Wireless CO2/ Temperature/Humidity Sensor

R72615A User Manual

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1. Introduction

R72615A is a ClassA type device based on the LoRaWAN open protocol.

R72615A is connected to a variety of sensors. As detectors for CO2, temperature and humidity, the values collected by the sensor are reported to the corresponding gateway.

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

Temperature and Humidity Sensor

CO2 Sensor

Main Body

Batteries (ER14505x8 pcs)

Indicator

Function Key

DC 7.2V

DC in

3. Main Features

- 7.2V battery power supply

- Simple operation and setting

- CO2 and temperature and humidity detection

- Adopt SX1276 wireless communication module

- Compatible with LoRaWAN™ Class A

- Frequency hopping spread spectrum (FHSS)

- Configuration parameters can be configured through third-party software platforms, data can be read and alarms 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

On this website, users can find battery life of various models in different configurations.

4.Set up Instruction

On/Off

Power on	Connect to battery pack
Turn on	Connect the battery pack directly to boot
Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds till green indicator flashes for 20 times.
Power off	Remove battery pack
Note:	1. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components. 2. The engineering test requires to write the engineering testing software separately.

Network Joining

Never joined the network	Turn on the device to search the network to join. The green indicator stays on for 5 seconds: success The green indicator remains off: fail
Had joined the network (not restored to factory setting)	Turn on the device to search the previous network to join. The green indicator stays on for 5 seconds: success The green indicator remains off: fail

Fail to join the network	It is recommended to check the device registration information on the gateway or consult the platform server provider.

Function Key

Press and hold for 5 seconds	Restore to factory setting / Turn off The green indicator flashes for 20 times: success The green indicator remains off: fail
Press once	The device is in the network: The green indicator flashes once,R72615A will send first data after 180 seconds then send second data after 30 seconds again. The device is not in the network: green indicator remains off

Restore to Factory Setting

Description	The R72615A carries a power-off network information saving memory function. This feature is turned off by default, that is, it will be re-joined every time it is powered back on. The function can be turned on by the ResumeNetOnOff command. At this time, each time the power is rewritten, the last joining information will be recorded (including saving the network address information assigned to it, etc.) and it will not be re-joined again. If you want to join a new network, you need to perform a factory setting operation first.
Operation method	1. Press and hold the button for 5 seconds and release (the button is released when the LED flashes), and the LED flashes 20 times; 2. The device automatically restarts to start re-joining.

Low Voltage Warning

Low Voltage	6.8V

5. Data Report

The device will immediately send a version package report and after 180s send two uplink packets with temperature and

humidity, CO2 and battery voltage at 30s interval.

The device sends data in the default configuration before any configuration is done.

Default setting:

ReportMaxTime:

720min (Subject to factory settings)

*The ReportMaxTime must greater than or equal to **ReportType count *ReportMinTime + 10** (units: seconds)

* The ReportMaxTime of EU868 must greater than or equal to 370s

ReportMinTime:

30s (US915, AU915, KR920, AS923, IN865)   // Interval time of two packets

120s (EU868)

* The ReportMinTime of EU868 must greater than or equal to 120s.

ReportType count = 2

Note:

1. It would take about **180** seconds for the CO2 sensor to sample and process the collected CO_2 value after being powered

2. It would take about **180** seconds for the CO2 sensor to sample and process the collected CO_2 value if you were to

manually trigger the device by pressing the button, please be patient.

3. The device report interval will be programmed based on the default firmware which may vary.

4. The interval between two reports must be the maximum time

5. R72615A does not support the ReportChange so the configuration is invalid.

6. Report cycle will be based on ReportMaxTime period when sending data packet (beginning to the end of the first data

as a period)

7. The device also supports Cayenne's TxPeriod cycle configuration instructions. Therefore, the device can also perform a

report according to the cycle time of the TxPeriod value; and whether the report period is ReportMaxTime or TxPeriod

will be depending on which cycle time is configured last time

Please refer Netvox *LoRaWAN Application Command document* and *Netvox Lora Command Resolver*

http://loraresolver.netvoxcloud.com:8888/page/index to resolve uplink data.

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				
R726 series (R72615A)	0x09	0x07	Battery (1Byte, unit:0.1V)	CO2 (2Byte ,0.1ppm)	NH3 (2Byte ,0.1ppm)	Noise (2Byte ,0.1db)	Reserved (1Byte,fixed 0x00)
		0x0C	Battery (1Byte, unit:0.1V)	Temperature (Signed2Bytes,unit:0.01℃)	Humidity (2Bytes,unit:0.01%)	WindSpeed (2Bytes,unit:0.01m/s)	Reserved (1Byte,fixed 0x00)

Example of R72615A Uplink:

Packet #1: 010907480FA0FFFFFFFF00

1st byte (01): Version

2nd byte(09): DeviceType 0x09 － R726 Series

3rd byte (07): ReportType

4th byte (48): Battery－7.2v , 48 H_{ex}=72 D_{ec}　72*0.1v=7.2v

5th 6th byte (0FA0): CO2－400PPM, 0FA0 H_{ex}=4000 D_{ec}　4000*0.1PPM=400PPM

7th 8th byte (FFFF): NH3 data is not available

9th 10th byte (FFFF): Noise data is not available

11th byte (00): Reserved

Packet #2: 01090C4809C41B58FFFF00

1st byte (01): Version

2nd byte (09): DeviceType 0x09 － R726 Series

3rd byte (0C): ReportType

4th byte (48): Battery－7.2v , 48 Hex=72 Dec　72*0.1v=7.2v

5th 6th byte (09C4): Temperature－25°, 09C4 Hex=2500 Dec　2500*0.01°=25°

7th 8th byte(1B58): Humidity－70% , 1B58 Hex=7000 Dec　7000*0.01%=70%

9th 10th byte (FFFF): Wind Speed data is not available

11th byte (00): Reserved

5.2 Example of ConfigureCmd

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	DeviceType	NetvoxPayLoadData		
ConfigReportReq		0x01		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)
ConfigReportRsp		0x81		Status(0x00_success)		Reserved (8Bytes,Fixed 0x00)
ReadConfig ReportReq	R72615A	0x02	0x09	Reserved (9Bytes,Fixed 0x00)		
ReadConfig ReportRsp		0x82		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved

(1) Configure the R72615A parameters: MinTime = 120s, MaxTime = 3600s

Downlink: 010900780E100000000000

Devices return:

   810900000000000000000000 (the configuration is successful)

   810901000000000000000000 (the configuration is failed)

(2) Read the R72615A device configuration parameters

Downlink: 020900000000000000000000

Devices return:

   820900780E100000000000 (device current configuration parameter)

Note:

1. The value of ReportMaxTime should be greater than (ReportType count * ReportMinTime + 10   unit: Second)

2. The minimum setting time of EU868 frequency band shall not be less than 120s, and the maximum setting time shall not be

   less than 370s

6. Installation

1. Due to transportation reasons, the R72615A and the battery pack will be screwed in advance at the factory.

  Please unscrew the screws before installation (red circle below).

3. R72615A uses battery pack to supply power.

   Please unscrew the screws at the four corners of the battery pack before installation and insert 8 ER14505 3.6V batteries into

   the battery compartment (4 sections on the front and 4 sections on the back side) as shown in Figure 1&2
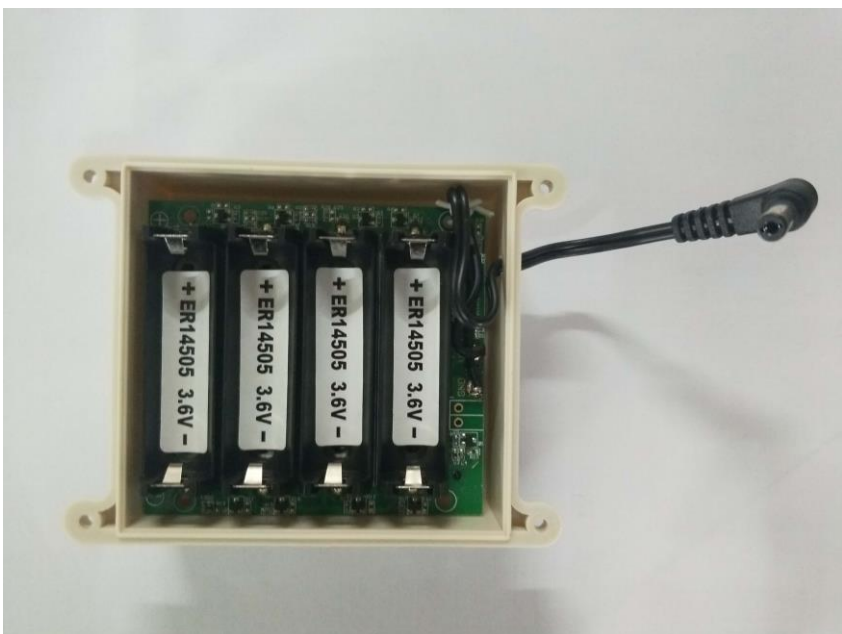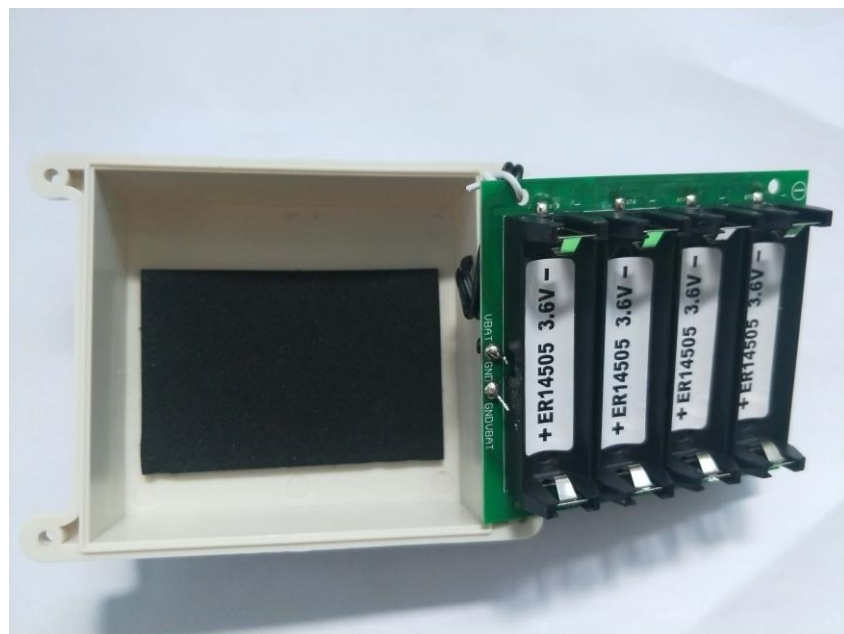

Figure 1 Battery PCB front   Figure 2 Battery PCB back

Note:

   (1) Please pay attention the positive and negative poles of the battery.

   (2) The battery PCB board has electronic parts is front side, when closing the cover, please pay attention the battery pack

       and bottom cover's power on the same side.

4. The device and battery pack can be installed on the wall or other object surface.

Housing screw

Battery Pack

Netvox

R72615A

DC in

Screws Fixed
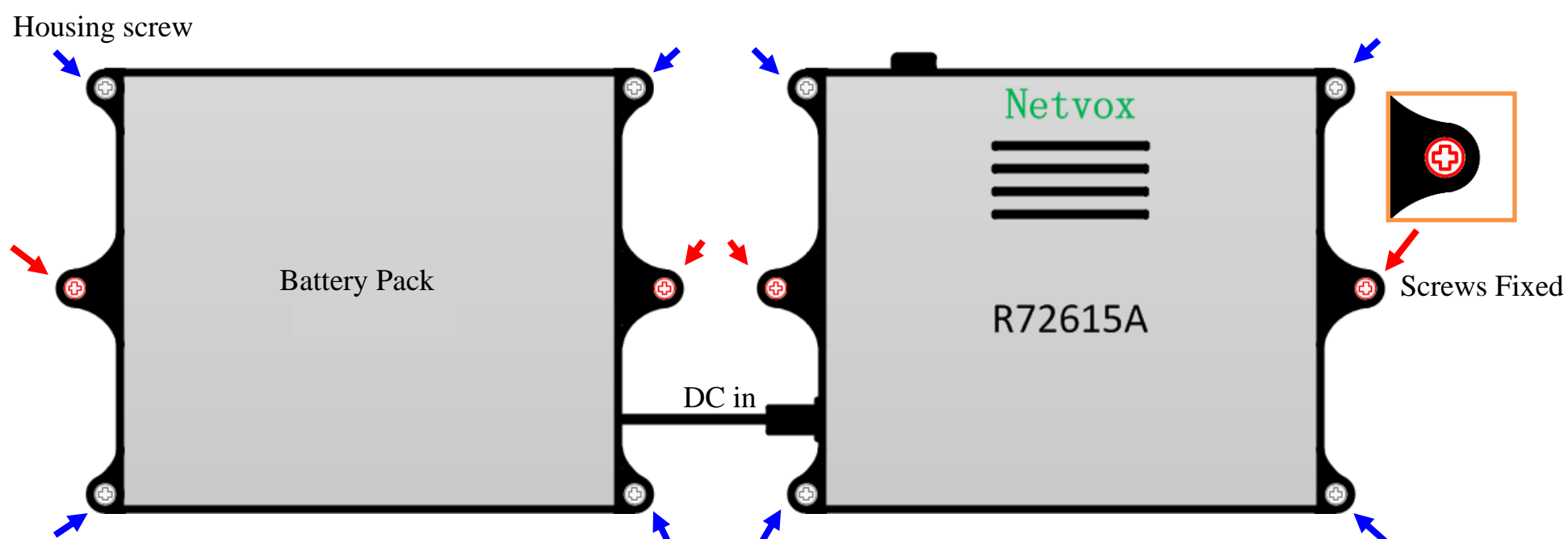
Note: Do not install the device in a metal shielded box or environment with other electrical equipment around it to avoid affecting the wireless transmission of the device.

5. R72615A will report data regularly according to MaxTime(default:720 min), and take about **180** seconds for the CO_2 sensor to sample and process the collected CO_2 value. The packets have temperature, humidity, CO_2 and battery voltage value.

Note: Max Time can be modified by the downlink command, and recommended not to set the time too short to avoid battery power consumption.

6. R72615A is suitable for the following scenarios:
   - Farm
   - Pig farm
   - Environmental monitoring

7. Information about Battery Passivation

Many of Netvox devices are powered by 3.6V ER14505 Li-SOCl2 (lithium-thionyl chloride) batteries that offer many advantages including low self-discharge rate and high energy density.

However, primary lithium batteries like Li-SOCl2 batteries will form a passivation layer as a reaction between the lithium anode and thionyl chloride if they are in storage for a long time or if the storage temperature is too high. This lithium chloride layer prevents rapid self-discharge caused by continuous reaction between lithium and thionyl chloride, but battery passivation may also lead to voltage delay when the batteries are put into operation, and our devices may not work correctly in this situation.

As a result, please make sure to source batteries from reliable vendors, and it is suggested that if the storage period is more than one month from the date of battery production, all the batteries should be activated.

If encountering the situation of battery passivation, users can activate the battery to eliminate the battery hysteresis.

ER14505 Battery Passivation:

7.1 To determine whether a battery requires activation

Connect a new ER14505 battery to a resistor in parallel, and check the voltage of the circuit.

If the voltage is below 3.3V, it means the battery requires activation.

7.2 How to activate the battery

a. Connect a battery to a resistor in parallel

b. Keep the connection for 5~8 minutes

c. The voltage of the circuit should be ≧3.3, indicating successful activation.

Brand	Load Resistance	Activation Time	Activation Current
NHTONE	165 Ω	5 minutes	20mA
RAMWAY	67 Ω	8 minutes	50mA
EVE	67 Ω	8 minutes	50mA
SAFT	67 Ω	8 minutes	50mA

Note:

If you buy batteries from other than the above four manufacturers, then the battery activation time, activation current, and required load resistance shall be mainly subject to the announcement of each manufacturer.

8. 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.