
Wireless Activity Detection Sensor

Wireless Activity Detection Sensor User Manual

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1. Introduction

The R311FA is a Wireless Activity Detection Sensor for Netvox ClassA type devices based on the LoRaWAN open protocol and is compatible with the LoRaWAN protocol.

When the device detects movement or vibration, it immediately triggers an alarm.

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 Features

- Apply SX1276 wireless communication module
- 2 section 3V CR2450 button battery powered
- Vibration and battery voltage detection
- Compatible with LoRaWAN™ 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
- Improved power management for longer 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.

4. Set up Instruction

On/Off

Power on	Insert two sections of 3V CR2450 button batteries and close the battery cover
Turn on	Press any function key till the green and red indicator flash once.
Turn off (Restore to factory setting)	Press and hold the function key for 5 seconds till the green indicator flashes for 20 times.
Power off	Remove Batteries.
Note:	<ol style="list-style-type: none">1. Remove and insert the battery; the device memorizes previous on/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. Press any function key and insert batteries at the same time; it will enter engineer testing mode.

Network Joining

Never joined the network	Turn on the device to search the network to join. 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 to join. 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)	First two mins: wake up every 15 seconds to send request. After two mins: enter sleeping mode and wake up every 15 minutes to send request. Note: Suggest to remove batteries if the device is not used to save power. Suggest to check device verification on gateway.

Function Key

Press and hold for 5 seconds	Restore to factory setting / Turn off The green indicator flashes for 20 times: success The green indicator remains off: fail
Press once	The device is in the network: the 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 setting value or the state changes: send a data report according to Min Interval.
The device is on but not in the network	First two mins: wake up every 15 seconds to send request. After two mins: enter sleeping mode and wake up every 15 minutes to send request. Note: Suggest to remove batteries if the device is not used. Suggest to check device verification on gateway.

Low Voltage Warning

Low Voltage	2.4V
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5. Data Report

The device will immediately send a version packet report along with an uplink packet including vibration status and battery voltage.

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

Default setting:

MaxTime: Max Interval = 60 min = 3600s

MinTime: Min Interval = 60 min = 3600s

BatteryChange: 0x01 (0.1V)

ActiveThreshold: 0x0003 (Threshold range: 0x0003-0x00FF, 0x03 is the most sensitive)

Deactivetime: 0x05 (Deactive time Range: 0x01-0xFF)

ActiveThreshold:

Active Threshold = 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

R311FA vibration alarm:

The device detects a sudden movement or vibration, change of the quiescent state, and it will immediately send a report. After the vibration alarm, the device waits for DeactiveTime to enter the quiescent state before starting the next detection. If the vibration continues to occur during this process, the timing restarts until it enters the quiescent state.

R311FX Series DeviceType:

R311FA 0x01; R311FB 0x02; R311FC 0x03

Note:

The device report interval will be programmed based on the default firmware which may vary.

The interval between two reports must be the minimum time.

Please refer Netvox *LoRaWAN Application Command document* and *Netvox Lora Command Resolver* <http://www.netvox.com.cn: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 < 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 data configuration:

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	R311FA	0x01	0x4F	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	BatteryChange (1byte Unit:0.1v)	Reserved (4Bytes,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)	Reserved (4Bytes,Fixed 0x00)

(1) Configure device parameters MinTime = 1min, MaxTime = 1min, BatteryChange = 0.1v

Downlink: 014F003C003C0100000000

The device returns:

814F00000000000000000000 (configuration succeeded)

814F01000000000000000000 (configuration failed)

(2) Read device configuration parameters

Downlink: 024F00000000000000000000

The device returns:

824F003C003C0100000000 (current device configuration parameters)

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData			
SetR311F TypeReq	R311F A	0x03	0x4F	R311FType (1Bytes,0x01_R311FA,0x02_R311FB,0x03_R311FC)		Reserved (8Bytes,Fixed 0x00)	
SetR311F TypeRsp		0x83		Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)	
GetR311F TypeReq		0x04		Reserved (9Bytes,Fixed 0x00)			
GetR311F TypeRsp		0x84		R311FType (1Bytes,0x01_R311FA,0x02_R311FB,0x03_R311FC)		Reserved (8Bytes,Fixed 0x00)	
SetActive ThresholdReq		0x05		Threshold (2Bytes)	Deactivetime (1Byte,Unit:1s)	Reserved (6Bytes,Fixed 0x00)	
SetActive ThresholdRsp		0x85		Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)	
GetActive ThresholdReq		0x06		Reserved (9Bytes,Fixed 0x00)			
GetActive ThresholdRsp		0x86		Threshold (2Bytes)	Deactivetime (1Byte,Unit:1s)	Reserved (6Bytes,Fixed 0x00)	

(3) Change the device type to R311FB (0x02)

Downlink: 034F02000000000000000000

The device returns:

834F00000000000000000000 (configuration succeeded)

834F01000000000000000000 (configuration failed)

(4) Check the current device type

Downlink: 044F00000000000000000000

The device returns:

844F02000000000000000000 (current device type R311FB)

Description	Device	CmdID	Device Type	NetvoxPayLoadData		
SetActiveThresholdReq	R311FA	0x05	0x4F	Threshold (2Bytes)	Deactivetime (1Byte, Unit: 1s)	Reserved (6Bytes, Fixed 0x00)
SetActiveThresholdRsp		0x85		Status (0x00_success)	Reserved (8Bytes, Fixed 0x00)	
GetActiveThresholdReq		0x06		Reserved (9Bytes, Fixed 0x00)		
GetActiveThresholdRsp		0x86		Threshold (2Bytes)	Deactivetime (1Byte, Unit: 1s)	Reserved (6Bytes, Fixed 0x00)

Assuming the threshold is 10m/s^2 , the value that needs to be set is $10/9.8/0.0625=16.32$, the last value is 16.32 which needs to be taken an integer, and the configuration is 16.

(5) Configure device parameters Threshold= 16, Deactivetime=10s

Downlink: 054F00100A000000000000

The device returns:

854F00000000000000000000 (configuration succeeded)

854F01000000000000000000 (configuration failed)

(6) Read device configuration parameters

Downlink: 064F00000000000000000000

The device returns:

864F00100A000000000000 (current device configuration parameters)

Restore function configuration

Description	Device	CmdID	Device Type	NetvoxPayloadData	
SetRestore ReportReq	R311FA	0x07	0x4F	RestoreReportSet (1byte) 0x00_DO NOT report when sensor restore, 0x01_DO report when sensor restore)	Reserved (8Bytes, Fixed 0x00)
SetRestore ReportRsp		0x87		Status (0x00_success)	Reserved (8Bytes, Fixed 0x00)
GetRestore ReportReq		0x08		Reserved (9Bytes, Fixed 0x00)	
GetRestore ReportRsp		0x88		RestoreReportSet (1byte, 0x00_DO NOT report when sensor restore, 0x01_DO report when sensor restore)	Reserved (8Bytes, Fixed 0x00)

(7) Configure Do report when sensor restore

Downlink: 074F01000000000000000000

Response:

874F00000000000000000000 (Configuration success)

874F01000000000000000000 (Configuration failure)

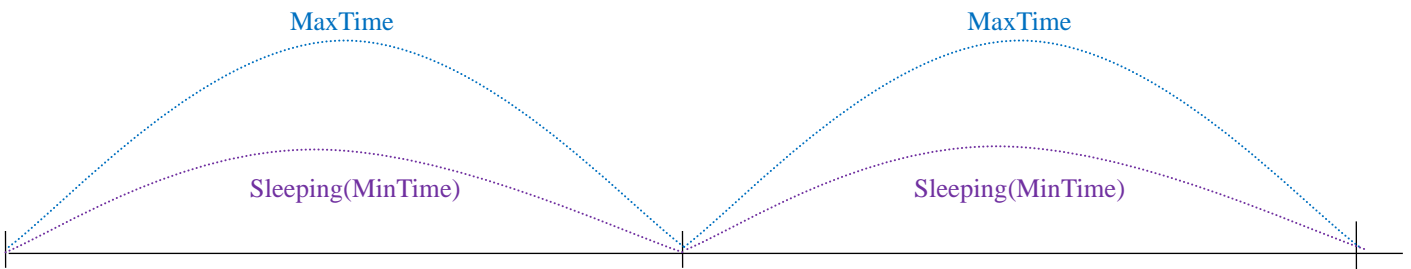
(8) Read device parameter:

Downlink: 084F00000000000000000000

Response: 884F01000000000000000000 (Current configuration)

Example for MinTime/MaxTime logic:

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



Wakes up and collects data

REPORTS 2.8V

Wakes up and collects data

REPORTS 2.8V

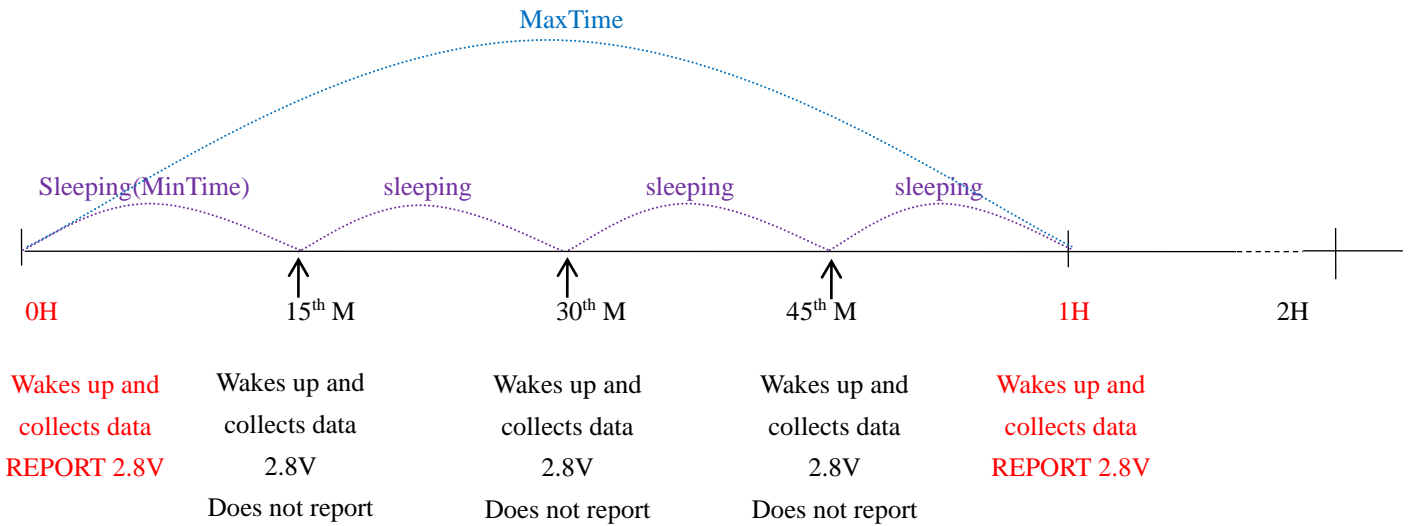
Wake up and collects data

REPORTS 2.8V

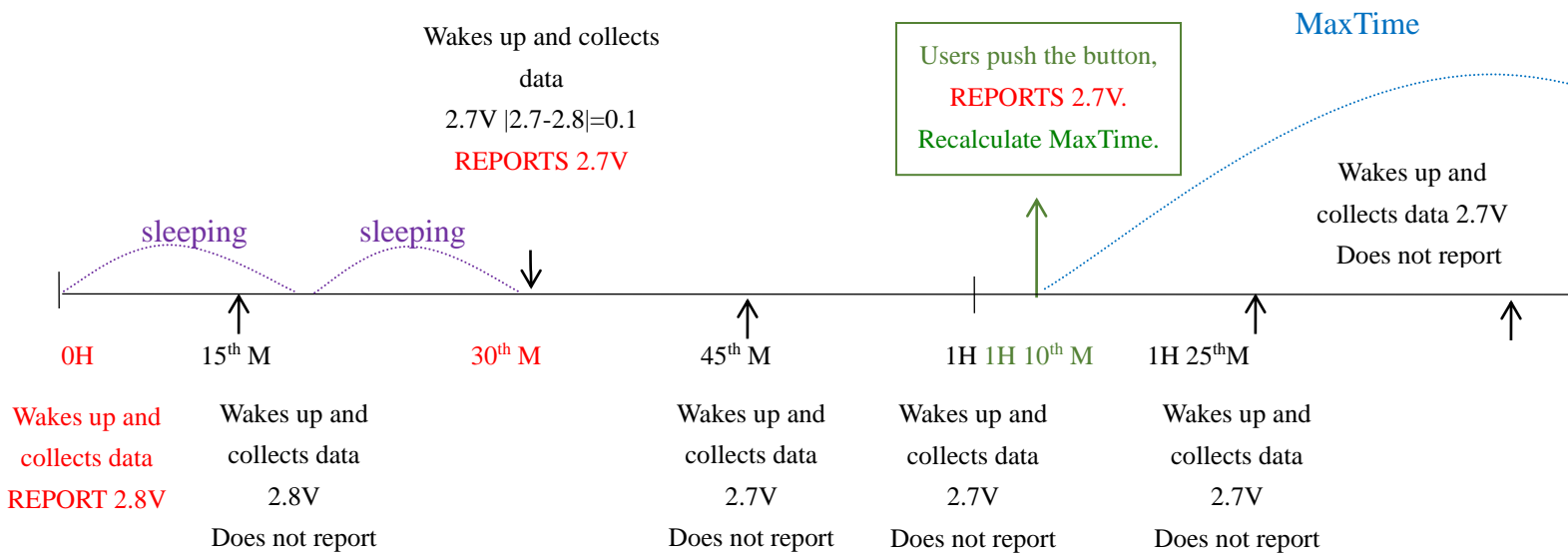
Note:

MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BtteryVoltageChange 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 change value 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. Installation

1. Remove the 3M adhesive on the back of the Activity Detection Sensor and attach the body to the surface of a smooth object (please do not stick it to a rough surface to prevent the device from falling off after a long time use).

Note:

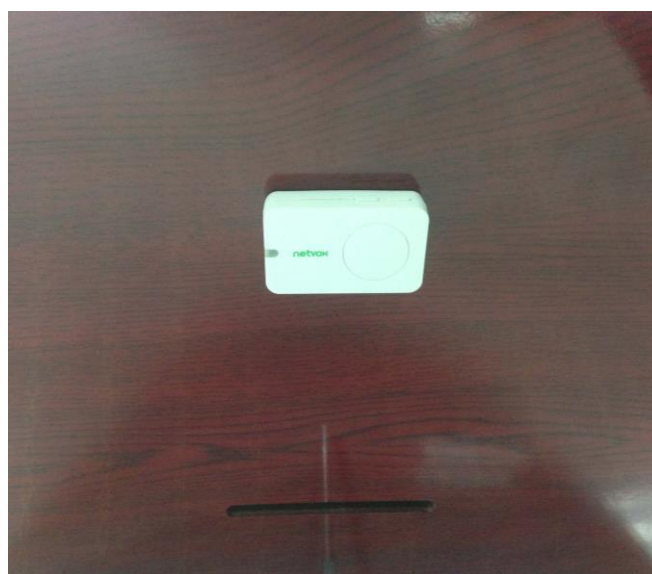
- Wipe the surface clean before installation to avoid dust on the surface to affect the adhesion of the device.
- Do not install the device in a metal shielded box or other electrical equipment around it to avoid affecting the wireless transmission of the device.



Activity Detection Sensor (R311FA) is suitable for the following scenarios:

- Valuables (Painting, Safe)
- Industrial Equipment
- Industrial Instrument
- Medical Instruments

When it necessary to detect a possibility of the valuables are moved and the motor running.



2. The device detects a sudden movement or vibration, and it will immediately sends a report.


After the vibration alarm, the device waits for a certain period of time (DeactiveTime- default : 5 seconds, can be modified) to enter the quiescent state before starting the next detection.

Note:

- If the vibration continues to occur during this process (quiescent state), then it will delay 5 seconds until it enters the quiescent state.
- When the vibration alarm is generated, the alarm bit of the data is "1", quiescent state bit of the data is "0"



7. Relative Devices

Model	Function	Appearance
R718MBA	Send an alarm when detecting vibration or movement	
R718MBB	Count the number of vibration or movement	
R718MBC	Count the time interval of vibration or movement	

8. 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.