CD2

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⚠ WARNING

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions can result in death, serious injury or equipment damage.

This product is intended for use in HVAC and building environmental control applications.
It is not intended for direct medical monitoring of patients.
It is not intended for life-safety applications.
Read and understand these instructions before installing this product.
The installer is responsible for 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.

CD2 Protocol Series

Duct Mount Air Quality Sensors

Product Overview

CD2 Protocol Series Air Quality Sensors are duct mount all-in-one sensors for monitoring air quality. The device combines CO_2, temperature, humidity, VOC and particulate matter (PM) sensing into a single unit to ensure a building's optimum air quality and energy efficiency.

Each device is an active sensor that converts a measurement into BACnet MS/TP or Modbus RTU outputs.

Different models are available based on application requirements for lower-cost installations.

The CD2 Protocol Series is available with an LCD display option on selected models. See the Product Identification section below for details.

Product Identification

Model	LCD	2% RH Sensor	Temp. Transmitter	NDIR CO2	VOC	PM
CD2LP2AVP	X	X	X	X	X	X
CD2LP2AVX	X	X	X	X	X	
CD2LPXAVP	X		X	X	X	X
CD2LPXAVX	X		X	X	X	
CD2XP2AVP		X	X	X	X	X
CD2XP2AVX		X	X	X	X	
CD2XPXAVP			X	X	X	X
CD2XPXAVX			X	X	X	

Note: Replaceable RH and temperature modules available to be ordered separately per table below.

Replaceable RH Elements & Temperature and Humidity Calibration Modules

Model	Description	Temp. Calibration	RH Calibration
HS1N	Replaceable RH sensor, 1% with NIST certificate	N/A	2-point calibration
HS2N*	Replaceable RH sensor, 2% with NIST certificate	N/A	2-point calibration
HS2X	Replaceable RH sensor, 2%	N/A	2-point calibration
TS2**	Replaceable temperature module with 2-point calibration certificate	2-point calibration	N/A
THS2**	Replaceable temperature and humidity module with 2-point calibration certificate	2-point calibration	2-point calibration

**Not for use with HO2 Series outdoor humidity sensors. **For use on temperature transmitter models only.*
Note: For instructions on installing replaceable elements, see Z208535-0x, Replacement Humidity and Temperature Sensors Installation Guide.

Specifications

OPERATING / STORAGE ENVIRONMENT	
Operating Temp. Range	0 to 50 °C (32 to 122 °F)
Operating Humidity Range	0 to 95% RH (non-condensing)
Storage Temp. Range	-25 to 70 °C (-13 to 158 °F)
Storage Humidity Range	0 to 95% RH (non-condensing)
Power Supply	3-wire volt mode: 20 to 30 Vdc, 24 Vac, 50 to 60 Hz

Specifications (cont.)

Output	BACnet MS/TP, Modbus RTU	
Power Consumption	See Maximum Power Consumption table, page 8	
Tube Length	200 mm	
Medium	Neutral gas, air	
Housing Material	Polycarbonate; flammability rating UL 94 V0	
Mouting Location	For indoor use only. Not suitable for wet locations.	
IP Rating	IP65	
Protection Class	Class III	
CO_2 SENSOR		
Sensor Type	Non-dispersive infrared (NDIR), diffusion sampling	
Output Range	0 to 10,000 ppm	
Accuracy	±30 ppm ±3% of measured value	
Repeatability	±20 ppm ±1% of measured value	
Response Time	<60 seconds for 90% step change	
Calibration	Field calibration support	
VOC SENSOR OPTION		
Sensor Type	Solid state	
Output Range	0 to 100% AQI for VOC	
Accuracy	±15% sensor-to-sensor variation	
	Level	**Ventilation Recommendation**
AQI Table	>61%	Greatly increased
	20 to 61%	Significantly increased
	10 to 20%	Slightly increased
	5 to 10%	Average
	0 to 5%	Target value
RH SENSOR OPTION		
Sensor Type	Solid state capacitive, replaceable	
Accuracy*	±2% from 10 to 80% RH @ 25 °C (77 °F) ±1%, ±2% replaceable models	
Hysteresis	1.5% typical	
Linearity	Included in accuracy specification	
Stability	±1% @ 20°C (68 °F) annually for 2 years	
Output Range	0 to 100% RH	
Temperature Coefficient	±0.1% RH/°C above or below 25 °C (77 °F) typical	
TEMPERATURE SENSOR OPTION		
Sensor Type	Solid state, integrated circuit	
Time Constant	Air velocity 1.5 m/s. approx. 72 s; Air velocity 3.0 m/s. approx. 52 s	
Accuracy**	±0.2 °C (±0.4 °F) typical @ 25 °C	
Resolution	0.1 °C (0.1 °F)	
Range	0 to 50 °C (32 to 122 °F)	
PM SENSOR OPTION		
Sensor Type	Laser-scatter	
Particulate Size	PM1.0, PM2.5, PM4.0, PM10	
Resolution	±1 $\mu g/m^3$	

Specifications (cont.)

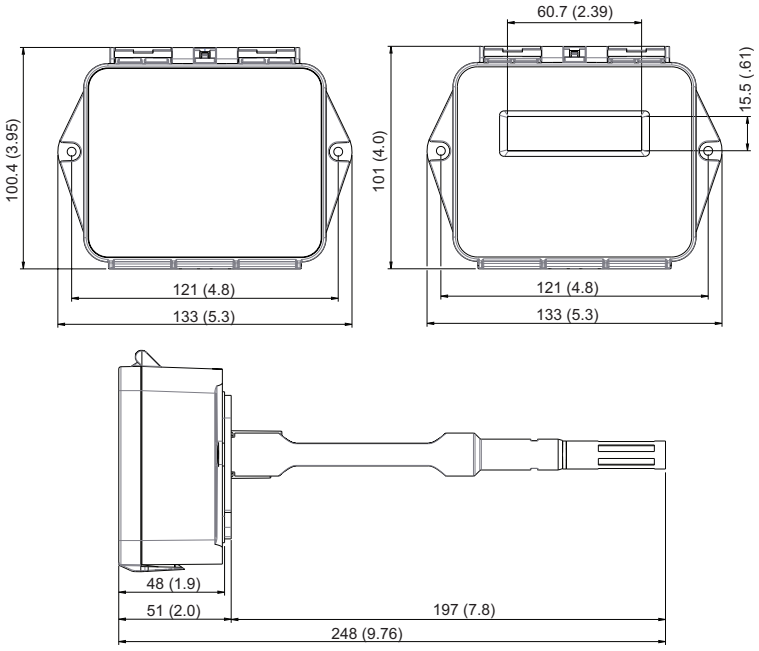
Mass Concentration Range	±1 µg/m³
Accuracy* **	PM 1 and PM 2.5: ±10 µg/m³ (0 to 100 µg/m³), ±10% (100 to 1000 µg/m³) PM 4 and PM 10: ±25 µg/m³ (0 to 100 µg/m³), ±25% (100 to 1000 µg/m³)
DISPLAY MODELS	
LCD Type	Positive display with backlight
Measurement Values Displayed	CO_2: ppm, Temp: °C or °F, Humidity: % RH, VOC: % AQI, PM: µg/m³
Display Resolution	CO_2: 1 ppm, Temp: 0.1 °C or °F, Humidity: 0.1% RH, VOC: 1% AQI, PM: 1 µg/m³
WIRING TERMINALS	
Terminal Blocks	Screwless terminal block with spring actuator, 16-24 AWG
WARRANTY	
Limited Warranty	5 years
COMPLIANCE INFORMATION	
Agency Approvals	UL 916 European Conformance CE: EN 60730-1, EN 61000-6-2, EN 61000-6-3, EN 61000 Series - Industrial Immunity, EN 61326-1 FCC Part 15 Class A, REACH, RoHS, RoHS 2 (China), RCM (Australia), ICES-003 (Canada), UKCA (UK)

** Humidity sensor measurement uncertainty should include: accuracy, hysteresis, temperature coefficient and stability.*

***±0.5 °C over full operating range.*

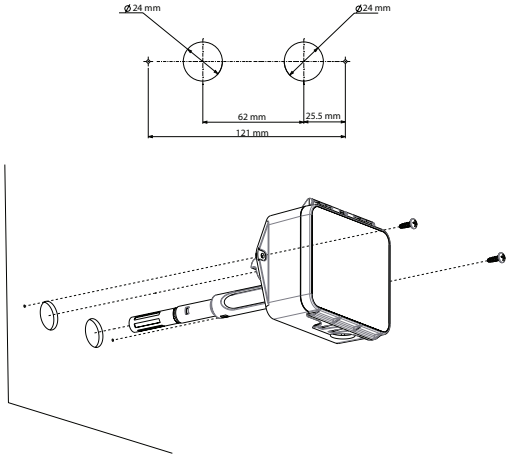
**** Sensor-to-sensor variation. PM4 and PM10 output values are calculated based on the distribution profile of all measured particles.*

Dimensions mm (in.)

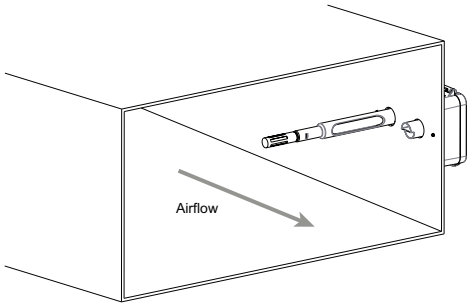


Installation

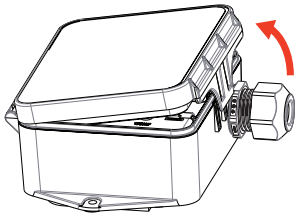
1. Prepare the duct for installation by drilling holes to accommodate the probe tubes for the PM sensor and CO_2/VOC intake. Ensure the gasket on the back is depressed to prevent leakage between the product and the duct. Do not over-tighten the screws.

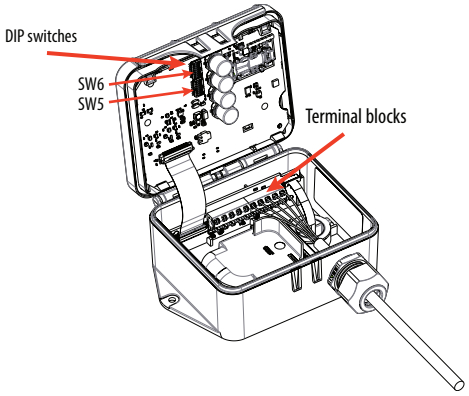


2. Ensure the probes are installed in the direction of the air flow. Install the probe in the middle of the duct and away from any restrictions to allow proper air flow.



3. Release the latch on the lid to access the DIP switches and terminal block.





Installation (cont.)

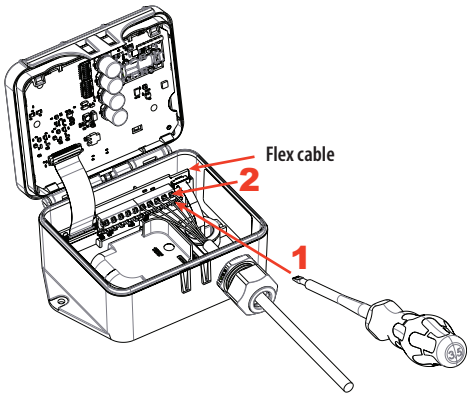
4. Wire the connections per the diagram in the Wiring section below. This device features spring terminals for screwless termination. Open the terminal point by inserting a screwdriver, then insert the wire above. Release the screwdriver to hold the wire in place. Details on wiring and configuration are contained in the next sections of this document.

NOTICE

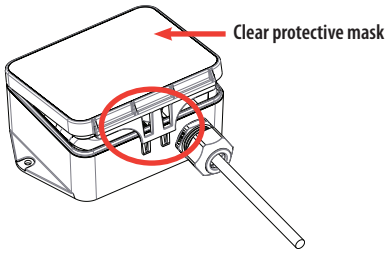
MISSING TEMPERATURE AND HUMIDITY READINGS

- Ensure flex cable is in place after wiring.

Failure to follow these instructions can result in no temperature or humidity readings.



5. Secure the latch-on cover in the closed position and remove the clear protective mask on the front label of the device.



Wiring

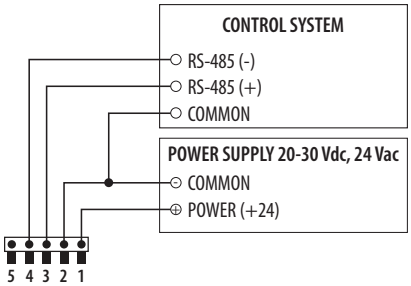
NOTICE

INACCURATE READINGS

- Do not run wiring in the same conduit as AC power wiring. Close proximity to AC power may influence accuracy.

Failure to follow these instructions can result in reduced accuracy.

Wiring Diagram

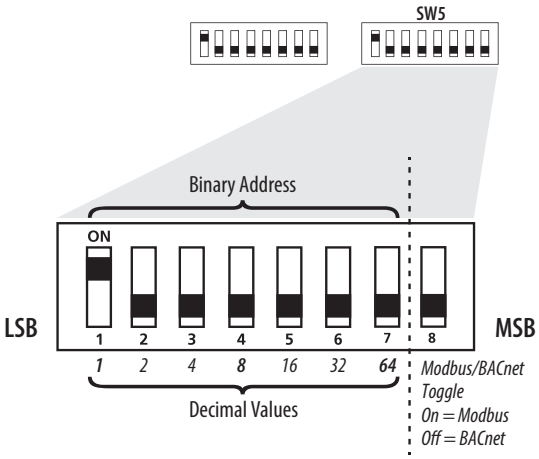


Configuration

Address Configuration

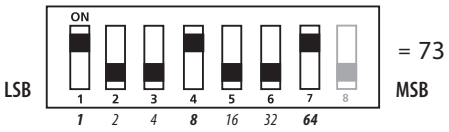
Each device on a single network must have a unique address. Set the DIP switch labeled "ADDRESS" to assign a unique address before the device is connected to the network. If an address is selected that conflicts with another device, neither device will be able to communicate.

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 right 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.



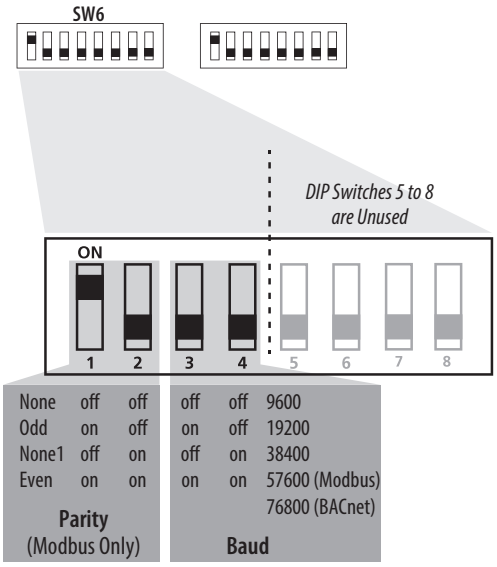
Position number 1 has an ON value of 1, position number 4 has an ON value of 8 and position number 7 has an ON value of 64 (1 + 8 + 64 = 73).

Communications Configuration

See the Installation section, Step 3 for the location of the DIP switches. The following parameters are configurable:

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

Configuration (cont.)



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			

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.

Configuration (cont.)

32-Bit Input Registers (Read Only):

16-Bit Register Location	Description	Format
1	Temp reading	32-bit floating point
2		
3	Humidity reading	32-bit floating point
4		
5	CO2 reading	32-bit floating point
6		
7	VOC reading	32-bit floating point
8		
9	Model number	5x16-bit ASCII characters as a single query
10		
11		
12		
13		
14~41	Unused	NA
42	Serial number	4x16-bit ASCII characters as a single query
43		
44		
45		
46-47	PM1 reading	32-bit integer
48-49	PM2.5 reading	
50-51	PM4 reading	
52-53	PM10 reading	

32-Bit Holding Registers (Read/Write):

16-Bit Register Location	Description	Format
7~39	Device name	4x16-bit ASCII characters as a single query

Note: All holding registers are preserved during power outages.

Coils (Read/Write):

Register	Description
4*	Invoke CO_2 calibration
5*	Sets display (only) temperature units (1 = °F, 0 = °C)
11	Triggers the CO_2 FRC 400 command

**Preserved during power outages.*

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
Device_Instance	0	4,194,302

Configuration (cont.)

Standard Object Types Supported:

Object Type	Supported Optional Properties	Writable Properties
Analog Input - AI	Reliability	None
Binary Value - BV	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 (°C)
Room Humidity	AI 2	Humidity in Room
CO2 Sensor	AI 3	CO_2 Concentration
VOC Sensor	AI 4	VOC Level
PM1 Sensor	AI 5	PM1.0 Level
PM2.5 Sensor	AI 6	PM2.5 Level
PM4 Sensor	AI 7	PM4.0 Level
PM10 Sensor	AI 8	PM10.0 Level
CO2 ABC Cal*	BV3	ACTIVE enables ABC Calibration INACTIVE disables ABC Calibration
Temperature Units*	BV4	ACTIVE displays temperature in Fahrenhiet INACTIVE displays temperature in Celsius
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)

** Preserved during power outages. Applicable to LCD models only.*

Device Objects Table:

Object Name	Object Identifier	Object Property	Description
Plant Room Units XXXXXXXX	Vendor_ID + nnn	Object _Identifer (R/W)	Unique value where nnn initially is the MS/TP address

BACnet Protocol Implementation Conformance Statement

Vendor Name: Veris Industries
Product Name: Plant Room Air Quality Unit
Product Model: CD2XPXXXX
BACnet Protocol Version: 1
BACnet Protocol Revision: 16
Product Description: Environmental Sensor
BACnet Standardized Device Profile (AnnexL): BACnet Application Specific Controller (B-ASC)

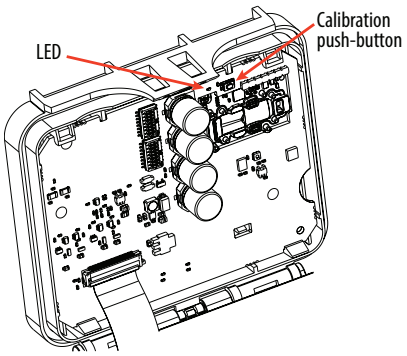
CO_2 Sensor Calibration

There are two methods for CO_2 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.

CO_2 Sensor Calibration (cont.)



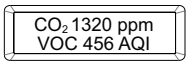
LCD Operation

Automatic Baseline Calibration (ABC)

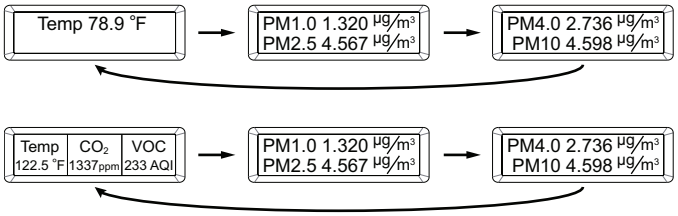
The ABC mode addresses the 400 ppm calibration. It allows turning on or off a background correction/recovery mode that will minimize any calibration error that has been caused by shock during handling and transportation or is caused by a long term shift in measurement. The ABC algorithm constantly keeps 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.

The screen displays sensor values for CO_2, PM, VOC (if equipped), RH (if equipped), temperature and Celsius/Fahrenheit.

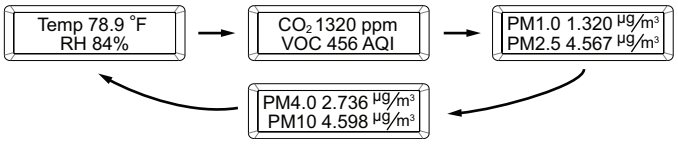
Single-Screen Operation



3-Screen Operation



4-Screen Operation



Maximum Power Consumption

Series	LCD	CO_2/VOC	PM	Temp/RH	Max. Power
CD2 Protocol	Yes	Yes	Yes	Yes	4VA @24VAC
	Yes	Yes	No	Yes	3VA @24VAC
	No	Yes	Yes	Yes	2VA @24VAC
	Yes	Yes	No	Yes	1.5VA @24VAC

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

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