Wireless Temperature and Humidity Sensor for Low Temperature Environment

R718A
User Manual

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1. Introduction

R718A, mainly used to detect the temperature and humidity at low temperature environment such as the freezer air. It collects data over LoRa network and sends it to devices to be shown, fully compatible with LoRa protocol.

LoRa Wireless Technology:

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance. Widely used in long-distance, low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. Main features include small size, low power consumption, transmission distance, 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

Indicator

Function Key

Built-in temperature and humidity sensor

3. Main Features

- Compatible with LoRa protocol.

- 2 x ER14505 AA lithium batteries (3.6V/ section)

- Capable to detect the ambient temperature and humidity

- Simple and easy installation

- IP rating IP65

- Compatible with LoRaWAN^{TM} 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 third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne

- Improved power management for longer battery life

- Battery Life:

  - Please refer to web: http://www.netvox.com.tw/electric/electric_calc.html

  - At this website, users can find battery life time for variety models at different configurations.

  1. Actual range may vary depending on environment.

  2. Battery life is determined by sensor reporting frequency and other variables.

4. Set up Instruction

On/Off

Power on	Insert batteries. (users may need a flat blade screwdriver to open)
Turn on	Press and hold the function key for 3 seconds till the green indicator flashes once.
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 Batteries.
Note	1. Remove and insert the battery; the device is at off state by default. 2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components. 3. At 1st -5th second after power on, the device will be in engineering test mode.

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 at 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

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: green indicator flashes once and sends a report The device is not in the network: green indicator remains off

Sleeping Mode

The device is on and in the network	Sleeping period: Min Interval. When the reportchange exceeds setting value or the state changes: send a data report according to Min Interval.

Low Voltage Warning

Low Voltage	3.2V

5. Data Report

The device will immediately send a version packet report along with an uplink packet including temperature, humidity and battery voltage.

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

Default setting:

MaxTime : Max Interval = 15 min = 900s

MinTime : Min Interval = 15 min = 900s

BatteryChange: 0x01 (0.1V)

TemperatureChange:0x0064 (1℃)

HumidityChange:0x0064 (1%)

Note:

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

The interval between two reports must be the minimum time.

Please refer Netvox *LoRaWAN Application Command document* and *Netvox Lora Command Resolver*
http://www.netvox.com.cn:8888/page/index to resolve uplink data.

Data report configuration and sending period are as following:

Min Interval (Unit:second)	Max Interval (Unit:second)	Reportable Change	Current Change≥ Reportable Change	Current Change＜ Reportable Change

Any number between 1~65535	Any number between 1~65535	Can not be 0.	Report per Min Interval	Report per Max Interval

Example of Report configuration

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

CmdID– 1 bytes

DeviceType– 1 byte – Device Type of Device

NetvoxPayLoadData– var bytes (Max=9bytes)

Description	Device	CmdID	Device Type	NetvoxPayLoadData				
Config ReportReq	R718A	0x01	0x0B	MinTime (2bytes Unit:s)	MaxTime (2bytesUnit:s)	Battery Change (1byte Unit:0.1v)	Temperature Change (2byte Unit:0.01℃)	Humidity Change (2byte Unit:0.01%)
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)	Battery Change (1byte Unit:0.1v)	Temperature Change (2byte Unit:0.01℃)	Humidity Change (2byte Unit:0.01%)

（1）**Command Configuration:**

MinTime = 1min、MaxTime = 1min、BatteryChange = 0.1v、TemperatureChange = 1℃、

HumidityChange = 1%

Downlink： 010B003C003C0100640064　　　　003C(H_{ex}) = 60($D_{ec)}$,　 64($H_{ex)}$ = 100(D_{ec})

Response：

010B003C003C0100640064

810B000000000000000000（Configuration success）

810B010000000000000000（Configuration failure）
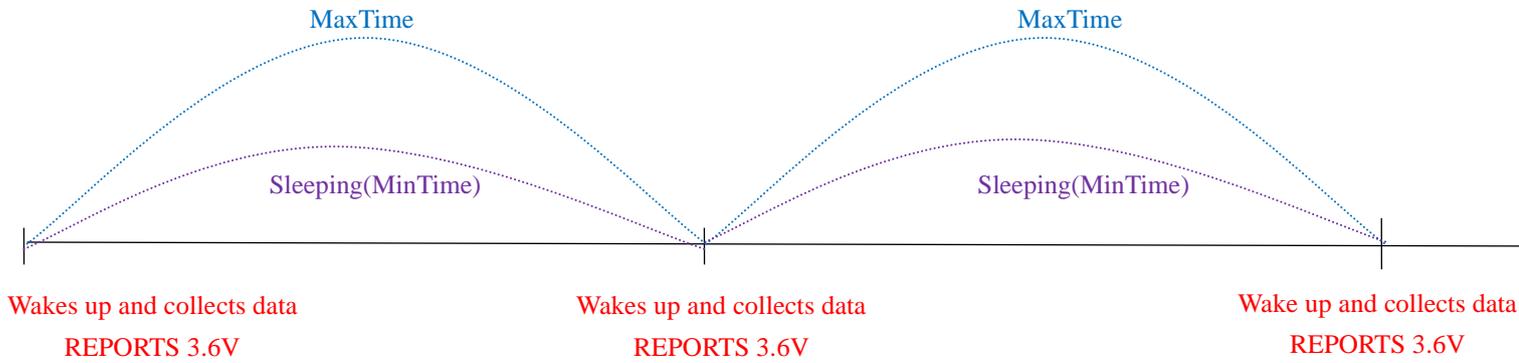
（2）**Read Configuration:**

Downlink： 020B000000000000000000

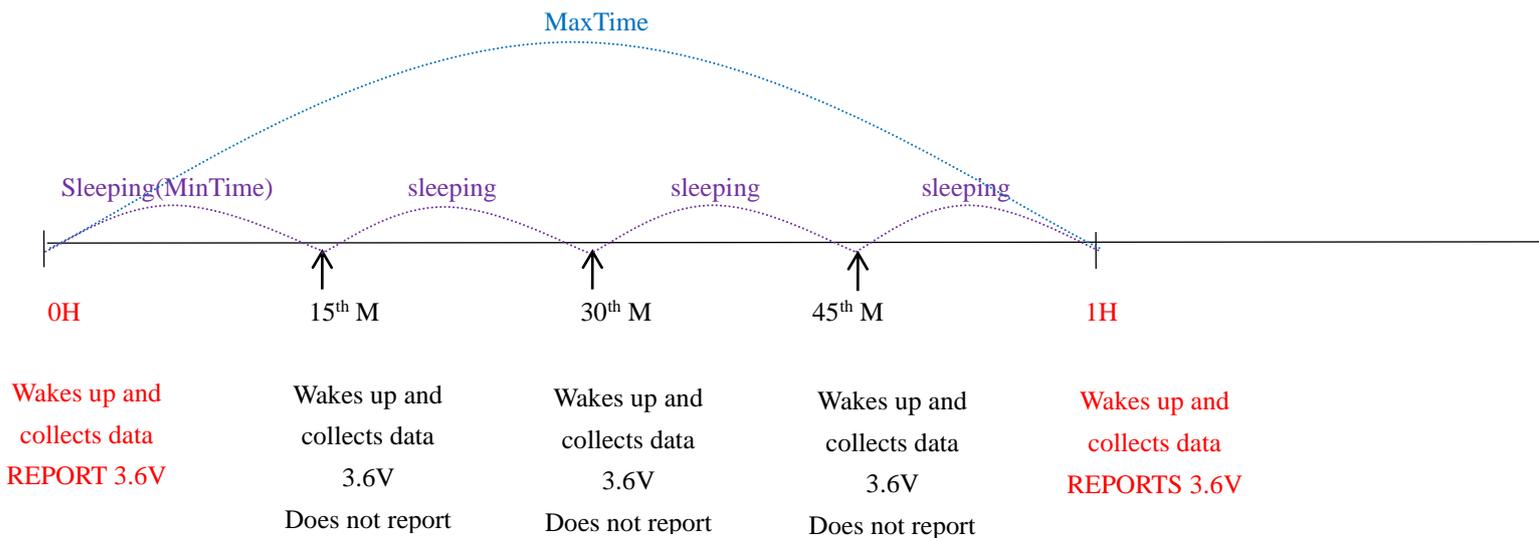Response：

820B003C003C0100640064（Current configuration）

Example for MinTime/MaxTime logic:

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

MaxTime

Sleeping(MinTime)

MaxTime

Sleeping(MinTime)

Wakes up and collects data
REPORTS 3.6V

Wakes up and collects data
REPORTS 3.6V

Wake up and collects data
REPORTS 3.6V

Note: 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.

MaxTime

Sleeping(MinTime)   sleeping   sleeping   sleeping

0H

15th M

30th M

45th M

1H

Wakes up and
collects data
REPORT 3.6V

Wakes up and
collects data
3.6V
Does not report

Wakes up and
collects data
3.6V
Does not report

Wakes up and
collects data
3.6V
Does not report

Wakes up and
collects data
REPORTS 3.6V

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

MaxTime

Wakes up and collects data
3.5V |3.5-3.6|=0.1
REPORTS 3.5V

Users push the button,
REPORTS 3.5V.
Recalculate MaxTime.

Wakes up and
collects data 3.5V
Does not report

sleeping   sleeping   ...

0H   15ᵗʰ M   30ᵗʰ M   45ᵗʰ M   1H   1H 10ᵗʰ M   1H 25ᵗʰ M

Wakes up and   Wakes up and   2H 10ᵗʰ M   Wakes up and   Wakes up and   Wakes up and
collects data   collects data   collects data   collects data   collects data
REPORTS 3.6V   3.6V   3.5V   3.5V   3.5V
                  Does not report   Does not report   Does not report   Does not report
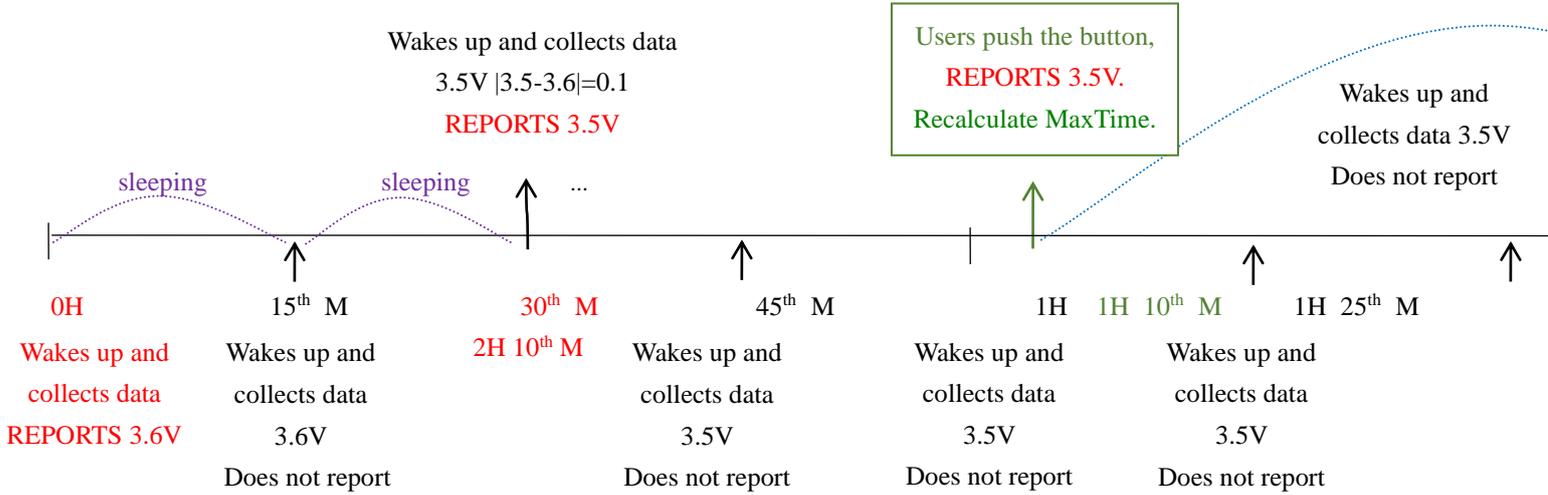
Notes :

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 variation 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.
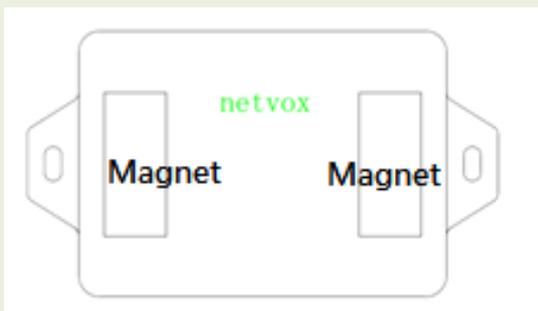
6. Installation

1.The Wireless Temperature and Humidity Sensor (R718A) has a built-in magnet (see Figure 1 below). When installed, it can be attached to the surface of an object with iron which is convenient and quick.

To make the installation more secure, use screws (purchased) to secure the unit to a wall or other surface (see Figure 2 below).

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

2. When the temperature and humidity detected by R718A is compared with the last reported values, when the temperature change is exceeded 1°C (default) or the humidity change is exceeded 1%(default),it will report current values.

3. Installation height recommendation:1-2 m

4. Installation ambient temperature: -40C° ~ 55°C

5. Installation direction recommendation: The output port(sensor) is facing down, and the LOGO is facing towards the person.

The figure shows the scene where the temperature and humidity sensor (R718A) is applied in the refrigerator.

It can also be applied to the following scenarios:

- Restaurant (refrigerator or freezer)
- Shopping mall supermarket (freezer)
- Engine room
- Environmental monitoring
- Smart city and intelligent building
- Storage and transportation of food and medicine
- Flowers and other perishable foods
- Wall or logistics refrigerator

When it is necessary to detect temperature or humidity.

Battery installation steps

Please replace the battery by a professional

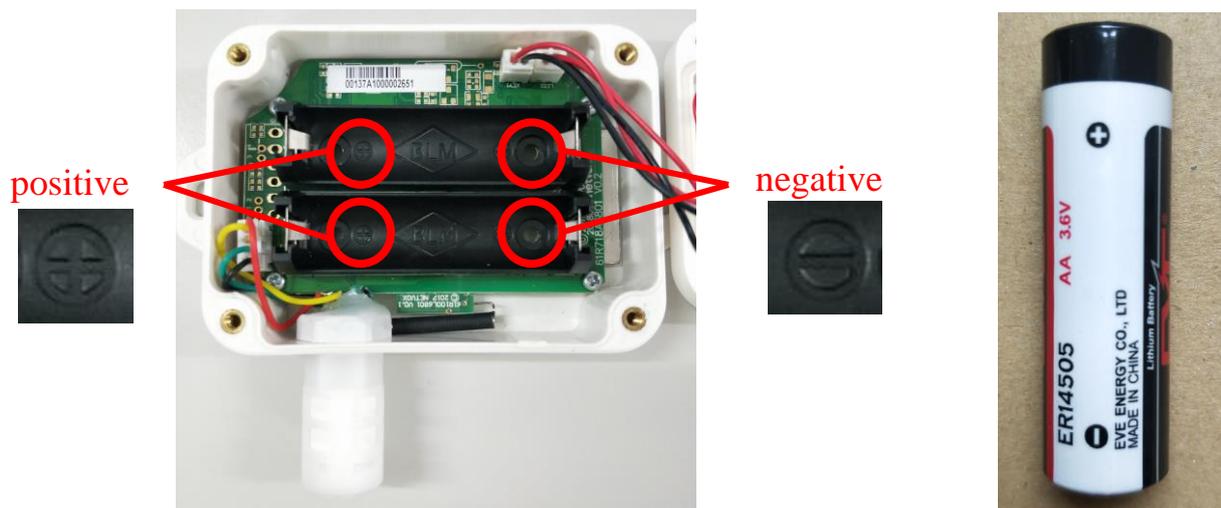The device must use 2 sections of ER14505 battery (3.6v/section)

Step 1

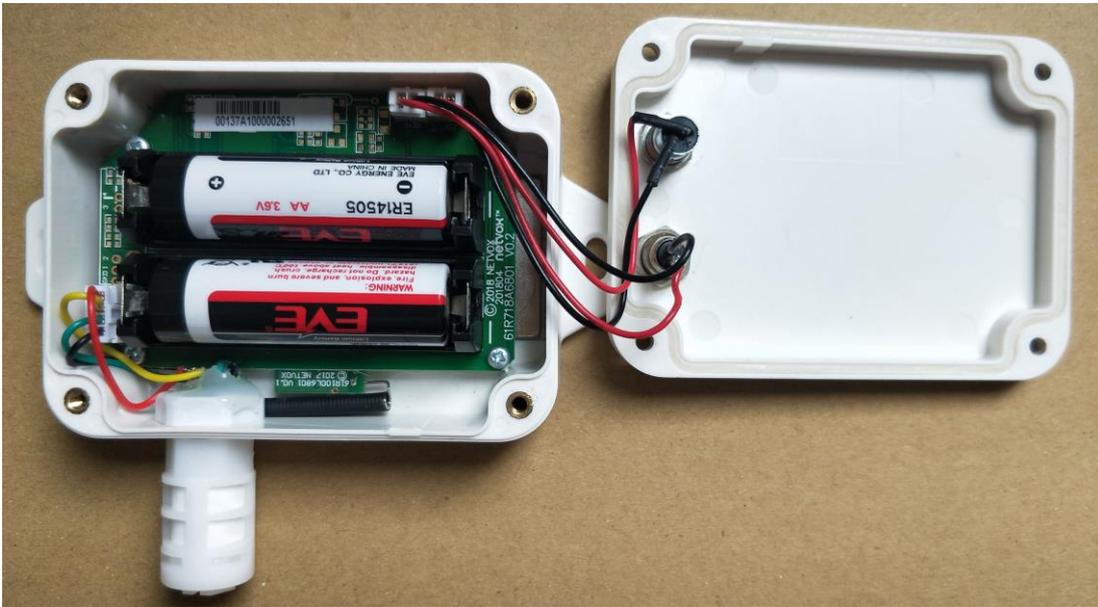　　Unscrew the four corners of the device with a screwdriver, as shown in the red circle below.

Step 2

　　Put the batteries into the battery bay of the device and note the positive and negative poles of the battery, please do not insert the battery reversely.

Step 3

After inserting the batteries, put the lid back on and tighten the four screws.

Note:

Please do not disassemble the device unless it is required to replace the batteries.

Do not touch the waterproof gasket, LED indicator light, function keys when replacing the batteries.

Please use suitable screwdriver to tighten the screws (if using an electric screwdriver, it is

recommended to set the torque as 4kgf) to ensure the device is impermeable.

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 the batteries should be produced within the last three months.

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

7.1 To determine whether a battery requires activation

Connect a new ER14505 battery to a 68ohm 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 68ohm resistor in parallel

b. Keep the connection for 6~8 minutes

c. The voltage of the circuit should be $\geqq 3.3V$

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.