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netvox R718EC Wireless Accelerometer and Surface Temperature Sensor User Manual

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Introduction

The R718EC is identified as a LoRaWAN ClassA device with three-axis acceleration, and temperature and is compatible with the LoRaWAN protocol. When the device moves or vibrates over the threshold value, it immediately reports the temperature, acceleration, and velocity of the X, Y, and Z axes.

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, and industrial monitoring. Main features include small size, low power consumption, transmission distance, anti-interference ability, and so on.

Appearance

Main Features

- Apply SX1276 wireless communication module
- 2 sections ER14505 3.6V Lithium AA size battery
- Detect the acceleration and velocity 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 the web: **http://www.netvox.com.tw/electric/electric_calc.html**
- On this website, users can find battery lifetime for various models at different configurations.
- Actual range may vary depending on the environment.
- 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	Press and hold the function key for 5 seconds, and the 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. The first 5 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
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 network	Sleeping period: Min Interval. When the reportchange 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 along with two uplink packets including temperature, battery voltage, acceleration and velocity 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 (0.1v)
- AccelerationChange = 0x0003 (m/s2)
- ActiveThreshold = 0x0003
- InActiveThreshold = 0x0002
- RestoreReportSet = 0x00 (DO NOT report when sensor restore)

Three-axis acceleration and velocity:

If the three-axis acceleration of the device exceeds ActiveThreshold, a report will be sent immediately. After the three-axis acceleration and speed are reported, the three-axis acceleration of the device needs to be lower than InActiveThreshold, 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. The device sends two packets of data. One is the acceleration of the three axes, and the other is the speed of the three axes and temperature. The interval between the two packets is 15s.

Note:

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.

ActiveThreshold and InActiveThreshold

Formula	**Active Threshold (or InActiveThreshold) = Critical value ÷ 9.8 ÷ 0.0625** * The gravitational acceleration at standard atmospheric pressure is 9.8 m/s2 * 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);
InActive Threshold	InActive Threshold can be changed by ConfigureCmd InActive Threshold range is **0x0002-0x00FF** (default is 0x0002)
Example	Assuming that the critical value is set to 10m/s2, the Active Threshold (or InActive Threshold) to be set is 10/9.8/0.0625=16.32 Active Threshold (or InActiveThreshold) to be set integer as 16. Note: When configuration, ensure that the Active Threshold must be greater than the InActive Threshold.

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 is an important accelerometer indicator because it defines the baseline used to measure acceleration. After installing R718EC, users need to let the device rest for 1 minute, and then power on. Then, turn on the device and wait for the device to take 1 minute to join the network. After that, the device will automatically execute the calibration. After calibration, the reported three-axis acceleration value will be within 1m/s2. When the acceleration is within 1m/s2 and the speed is within 160mm/s, it can be judged that the device is stationary.

Example of data configuration

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

- **CmdID**– 1 byte
- **DeviceType**– 1 byte – Device Type of Device
- **NetvoxPayLoadData**– var bytes (Max=9bytes)

Description	Device	CmdID	Device Type	NetvoxPayLoadData				
Config ReportReq	R718EC	0x01	0x1C	MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit:0.1v)	AccelerationChange (2byte Unit: m/s2)	Reserved (2Bytes,Fixed 0x00)
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)	AccelerationChange (2byte Unit: m/s2)	Reserved (2Bytes,Fixed 0x00)
SetActive ThresholdReq		0x03		ActiveThreshold (2Bytes)		InActiveThreshold (2Bytes)	Reserved (5Bytes,Fixed 0x00)	
SetActive ThresholdRsp		0x83		Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)		
GetActive ThresholdReq		0x04		Reserved (9Bytes,Fixed 0x00)				

| GetActive ThresholdRsp	0x84	ActiveThreshold (2Bytes)	InActiveThreshold (2Bytes)	Reserved (5Bytes,Fixed 0x00)

Example for MinTime/Maxime logic

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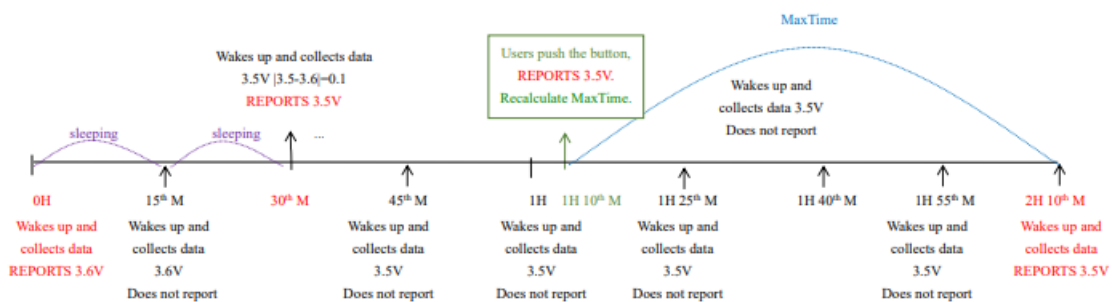

Note:

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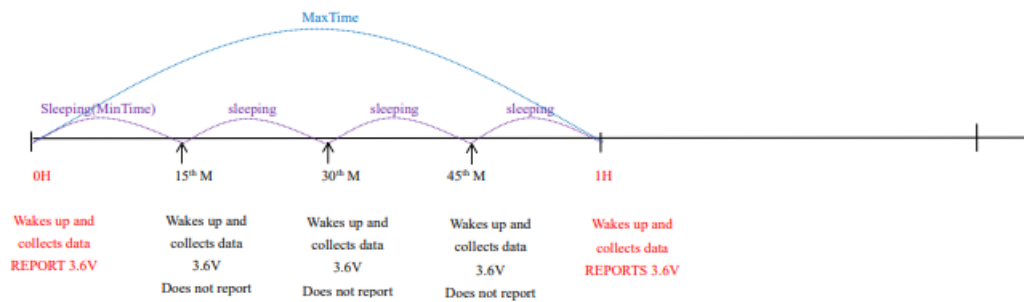
Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.

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 the MinTime interval. If the data variation is not greater than the last data reported, the device reports according to the MaxTime 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 MaxTime interval, another cycle of MinTime/MaxTime calculation is started.

Example Application

In the case of detecting if the generator is working normally, it is recommended to install R718EC horizontal while the generator is power-off and in static status. After installing and fixing R718EC, please turn on the device. After the device is joined, one minute later, R718EC would perform the calibration of the device (the device cannot be moved after the calibration. If it needs to be moved, the device needs to be turned off/powered off for 1 minute, and then the calibration would be performed again). R718EC would need some time to gather the data of the three-axis accelerometer & the temperature of the generator while it is working normally. The data is a reference for the settings of ActiveThreshold & InActiveThreshold, it is also for checking if the generator is working abnormally.

Assuming that the collected Z Axis Accelerometer data is stable at 100m/s², the error is ±2m/s², the ActiveThreshold can be set to 110m/s², and the InActiveThreshold is 104m/s².

Note:
Please do not disassemble the device unless it is required to replace the batteries. Do not touch the waterproof gasket, LED indicator light, or function keys when replacing the batteries. Please use a 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 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

- 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 ≧3.3V

Important Maintenance Instruction

Kindly pay attention to the following 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 a dusty or dirty environment. It might damage its detachable parts and electronic components.
- Do not store the device under excessive heat conditions. 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 the device and affect the operation.
- Do not throw the battery into the fire, or the battery will explode. Damaged batteries may also explode.

Documents / Resources

netvox Model R718EC Wireless Accelerometer and Surface Temperature Sensor **Wireless Accelerometer** **and** **Surface Temperature Sensor** **R718EC** **User Manual** Copyright©Netvox Technology Co., Ltd.	[**netvox R718EC Wireless Accelerometer and Surface Temperature Sensor**](#) [pdf] User Manual Wireless Accelerometer and Surface Temperature Sensor, R718EC Wireless Accelerometer and Surface Temperature Sensor

References

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