



# CW2 Protocol Series

## Wall Mount Air Quality Sensors

### Product Overview

The CW2 Protocol Series of air quality sensors for living space is a flexible multi-sensor platform for use with BAS controllers designed to accept BACnet or Modbus outputs. CW2 Protocol Series sensors are available with three user interface options: touchscreen, LCD with three buttons and blank. CO<sub>2</sub> and temperature sensors are included with all CW2 Protocol Series air quality sensors. Models with VOC sensors and relative humidity sensors are also available.



### NOTICE

- This product is not intended for life or safety applications.
- Do not install this product in hazardous or classified locations.
- Read and understand the instructions before installing this product.
- Turn off all power supplying equipment before working on it.
- The installer is responsible for conformance to all applicable codes.

If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

### Product Identification

<b>User Interface</b>	<b>Output</b>	<b>RH Accuracy*</b>	<b>VOC Sensor</b>
CW2 <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T = Color touchscreen L = 3-button LCD display X = None	P = BACnet/Modbus	2 = 2% X = None	V = NDIR CO <sub>2</sub> /VOC = None

\* Replaceable RH module available to be ordered separately per table below.

### Replaceable RH Elements

Model	RH Accuracy	Calibration Certificate	Description
HS1N	±1%	X	Replaceable RH sensor, 1% with NIST certification
HS2N	±2%	X	Replaceable RH sensor, 2% with NIST certification
HSX	±2%		Replaceable RH sensor, 2%

### Specifications

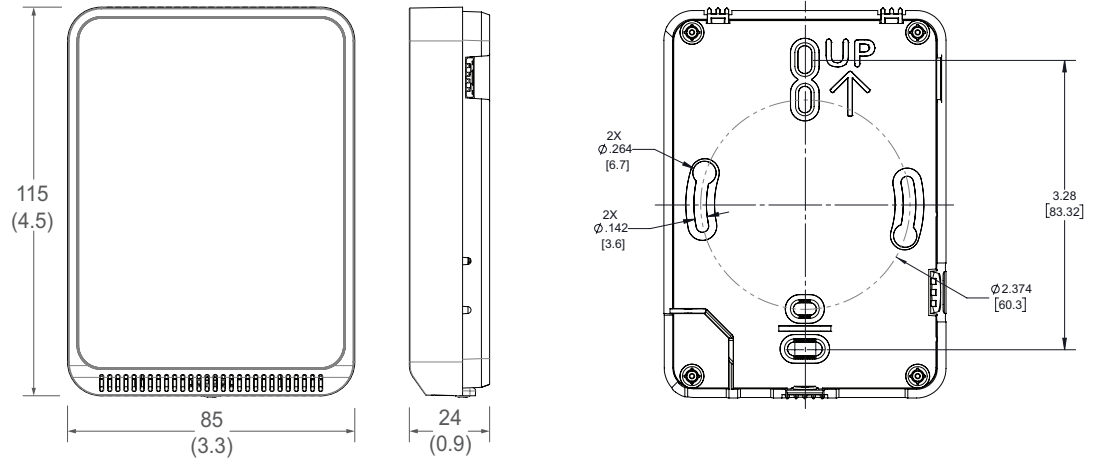
OPERATING ENVIRONMENT	
<b>Input Power</b>	Class 2; 20 to 30 Vdc, 24 Vac, 50 to 60 Hz
<b>Protocol Output</b>	BACnet or Modbus via RS-485, selectable
<b>Operating Temp. Range</b>	0 to 50 °C (32 to 122 °F)
<b>Operating Humidity Range</b>	0 to 95% RH non-condensing
<b>Housing Material</b>	High-impact ABS plastic
<b>Terminal Block Torque</b>	0.5 to 0.6 N-m (0.37 to 0.44 in-lbf)
<b>IP Rating</b>	IP 30
<b>Mounting Location</b>	For indoor use only. Not suitable for wet locations.
<b>Surface Mount</b>	The device can be surface mounted on Single Gang J-Box, British Standard and CE60 wall boxes
CO <sub>2</sub> TRANSMITTER	
<b>Sensor Type</b>	Non-dispersive infrared (NDIR), diffusion sampling
<b>Output Range</b>	0 to 2000 ppm
<b>Accuracy</b>	±30 ppm ±3% of measured value
<b>Repeatability</b>	±20 ppm ±1% of measured value
<b>Response Time</b>	<60 seconds for 90% step change
VOC TRANSMITTER OPTION	
<b>Sensor Type</b>	Solid state

Specifications (cont.)

<b>Output Range</b>	0 to 100% AQI for VOC		
<b>Accuracy</b>	±15% of measured value		
<b>Output Scale</b>	0 to 1,000 ppb of total VOC (TVOC)		
	<b>Level</b>	<b>Ventilation Recommendation</b>	<b>TVOC (ppb)</b>
<b>AQI Table*</b>	>61%	Greatly increased	>610
	20 to 61%	Significantly increased	200 to 610
	10 to 20%	Slightly increased	100 to 200
	5 to 10%	Average	50 to 100
	0 to 5%	Target value	0 to 50
<b>RH TRANSMITTER OPTION</b>			
<b>HS Sensor</b>	Thin-film capacitive, replaceable		
<b>Accuracy</b>	±2% from 10 to 80% RH @ 25°C (77 °F)		
<b>Hysteresis</b>	1.5% typical		
<b>Stability</b>	±1% @ 20°C (68 °F) annually for 2 years		
<b>Output Range</b>	0 to 100% RH		
<b>Temperature Coefficient</b>	±0.1% RH/°C above or below 25 °C (77 °F) typical		
<b>TEMPERATURE TRANSMITTER</b>			
<b>Sensor Type</b>	Solid state, integrated circuit		
<b>Accuracy</b>	±0.2 °C (±0.4 °F) typical		
<b>Resolution</b>	0.1 °C (0.1 °F)		
<b>Range</b>	0 to 50 °C (32 to 122 °F)		
<b>DISPLAY MODELS</b>			
<b>Touchscreen</b>	61 mm (2.4 in), color, backlit, capacitive, 240x300 px Setpoint: Temperature, humidity or fan speed selectable Timeout override: Display timeout Lockout override: Touchscreen/button lockout		
<b>LCD</b>	52mm (2.05 in), segmented with 3 buttons Setpoint: Temperature, humidity or fan speed selectable Timeout override: Display timeout Lockout override: Touchscreen/button lockout		
<b>SETPOINTS</b>			
<b>Temperature Setpoint</b>	Scale: 0 to 50 °C (32 to 122 °F) or 10 to 35 °C (50 to 95 °F) max., adjustable span		
<b>Humidity Setpoint</b>	Scale: 0 to 100% RH		
<b>Fan Speed Setpoint</b>	Off, Low, Medium, High, Auto		
<b>OVERRIDE</b>			
<b>Override Button</b>	Display models feature a momentary override button		
<b>WIRING TERMINALS</b>			
<b>Terminal Blocks</b>	Screw terminals, 18-24 AWG		
<b>Screw Terminal Torque</b>	0.2 N-m (2.0 in-lbF) max.		
<b>WARRANTY</b>			
<b>Limited Warranty</b>	5 years		
<b>COMPLIANCE INFORMATION</b>			
<b>Agency Approvals</b>	UL 916, European conformance CE: EN61000-6-2, EN61000-6-3, EN61000 Series - industrial immunity, EN 61326-1 FCC Part 15 Class B, REACH, RoHS, RCM (Australia), ICES-003 (Canada)		

\* Air Quality Index for VOC aligns with TVOC levels for IAQ as specified by the WHO (World Health Organization).

## Dimensions



## Functions

The CW2 Protocol Series sensor measures CO<sub>2</sub>, VOC (if equipped), RH (if equipped) and temperature in a room and provides protocol outputs to a controller.

## Installation

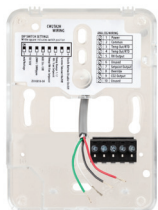
1. Remove the cover from the base at the bottom of the device.



2. Position the sensor base vertically on the wall 1.35 m (4.5 ft.) above the floor with the “UP” arrow facing upward. Locate away from windows, vents and other sources of draft. If possible, do not mount on an external wall, as this may cause inaccurate temperature readings.

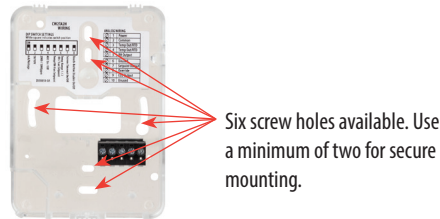


3. Pull 18 or 22 AWG cable(s) through the hole in the backplate.

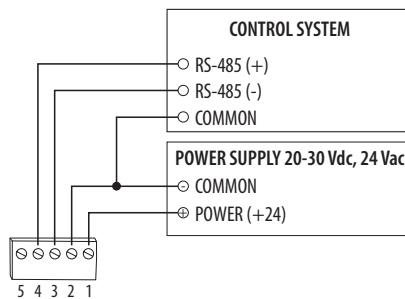
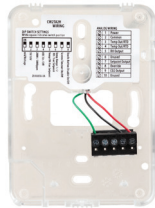


## Installation (cont.)

4. Mount the backplate onto the wall using the screws provided.



5. Connect the wires to the screw terminals. Do not over-tighten the screws.



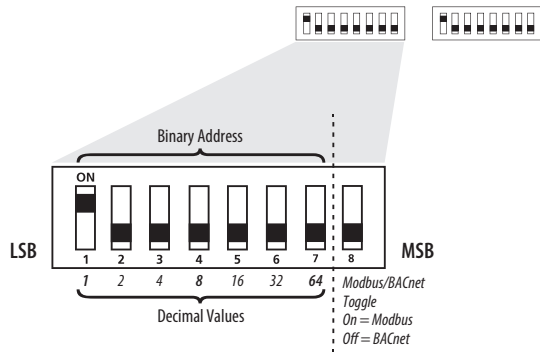
Configure the device.

### Address Configuration:

Each device on a single network must have a unique address. Set the DIP switch labeled "ADDRESS" to assign a unique address before the device is connected to the network. If an address is selected that conflicts with another device, neither device will be able to communicate.

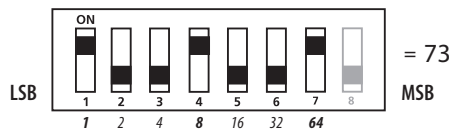
## Installation (cont.)

Address the device as any whole number between and including 1 to 127. Note that zero is not a valid address for Modbus; zero is a valid address for BACnet. Positions 1 through 7 of the “ADDRESS” DIP switch designate the address. Position 8 toggles between the Modbus and BACnet communication protocols, as shown in the diagram below. This is the left bank of DIP switches on the sensor.



To set an address using the DIP switch, simply add the values of any switches that are in the ON position.

For example, an address of 73 is set as shown in the diagram below.

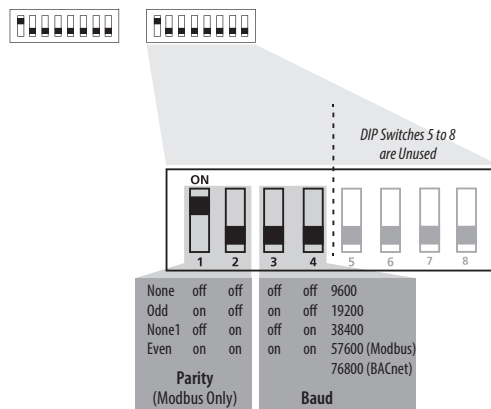


Position number 1 has an ON value of 1, position number 4 has an ON value of 8 and position number 7 has an ON value of 64 (1 + 8 + 64 = 73).

### Communications Configuration:

See the Product Diagram section for the location of the DIP switch labeled “CONFIG”. The following parameters are configurable:

- Parity (Modbus only): None, Odd, None1 (one stop bit), Even
- Baud rate: 9600, 19200, 38400, 57600 (Modbus), 76800 (BACnet)



Example: No Parity, 19200 Baud

1	2	3	4	5	6	7	8
off	off	on	off	off	off	off	off
None		19200 Baud		Unused			

## Installation (cont.)

### Modbus Point Map

Function Codes:

Function Code	Function
03	Read holding (RW) registers
04	Read input (RO) registers
06	Write single register*
16	Write multiple registers
01	Read coils
05	Write single coil
15	Write multiple coils

\*Not supported.

All of these values correspond to BACnet objects with the same name. See the BACnet Conformance Statement for their definitions.

Note that an attempt to write to “read only” holding registers will give an error and the entire write command will not be executed even if writing to read/write locations were also requested. Exception code 2 is given in this case. “Preserved” means the values is maintained through power outages.

### 32-Bit Input Registers (Read Only):

Register	Description
1	Temperature reading in IEEE 32-bit floating point
3	Humidity reading in IEEE 32-bit floating point
5	CO <sub>2</sub> reading in IEEE 32-bit floating point
7	VOC reading in IEEE 32-bit floating point
9	Model (numeric representation of ASCII characters)
42	Serial number (numeric representation of ASCII characters)

### 32-Bit Holding Registers (Read/Write):

Register	Description
1	Temperature setpoint
3	Humidity setpoint
5	Screen color set
7	Device name
40	Fan speed
42	CO <sub>2</sub> yellow limit
44	CO <sub>2</sub> red limit

Note: All holding registers are preserved during power outages.

### Coils (Read/Write):

Register	Description
2*	CO <sub>2</sub> stoplight
3*	Touchbutton disable
4*	Invoke CO <sub>2</sub> calibration
5*	Temperature (°C)
6	Occupancy override
7*	Touch timeout
8*	Display shows humidity
9*	Display shows CO <sub>2</sub> level
10*	Display shows VOC level
11	Set 400ppm as CO <sub>2</sub> baseline
12*	Display shows temperature setpoint on main screen

\*Preserved during power outages.

## Installation (cont.)

### BACnet Descriptions

Note: In the tables below, all properties are read-only unless otherwise noted. "Preserved" means the value is maintained through power outages.

#### Present\_Value Range Restrictions:

Object Name	Minimum Value	Maximum Value
DEV - Object_Name	1 Character	65 Characters
Temperature Setpoint Min_Pres_Value Max_Pres_Value	Min_Pres_Value 0 Min_Pres_Value +1	Max_Pres_Value Max_Pres_Value -1 50
Humidity Setpoint Min_Pres_Value Max_Pres_Value	Min_Pres_Value 0 Min_Pres_Value +1	Max_Pres_Value Max_Pres_Value -1 100
Screen Color	1	4
CO2 Yellow Limits	400	10000
CO2 Red Limits	400	10000
Fan Speed	1	5
Device_Instance	0	4,194,302

#### Standard Object Types Supported:

Object Type	Supported Optional Properties	Writable Properties
Analog Input - AI	Reliability	None
Analog Value - AV	Min_Pres_Value Max_Pres_Value	Min_Pres_Value Max_Pres_Value Present_Value
Binary Value - BV	None	Present Value
Multistate Value - MSV	None	Present Value
Device - DEV	Max_Info_Frames Max_Master	APDU_Timeout Max_Master Object_Name

#### Objects Table:

Object Name	Object Identifier	Object Property
Room Temperature	AI 1	Temperature in Room
Room Humidity	AI 2	Humidity in Room
CO2 Sensor	AI 3	CO <sub>2</sub> Concentration
VOC Sensor	AI 4	VOC Level
Temperature Setpoint*	AV 1	Setpoint Value for Temperature
Humidity Setpoint*	AV2	Setpoint Value for Humidity
CO2 Yellow Limit*	AV3	CO <sub>2</sub> threshold at which the screen color changes from green to yellow
CO2 Red Limit*	AV4	CO <sub>2</sub> threshold at which the screen color changes from yellow to red
CO2 Stoptlight*	BV 1	ACTIVE enables CO <sub>2</sub> Stoptlight INACTIVE disables CO <sub>2</sub> Stoptlight
Touch Disable*	BV2	ACTIVE disables Touch Response INACTIVE enables Touch Response
CO2 ABC Cal*	BV3	ACTIVE enables ABC Calibration INACTIVE disables ABC Calibration
Temperature Units*	BV4	ACTIVE displays temperature in Fahrenheit INACTIVE displays temperature in Celsius

## Installation (cont.)

Object Name	Object Identifier	Object Property
Occupancy Override	BV5	ACTIVE means room is not occupied INACTIVE means room is occupied
Screen Timeout*	BV 6	ACTIVE enables Screen Timeout INACTIVE disables Screen Timeout
Display Humidity*	BV7	ACTIVE displays humidity on Screen INACTIVE removes humidity from Screen
Display CO2*	BV8	ACTIVE displays CO <sub>2</sub> level on Screen INACTIVE removes CO <sub>2</sub> level from Screen
Display VOC*	BV9	ACTIVE displays VOC level on Screen INACTIVE removes VOC level from Screen
CO2 FRC 400	BV10	ACTIVE sets 400 ppm as CO2 baseline after Present_Value is read INACTIVE leaves CO2 baseline in last state (no action)
Select Temperature Display*	BV11	ACTIVE displays temperature setpoint on main screen INACTIVE displays temperature setpoint in upper left corner and current temperature on main screen
Screen Color Set*	MSV 1	Selection for Screen Color Theme
Fan Speed*	MSV 2	Fan Speed Selection

\* Preserved during power outages.

### Device Objects Table:

Object Name	Object Identifier	Object Property	Description
Living Space Room Unit XXXXXXX	Vendor_ID + nnn	Object _Identifier (R/W)	Unique value where nnn initially is the MS/TP address

### BACnet Protocol Implementation Conformance Statement

Vendor Name: Veris Industries

Product Name: Living Space Room Unit

Product Model: CW2XXXX

BACnet Protocol Version : 1

BACnet Protocol Revision: 16

Product Description: Environmental Sensor

BACnet Standardized Device Profile (AnnexL):

BACnet Application Specific Controller (B-ASC)

List All BACnet Interoperability Building Blocks Supported(Annex K):

DS-RP-B, DS-RPM-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B

Data Link Layer Options: MS/TP (Clause 9), baud rates, 9600, 19200, 38400, 76800

Device Address Binding: Static Device binding is not supported.

Networking Options: None

Character Sets supported: ISO 10646 (UTF-8)

- With sensor base fully installed, align top of cover to mounting tabs on top of sensor base. Swing cover downward until it latches at the bottom.





## Installation (cont.)

7. Install locking screw to secure cover in closed position.

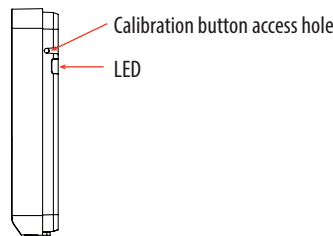


## CO<sub>2</sub> Sensor Calibration

There are two methods for CO<sub>2</sub> calibration available: 400 ppm baseline calibration and automatic baseline calibration (ABC).

### 400 ppm Baseline Calibration

400 ppm baseline calibration allows the sensor to be set at 400 ppm. Push and hold the calibration button for 3 to 5 seconds. The LED will flash green. Once the button is released, calibration is complete and the LED switches off.



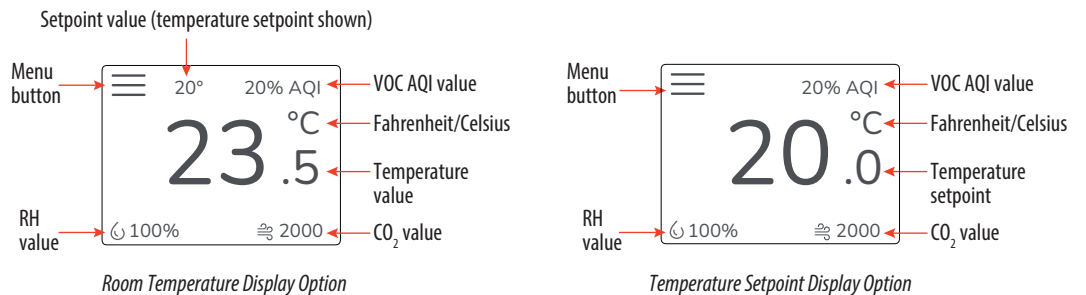
### Automatic Baseline Calibration (ABC)

The ABC mode addresses the 400 ppm calibration. It allows turning on or off a background correction/recovery mode that will minimize any calibration error that has been caused by shock during handling and transportation or is caused by a long term shift in measurement. The ABC algorithm constantly keeps track of the sensor's lowest reading over a preconfigured time interval and slowly corrects for any long-term drift detected as compared to the expected fresh air value of 400 ppm. After initial startup, it is expected that the sensor reaches specified accuracy after 7 to 21 days.

## Touchscreen Operation

### Main Screen

The touchscreen user interface displays applicable sensor output values (temperature, RH, CO<sub>2</sub> and VOC), setpoint value, menu button and CO<sub>2</sub> stoplight status (if enabled).



### Menu Screen

The menu screen opens when pressing the Menu button on the main screen. Integrator's submenu, occupancy/override, Fahrenheit/Celsius, settings, setpoint submenu (temp, RH and fan) and CO<sub>2</sub> stoplight buttons are displayed on the menu screen.



Note: RH setpoint will not appear on non-RH models.

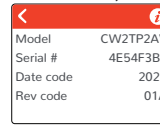
## Touchscreen Operation (cont.)

### Menu Button Functions



**Integrator's Submenu**  
Press this icon to access the Integrator's menu.

Submenu Only



**Occupied Override Button**  
Press this icon to provide momentary signal output to the controller

Single Press Only

Signals occupied/override call to controller.



**Fahrenheit/Celsius Switch**  
Press this icon to display either °C or °F.

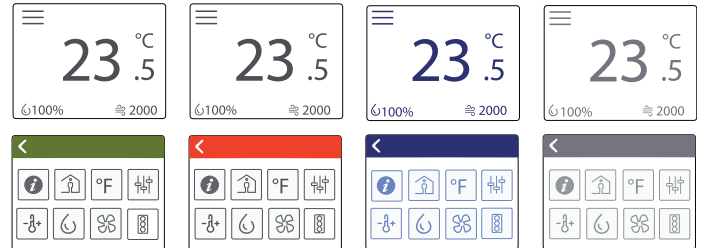
Single Press Only

Changes units to Fahrenheit when pressed.  
 Changes units to Celsius when pressed.



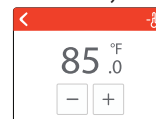
**Settings**  
This icon provides the ability to change the color scheme of the display.

Submenu Only



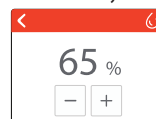
**Temp Setpoint Adjustment**  
Click this icon to access the setpoint change menu.

Submenu Only



**Humidity Setpoint Adjustment**  
Click this icon to access the setpoint change menu.

Submenu Only



**Fan Speed**  
Click this icon to access the fan speed menu.

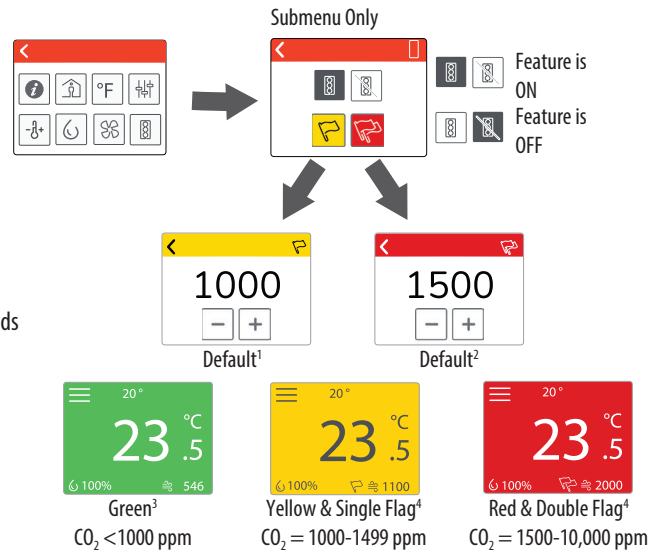
Submenu Only



## Touchscreen Operation (cont.)

**CO<sub>2</sub> Stoplight Menu**  
 Click this icon to toggle the CO<sub>2</sub> Stoplight feature on and off. With CO<sub>2</sub> Stoplight turned on, the background color of the main screen changes with CO<sub>2</sub> level. This provides a visual indicator of CO<sub>2</sub> levels to the room occupants.

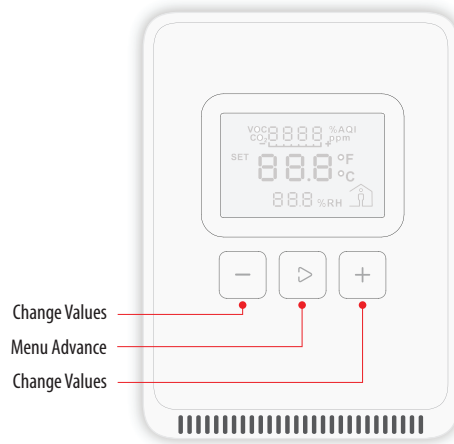
Using the +/- buttons, the thresholds at which the colors change on the main screen are user configurable, as described in the diagram.



1. Values <400 ppm will be rounded up to the minimum limit of 400 ppm.
2. Values >10,000 ppm will be rounded down to the maximum limit of 10,000 ppm.
3. Possible to adjust CO<sub>2</sub> thresholds by changing the yellow and red limits.
4. User configurable in increments of 10 ppm using the +/- buttons. With a long press of these buttons, the number will change more quickly.

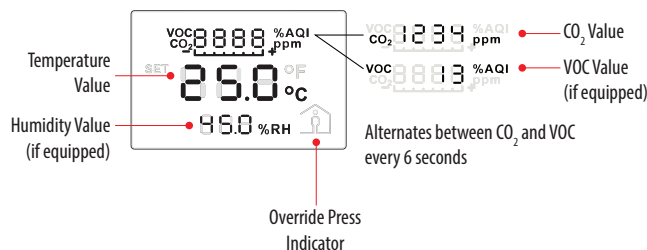
## LCD Display Operation

### Button Functions



### Display Icons

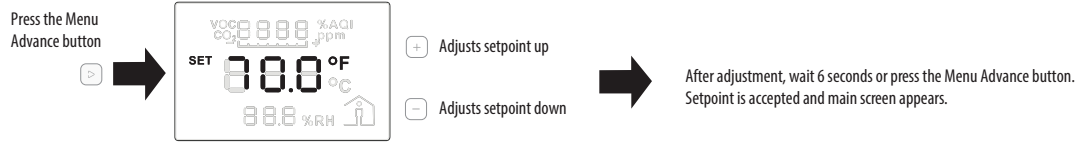
The main screen displays sensor values for CO<sub>2</sub>, VOC (if equipped), RH (if equipped), room temperature or temperature setpoint and Celsius/Fahrenheit.



## Setpoint Function

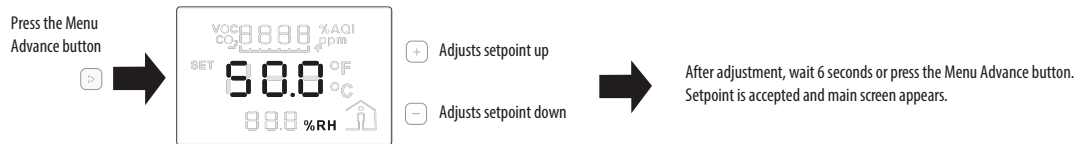
The Menu Advance button cycles between Temperature, RH (if equipped), Fan Speed setpoints and Celsius/Fahrenheit adjustment screens in order.

### Temperature Setpoint Adjustment



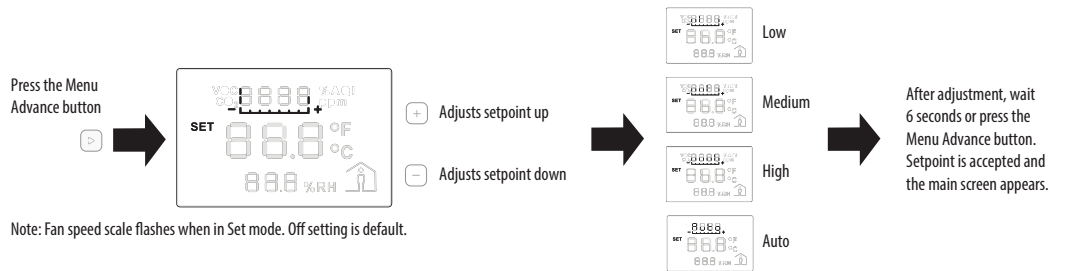
Note: Numeric information will flash while in Set mode.

### RH Setpoint Adjustment



Note: Numeric information will flash while in Set mode.

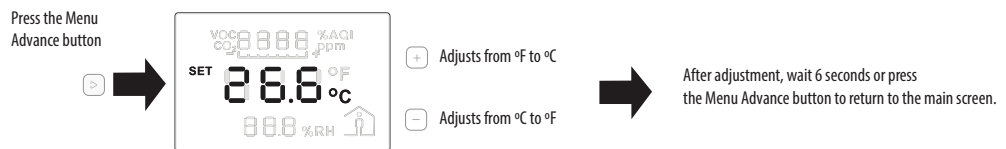
### Fan Speed Setpoint Adjustment



Note: Fan speed scale flashes when in Set mode. Off setting is default.

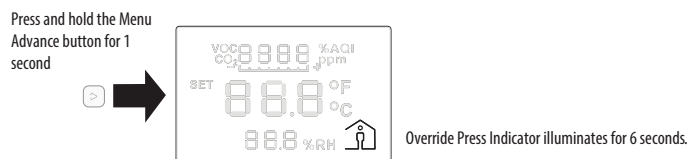
### Changing Celsius and Fahrenheit Scales

The Menu Advance button cycles between Temperature, RH (if equipped), Fan Speed setpoints and Celsius/Fahrenheit adjustment screens in order.



Note: °F or °C text will flash while in Set mode.

### Occupied/Override Button



## China RoHS Compliance Information

*Environment-Friendly Use Period (EFUP) Table*

部件名称	有害物质 - Hazardous Substances					
Part Name	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
电子件 Electronic	X	O	O	O	O	O

本表格依据SJ/T11364的规定编制。

O: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。

(企业可在此处，根据实际情况对上表中打“X”的技术原因进行进一步说明。)

This table is made according to SJ/T 11364.

O: indicates that the concentration of hazardous substance in all of the homogeneous materials for this part is below the limit as stipulated in GB/T 26572.

X: indicates that concentration of hazardous substance in at least one of the homogeneous materials used for this part is above the limit as stipulated in GB/T 26572

Z000057-0B