

# **Wireless CO Detector**

## **RA02C**

## **User Manual**

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# 1. Introduction

RA02C is a CO/temperature detector for Netvox Class-A devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol.

## **LoRa Wireless Technology:**

LoRa is a wireless communication technology famous for its long-distance transmission and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation technique greatly extend the communication distance. It can be widely used in any use case that requires long-distance and low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong anti-interference ability and so on.

## **LoRaWAN:**

LoRaWAN uses LoRa technology to define end-to-end standard specifications to ensure interoperability between devices and gateways from different manufacturers.

## 2. Appearance



## 3. Main Feature

- 2 x 1.5V AAA size alkaline batteries
- CO and temperature detection
- Compatible with LoRaWAN™ Class A
- Frequency hopping spread spectrum
- Configuration parameters can be configured via a third-party software platform, data can be read and alerts can be set via SMS text and email (optional)
- Applicable to the third-party platforms: Actility/ ThingPark, TTN, MyDevices/ Cayenne
- Low power consumption and long battery life

Note: Battery life is determined by the sensor reporting frequency and other variables.

Please refer to [http://www.netvox.com.tw/electric/electric\\_calc.html](http://www.netvox.com.tw/electric/electric_calc.html).

On this website, users can find various types of batteries in different configurations.

## 4. Set up Instruction

### On/Off

Power on	Insert batteries. (Users may need a screwdriver to open the cover)
Turn on	Press any function key to turn on the device. After releasing the key, the red and green indicators will flash at the same time to indicate that it turns on successfully.
Turn off (Restore to factory setting)	Press and hold both keys for 5 seconds till the green indicator flashes and then release; LED flashes quickly 20 times.
Power off	Remove Batteries.
Note:	<ol style="list-style-type: none"> <li>1. After remove and insert the battery, the device memorizes previous on/off state by default.</li> <li>2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.</li> <li>3. Do not power on the device while any function key is pressed, otherwise the device will enter the engineering test mode.</li> </ol>

### Network Joining

Never joined the network	<p>Turn on the device to search the network.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Had joined the network	<p>Turn on the device to search the previous network.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Fail to join the network	Suggest to check the device verification information on the gateway or consult your platform server provider.

### Function Key and Test Key

Press and hold both keys for 5 seconds	<p>Restore to factory setting / Turn off</p> <p>The green indicator flashes 20 times: success</p> <p>The green indicator remains off: fail</p>
Press function key once	<p>The device is in the network: green indicator flashes once and sends a report</p> <p>The device is not in the network: green indicator remains off</p>
Press test key once	<p>The device is in the network: The buzzer alarms for 5 seconds, the red indicator flashes 5 times, and sends a report</p> <p>The device is not in the network: green indicator remains off</p>

## Sleeping Mode

The device is on and in the network	Sleeping period: Min Interval. When the reportchange exceeds setting value or the state changes, a data report will be sent according to Min Interval.
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## Low Voltage Warning

Low Voltage Threshold	2.4V
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## 5. Data Report

The device will immediately send a version packet report and a data report.

Data will be reported by default setting before any configuration.

### Default setting:

Max Interval = 0x0E10 (3600s)

Min Interval = 0x0E10 (3600s) (The voltage is detected every Min Interval by default.)

Battery Voltage Change: 0x01 (0.1V)

### CO Trigger:

The CO concentration is sampled 30 seconds after the device is powered up, when the concentration is higher than 110 ppm, the red indicator light flashes, the buzzer alarms and immediately sends a report (CO alarm bit is 1).

If the alarm continues, the report will be sent every 30 seconds. When the concentration drops below 110ppm, the flashing end alarm will be stopped and an alarm will be sent to restore the report.

### High Temperature Alarm:

After the device is successfully connected to the network, the temperature will be sampled once every 1 minute.

When the temperature is higher than 60°C, the buzzer will alarm, the red indicator will flash, and a report will be sent immediately. (The fire alarm bit is 1.)

If the alarm continues, the report will be sent every 1 minute. When the temperature below 60°C, the flashing end alarm will be stopped and an alarm will be sent to restore the report. (The fire alarm bit is 0.)

### Note:

- (1) The device report interval will be programmed based on the default firmware.
- (2) The interval between two reports must be the minimum time.

The reported data is decoded by the Netvox LoRaWAN Application Command document and

<http://cmddoc.netvoxcloud.com/cmddoc>

## 5.1 Example of ReportDataCmd

FPort: 0x06

Bytes	1	1	1	Var(Fix=8 Bytes)
	Version	DeviceType	ReportType	NetvoxPayLoadData

**Version**– 1 byte –0x01—the Version of NetvoxLoRaWAN Application Command Version

**DeviceType**– 1 byte – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype doc

**ReportType** – 1 byte –the presentation of the NetvoxPayLoadData, according the devicetype

**NetvoxPayLoadData**– Fixed bytes (Fixed =8bytes)

Device	Device Type	Report Type	NetvoxPayLoadData			
RA02C	0x11	0x01	Battery (1Byte, unit:0.1V)	CO Alarm (1Byte) 0:no alarm 1:alarm	HighTempAlarm (1Byte) 0:noalarm 1:alarm	Reserved (5Bytes, fixed 0x00)

Example of Uplink: 0111011C01010000000000

1<sup>st</sup> byte (01): Version

2<sup>nd</sup> byte (11): DeviceType 0x11— RA02C

3<sup>rd</sup> byte (01): ReportType

4<sup>th</sup> byte (1C): Battery—2.8v , 1C Hex=28 Dec 28\*0.1v=2.8v

5<sup>th</sup> byte (01): CO Alarm

6<sup>th</sup> byte (01): High Temperature Alarm

7th ~ 11th byte (0000000000): Reserved

## 5.2 Example of ConfigureCmd

FPort: 0x07

Bytes	1	1	Var (Fix =9 Bytes)
	CmdID	DeviceType	NetvoxPayLoadData

**CmdID**– 1 byte

**DeviceType**– 1 byte – Device Type of Device

**NetvoxPayLoadData**– var bytes (Max=9bytes)

Description	Device	CmdID	Device Type	NetvoxPayLoadData			
Config ReportReq	RA02C	0x01	0x11	MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit: 0.1v)	Reserved (4Bytes, Fixed 0x00)
Config ReportRsp		0x81		Status (0x00_success)		Reserved (8Bytes, Fixed 0x00)	
ReadConfig ReportReq		0x02		Reserved (9Bytes, Fixed 0x00)			
ReadConfig ReportRsp		0x82		MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit: 0.1v)	Reserved (4Bytes, Fixed 0x00)

**(1) Command Configuration:**

MinTime = 1min, MaxTime = 1min, BatteryChange = 0.1v

Downlink: 0111003C003C0100000000 003C(H<sub>ex</sub>) = 60(D<sub>ec</sub>)

Response: 81110000000000000000 (Configuration success)

81110100000000000000 (Configuration failure)

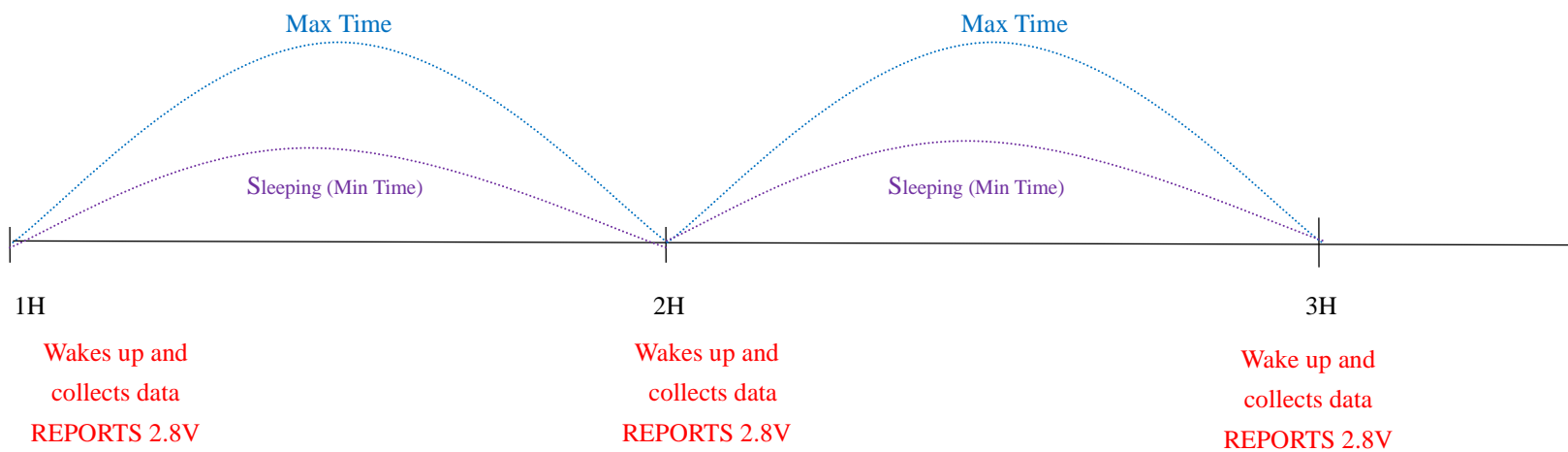
**(2) Read Configuration:**

Downlink: 02110000000000000000

Response: 8211003C003C0100000000 (Current configuration)

**5.3 Example for MinTime/MaxTime logic**

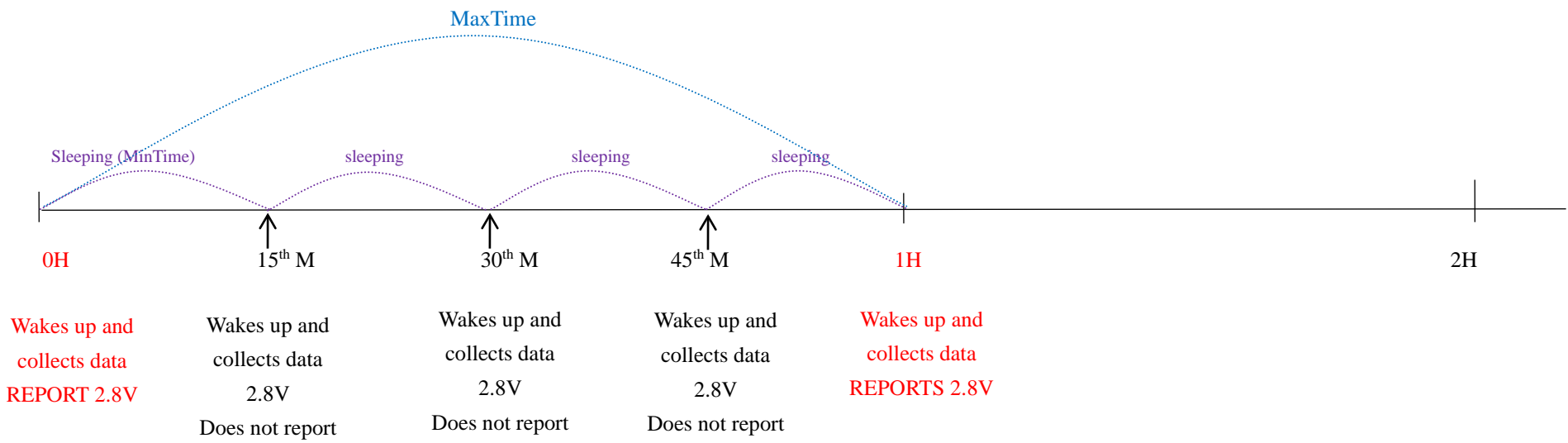
**Example#1** based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V



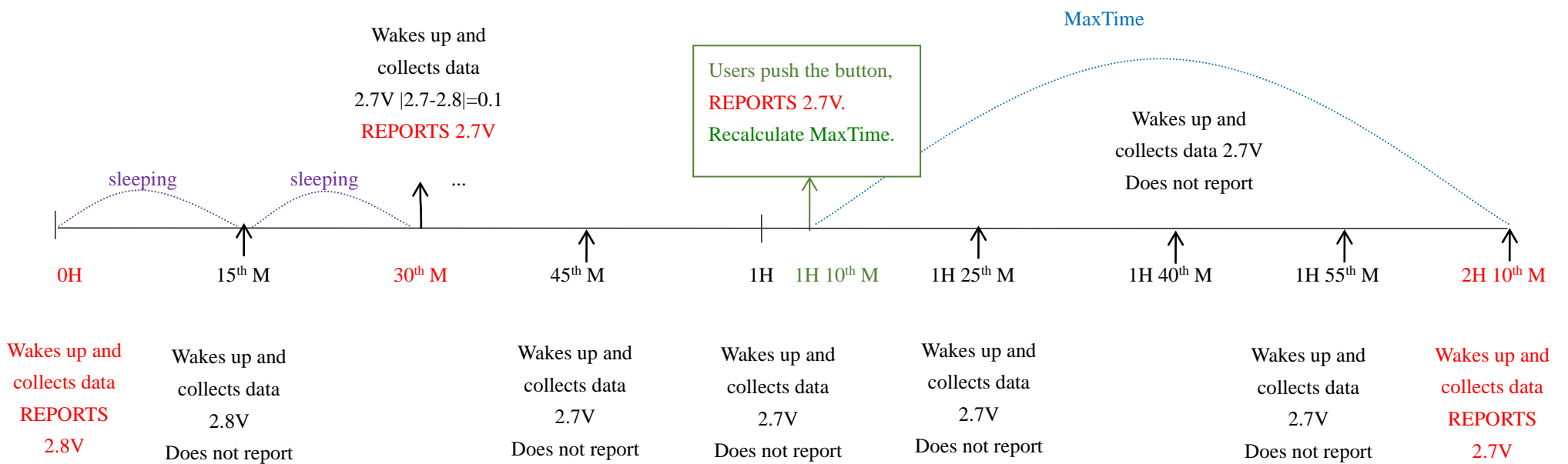
MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.



**Example#2** based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



**Example#3** based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



Notes:

- 1) The device only wakes up and performs data sampling according to MinTime Interval. When it is sleeping, it does not collect data.
- 2) The data collected is compared with the last data reported. If the data change value is greater than the ReportableChange value, the device reports according to MinTime interval. If the data variation is not greater than the last data reported, the device reports according to MaxTime interval.
- 3) We do not recommend to set the MinTime Interval value too low. If the MinTime Interval is too low, the device wakes up frequently and the battery will be drained soon.
- 4) Whenever the device sends a report, no matter resulting from data variation, button pushed or MaxTime interval, another cycle of MinTime / MaxTime calculation is started.

## 6. Important Maintenance Instruction

Kindly pay attention to the following in order to achieve the best maintenance of the product:

- Keep the device dry. Rain, moisture, or any liquid might contain minerals and thus corrode electronic circuits. If the device gets wet, please dry it completely.
- Do not use or store the device in dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under excessive heat condition. High temperature can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store the device in places that are too cold. Otherwise, when the temperature rises to normal temperature, moisture will form inside, which will destroy the board.
- Do not throw, knock or shake the device. Rough handling of equipment can destroy internal circuit boards and delicate structures.
- Do not clean the device with strong chemicals, detergents or strong detergents.
- Do not apply the device with paint. Smudges might block in the device and affect the operation.
- Do not throw the battery into the fire, or the battery will explode. Damaged batteries may also explode.

All of the above applies to your device, battery and accessories. If any device is not working properly, please take it to the nearest authorized service facility for repair.