Wireless Tilt Sensor
R311K
User Manual

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1. Introduction

R311K is a long-distance tilt detection device which is a Class A device based on the LoRaWAN open protocol of Netvox and is compatible with LoRaWAN protocol. The device is a title detection sensor. When the device is tilted greater than or equal to 45 degrees in any direction, it will send a tipping signal.

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 Feature

- 2 x 3V CR2450 button batteries

- Compatible with LoRaWAN

- Detect voltage and tilt status of the device

- Easy set up and installation

- Protection level IP30

- Compatible with LoRaWAN™ Class A

- Frequency hopping spread spectrum technology

- Configurable parameters via third-party software platform, reading data and setting alarms via SMS text and email (optional)

- Applicable to the third-party platforms: Actility/ ThingPark/ TTN/ MyDevices/ Cayenne

- The product has low power consumption and supports longer battery life.

Note: Battery life is determined by sensor reporting frequency and other variables.

Please refer to web: http://www.netvox.com.tw/electric/electric_calc.html

In this website, users can find battery lifetime for various models at different configurations.

4. Set up Instruction

On/Off

Power on	Insert batteries (user may need a screwdriver to open) Insert 2 x 3V CR2450 button batteries into the battery slot in the correct direction and close the back cover. Note: Require 2 button batteries to supply power at the same time.
Turn on	Press and hold the function key till the green and red indicator flashes once.
Turn off (Restore to original setting)	Press simultaneously and hold two buttons for 5 seconds, and then the green indicator flashes 20 times and the device will turn off automatically.
Power off	Remove Batteries
Note:	1. Remove and reinsert the battery: the device will remember the previous on/off status by default. 2. After insert batteries and press the button at the same time, the device will be in engineering testing mode. 3. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.

Network Joining

Never join 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 (Not restore to the original setting)	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	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 the original setting / Turn off The green indicator flashes 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 turn on and join in the network	Sleeping period: Min Interval. When the reportchange exceeds the default or the state of the device changes: send a data report according to Min Interval.

Low Voltage Warning

Low Voltage	2.4V

5. Data Report

After power on, the device will immediately send a version packet report and an attributes report.

The device sends data according to the default configuration before any other configuring.

Default setting:

Report MaxTime：Max Interval ----3600s

Report MinTime：Min Interval ----3600s (Default: Every Min Interval will detect the state of the dry contact one time)

BatteryVoltageChange ---- 0x01(0.1V)

Triggering the tilt detection:

The device adopts 45° tilt detection around the entire circumference. The initial state of the device is vertical placement.

When the tilt angle (any direction) changes more than 45° (45°~180°), an tipping alarm will be issued immediately.

Device Tilt: 1, Device Recovery: 0
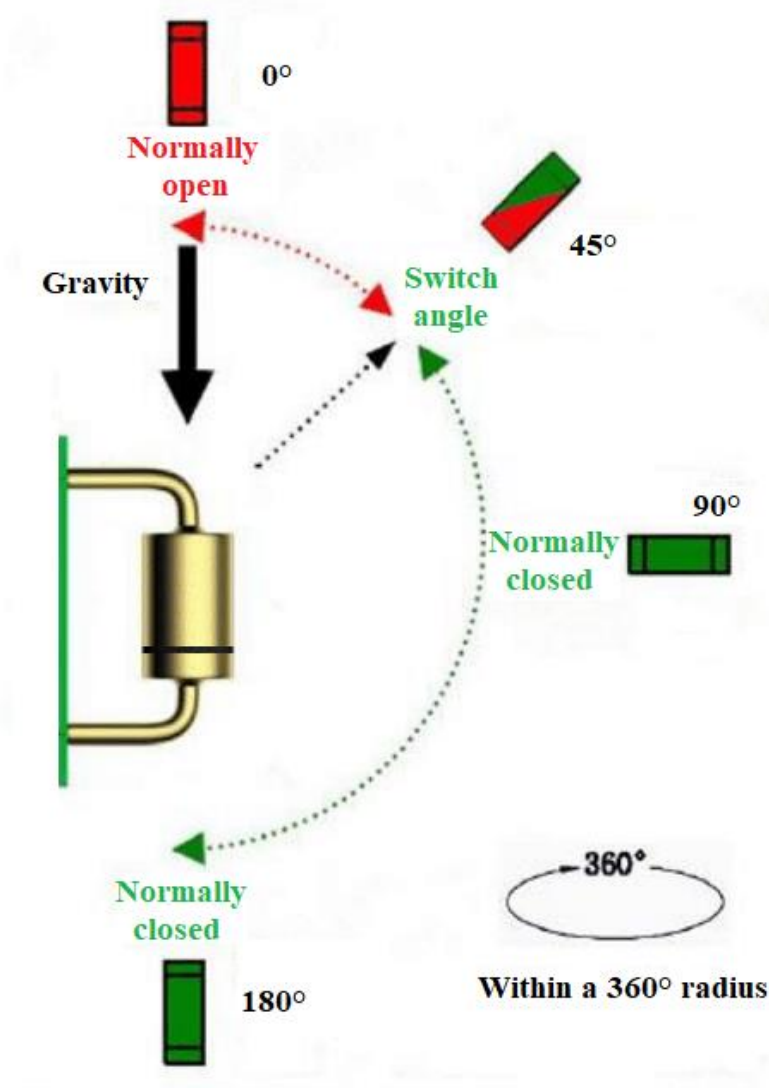
Note:

1. The cycle of the device sending the data report is according to the default.

2. The interval between two reports must be the MinTime.

3. R311K defaults Max Interval = 60min, Min Interval = 60min

(If there are special customized shipments, the settings will be changed according to customer's requirement.)

The device reported data parsing please refer to

Netvox LoraWAN Application Command document and *Netvox Lora Command Resolver*

http://www.netvox.com.cn:8888/cmddoc

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 ConfigureCmd

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	CmdID	Device Type	NetvoxPayLoadData			
ConfigReport Req	R311K	0x01	0x9E	MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit:0.1v)	Reserved (4Bytes, Fixed 0x00)
ConfigReport Rsp		0x81		Status (0x00_success)		Reserved (8Bytes, Fixed 0x00)	
ReadConfigR eportReq		0x02		Reserved (9Bytes, Fixed 0x00)			
ReadConfigR eportRsp		0x82		MinTime (2bytes Unit :s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit:0.1v)	Reserved (4Bytes, Fixed 0x00)

(1) Configure R311K device parameter MinTime = 1min、MaxTime = 1min、BatteryChange = 0.1v

Downlink： 019E003C003C0100000000

Device return：

819E000000000000000000 (configuration success)
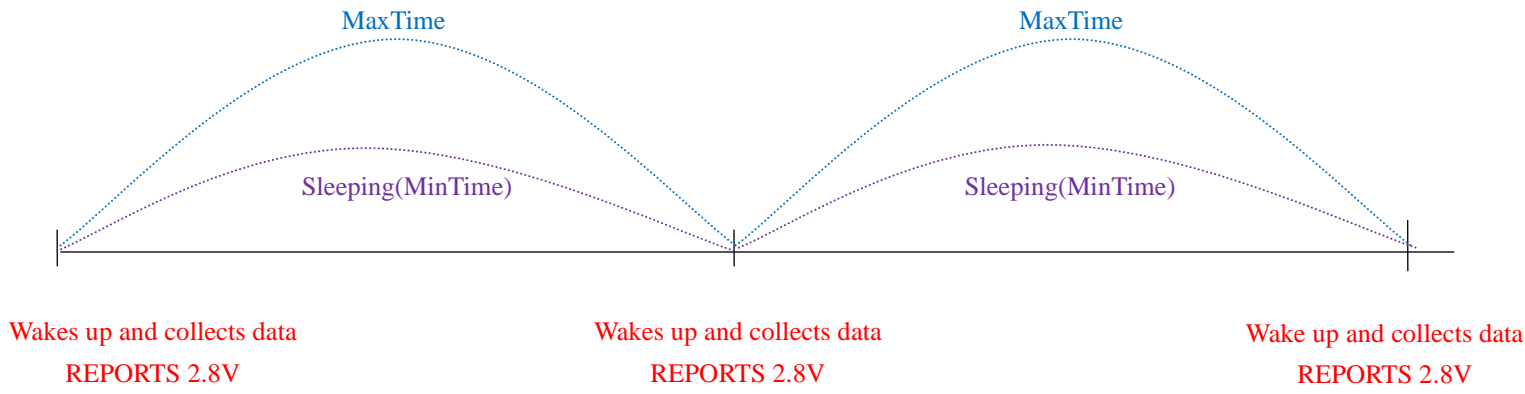
819E010000000000000000 (configuration failure)

(2) Read R311K device parameter

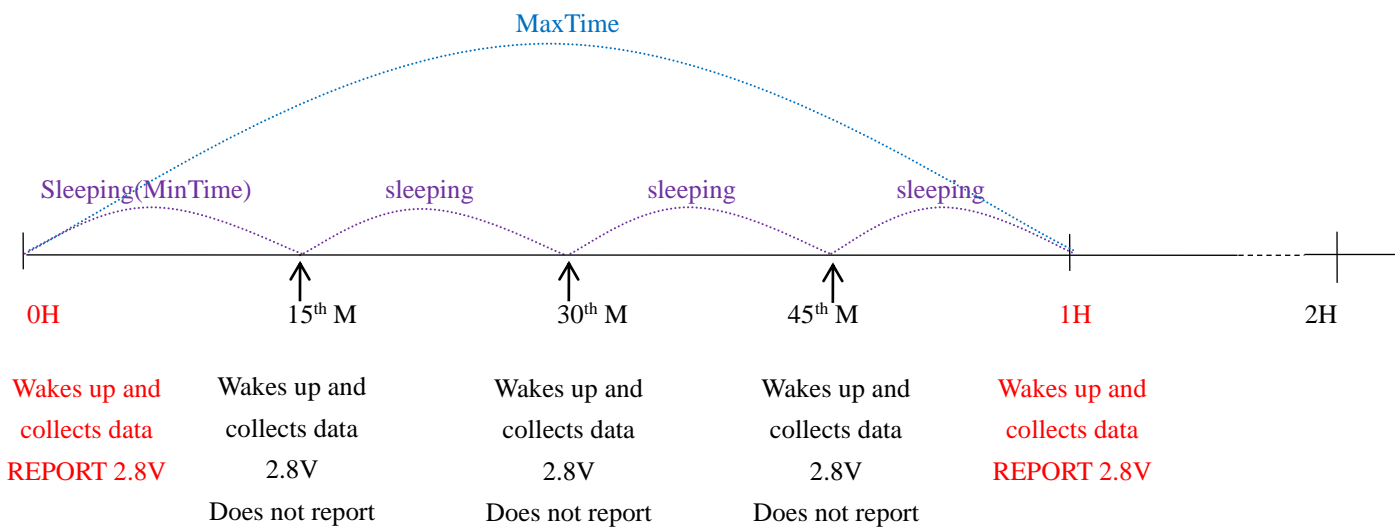Downlink： 029E000000000000000000

Device return：

829E003C003C0100000000 (device current parameter)

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

MaxTime　　　　　　　MaxTime

Sleeping(MinTime)　　　　　　Sleeping(MinTime)

Wakes up and collects data　　Wakes up and collects data　　Wake up and collects data
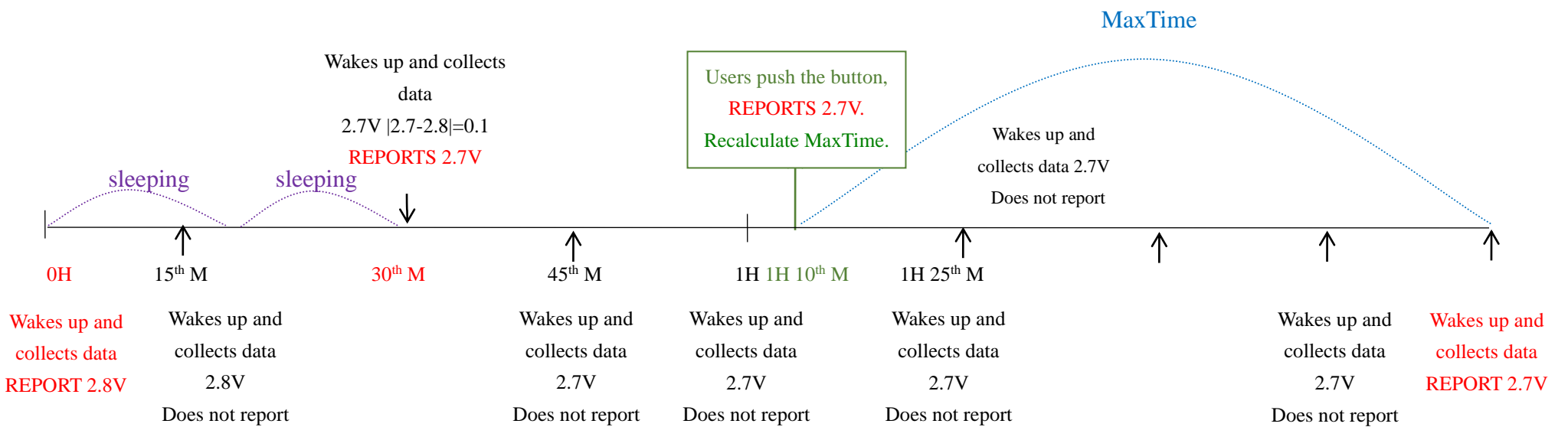REPORTS 2.8V　　　　REPORTS 2.8V　　　　REPORTS 2.8V

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.

MaxTime

Sleeping(MinTime)　　sleeping　　sleeping　　sleeping

0H　　　　15th M　　　　30th M　　　　45th M　　　　1H　　　　2H

Wakes up and collects data REPORT 2.8V

Wakes up and collects data 2.8V Does not report

Wakes up and collects data 2.8V Does not report

Wakes up and collects data 2.8V Does not report

Wakes up and collects data REPORT 2.8V

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

MaxTime

Wakes up and collects data
$2.7V |2.7-2.8|=0.1$
REPORTS 2.7V

Users push the button,
REPORTS 2.7V.
Recalculate MaxTime.

Wakes up and collects data 2.7V Does not report

sleeping　　sleeping

0H　　15th M　　30th M　　45th M　　1H 1H 10th M　　1H 25th M

Wakes up and collects data REPORT 2.8V

Wakes up and collects data 2.8V Does not report

Wakes up and collects data 2.7V Does not report

Wakes up and collects data 2.7V Does not report

Wakes up and collects data 2.7V Does not report

Wakes up and collects data 2.7V Does not report

Wakes up and collects data REPORT 2.7V

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 collected data is compared with the last reported data. If the variation of the data is greater than the value of ReportableChange, the device will report according to MinTime interval. If the data variation is not greater than the last reported data, the device will report according to MaxTime interval.

(3) We do not recommend setting the MinTime Interval value too low. If the MinTime Interval is too low, the device will wake up frequently and the battery will be drained soon.

(4) When the device sends a report, no matter the data changes, button is pushed or MaxTime interval comes, another cycle of MinTime / MaxTime calculation starts.

6. Installation

(1) The device does not have a waterproof function. After the configuration of joining the network is completed, please place it indoors.

(2) The dust at the installation location should be wiped clean before paste the device.

(3) The battery installation method is as the figure below. (the battery with the "+" side facing up)
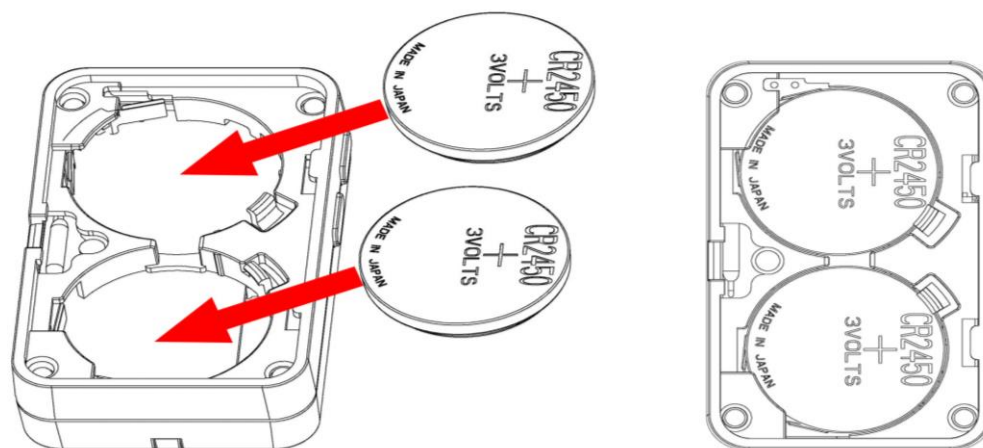
Note: The user may need a screwdriver to open the cover.

7. Important Maintenance Instruction

Kindly pay attention to the following in order to achieve the best maintenance of the product:

• 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.