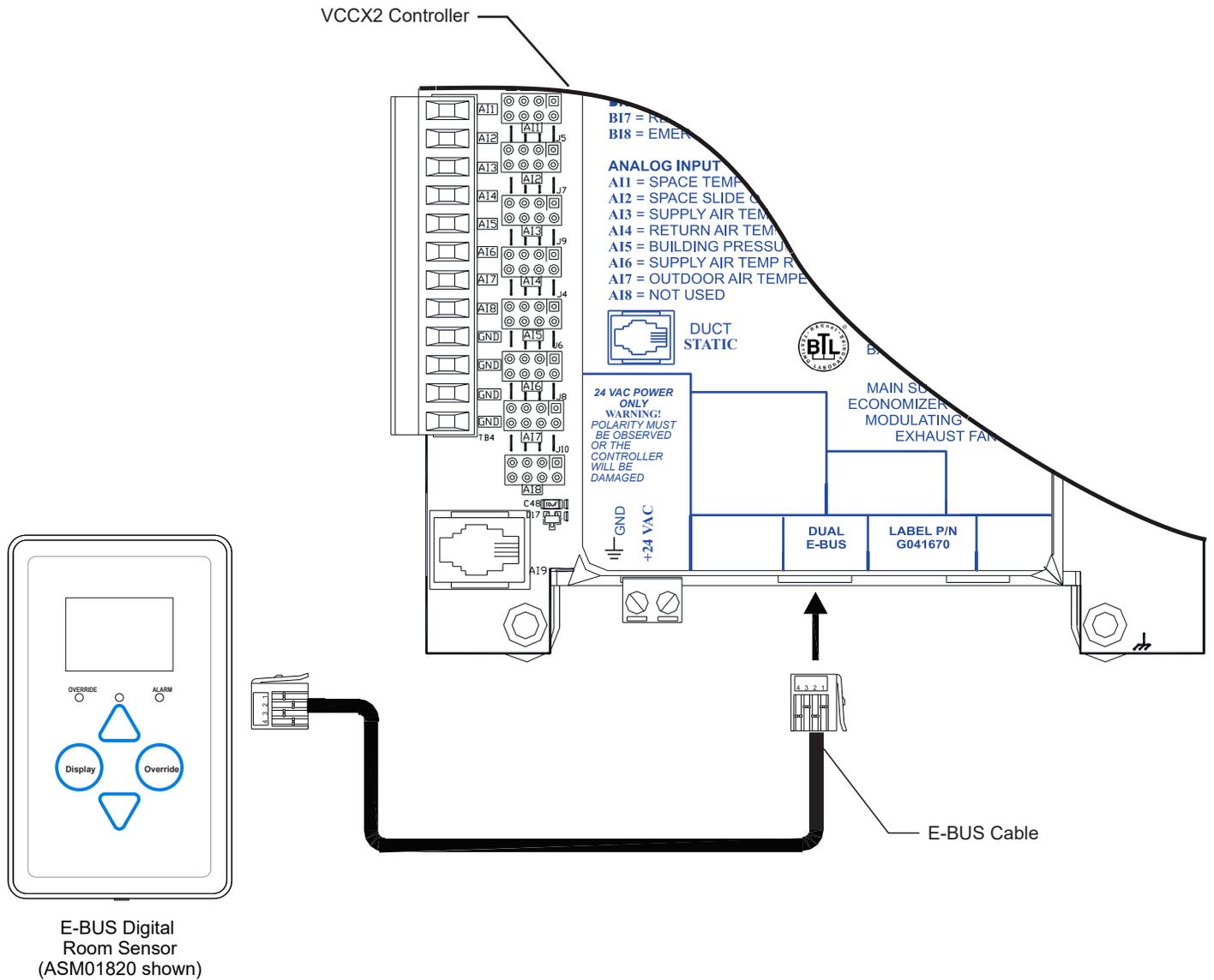


Figure 3: E-BUS Digital Room Sensor Wiring to Controller

WIRING

E-BUS Digital Room Sensor to VAV/Zone Controller

The E-BUS Digital Room Temperature Sensor with LCD Display - Temperature Only connects to the VAV/Zone Controller with an E-BUS cable. It can also be hard-wired to the VAV/Zone Controller.

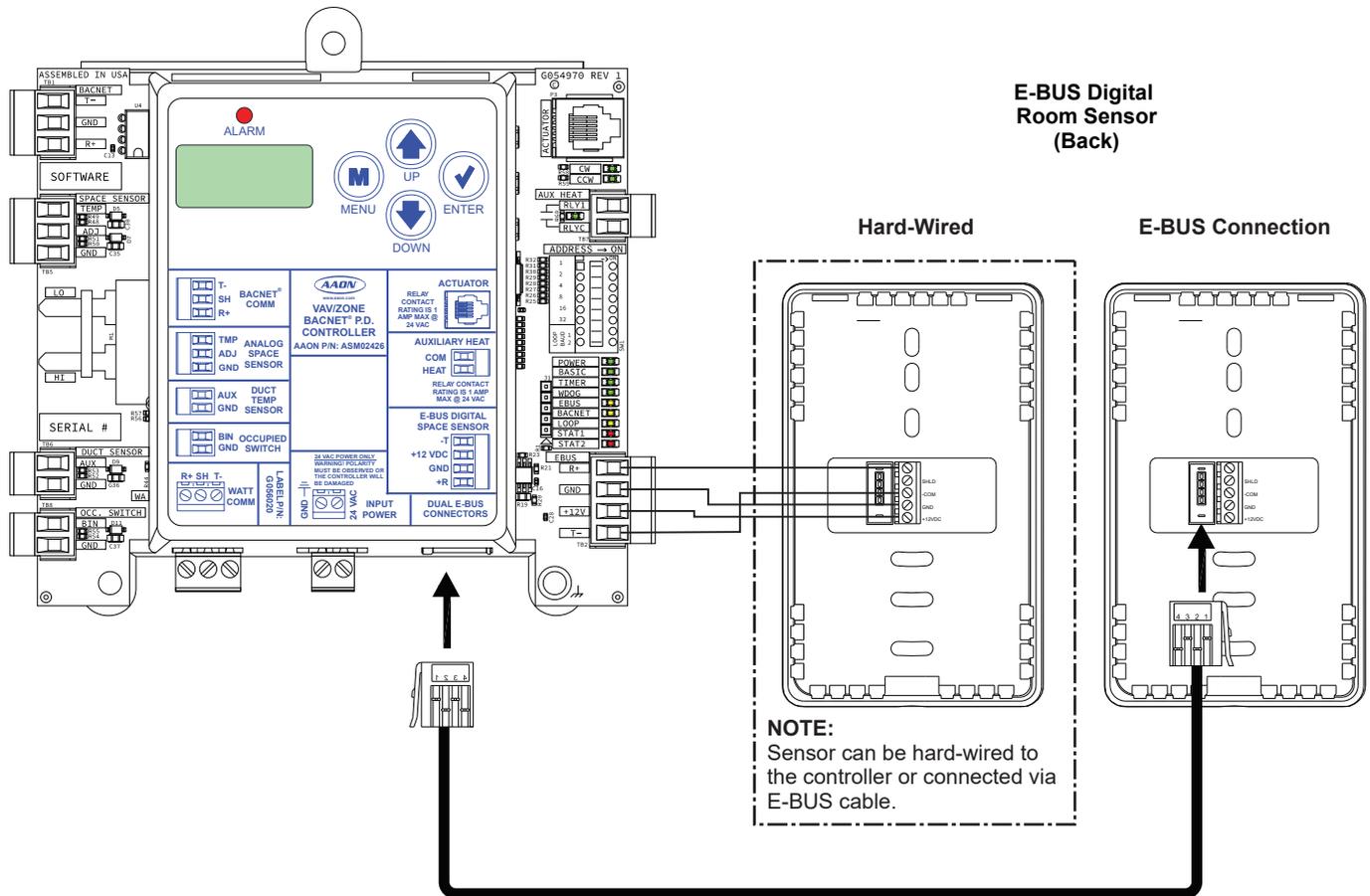


Figure 5: E-BUS Digital Room Sensor to VAV/Zone Controller Wiring

BASIC OPERATION

Buttons and LEDs

Sensor Operation

When power is first applied to the E-BUS Digital Room Sensor, the sensor will display the current space temperature and the current setting of the slide offset. The ASM01820 and ASM07291 models 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 four 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 three user-visible LEDs, one to indicate an override, one to indicate an alarm, and one to indicate that a button has been pressed. See **Figure 6, this page**, for LED and button descriptions.

LED Operation

Refer to **Figure 6, this page**, for LED locations.

Alarm LED: The Alarm LED will light up solid when there is an alarm from the controller. The default for the Alarm LED is to be disabled. The Alarm LED can be enabled by configuring the VCCX2 Controller with the Service Tool.

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 Mode, 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.

Comm LED: The Comm LED located on the back of the sensor blinks on whenever communications are sensed.

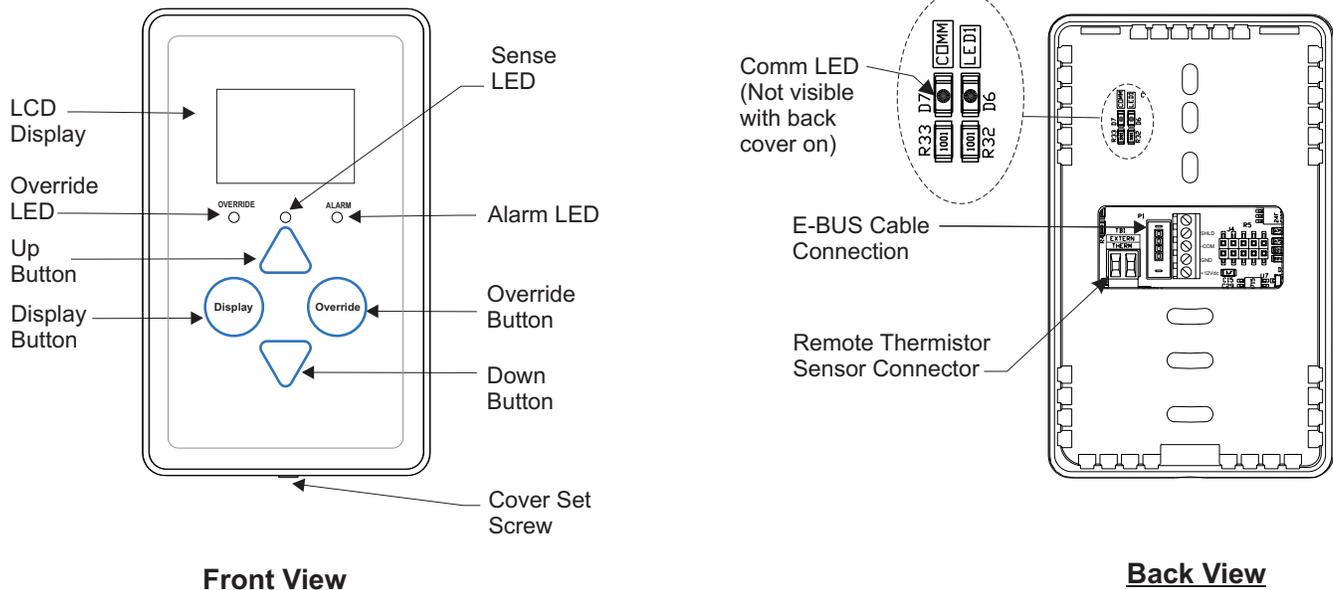


Figure 6: E-BUS Digital Room Sensor Components

LCD Display Screens

Main Display Screens

There are three main display screens. The first screen displays the current space temperature, operation mode, slide offset, and RH (RH is available on the ASM01820 and ASM07291 models). The second screen displays the outdoor air temperature and/or humidity if connected to the appropriate sensor. The third screen displays the unit information for the controller connected to the E-BUS Digital Room Sensor.

Home Screen

The Home Screen displays the current space temperature, the humidity in the room (RH is available on the ASM01820 and ASM07291 models), 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.

Descriptions of the displayed operation modes can be found on page 7.

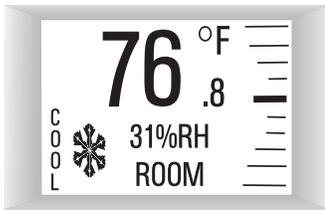


Figure 7: Home Screen

Outdoor 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.

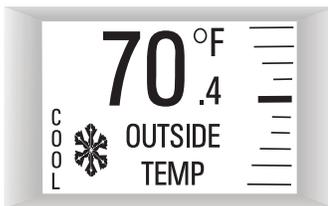


Figure 8: Outdoor Status Screen

Unit Information Screen

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

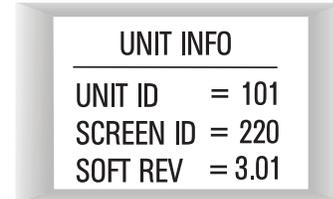


Figure 9: Unit Information Screen

Setpoint Adjust Screen

Touching <Up>, or <Down> will display the Setpoint Adjust Screen. You can adjust the cooling and heating setpoints from this screen based on the VAV/Zone or VCCX2 Controller 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.

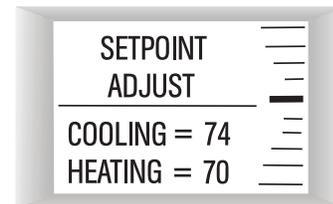


Figure 10: Setpoint Adjust Screen

NOTE: If the VAV/Zone or VCCX2 Controller's slide offset setpoint is set to zero, this screen will not appear when you touch <Up>, or <Down>.

NOTE: If using multiple sensors for averaging, digital sensors addressed 2 or higher will not display the slide adjust.

SENSOR SCREENS

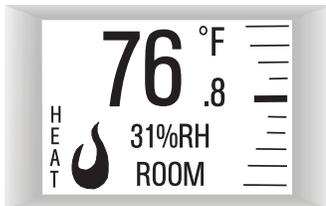
LCD Display Screens

Operation Modes

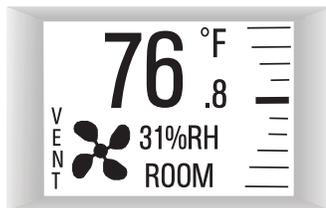
The different icons shown are a snowflake for Cooling Mode, a flame for Heating Mode, a fan in motion for Vent Mode, and a moon for Unoccupied Mode. When the unit is in Unoccupied Mode, the screen's background will turn dark.



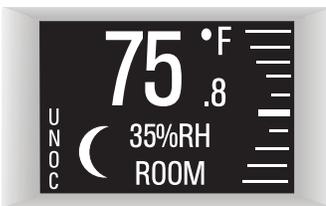
Cooling Mode
with Snowflake Icon



Heating Mode
with Flame Icon



Vent Mode
with Fan in Motion Icon



Unoccupied Mode
with Moon Icon

Figure 11: Operation Mode Screens

SENSOR SCREENS

Sensor Configuration and Test Screens

Sensor Configuration and Test Screens

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

NOTE: While in the Sensor Configuration and 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 Home Screen.

While the Unit Information Screen is being displayed, you can enter the Sensor Configuration and Test Screen options by touching simultaneously below the **<Display>** and **<Override>** buttons.

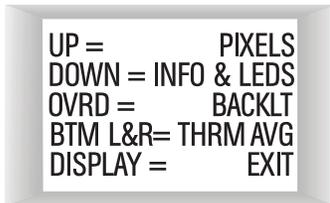


Figure 12: Sensor Configuration and Test Screen

Pixel Test Screen

Touch **<Up>** while at the Sensor Configuration and Test Screen to access the Pixel Test Screen. This tests the pixels of the LCD display, allowing you to make the screen white with black characters, black with white characters, a solid black screen, or a solid white screen. To exit this screen, touch **<Display>**.

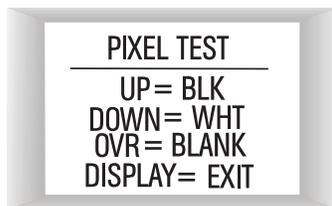


Figure 13: Pixel Test Screen

Sensor Info & LED Test Screen

Touch **<Down>** while at the Sensor Configuration and Test Screen to access the Info & LED Test Screen. This 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 **<Up>** will turn the LEDs on and touching **<Down>** will turn the LEDs off. To exit this screen, touch **<Display>**.

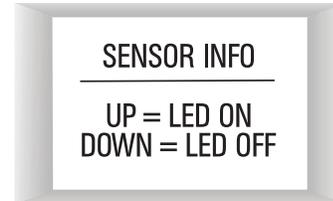


Figure 14: Sensor Info & LED Test Screen

LCD Backlight Test Screens

Touch **<Override>** while at the Sensor Configuration and Test Screen to access the Backlight Screen. 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>**.

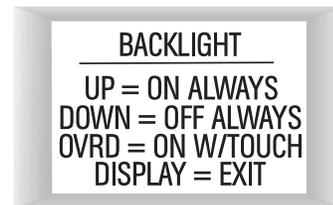


Figure 15: Backlight Screen

Sensor Configuration and Test Screens

Temperature Averaging Screen

While at the Sensor Configuration and Test Screen, touch the **<Display>** and **<Override>** buttons simultaneously to access the Temperature Averaging Screen.

This option allows you to set the rate, from 1-15 seconds, at which the sensor takes a new temperature reading. Touch **<Up>** to increase the number of seconds and touch **<Down>** to decrease the number of seconds. To exit this screen, touch **<Display>**.

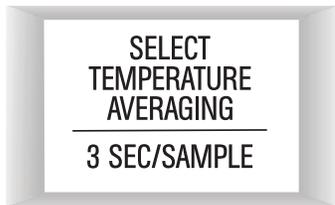


Figure 16: Temperature Averaging Screen

NOTE: The sensor takes the average of the last 10 readings based on the number that is entered in this screen. If the sensor is next to an outside doorway, selecting a higher number for the sample will give a more accurate reading for the room temperature in case the outside door is opened often.

Display Options Screen

While at the Temperature Averaging Screen, touch the **<Override>** button to access the Display Options Screen.

This option allows you to select the display type shown on the main screen. Touch **<Up>** to select the space temperature setpoint and touch **<Down>** to select the space temperature reading. The default is temperature.

To exit this screen, touch **<Display>**.

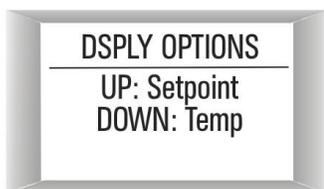


Figure 17: Display Options Screen

Address Screen

While at the Display Options Screen, touch the **<Override>** button. To access the Address Screen.

This option allows you to set the address, from 1-10. Touch **<Up>** to increase the number and touch **<Down>** to decrease the number. The default is 1.

To exit this screen, touch **<Display>**.



Figure 18: Address Screen

APPENDIX A - REMOTE SENSOR

Connecting a Remote Sensor

Connecting a Remote Sensor

If the job requires this sensor to be mounted outside of a conditioned space, a Standard Room Sensor (ASM02227) or Duct Temperature Sensor (G051250), or any two-wire 10K Ohm, Type III thermistor temperature sensor can be hard-wired to the E-BUS Digital Room Sensor.

NOTE: Other versions of the AAON space sensors (ASM01638, ASM01642, ASM01643) 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.

NOTE: Be sure to cycle power to begin reading the remote sensor.

NOTE: Disconnect the E-BUS cable from the Digital Room Sensor before performing any of the following modifications.

E-BUS Digital Room Temperature Only Sensor

If using the Temperature Only version of the Digital Room Sensor, you must first remove the Sensor's back cover. You will see a loop of wire hanging off of the sensor circuit board. This is the external thermistor loop wire. Clip the external thermistor loop wire so that the sensor will read the remote temperature input.

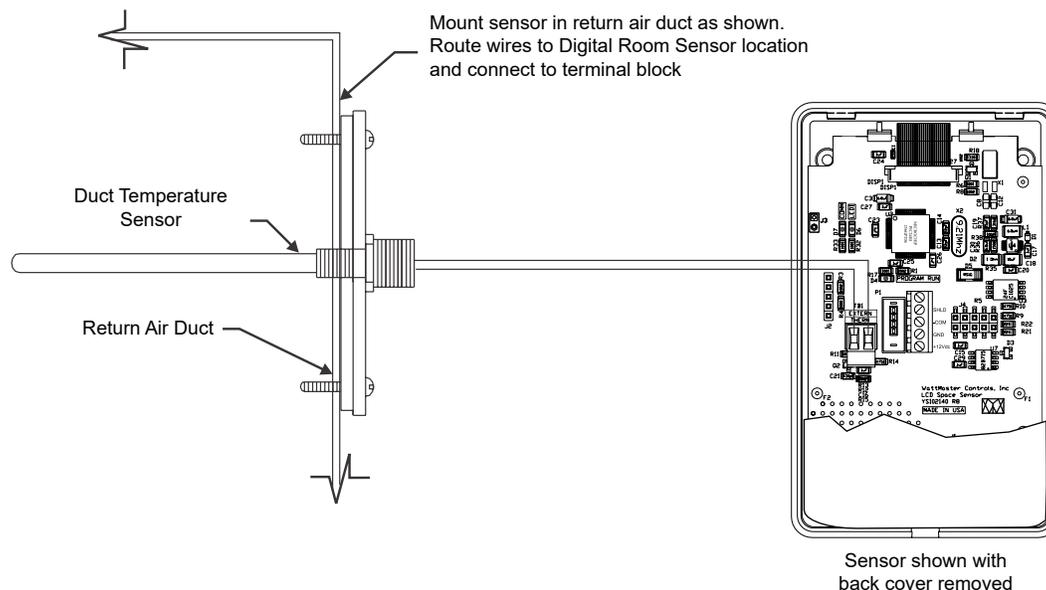


Figure 19: Duct Temperature Sensor Wiring

NOTE: 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 a Standard Space Sensor as the remote sensor, you must clip off the C1 capacitor from the back of the sensor, **Figure 20, page 12.**

E-BUS Digital Room Temperature and Humidity Sensor

If using the Temperature and Humidity versions of the Digital Room Sensor, you only need to wire the remote sensor to the remote sensor terminal block on the Digital Room Sensor.

WARNING: Do not clip or remove the temperature/humidity sensor element on the Digital Room Sensor, **Figure 22, page 12.**

When the remote temperature sensor is wired in, it will override the on-board temperature value of the Digital Room Sensor, even though the sensor element remains attached.

If using a Standard Space Sensor as the remote sensor, you must clip off the C1 capacitor from the back of the sensor, **Figure 20, page 12.**

APPENDIX A - REMOTE SENSOR

Connecting a Remote Sensor

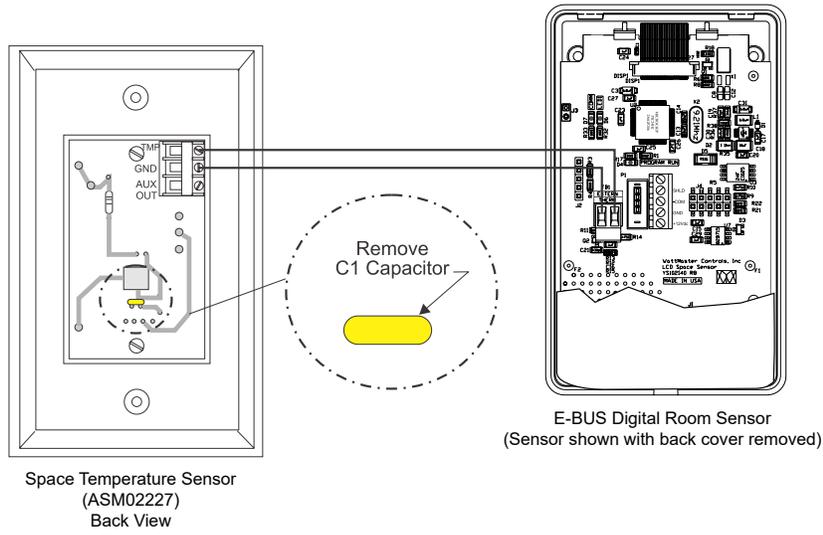


Figure 20: Connecting the ASM0227 Standard Room Sensor

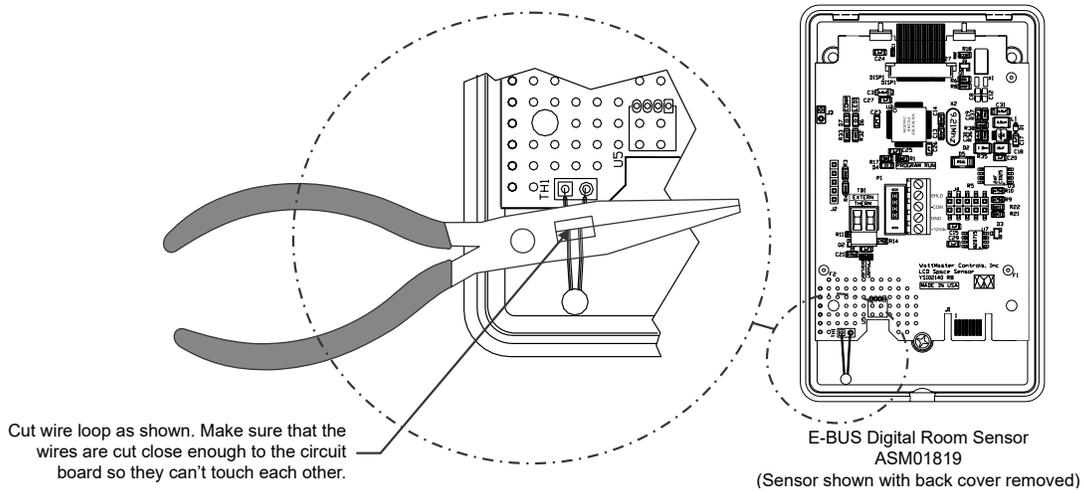


Figure 21: Wire Clipping Instructions for the E-BUS Digital Room Temperature Sensor with LCD Display - Temperature Only (ASM01819)

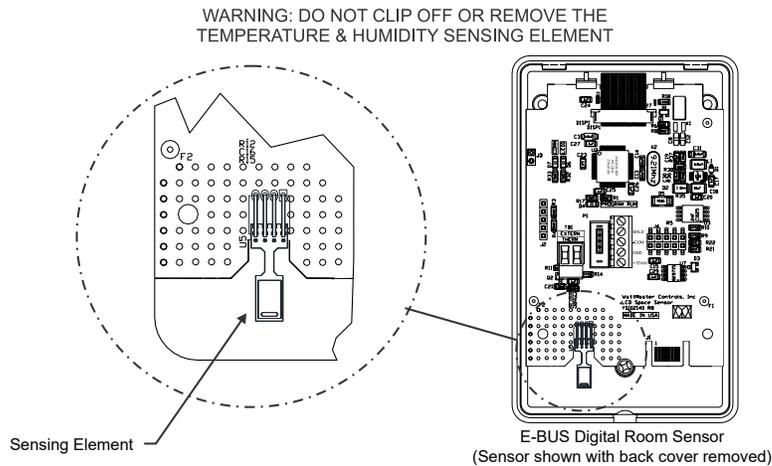


Figure 22: E-BUS Digital Room Temperature Sensor Temperature and Humidity Sensing Element

APPENDIX B - MOUNTING PLATE

Dimensions

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.

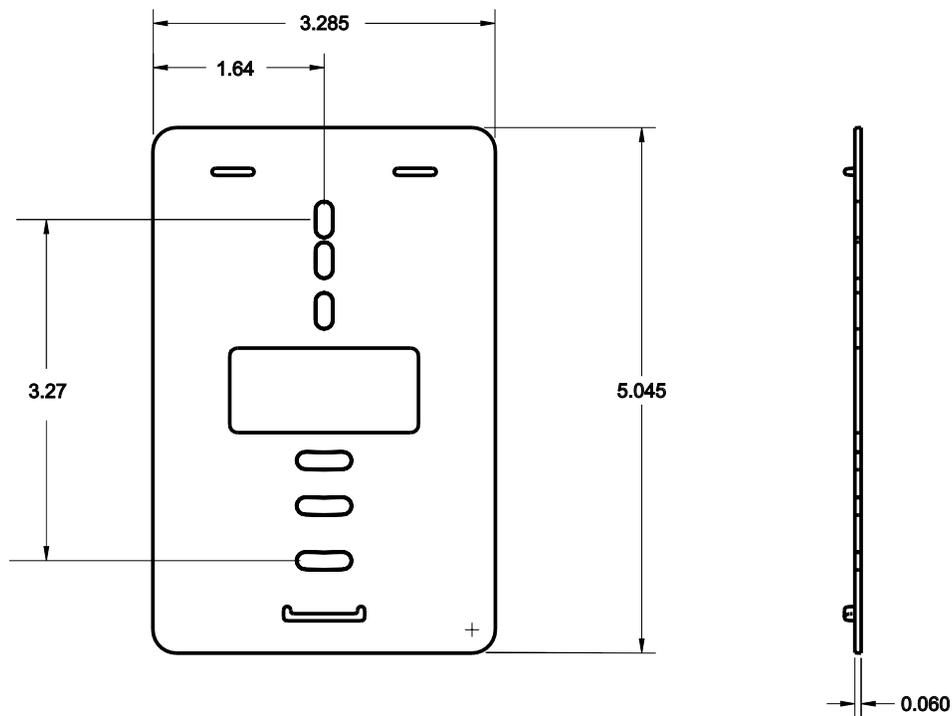


Figure 23: Mounting Plate Dimensions

APPENDIX C - TROUBLESHOOTING

Troubleshooting the Temperature Only Sensor

For temperature and resistance testing, the sensor must be disconnected from its E-BUS cables. The meter must be set to measure resistance in Ohms. Use **Table 1, page 15**, 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 a separate accurate temperature measuring device located in the area where the sensor is currently located.

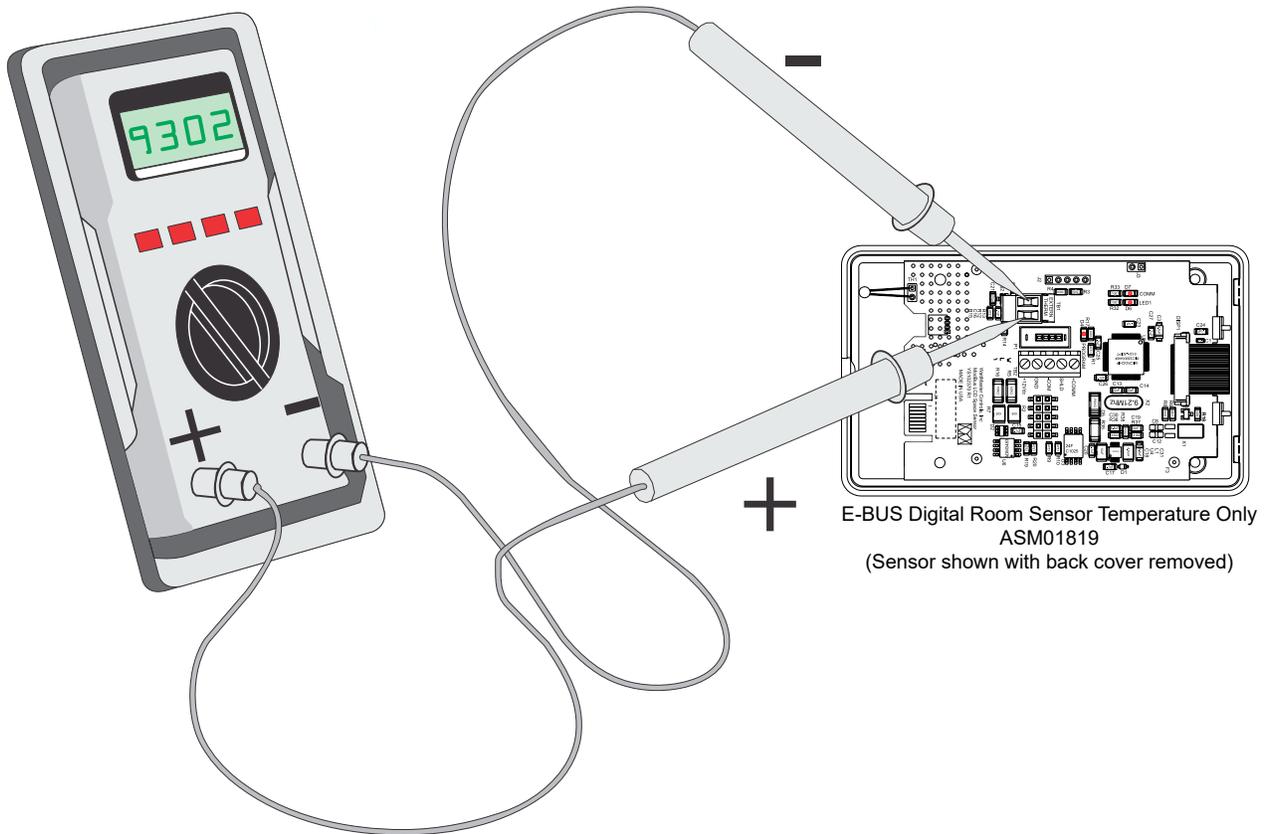


Figure 24: Temperature/Resistance Testing (ASM01819)

APPENDIX C - TROUBLESHOOTING

Troubleshooting the Temperature Only Sensor

TEMPERATURE – RESISTANCE – FOR TYPE III 10 K OHM THERMISTOR SENSORS					
Temp (°F)	Temp (°C)	Resistance (Ohms)	Temp (°F)	Temp (°C)	Resistance (Ohms)
-10	-23.3	93333	72	22.2	11136
-5	-20.6	80531	73	22.8	10878
0	-17.8	69822	74	23.3	10625
5	-15	60552	75	23.9	10398
10	-12.2	52500	76	24.4	10158
15	-9.4	45902	77	25	10000
20	-6.6	40147	78	25.6	9711
25	-3.9	35165	80	26.7	9302
30	-1.1	30805	82	27.8	8893
35	1.7	27140	84	28.9	8514
40	4.4	23874	86	30	8153
45	7.2	21094	88	31.1	7805
50	10	18655	90	32.2	7472
52	11.1	17799	95	35	6716
54	12.2	16956	100	37.8	6047
56	13.3	16164	105	40.6	5453
58	14.4	15385	110	43.3	4923
60	15.6	14681	115	46.1	4449
62	16.7	14014	120	48.9	4030
64	17.8	13382	125	51.7	3656
66	18.9	12758	130	54.4	3317
68	20	12191	135	57.2	3015
69	20.6	11906	140	60	2743
70	21.1	11652	145	62.7	2502
71	21.7	11379	150	65.6	2288

Table 1: Temperature/Resistance for Type III 10K Ohm Thermistor Sensors

E-BUS Digital Room Sensor Technical Guide

G042540 Rev. Q · 221003

AAON Controls Support:

866-918-1100

Monday through Friday, 7:00 AM to 5:00 PM Central Time

Controls Support website:

www.aaon.com/aaon-controls-technical-support

AAON Factory Technical Support:

918-382-6450 | techsupport@aaon.com

NOTE: Before calling Technical Support, please have the model and serial number of the unit available.

PARTS: For replacement parts, please contact your local AAON Representative.



2425 So. Yukon Ave • Tulsa, OK • 74107-2728
Ph: (918) 583-2266 • Fax: (918) 583-6094
AAON P/N: G042540, Rev. Q
Created in the USA • © September 2022 AAON
All Rights Reserved