



# MerryIoT Air Quality CO2

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## Reference Manual

CD10-915

CD10-868

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Model Name: CD10

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## 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

### 2.4 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)

### 2.6 Certifications and Conformity

FCC	2AAS9CD10
CE	Certified.
IC	26296-CD10

### 2.3 Power

Source	3.6V AA Li-SOCI2 2700 mAH battery x 2
System Maximum Voltage	3.6V
System Minimum Voltage	2.7V
Current	135 mA maximum

### 2.5 User Interface

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

### 2.7 Additional Features

Battery Monitoring	
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# 3. Operation

## 3.1 Installation Mode

- Users need to press the button over 5 seconds to activate 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 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:

- Immediately send a message with Temp, RH values, and CO2 as 0 within the first 10 minutes after joining.
- Immediately send a message with Temp, RH, and CO2 values with the last time reading after joining for more than 10 minutes.

CO2 Fresh Air Calibration (will only carry out after join in LNS successfully):

- Bring the device outside in the fresh air, 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. The CO2 sensor will then use the CO2 levels from fresh air to compare with the CO2 levels indoors to give correct values.

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

BLE DFU Mode:

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

#### 4.1.2 Payload

Port	127
Payload Length	6 bytes

Bytes	0	1	2	3	4	5
Field	Status	Battery	Temp.	RH	CO <sub>2</sub>	

<b>Status</b>	<p><b>Sensor status</b></p> <p>Bits [0]                    1 – Trigger Event, 0 – Keepalive</p> <p>Bits [1]                    1 – Button pressed, 0 - Button released</p> <p>Bits [2]                    RFU</p> <p>Bits [3]                    RFU</p> <p>Bits [4]                    1 - CO<sub>2</sub> is over the threshold (CO<sub>2</sub> &gt; 1200 ppm)</p> <p>Bits [5:7]                 RFU</p>
<b>Battery</b>	<p><b>Battery level</b></p> <p>Bits [3:0]                 unsigned value v, range 0 – 15. battery voltage in V = (21 + v) ÷ 10.</p> <p>Bits [7:4]                 RFU</p>
<b>Temp</b>	<p><b>Environment Temperature</b></p> <p>Bits [7:0]                 sign integer temperature in °C -20~50 °C</p>
<b>RH</b>	<p><b>Relative humidity as measured by the digital sensor</b></p> <p>Bits [6:0]                 unsigned value in %, range 0-100.</p> <p>Bit [7]                      RFU</p>
<b>CO<sub>2</sub></b>	<p><b>CO<sub>2</sub> equivalent estimate</b></p> <p>Bits [15:0]                Unsigned value in ppm, range 0-40000. *Note: little-endian format.</p>

## 5. Battery

### 5.1 Replacement

Use ER14505 (3.6V AA Li-SOCI<sub>2</sub>) only.  
Remove the battery cover and replace the batteries.  
(Cross-slot screwdriver required)



### 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.

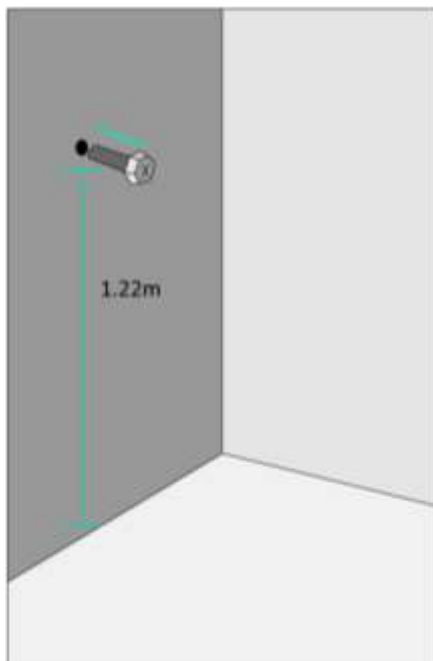
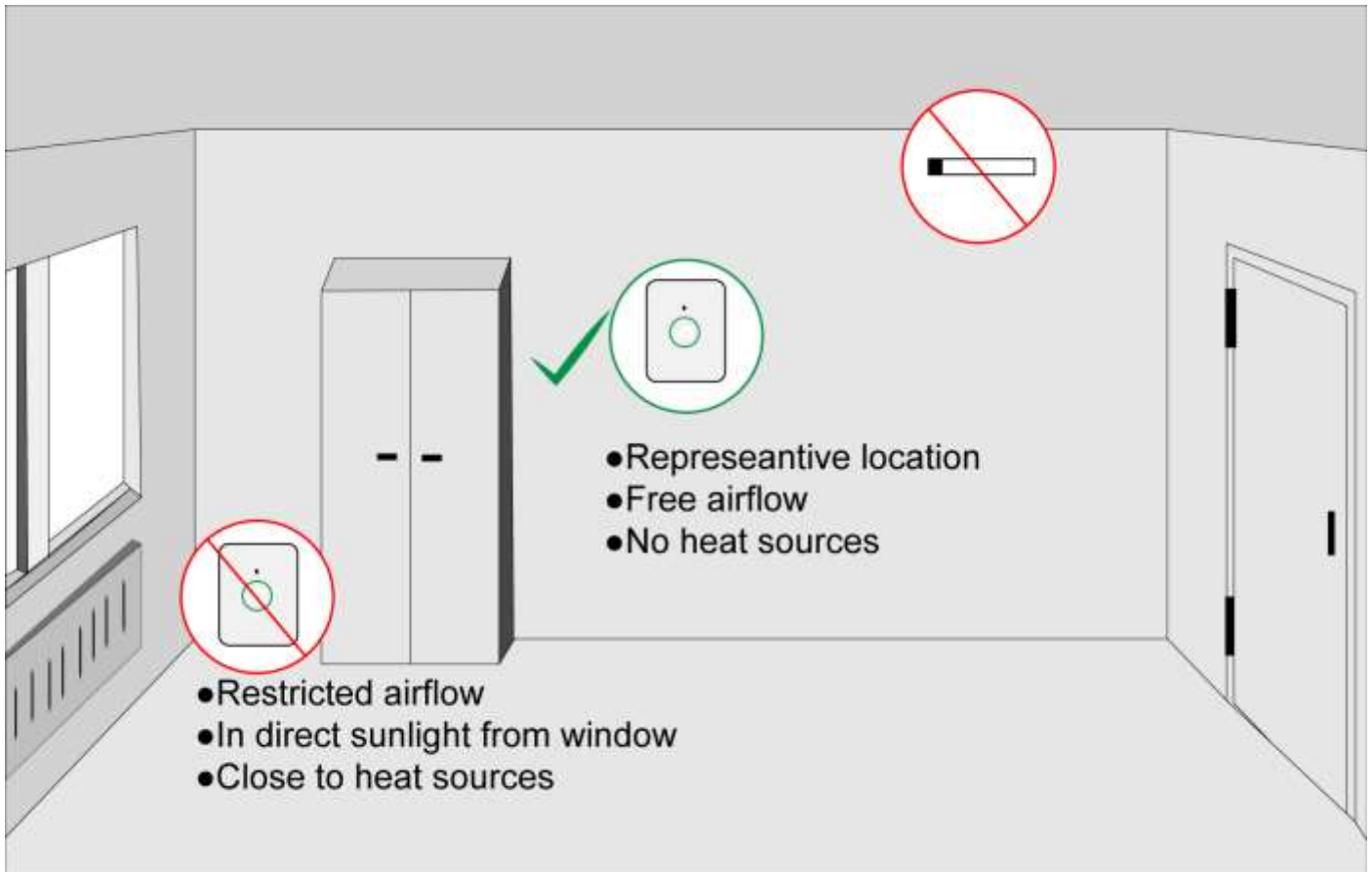
There is a danger of explosion if the battery is incorrectly replaced.

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.

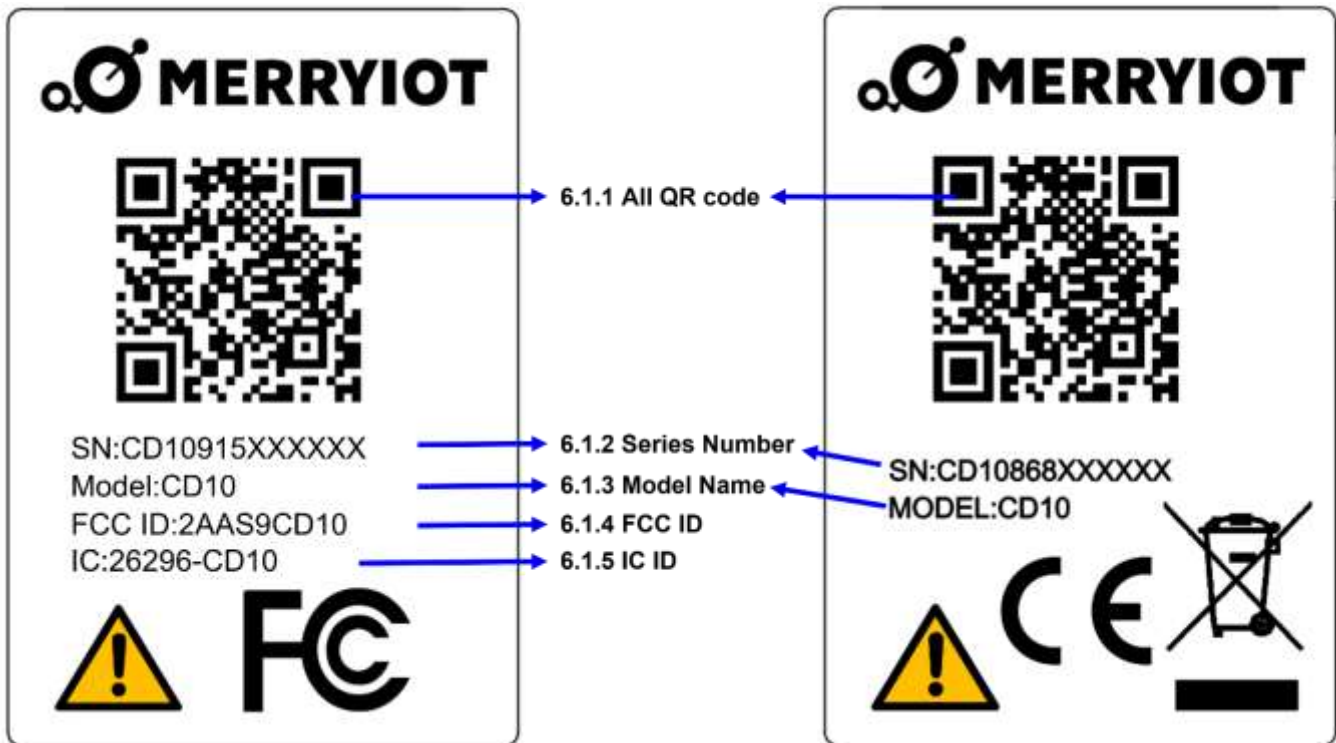
## 6. Installation





## 7. Label format information

### 7.1 Device back label



#### 7.1.1 All QR code

URN:LW:DO: 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 including in 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 number.

## 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](http://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 a 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 receiver.
- Connect the equipment into 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 minimum distance 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 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 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
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### 13.1.2 Payload

Bytes	0	0~1
Field	Cmd	Config

<b>Cmd</b>	<b>Command</b>	1 byte									
	Bit [7:0]	<p>0x00 – Set keepalive interval &amp; detection interval.            Keepalive interval default value: 12            Unit: 5min =&gt; 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 keepalive interval</p> <p>0x03 – Set buzzer alarm period (in seconds),            Enable/Disable CO2, and Enable/Disable proximity sensor            Buzzer alarm period default value: 3 s            *Note: only for over CO2 threshold            CO2 Sensor default: Enable            Proximity Sensor default: Disable</p> <p>0x04 - Set CO2 threshold            CO2 threshold default value :1000 ppm            value range: 400~65535</p> <p>0x05 - Set CO2 calibration value.            default value :400 ppm            value range: 400~2000</p>									
<b>Config</b>	<b>Configuration</b>	0~11 bytes									
	See the table as follows:										
	<table border="1"> <thead> <tr> <th>Cmd</th> <th>Command Description</th> <th>Config Length</th> </tr> </thead> <tbody> <tr> <td>0x00</td> <td>Get Sensor Configuration <b>(Only for unconfirmed downlink)</b> *Note: little-endian format.</td> <td>0 bytes</td> </tr> <tr> <td>0x00</td> <td>Set keepalive interval &amp; detection Interval. <b>(Unit: 5min)</b> [0~7] Keepalive interval value</td> <td>2 bytes</td> </tr> </tbody> </table>		Cmd	Command Description	Config Length	0x00	Get Sensor Configuration <b>(Only for unconfirmed downlink)</b> *Note: little-endian format.	0 bytes	0x00	Set keepalive interval & detection Interval. <b>(Unit: 5min)</b> [0~7] Keepalive interval value	2 bytes
Cmd	Command Description	Config Length									
0x00	Get Sensor Configuration <b>(Only for unconfirmed downlink)</b> *Note: little-endian format.	0 bytes									
0x00	Set keepalive interval & detection Interval. <b>(Unit: 5min)</b> [0~7] Keepalive interval value	2 bytes									

	[8~15] Detection interval value(must be shorter than or equal to keepalive interval) *Note: little-endian format.	
0x03	[0~5] Buzzer alarm period in seconds 0~63 seconds [6] Enable/disable CO2 sensor 0: disable 1: enable(default) [7] Enable/disable 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, 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 downlink)

Port	204
Payload Length	11 bytes

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

Payload Length	9 bytes
Payload Content	<p>Frame count 1 content</p> <p>Ex:  <b>01 01200000 7ff1f102</b></p> <p><b>01</b> =&gt; command ID  <b>01200000</b> =&gt; HW ID: 0x00002001 (little-endian format)  <b>7ff1f102</b> =&gt; FW Version: 0x02f1f17f (little-endian format)</p>

## 14. BLE FOTA Downlink Command

Port	206
Payload Length	3 bytes

### 14.1 Payload

<b>Bytes</b>	0~2
<b>Payload</b>	0x444655