



netvox R720E Wireless TVOC Temperature Humidity Sensor User Manual

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netvox R720E Wireless TVOC Temperature Humidity Sensor



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Introduction

R720E is the temperature, humidity and TVOC detection device which is Class A device of NETVOX based on LoRa WAN TM 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.

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 LoRaWANTM 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 life time 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 once.
Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds, and the green indicator flashes 20 times.
Power off	Remove Batteries.

Note:	<p>1. Remove and insert the battery; the device is at off state by default. Press and hold</p> <p>the function key for 3 seconds till the green indicator flashes once to turn on the device.</p> <p>2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.</p> <p>3. At the first 5 seconds after power on, the device will be in engineering test mode.</p>
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 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 The green indicator remains off: fail</p>
Fail to join the network	<p>Suggest to check the device verification information on the gateway or consult your platform</p> <p>server provider.</p>
Function Key	

Press and hold for 5 seconds	<p>Restore to factory setting / Turn off</p> <p>The green indicator flashes 20 times: success 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>

Low Voltage Warning

Low Voltage	3.2V
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Data Report

- The device will immediately send a version packet report and a data report including 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
- **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.)
3. 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 self.
The data parsing reported by the device is referenced by the Netvox LoraWAN Application Command document and <http://loraresolver.netvoxcloud.com:8888/page/index>

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 ≥ 240	Any number between n 240~65535	Can not be 0	Report per Min Interval	Report per Max Interval

Example of Configure Cmd

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

Config ReportReq		0x01		MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	Battery Change (1 byte Unit: 0.1v)	TVOC Change (2bytes Unit 1ppb)	Reserved (2Bytes, Fixed 0x00)
				Status (0x00_success)		Reserved (8Bytes, Fixed 0x00)		
				Reserved (9Bytes, Fixed 0x00)				

ReadConfig	R720 E	0x82	0xA5	MinTime (2byte s, Unit: s)	MaxTime (2byt es, Unit: s)	B a t t e r y C h a n g e (1 b y t e , U n i t : 0 . 1 v)	TVOC Change (2bytes, Unit: 1 ppb)	Reserved (Byt es, Fixed 0x00)		
ReportRsp										
ResetTVOC						Reserved (9Bytes, Fixed 0x00)				
BaseLineReq				0x03						
ResetTVOC		0x83		Status (0x00_success)		Reserved (8Bytes, Fixed 0x00)				
BaseLineRsp										

1. Command Configuration:

- **MinTime** = 5min, MaxTime = 5min, BatteryChange = 0.1v, TVOC Change=100ppb
 - **Downlink:** 01A5012C012C0100640000
 - **Response:**
 - 81A500000000000000000000 Configuration success
 - 81A501000000000000000000 Configuration failure
- * When min time < 4min, Configuration fails

2. Read Configuration:

- **Downlink:** 02A500000000000000000000
- **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:** 03A500000000000000000000
- **Response:**
 - 83A500000000000000000000 Configuration success
 - 83A501000000000000000000 Configuration failure

Example of Report Data Cmd

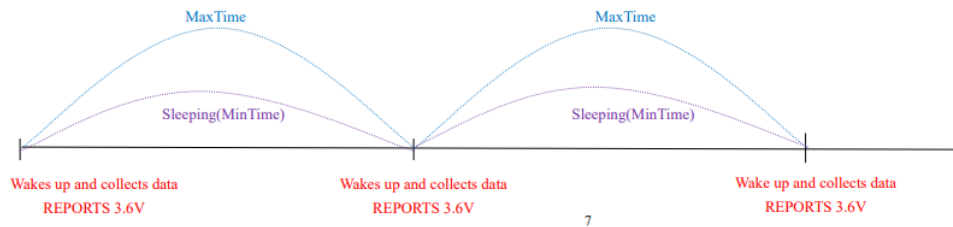
Bytes	1 Byte	1 Byte	1 Byte	Var(Fix=8 Bytes)
	Version	Device Type	Report Type	Netvox Pay Load Data

- Version– 1 byte–0x01—the Version of Netvox Lora WAN Application Command Version
- Device Type– 1 byte – Device Type of Device
- Report Type – 1 byte –the Presentation of the Netvox Pay Load Data according the device type
- Netvox Pay Load Data– Fixed bytes (Fixed =8bytes)

Device	Device Type	Report Type	Netvox Pay Load Data				
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)

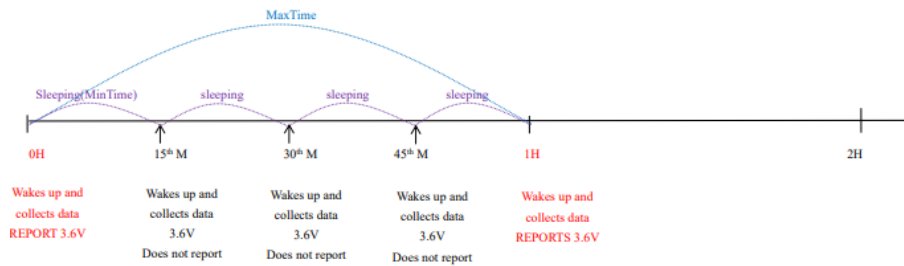
- **Uplink:** 01A5012400290A4B11B400
 - **TVOC**= 0029 Hex = 41 Dec , 41 ppb
 - **Temperature**= 0A4B Hex = 2635 Dec , $2635 \times 0.01^\circ = 26.35^\circ \text{C}$
 - **Humidity**= 11B4 Hex = 4532 5 Dec , $4532 \times 0.01\% = 45.32\%$

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

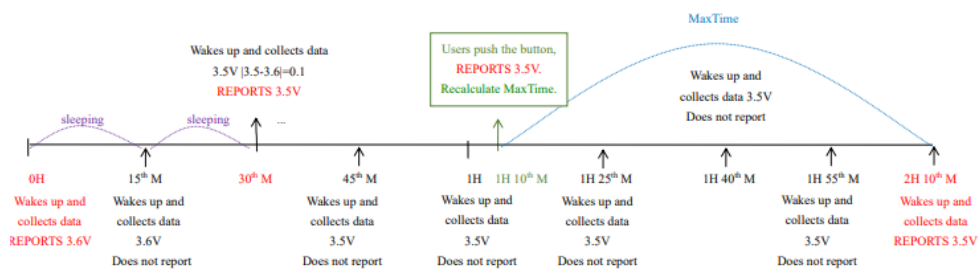


Note: Max Time=Min Time. Data will only be report according to Max Time (Min Time) duration regardless Battery Voltage Change value.

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.

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 Max Time interval.

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.

Whenever the device sends a report, no matter resulting from data variation, button pushed or Max Time interval, another cycle of Min Time/Max Time calculation is started.

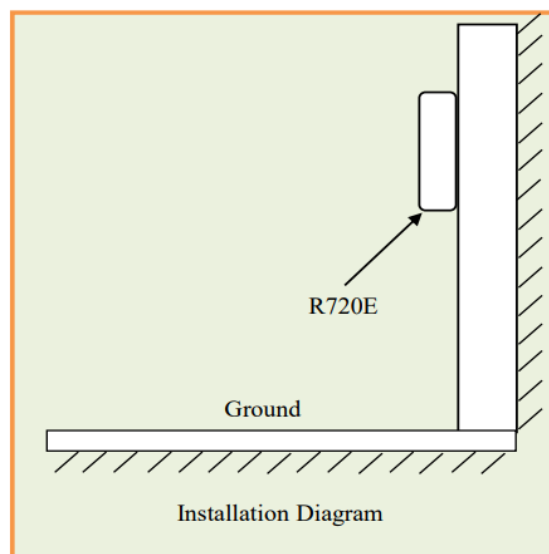
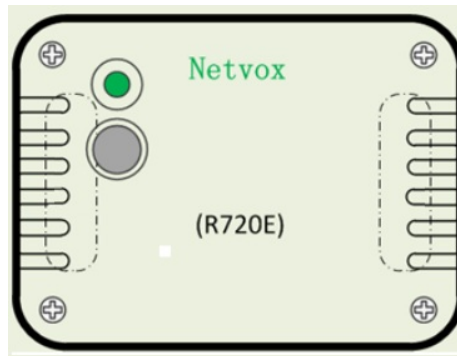
Installation

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 defaults 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 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:

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.

2. How to activate the battery

- Connect a battery to a resistor in parallel
- Keep the connection for 5~8 minutes
- 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.

Important Maintenance Instruction

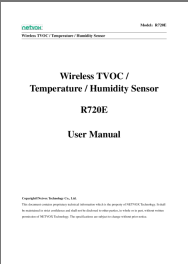
The device is a product with superior design and craftsmanship and should be used with care. The following suggestions will help you use the warranty service effectively.

- 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 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.

Documents / Resources

	netvox R720E Wireless TVOC Temperature Humidity Sensor [pdf] User Manual R720E, Wireless TVOC Temperature Humidity Sensor, TVOC Temperature Humidity Sensor, Temperature Humidity Sensor, Humidity Sensor, R720E, Sensor
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References

-  [Netvox Command Resolver](#)
-  [ÉÔ°ö;£i£j£](#)