netvox R720E Wireless TVOC/Temperature/Humidity Sensor User Manual

Wireless TVOC / Temperature / Humidity Sensor R720E
User Manual

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Introduction

R720E is the temperature, humility, and TVOC detection device which is a Class A device of NETVOX based on LoRaWAN TM protocol.

LoRa Wireless Technology:
Lora is a wireless communication technology dedicated to long-distance and low power consumption. Compared with other communication methods, the 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.

Appearance

Main Features

- Adopt SX1276 wireless communication module
- 2 ER14505 lithium batteries AA size (3.6V / section) in parallel
- TVOC concentration, temperature, and humidity detection
- The base is attached with a magnet that can be attached to a ferromagnetic material object
- Protection class 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
- 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.

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 onc e.
Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds, and the green indicator flashes 2 0 times.
Power off	Remove Batteries.
Note:	1. Remove and insert the battery; the device is at off state by default. Press and hold the function key for 3 seconds till the green indicator flashes once to turn on the device. 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 the first 5 seconds after power-on, the device will be in engineering test mo de.

Network Joining

Never joined the network	Turn on the device to search the network. The green indicator stays on for 5 seconds: success The green indicator remains off: fail
Had joined the network	Turn on the device to search the previous network. The green indicator stays on for 5 seconds: success The green indicator remains off: fail
Fail to join the network	Suggest checking the device verification information on the gateway or consult y our platform service provider.

Function Key

Press and hold for 5 seconds	Restore to factory setting / Turn off The green indicator flashes 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: the green indicator remains off

Sleeping Mode

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

Low Voltage Warning

Low Voltage	3.2V

Data Report

The device will immediately send a version packet report and a data report including the voltage of the battery and TVOC value.
The device sends data according to the default configuration before any other configuring.

Default Setting:
Maximum time: Max Interval = 15 min
Minimum time: Min Interval = 15 min * Minimum time should not be less than 4min.
Battery Change = 0x01 (0.1V)
TVOC Change = 0x012C (300 ppb)

TVOC Measurement Range: 0 ppb to 60000 ppb

Excellent	0 to 65 ppb
Good	65 to 220 ppb
Moderate	220 to 660 ppb
Poor	660 to 2200 ppb
Unhealthy	2200 to 60000 ppb

Note:

1. R720E needs to work for 13 hours after the first power-on.
   (The sensor needs to be calibrated automatically during the 13 hours, and the data will be biased during this period. The accurate data shall prevail after 13 hours. At present, this step has been completed before the shipment.)
2. On the condition that the sensor can operate normally, the read data is valid after the device is powered off and has been turned on again for 20 minutes.
   (The 20 minutes is the time for the sensor to enter a stable state.)

The device will report 0xFFFF when the sensor is damaged, the initiation fails, and the device fails to read the data three times continuously after warming up.
*The above process will be completed automatically after the device is turned on; therefore, users do not need to operate by themselves.

The data parsing reported by the device is referenced by the Netvox LoraWAN Application Command document and **http://loraresolver.netvoxcloud.com:8888/page/index**

Min Interval (Unit: second)	Max Interval (Unit: second)	Reportable Change	Current Change ≥ Reportable Change	Current Change Reportable Change
Any number ≥ 240	Any number betwee n 240~65535	Can not be 0	Report per Min Interval	Report per Max Interval

Example of ConfigureCmd
FPort 0x07

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

ReportReq	R720E	Ox01	OxA5	Config MinTime (2bytes Unit : s)	MaxTime (2bytes Unit : s)	BatteChange (!byte Unit:0.1v)	TVOC Change (2bytes Unit : I ppb)	Reserved (2Bytes. Fixed Ox00)
Config ReportRsp		Ox81		Status (OxOtsuccas)		Reserved (8Bytes. Fixed Ox00)		
ReadConfig ReportReq		0x02		every Red (9Bytes, Fixed Ox00)				
ReadConfig ReportRsp		0x82		MinTime (2bytes, Unit: s)	Maxlime (2bytes. Unit: s)	BatteryChange (!byte, Unit: 0.1v)	TVOC Change (2bytes, Unit: I ppb)	Reserved (Bytes, Fixed Ox00)
ResetTVOC BaseLineReq		0x03		Reserved (9Bytes. Fixed Ox00)				
ResetTVOC BaseLineRsp		Ox83		Status (OxOtsuccess)		Reserved (8Bytes, Fixed Ox00)		

1. **Command Configuration:**

   MinTime = 5min, MaxTime = 5min, BatteryChange = 0.1v, TVOC Change=100ppb

   Downlink 01A5012C012C0100640000

   Response

   81A5000000000000000000 Configuration success

   81A5010000000000000000 Configuration failure

   * When min time < 4min, Configuration fails

2. **Read Configuration:**

   Downlink 02A5000000000000000000

   Response

   82A5012C012C0100640000 Current configuration

3. **Calibrate the baseline:**

   After the configuration is successful, users can re-acquire and set the baseline value after 13 hours.

   Downlink 03A5000000000000000000

   Response

   83A5000000000000000000 Configuration success

   83A5010000000000000000 Configuration failure

Example of ReportDataCmd

FPort 0x06

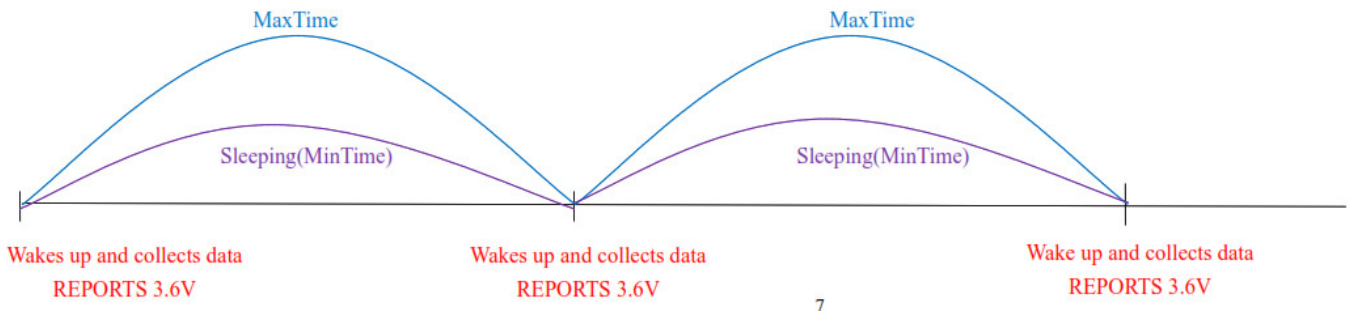
Bytes	1 Byte	1 Byte	1 Byte	Var(Fix=8 Bytes)
	Version	DeviceType	ReportType	NetvoxPayLoadData

Version– 1 byte–0x01——the Version of NetvoxLoRaWAN Application Command Version
DeviceType– 1 byte – Device Type of Device
ReportType – 1 byte –the Presentation of the NetvoxPayLoadData according to the device type
NetvoxPayLoadData– Fixed bytes (Fixed =8bytes)

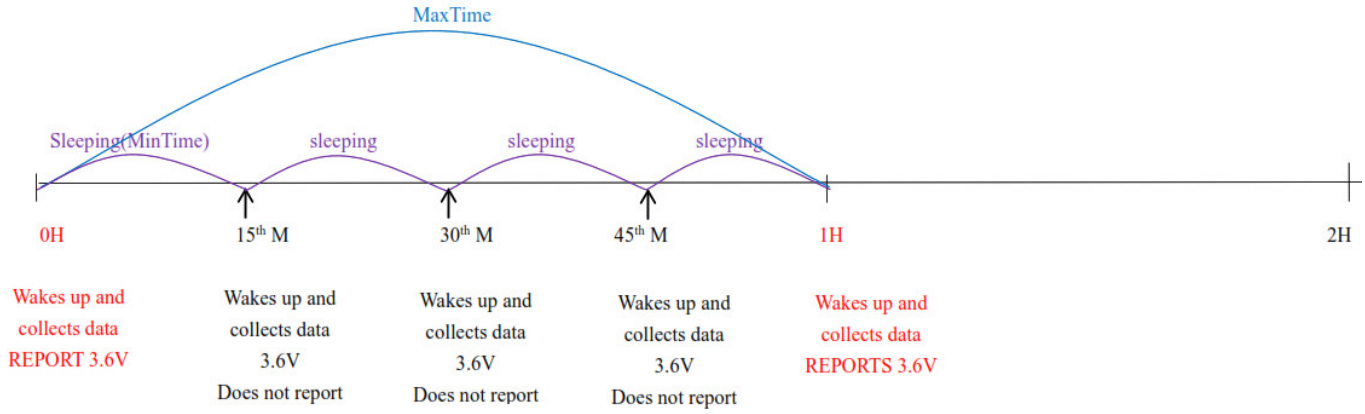
Device	Device Type	Riport Type	NetvoxPayLoadData				
R720E	0xA5	0x01	Battery (1Byte, Unit: 0.1V)	TVOC (2Bytes, 1ppb)	Temperature (Signed2Bytes, Unit: 0.01°C)	Humidity (2Bytes, Unit: 0.01%)	Reserved (1Byte, fixed 0x00)

Uplink 01A5012400290A4B11B400
TVOC= 0029 Hex = 41 Dec , 41 ppb
Temperature= 0A4B Hex = 2635 Dec , 2635*0.01° = 26.35 °C
Humidity= 11B4 Hex = 4532 5 Dec , 4532*0.01% = 45.32 %

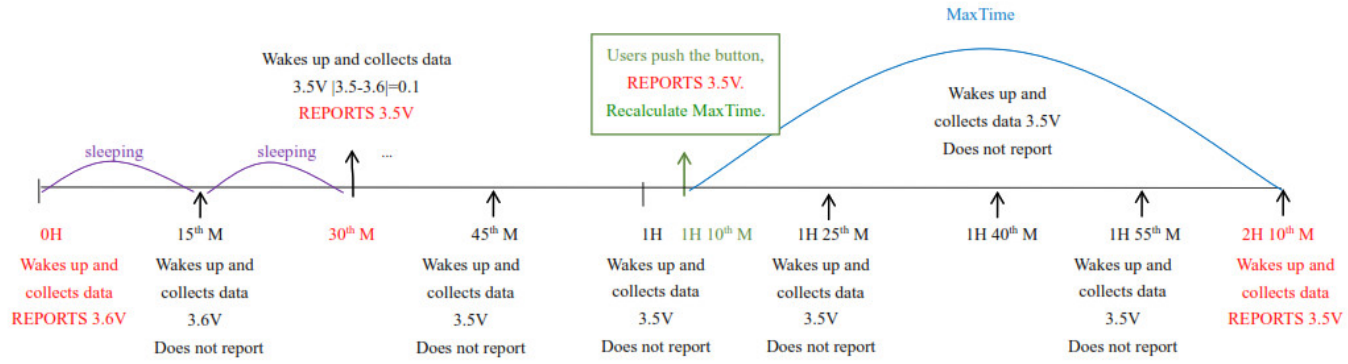
Example for MinTime/MaxTime logic:
Example#1 based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V



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

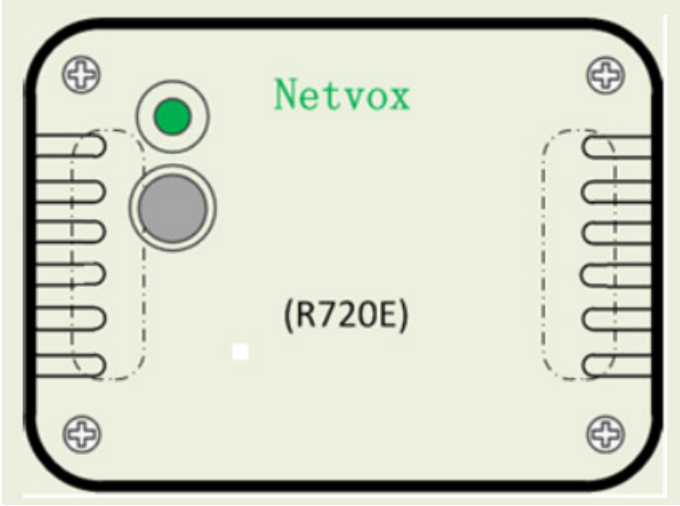


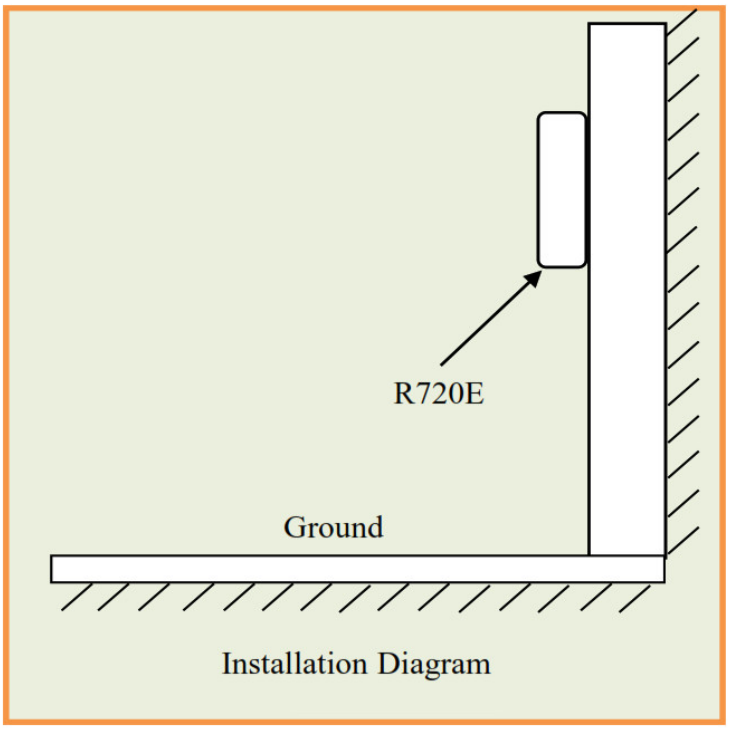
Notes :

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 Maxime interval.
3. We do not recommend setting 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 Maxime interval, another the cycle of MinTime/Maxime calculation is started.

Installation

1. R720E has a built-in magnet (the dotted line in the figure below).
   When installing, the sensor can be attached to the surface of iron objects.
2. If it is installed on a wall or other object without iron, users can install another piece of iron on the wall or other object, and then attach the sensor to the iron.
   Note:
   • Do not install the device in a metal shielded box or an environment with other electrical equipment around to avoid affecting the wireless transmission signal of the device.





3. R720E detects according to Min Time. When the detected TVOC value or battery voltage is compared with the last report, the value exceeds the set value. (Default TVOC Value: 300ppb; Default Battery Voltage: 0.1V) If the TVOC concentration exceeds 300ppb or the battery voltage exceeds 0.1V, the currently detected TVOC, temperature, and humidity will be sent.
4. If the variation of TVOC concentration or battery voltage does not exceed the set value, the data is reported regularly according to the Max Time.

Note: Min Time and Max Time default 15 minutes. Min Time and Max Time default 15 minutes.

R720E is suitable below scenarios:

- Residential
- Shopping mall
- Station
- School
- Airport
- Construction site

  The place needs to detect the TVOC, temperature, or humidity.

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 a 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.

***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.
*How to activate the battery

1. Connect a battery to a 68ohm resistor in parallel
2. Keep the connection for 6~8 minutes
3. The voltage of the circuit should be ≧3.3V

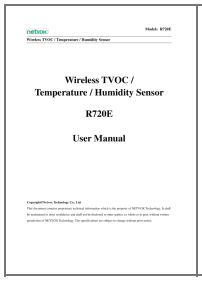
Important Maintenance Instruction

The device is a product with superior design and craftsmanship and should be used with care.
The following suggestions will help you use the warranty service effectively.

- 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 an 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 an excessively 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 repair.

Documents / Resources


netvox Models: R720E
Wireless TVOC / Temperature / Humidity Sensor

Wireless TVOC /
Temperature / Humidity Sensor

R720E

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