

Wireless Air Pressure and Temperature Sensor

R720C

User Manual

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1. Introduction

R720C is a device for detecting air pressure and temperature that is a ClassA device based on the LoRaWAN open protocol of Netvox, and is compatible with the LoRaWAN 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



3. Main Feature

- Compatible with LoRaWAN
- 2 ER14505 lithium batteries (3.6V / section) parallel power supply
- Detect atmospheric pressure and temperature in air
- The base is attached with a magnet that can be attached to a ferrous object
- Protection class IP65
- 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 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 lifetime for varied models at different configurations.

4.Set Up Instruction

On/Off

Power on	Insert batteries. (users may need a 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 the green indicator flashes 20 times.
Power off	Remove Batteries.
Note:	<ol style="list-style-type: none"> 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. Five seconds after power on, the device will be in engineering test mode.

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 (Not in the factory setting)	<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

Press and hold 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 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>

Sleeping Mode

The device is on and in the network	<p>Sleeping period: Min Interval.</p> <p>When the reportchange exceeds setting value or the state changes: send a data report according to Min. Interval.</p>
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Low Voltage Threshold Alarm

Low Voltage	3.2V
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5. Data Report

The device will immediately send a report of the version package and a report data with atmospheric pressure and temperature values.

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

Maximum time: Max Interval = 15min

Minimum time: Min Interval = 15min (The current voltage value is detected every Min Interval according to the default.)

Default reportchange:

BatteryChange ---- 0x01 (0.1v)
 PressureChange ---- 0x000A (1 hPa)
 TemperatureChange ---- 0x0064 (1°C)

Note:

1. The unit of air pressure in the data packet is 0.01hPa, and the unit of air pressure change is 0.1hPa.

Notice the difference between the two units.

2.The cycle that the device reporting the data is configured before shipment.

3.The interval between two reports must be the minimum time

(If there is special customized shipment, the setting is changed according to customer requirements.)

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

<http://cmddoc.netvoxcloud.com/cmddoc> 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 \geq 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 ConfigureCmd

FPort: 0x07

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	Cmd ID	Device Type	NetvoxPayLoadData				
Config ReportReq	R720C	0x01	0x70	MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	Battery Change (1byte Unit:0.1v)	Temperature Change (2byte Unit:0.01°C)	AirPress Change (2byte Unit:0.1hPa)
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)	Temperature Change (2byte Unit:0.01°C)	AirPress Change (2byte Unit:0.1hPa)

(1) Configure R720C device parameter MinTime = 1min、 MaxTime = 1min、 BatteryChange = 0.1v、

TemperatureChange=1°C(100*0.01°C), AirPressChange=1hPa (10*0.1hPa)

Downlink: 0170003C003C010064000A

Device return:

Uplink: 81700000000000000000000 (configuration success)

Uplink: 81700100000000000000000 (configuration failure)

(2) Read R720C device parameter

Downlink: 0270000000000000000000

Device return:

Uplink: 8270003C003C010064000A (device current parameter)

Example of ReportDataCmd

FPort: 0x06

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

Version– 1 bytes –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)

R720C	0x70	0x01	Battery (1Byte, unit: 0.1V)	AirPressure (4Bytes, unit: 0.01hPa)	Temperature (Signed2Bytes, unit: 0.01°C)	Reserved (1Bytes, fixed 0x00)
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Ex1. Uplink: 01700124000181F009C400

1st byte (01): Version

2ndbyte(70): DeviceType 0x70 — R720C

3rdbyte(01): ReportType

4th byte(24): Battery , 24 H_{ex}=36 D_{ec} 36*0.1v=3.6v

5th6th7th8th byte(000181F0): Air Pressure, 181F0 H_{ex}=98800 D_{ec} 98800*0.01hPa = **988hPa**

9th10th byte(09C4): Temperature, 09C4 H_{ex}=2500 D_{ec} 2500*0.01°C= **25°C**

11th byte(00): Reserved

Ex2. Uplink: 0170019F00011170FE0C00

1st byte (01): Version

2ndbyte(70): DeviceType 0x70 — R720C

3rdbyte(01): ReportType

4th byte(9F): Battery (Bit7 represent **low battery**), 1F H_{ex}=31 D_{ec} 31*0.1v=3.1v

5th6th7th8th byte(00011170): Air Pressure, 11170 H_{ex}=70000 D_{ec} 70000*0.01hPa = **700 hPa**

9th10th byte(FE0C): Temperature (must decode with **signed** type value), FE0C H_{ex}= -500 D_{ec} -500*0.01°C= **-5 °C**

11th byte(00): Reserved

Example of GlobalCalibrateCmd Configuration

FPort: 0x0E (Port:14)

Description	Cmd ID	Sensor Type	PayLoad(Fix =9 Bytes)				
SetGlobal CalibrateReq	0x01	0x01 0x35	Channel(1Byte) 0_Channel1, 1_Channel2,etc	Multiplier (2bytes,Unsigned)	Divisor (2bytes,Unsigned)	DeltValue (2bytes,Signed)	Reserved (2Bytes,Fixed 0x00)
SetGlobal CalibrateRsp	0x81		Channel(1Byte) 0_Channel1, 1_Channel2,etc	Status (1Byte,0x00_success)		Reserved (7Bytes,Fixed 0x00)	
GetGlobal CalibrateReq	0x02		Channel (1Byte,0_Channel1,1_Channel2,etc)	Reserved (8Bytes,Fixed 0x00)			
GetGlobal CalibrateRsp	0x82		Channel(1Byte) 0_Channel1, 1_Channel2,etc	Multiplier (2bytes,Unsigned)	Divisor (2bytes,Unsigned)	DeltValue (2bytes,Signed)	Reserved (2Bytes,Fixed 0x00)
ClearGlobal CalibrateReq	0x03	Reserved (10Bytes,Fixed 0x00)					
ClearGlobal CalibrateRsp	0x83	Status (1Byte,0x00_success)			Reserved (9Bytes,Fixed 0x00)		

SensorType

Temperature 0x01

Air Press Sensor 0x35

The following example is 0x35 atmospheric pressure of GlobalCalibrateCmd.

(1)If the R720C detects is 1000 hPa and the actual atmospheric pressure is 999 hPa, it means the calibration we want to make is -1hPa.

Configure R720C device parameter Channel = 01、Multiplier = 000A 、 Divisor = 0001、 DeltValue = FFFF(-1)

(The calibration data is 000A*FFFF = -10)

Downlink:

013501000A0001FFFF0000

Device return:

Uplink: 81350100000000000000000000000000 (configuration success)

Uplink: 81350101000000000000000000000000 (configuration failure)

(2) Read R720C device parameter

Downlink: 0235010000000000000000

Device return:

Uplink: 823501000A0001FFFF0000 (device current parameter)

(3) Clear R720C device parameter

Downlink: 0300000000000000000000

Device return:

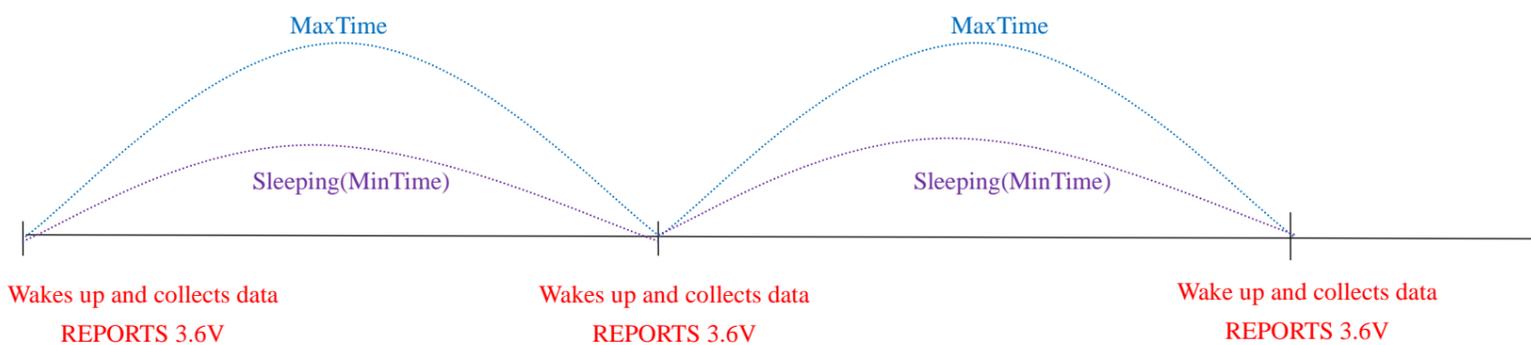
Uplink: 8300000000000000000000

Note:

1. When Multiplier is not 1, Calibration value = $\text{DeltValue} * \text{Multiplier}$.
2. When Divisor is not 1, Calibration value = $\text{DeltValue} / \text{Divisor}$.
3. The choices of the Channel would be 00-03 Channel
4. With different sensor type, it is forbidden to use that same Channel number.
5. This universal calibration supports calibration of positive and negative numbers.

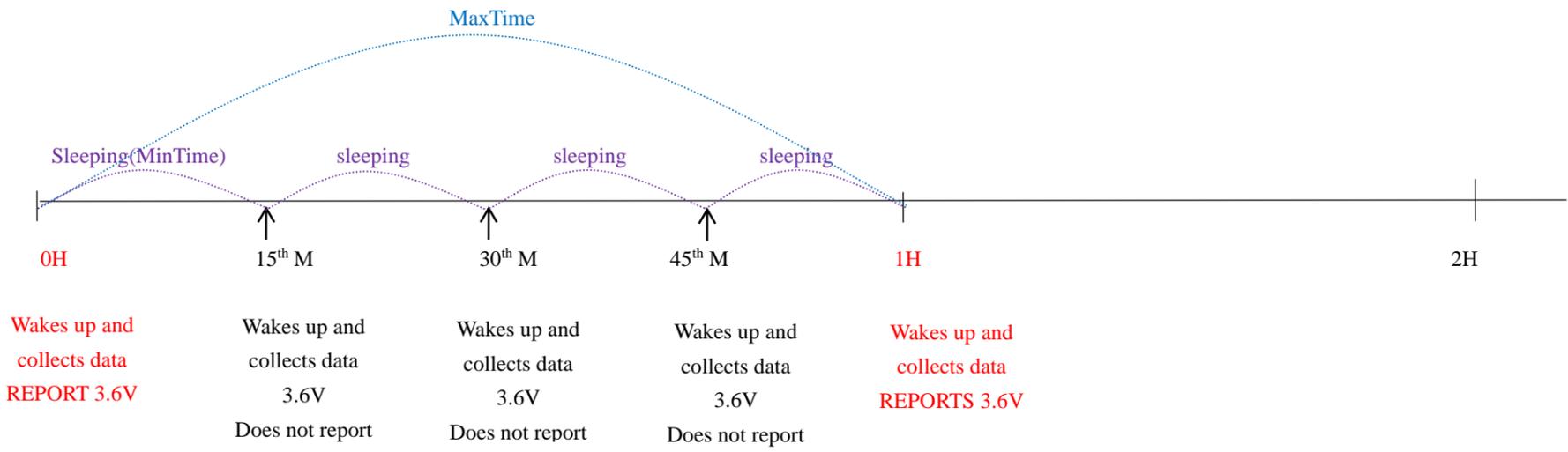
Example for MinTime/MaxTime logic:

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

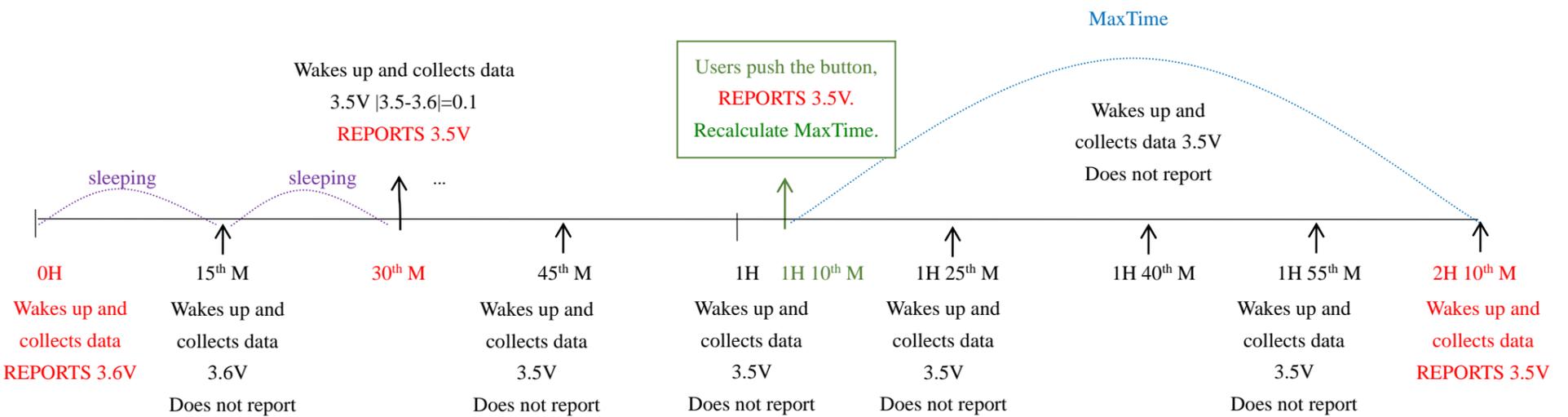


Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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



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 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. 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:

6.1 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.

6.2 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.

7.Important Maintenance Instruction

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

- Keep the equipment dry. Rain, moisture and various liquids or water may contain minerals that can corrode electronic circuits.

In case the device is wet, please dry it completely.

- Do not use or store in dusty or dirty areas. This way can damage its detachable parts and electronic components.
- Do not store in excessive heat place. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store in excessive cold place. 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. Treating equipment roughly can destroy internal circuit boards and delicate structures.
- Do not wash with strong chemicals, detergents or strong detergents.
- Do not paint the device. Smudges can make debris block detachable parts up and affect normal operation.
- Do not throw the battery into the fire to prevent the battery from exploding.

Damaged batteries may also explode.

All the above suggestions apply equally to your device, batteries and accessories.

If any device is not operating properly, please take it to the nearest authorized service facility for repairing.