MerryIoT Air Quality CO2

Reference Manual

CD10-915

CD10-868

Model Name: CD10

Table of Content

1. Description

The MerryIoT Air Quality CO2 is designed for in-home and in-building usage for consumer or facility management applications. The design is optimized for high-volume manufacturing, optimal battery lifetime, and pleasing aesthetics for in-building placement.

2. Specifications

2.1 Mechanical

2.1.1 Sensor

Length x Width x Height	90mm x 70mm x 35mm
Weight	96 g without battery 124 g with battery
Sensor	CO2 Temperature & Relative Humidity

2.2 Environmental

Temperature	0°C to +50°C
IP Rating	IP X0 equivalent

2.3 Power

Source	3.6V AA Li-SOCI2 2700 mAh battery x 2
System Maximum Voltage	3.6V
System Minimum Voltage	2.8V
Max. Current	120 mA
Min. Current	20 µA (Sleeping mode)

2.4 Radio

Frequency	Either 863–870MHz for EU models and 902–928MHz for North America
Rx Sensitivity (Conducted)	-137 dBm
Antenna Gain (Lora)	0.61 dBi (Peak)
Antenna Gain (BLE)	2.71 dBi (Peak)

2.5 User Interface

LEDs	LED Ring with Red/Yellow/Green color indicators
CO2	CO2 sensor
Button	Test Button
Buzzer	Alarm 0cm 75dB
Wave	A proximity sensor detects within 3cm

2.6 Certifications and Conformity

FCC	2AAS9CD10
CE	Certified.
IC	26296-CD10

2.7 Additional Features

Battery Monitoring	

3. Operation

3.1 Installation Mode

- Users need to press the button for over 5 seconds to activate the operation into installation mode. When the Sensor tries to join the network, it will keep blinking the yellow LED for 3 seconds.
- Once the sensor joins the network, the yellow LED will keep on for 3 seconds and send an uplink with a CO2 value of 0.
- Users can press the button for over 5 seconds to try to join the network again.

3.2 Default Operation

- During default operation the device will send a message to the network anytime there is a sufficient delta in the environmental conditions
  - CO2 over the threshold (Buzzer alarm)
  - Button pressed (No buzzer alarm)
  - Keepalive message (No buzzer alarm)
- The precise trigger values can be found in 4.1.2.
- Users can press the button to send a test message to the network.
- When the user waves in front of the sensor, the LEDs will show the CO2 status as below for 5 seconds. (Table 1). Default disable.
- The device will send a message that it has been inactive for 60 minutes.
- The device will detect the environment every 10 minutes.
- While in default mode the device will flash the yellow LED 3 times within 100ms only when the user presses the test button.

- The device will send uplink three times with the FW version when the device joined successfully.

CO2 PPM	Air Quality	LED Color Indication
> 1000	Poor	Red
800~1000	Fair	Yellow
< 800	Good	Green

Table 1. CO2 Air Quality LED indicator

4. Messages

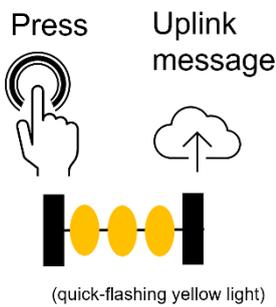LoRaWAN Packets for this device use port 127

4.1 Status

4.1.1 Triggers

CO2 Sensor Packet Triggers:

- 60-minute inactivity

- CO2 > 1000 ppm

- The device will scan the environment every 10 minutes.

Button Pressed Trigger:

- A single press-send uplink message

Press   Uplink
message

(quick-flashing yellow light)

- ■ The first 10 minutes after joining: Immediately send a message with values of Temperature, Relative Humidity. Yet, CO2 values as 0 ppm.

- ■ 10 minutes after, in normal operation: Immediately send a message with Temperature, Relative Humidity values, and actual CO2 values with the last time readings.

- Long press more than **5s**-Rejoin trigger

Press & hold   release   Join successfully

(solid yellow light)   (quick-flashing yellow light)   (solid yellow light)

5 sec.
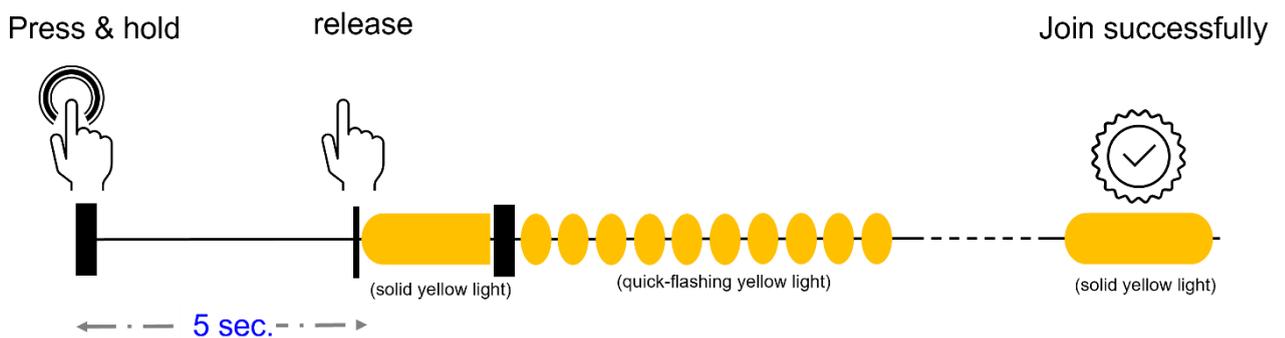
- Long press more than **10s**-CO2 Forced Recalibration (will only carry out after joining in LNS successfully):
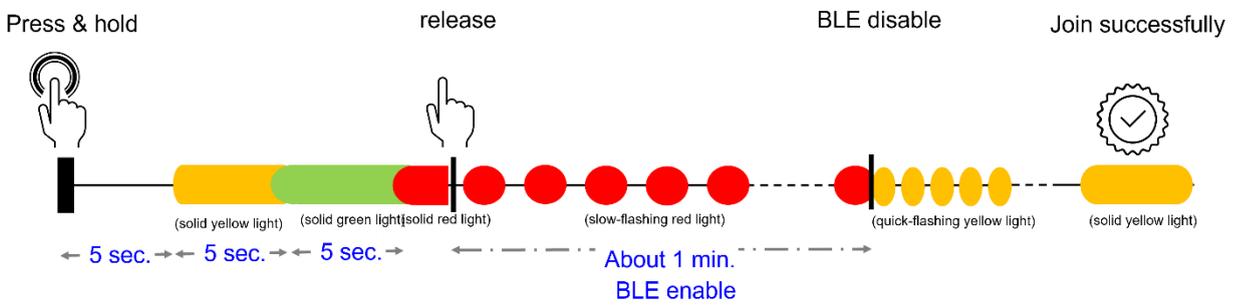
Press & hold | release | Uplink message

(solid yellow light) (solid green light)

← 5 sec. → ← 5 sec. → ←— · — · —— · —— · About 10 min. · —— · —— · —— · —— · →
Forced calibration in process
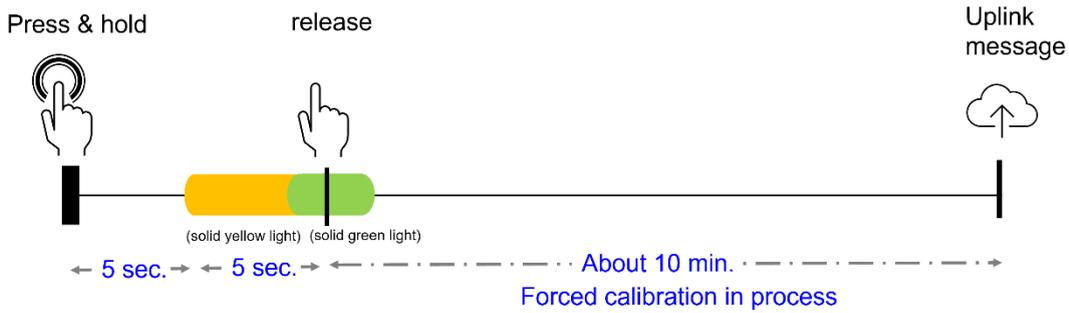
- ■ Bring the device outside in the fresh air then press and hold the button for over 10 seconds until the Green LED starts blinking. Leave the Sensor in the fresh air for 10 minutes.

  *CAUTION: Please make sure to carry out this procedure in a fresh-air environment, or the sensor might have a false reading.

- Long press more than **15s**-BLE DFU Mode:

Press & hold | release | BLE disable | Join successfully

(solid yellow light) (solid green light)(solid red light) (slow-flashing red light) (quick-flashing yellow light) (solid yellow light)

← 5 sec. → ← 5 sec. → ← 5 sec. → ←— · —— · —— · About 1 min. · —— · —— · —— →
BLE enable

- ■ Press and hold the button for over 15 seconds until the RED LED starts blinking. The Red LED starts blinking (like a breathing light) which means the DFU mode is enabled. Users can use BLE to upgrade the FW.

CO2 Auto Calibration:

- The CO2 sensor has an auto-calibration algorithm for achieving maintenance-free gas sensors. By sampling the values for 8 days and then comparing the lowest stable value with the meter 400 points, it adjusts the zero point according to the new value. The sensor must be placed in an environment where the CO2 level is expected to drop to nearly outside air at least once a week when this function is enabled.

4.1.2 Payload

Port	127
Payload Length	7 bytes

Bytes	0	1	2	3	4	5	6
Field	Status	Battery	Temp.		RH	CO$_2$	

Status	**Sensor status**	
	Bits [0]	1 – Trigger Event, 0 – Keepalive
	Bits [1]	1 – Button pressed, 0 - Button released
	Bits [2]	RFU
	Bits [3]	RFU
	Bits [4]	1 - CO2 is over the threshold (CO2 > 1000 ppm)
	Bits [5]	1 - CO2 Calibration flag
	Bits [6:7]	RFU

Battery	**Battery level**	
	Bits [3:0]	unsigned value v, range 0 – 15.
		battery voltage in V = (21 + v) ÷ 10.
	Bits [7:4]	RFU

Temp	**Environment Temperature**	
	Bits [15:0]	Signed value x, little-endian format.
		Temperature measurement range : -40.0 ~ 70.0 °C
		Ex.
		Positive number:
		EF01 => 01EF = 495, Temp = 495 ÷ 10 = 49.5 °C
		Negative number:
		F0FF => FFF0 = 65520 +(-65535) -1 =-16
		Temp = -16 ÷ 10 = -1.6 °C

RH	**Relative humidity as measured by the digital sensor**	
	Bits [6:0]	unsigned value in %, range 0-100.
	Bit [7]	RFU

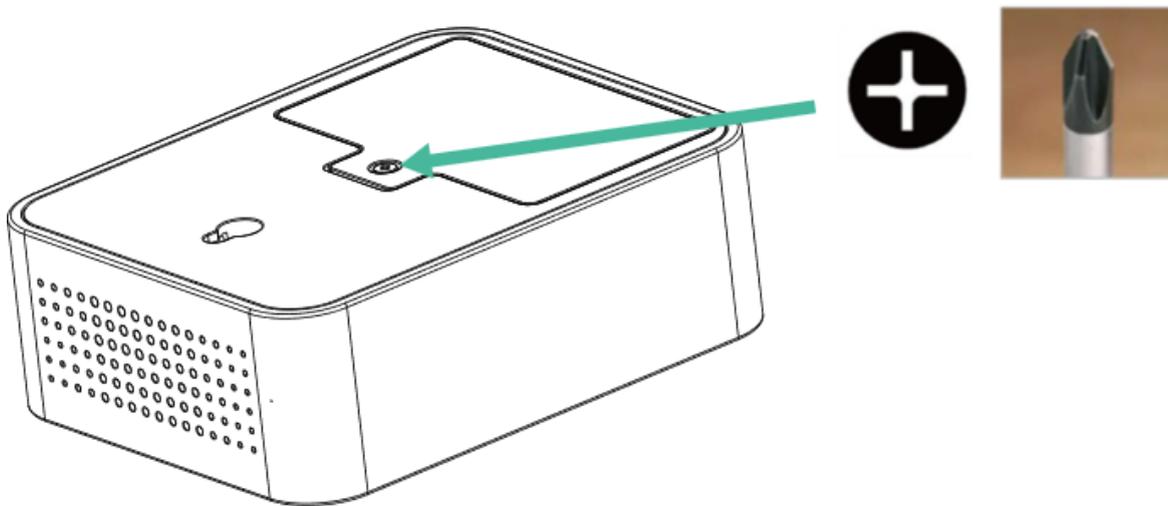| CO$_2$	**CO2 equivalent estimate**	
	Bits [15:0]	Unsigned value in ppm, range 0-40000.
		*Note: little-endian format.

5. Battery

5.1 Replacement

1 **Tools: Cross-type screwdriver x 1 (PH0)**

2 **Remove the battery cover of the sensor with a cross-type screwdriver (PH0 size).**

3 **Replace the battery with new ones (Li-SiO2 battery, "ER14505", AA size x 2 pcs).**
   *Caution: Using batteries other than the ones provided may result in loss of performance and battery life, and also damage to the device. Dispose of properly, observing environmental protection rules. Mixing of cells can result in battery leakage and sub-optimal device performance.

X2

ER14505*

Lithium-thionyl Chloride
(Li-SOCl2) Battery, AA
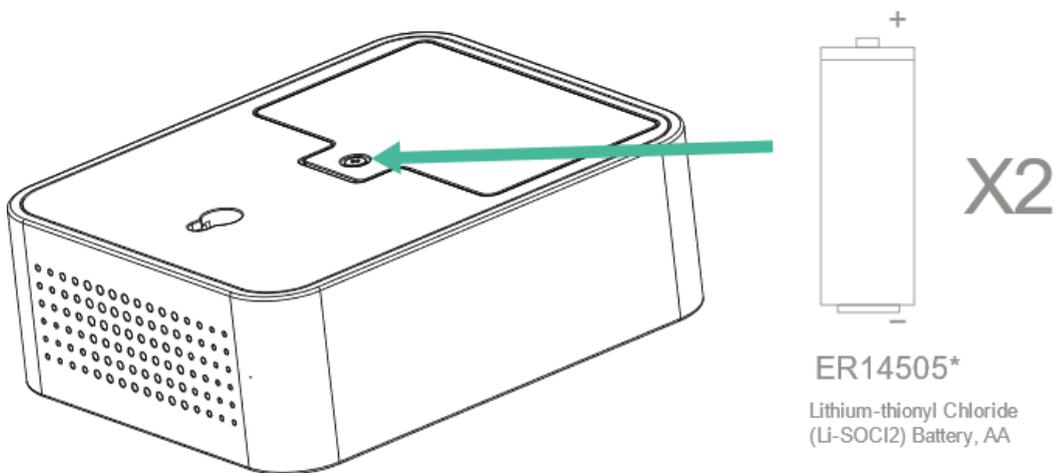
4 **Re-assemble the battery cover.**

5.2 Cautions

CAUTION: Disposal of a battery (or battery pack) into a fire or a hot oven, or mechanically crushing or cutting of a battery (or battery pack) can result in an EXPLOSION!

Leaving a battery (or battery pack) in an extremely high temperature surrounding environment can result in an EXPLOSION or leakage of flammable liquid or gas.

A battery (or battery pack) subjected to extremely low air pressure may also result in an EXPLOSION or leakage of flammable liquid or gas.

Discard used batteries according to the manufacturer's instructions.

CAUTION: The unit is provided with a battery-powered circuit.

There is a danger of explosion if the battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer.

Discard used batteries according to the manufacturer's instructions.

Risk of Explosion if Battery is replaced by an Incorrect Type. Dispose of Used Batteries according to the Instructions.
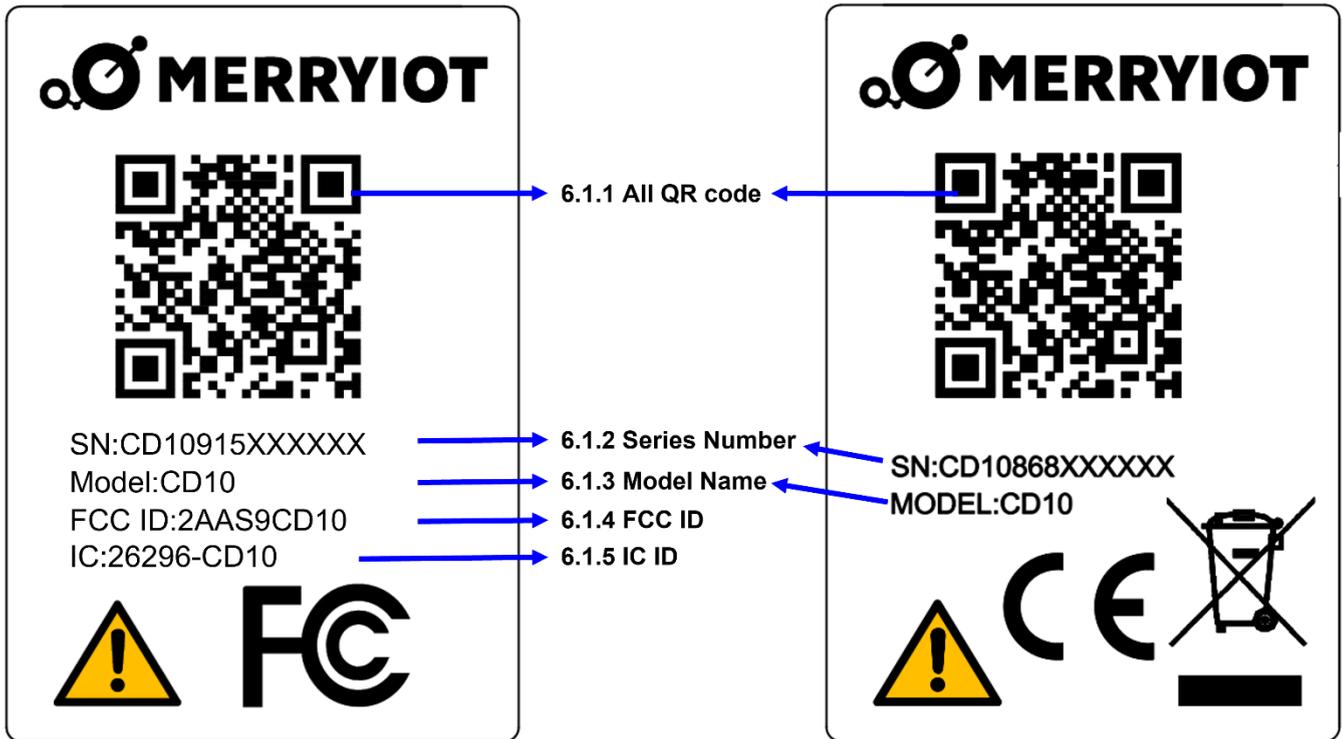
6. Installation

●Represeantive location
●Free airflow
●No heat sources

●Restricted airflow
●In direct sunlight from window
●Close to heat sources

1.22m
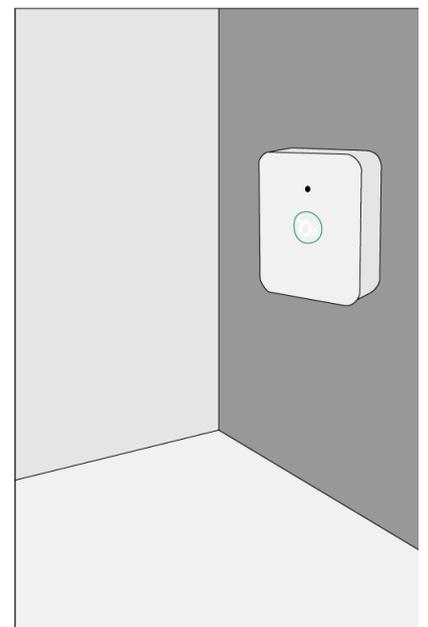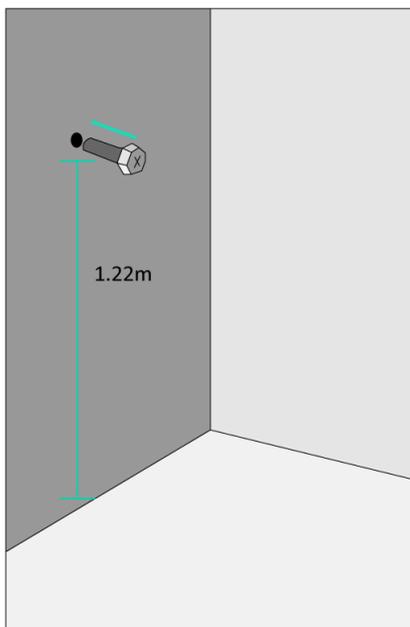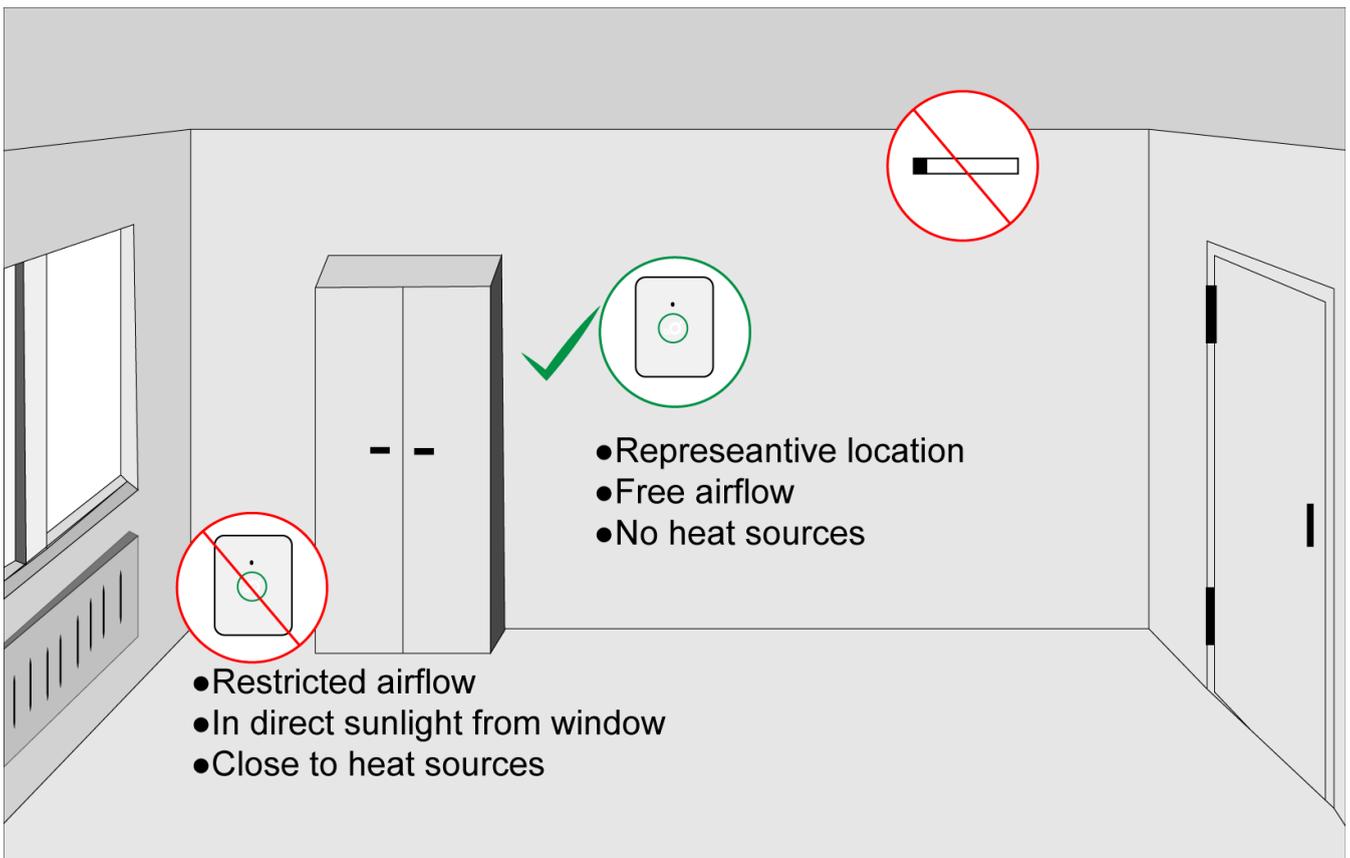
7. Label format information

7.1 Device back label

7.1.1 All QR code

URN:LW:D0: 0016160000000003:0016160000XXXXXX:01632001

The total maximum resulting character sentence is 48 alphanumeric characters long.

7.1.1.1 JoinEUI
900MHz: 0016160000000003. (US)
800MHz: 0016160000000004. (EU)
Uses a hexadecimal representation resulting in 16 characters.

7.1.1.2 DevEUI
0016160000XXXXXX.
Uses a hexadecimal representation resulting in 16 characters

7.1.1.3 ProfileID
The profile identifier encodes a Vendor Identifier and a Vendor Profile Identifier as a hexadecimal representation resulting in 8 characters.

7.1.1.3.1 VendorID
0163
VendorID is assigned by the LoRa Alliance.

7.1.1.3.2 VendorProfileID
900MHz: 2001 (US)
800MHz: 3001 (EU)

7.1.2 Serial Number

SN: CD10915XXXXXX

Not included in the QR code.

7.1.3 Model Name

MODEL: CD10.

Fixed code, not including in QR code.

7.1.4 FCC ID

2AAS9CD10

7.1.5 IC ID

26296-CD10

7.1.6 Caution!

⚠️ For more information, please refer to chapter 5.2. and 10.

7.2 Packaging label

GS1 DataMatrix

- The GS1 Application Identifier (21) indicates that the GS1 Application Identifier data field contains a serial number.
- The GS1 Application Identifier (92) assigned to the company's internal information is DevEUI.

Barcode (Code 128)
SKU No.:
SEN-000104-915
*NOTE: different SKU with different numbers.

8. Important Product & Safety Instructions

For the most current and more detailed information about Browan features and settings as well as safety instructions, please download the user manual for the products online at www.browan.com before the use of any Browan products or services.

Certain sensors contain magnets. **Keep away from ALL Children!** Do not put it in your nose or mouth. Swallowed magnets can stick to intestines causing serious injury or death. Seek immediate medical attention if magnets are swallowed.

These products are not toys and contain small parts that can be dangerous to children under 3 years old. Do not allow children or pets to play with products.

Observe proper precautions when handling batteries. Batteries may leak or explode if improperly handled.

Observe the following precautions to avoid a sensor explosion or fire:

- Do not drop, disassemble, open, crush, bend, deform, puncture, shred, microwave, incinerate, or paint the sensors, Hub, or other hardware.

- Do not insert foreign objects into any opening on the sensors or Hub, such as the USB port.

- Do not use the hardware if it has been damaged—for example, if cracked, punctured, or harmed by water.

- Disassembling or puncturing the battery (whether integrated or removable) can cause an explosion or fire.

- Do not dry the sensors or battery with an external heat source such as a microwave oven or hairdryer.

9. Warnings

- Do not place naked flame sources, such as lighted candles, on or near the equipment.

- The battery shall not be exposed to excessive heat such as sunshine, fire, or the like.

- Do not dismantle, open or shred battery packs or cells.

- Do not expose batteries to heat or fire. Avoid storage in direct sunlight.

- Do not short-circuit the battery. Do not store batteries in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects.

- Do not remove a battery from its original packaging until required for use.

- Do not subject batteries to mechanical shock.

- In the event of a battery leaking, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts of water, and seek medical advice.

- Do not use any charger other than that specifically provided for use with the equipment.

- Observe the plus (+) and minus (-) marks on the battery and equipment and ensure correct use.

- Do not use any which is not designed for use with the product.

- Do not mix cells of different manufacture, capacity, size, or type within a device.

- Keep batteries out of the reach of children.

- Seek medical advice immediately if a battery has been swallowed.

- Always purchase the correct battery for the equipment.

- Keep batteries clean and dry.

- Wipe the battery terminals with a clean dry cloth if they become dirty.

10. Notices

- Avoid exposing your sensors or batteries to very cold or very hot temperatures. Low or high-temperature conditions may temporarily shorten the battery life or cause the sensors to temporarily stop working.

- Take care in setting up the Hub Gateway and other hardware. Follow all installation instructions in the User Guide. Failure to do so may result in injury.

- Do not install hardware equipment while standing in water or with wet hands. Failure to do so can result in electric shock or death. Use caution when setting up all electronic equipment.

- When charging the sensors, do not handle the sensors with wet hands. Failure to observe this precaution could result in electric shock.

- PROP 65 WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm

- Cleaning Browan Products: Use a clean dry cloth or wipe to clean Browan products. Do not use detergent or abrasive materials to clean the Browan products, as this may damage the sensors.

11. Cautions

CAUTION: Disposal of a battery (or battery pack) into a fire or a hot oven, or mechanically crushing or cutting of a battery (or battery pack) can result in an **EXPLOSION!**

Leaving a battery (or battery pack) in an extremely high temperature surrounding environment can result in an **EXPLOSION** or leakage of flammable liquid or gas.

A battery (or battery pack) subjected to extremely low air pressure may also result in an **EXPLOSION** or leakage of flammable liquid or gas.

Discard used batteries according to the manufacturer's instructions.

CAUTION: The unit is provided with a battery-powered circuit.

There is a danger of **EXPLOSION** if the battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Risk of **EXPLOSION** if Battery is replaced by an Incorrect Type. Dispose of Used Batteries According to the Instructions.

12. Regulatory

Hereby, Browan Communications Inc. declares that the radio equipment for Browan products complies with Directive 2014/53/EU.

This device complies with Part 15 of the FCC Rules and RSS Standards of Industry Canada.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This symbol means that according to local laws and regulations your product should be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. Some collection points accept products for free. The separate collection and recycling of your product at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

12.1 Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:
Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/CANADA

Operation of this device is restricted to indoor use only

12.2 Industry Canada statement:

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference

(2) This device must accept any interference, including interference that may cause undesired operation of the device

Cet appareil contient des émetteurs / récepteurs exempts de licence qui sont conformes au (x) RSS (s) exemptés de licence d'Innovation, Sciences et Développement économique Canada. L'opération est soumise aux deux conditions suivantes :

(1) Cet appareil ne doit pas causer d'interférences

(2) Cet appareil doit accepter toute interférence, y compris les interférences pouvant provoquer un fonctionnement indésirable de l'appareil.

Radiation Exposure Statement:
This equipment complies with Canada's radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:
Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

13. Configuration Downlink Command

13.1 Configuration Command

Port	204

13.1.2 Payload

Bytes	0	0~1
Field	Cmd	Config

Cmd	**Command**	1 byte
	Bit [7:0]	0x00 – Set keepalive interval & detection interval. Keepalive interval default value: 12 Unit: 5min => 12*5 mins = 60 mins Value range: 1~216 (5min ~ 18hours) *Note: 0 means no changes Detection interval default value: 10 mins value range: 1~216 (5min ~ 18hours) *Note: 0 means no changes *Note: Must be shorter than or equal to the keepalive interval 0x03 – Set buzzer alarm period (in seconds), Enable/Disable CO_2 auto-calibration, Enable/Disable CO_2, and Enable/Disable proximity sensor Buzzer alarm period default value: 3 s *Note: only for those over the CO_2 threshold CO_2 auto calibration default: Disable CO_2 Sensor default: Enable Proximity Sensor default: Disable 0x04 - Set CO_2 threshold default value:1000 ppm value range: 400~65535 0x05 - Set CO_2 calibration value. default value:400 ppm value range: 400~2000

Config	**Configuration**	0~11 bytes

See the table as follows:

Cmd	Command Description	Config Length
0x00	Get Sensor Configuration **(Only for unconfirmed downlinks)** *Note: little-endian format.	0 bytes
0x00	Set keepalive interval & detection Interval.	2 bytes

		(Unit: 5min) [0~7] Keepalive interval value [8~15] Detection interval value(must be shorter than or equal to keepalive interval) *Note: little-endian format.	

	0x03	[0~4] Buzzer alarm period in seconds
		    0~32 seconds
		[5] Enable/disable CO2 auto-calibration
		    0: disable
		    1: enable(default)
		[6] Enable/disable the CO2 sensor
		    0: disable
		    1: enable(default)
		[7] Enable/disable the proximity sensor
		    0: disable (default)
		    1: enable
			1 byte

	0x04	Set CO2 threshold *Note: little-endian format.	2 bytes
	0x05	Set CO2 Calibration Value (400~2000 ppm) *Note: little-endian format.	2 bytes

Payload Content	**Command content**
	
	Ex:
	000C01 || 0343 || 04E803 || 059001
	
	00 0C01 => Set keepalive interval: 0x0C -> 12 (x 5min) = 60 min (Unit:5min),
	             Set Detection interval 0x01-> 1 (x 5min) = 5 mins
	*Note: 0 means no change (Unit: 5min)
	03 43 => Buzzer alarm period in 3 seconds, disable CO2 auto-calibration, enable
	            CO2 and disable proximity sensor: 0x43
	04 E803 => Set CO2 threshold: 0x03E8 -> 1000 ppm
	          *Note: little-endian format.
	05 9001 => Set CO2 calibration value: 0x0190 -> 400 ppm
	          *Note: little-endian format.

13.2 Response Content

(Only for unconfirmed downlinks)

Port	204
Payload Length	11 bytes

Payload Content	Response content

	Ex:
	000C01 0343 04E803 059001
	
	00 0C01 => Set keepalive interval: 0x0C -> 12 (x 5min) = 60 min (Unit:5min),
	        Set Detection interval 0x01-> 1 (x 5min) = 5 mins
	        *Note: 0 means no change (Unit: 5min)
	03 43 => Buzzer alarm period in 3 seconds, disable CO_2 auto-calibration, enable CO_2 and disable proximity sensor: 0x43
	04 E803 => Set CO_2 threshold: 0x03E8 -> 1000 ppm
	       *Note: little-endian format.
	05 9001 => Set CO_2 calibration value: 0x0190 -> 400 ppm
	       *Note: little-endian format.

13.3 Frame Count 1 Content

Payload Length	9 bytes
Payload Content	Frame count 1 content Ex: **01 01200000 7ff1f102** **01** => command ID **01200000** => HW ID: 0x00002001 (little-endian format) **7ff1f102** => FW Version: 0x02f1f17f (little-endian format)

14. BLE FOTA Downlink Command

Port	206
Payload Length	3 bytes

14. 1 Payload

Bytes	0~2
Payload	0x444655

15. Reboot Downlink Command

Port	206
Payload Length	6 bytes

15. 1 Payload

Bytes	0~5
Payload	0x5245424F4F54