Manuals+ — User Manuals Simplified.

netvox R718EA Wireless Tilt Angle and Surface Temperature Sensor User Manual

Home » **netvox** » **netvox R718EA Wireless Tilt Angle and Surface Temperature Sensor User Manual**

netvox R718EA Wireless Tilt Angle and Surface Temperature Sensor User Manual

Contents

Introduction

The R718EA is a LoRaWAN ClassA device, it detects the angle of three axis tilt and surface temperature of the

detected object, and it is compatible with LoRaWAN protocol. When the device moves or vibrates over threshold value, it immediately reports the data of temperature and the tilt angle.

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

- Apply SX1276 wireless communication module
- 2 sections ER14505 3.6V Lithium AA battery
- Detect tilt angle of the X, Y, and Z axes
- The base is attached with a magnet that can be attached to a ferromagnetic material object
- Protection level IP65/IP67 (optional)
- Compatible with LoRaWANTM Class A
- Frequency hopping spread spectrum technology
- 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)
- Available third-party platform: Actility / ThingPark, TTN, MyDevices/Cayenne
- Low power consumption and long 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.

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 green indicator flashes 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. Five seconds 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. 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 (when the device is on)	Suggest to check the device verification information on the gateway or consult your platform server 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: 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

Data Report

The device will immediately send a version packet report along with two uplink packets including temperature, battery voltage, tilt angle of the X, Y, and Z axes.

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

Default Setting:

- MaxTime: Max Interval = 60 min = 3600s
- MinTime: Max Interval = 60 min = 3600s
- BatteryChange = 0x01 (Unit: 0.1v)
- AngleChange = 0x05 (Unit: 1°, Accuracy: 3°)
- ActiveThreshold = 0x0003 (Range:0x0003-0x00FF)
- Deactivetime = 0x05 (5 seconds) (Range:0x0003-0x00FF)
- Temperature Change = 0x0A (Unit: 0.1°C)

R718EA Reporting Requirements:

After the three-axis acceleration of the device exceeds Active Threshold and then the device is stationary, if the tilt angle change of one of the three axes is greater than or equal to the set Angle Change, a report is sent immediately to report the three-axis tilt angle, battery voltage, and temperature. The three-axis acceleration of the device needs to be lower than
In Active Threshold, the duration is greater than 5s (cannot be modified), and the vibration stops completely, the

next detection will start. If the vibration continues during this process after the report is sent, the timing will restart.

Calibration

1. The device must be placed horizontally during automatic calibration.
2. After calibration, the angles of X, Y, Z axes are about 0°, 0°, -90° when the device is placed horizontally.

Note:

R718EA is using three-axis accelerometer to detect tilt.

1. The device report interval will be programmed based on the default firmware which may vary.
2. The interval between two reports must be the minimum time.

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

http://loraresolver.netvoxcloud.com: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　R eportable Change
Any number between 1~65535	Any number between 1~65535	Can not be 0.	Report per Min Interval	Report per Max Interval

Active Threshold and In Active Threshold

Formula	**Active Threshold= Critical value ÷ 9.8 ÷ 0.0625** The gravitational acceleration at standard atmospheric pressure is 9.8 m/s^2 The scale factor of the threshold is 62.5 mg
Active Threshold	Active Threshold can be changed by ConfigureCmd Active Threshold range is **0x0003-0x00FF** (default is 0x0003);
Deactive time	Deactivetime can be changed by ConfigureCmd Deactivetime range is **0x03-0xFF** (default is 0x05)
Example	Assuming that the critical value is set to be 10m/s^2, the Active Threshold would be set 10/9.8/0.0625=16.32 Active Threshold would be set integer as 16.

Calibration

The accelerometer is a mechanical structure that contains components that can move freely.

These moving parts are very sensitive to mechanical stress, far beyond solid-state electronics.

The 0g offset or offset is an important accelerometer indicator because it defines the baseline used to measure acceleration.

After installing R718EA, turn on the device and wait for the device join the network 1 minute, the device will automatically offset the calibration.

If the device installation position moves, you need to power off the device 1 minute and restart turn on.

The X, Y, Z axis direction of R718EA

Example of data configuration

FPort 0x07

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

CmdID– 1 byte
DeviceType– 1 byte – Device Type of Device
NetvoxPay Load Data– var bytes (Max=9bytes)

Description	Device	CmdID	Device Type	NetvoxPayLoadData					
ConfigReportReq	R718EA	0x01	0x9A	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	BatteryChange (1byte Unit:0.1v)	AngleChange (1byte Unit:1°)	Temperature Change (1 byte Unit:0.1°C)	Reserved (2Bytes,Fixed 0x00)
ConfigReportRsp		0x81		Status(0x00_success)			Reserved (8Bytes,Fixed 0x00)		
ReadConfigReportReq		0x02		Reserved (9Bytes,Fixed 0x00)					
ReadConfigReportRsp		0x82		MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	BatteryChange (1byte Unit:0.1v)	AngleChange (1byte Unit:1°)	Temperature Change (1 byte Unit:0.1°C)	Reserved (2Bytes,Fixed 0x00)
SetActiveThresholdReq		0x03		Threshold (2Bytes)		Deactivetime (1Byte,Unit:1s)		Reserved (6Bytes,Fixed 0x00)	
SetActiveThresholdRsp		0x83		Status (0x00_success)			Reserved (8Bytes,Fixed 0x00)		
GetActiveThresholdReq		0x04		Reserved (9Bytes,Fixed 0x00)					
GetActiveThresholdRsp		0x84		Threshold (2Bytes)		Deactivetime (1Byte,Unit:1s)		Reserved (6Bytes,Fixed 0x00)	

1. Configure device parameters Min Time = 1min, Max Time = 1min, **Battery Change** = 0.1v, Angle Change =5°, TemperatureChange=1°C

   Downlink: 019A003C003C01050A0000 003C(Hex) = 60(Dec)

   Device returns:

   819A000000000000000000 (Configuration is successful)

   819A010000000000000000 (Configuration failed)

2. **Read device parameters**

   Downlink: 029A000000000000000000

   Device returns:

   829A003C003C01050A0000 (current device parameters)

3. **Configure device parameters ActiveThreshold=16, Deactivetime =5 seconds**

   Assuming that the Active Threshold is set to 10m/s2 , the value to be set is 10/9.8/0.0625=16.32,and the last value obtained is an integer and is configured as 16.

Downlink: 039A001005000000000000

Device returns:

839A000000000000000000 (Configuration is successful)

839A010000000000000000 (Configuration failed)

4. **Read device parameters**

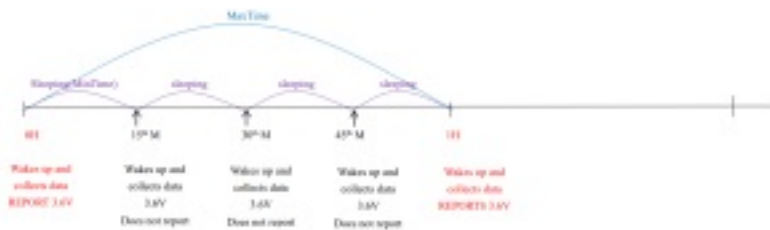**Downlink:** 049A000000000000000000

Device returns:

849A001005000000000000 (Device current parameter)
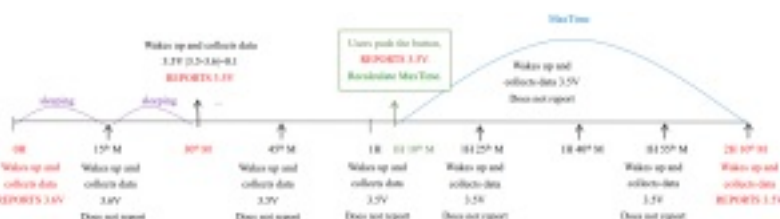
Example for MinTime/MaxTime logic:

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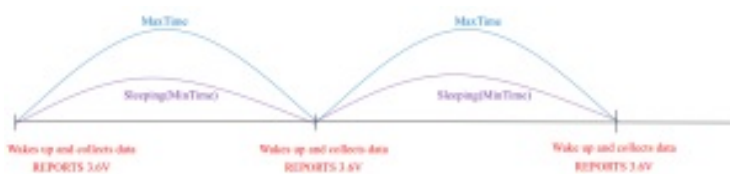
Example#2 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. Battery Voltage Change= 0.1V.

Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. Battery Voltage Change= 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 Reportable Change 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.

Installation

While installing, it is recommended to install R718EA while the device is power-off, and be installed horizontal at a stationary place. After installing and fixing R718EA, please turn on the device. After the device is joined, one minute later, R718EA would perform the offset calibration of the device.

R718EA would need some time to gather the data of three-axis tilt angle, the voltage of battery and the surface temperature for reference

The specific configuration depends on the actual situation.

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.

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.

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 3.2V, it means the 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 3.2V, it means the battery requires activation.

How to activate the battery

- a. Connect a battery to a 68ohm resistor in parallel (3.6V / 68ohm=53mA)
- b. Keep the connection for 2 minutes
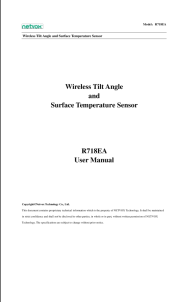- c. The voltage of the circuit should be ≧3.2V

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.

Documents / Resources

	netvox R718EA Wireless Tilt Angle and Surface Temperature Sensor [pdf] User Manual R718EA, Wireless Tilt Angle and Surface Temperature Sensor

Manuals+,