

# **Wireless Wearable Emergency Button with Inactivity Detection**

## **R309 Series User Manual**

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## 1. Introduction

R309 is a long-distance wireless wearable emergency button device for Netvox ClassA type devices based on LoRaWAN open protocol, which also has an inactivity detection function and is compatible with LoRaWAN protocol.

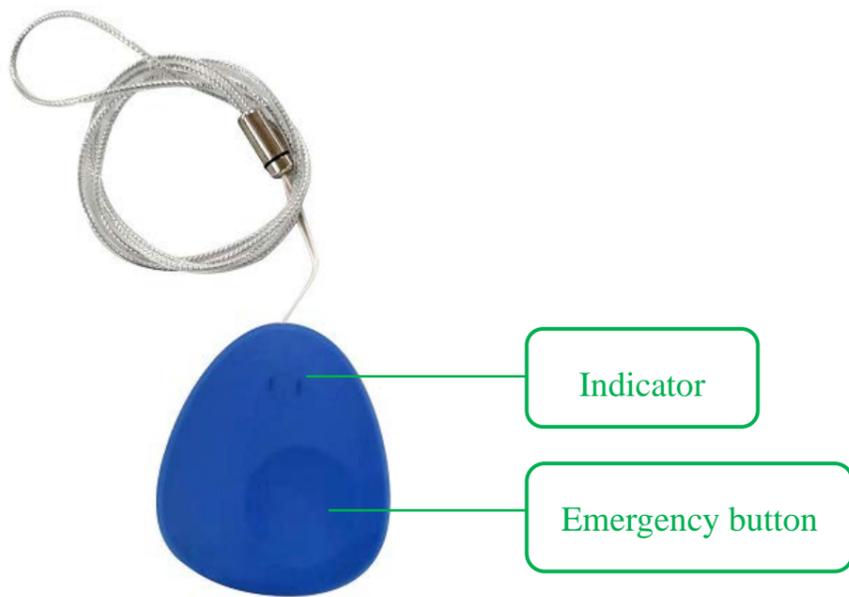
### **LoRa Wireless Technology:**

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 and 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



R30900 Lanyard Version



R30901 Wristband Version

## 3. Features

- 2 x 3V CR2032 button batteries
- Compatible with LoRaWAN Class A
- Detectable voltage value and emergency button status
- Long-time inactivity detection
- IP Rating: IP67
- Simple operation and setting
- It is light in size and can be worn with wristband or lanyard
- Frequency hopping spread spectrum technology
- Applicable to the third-party platforms: Actility/ ThingPark/ TTN/ MyDevices/ Cayenne
- Low-power consumption, 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](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 two 3V CR2032 button batteries and close the battery cover. (Please note the positive and negative poles of the battery.)
Turn on	Press and hold the emergency button for 3 seconds until the green/red indicator flashes once.
Turn off (Restore to original setting)	Press emergency button for 5 seconds, and then the green indicator will flash continuously. After release emergency button, the green indicator flashes 20 times and the device will turn off automatically.
Power off	Remove Batteries
Note:	<ol style="list-style-type: none"> <li>1. Remove and insert the battery; the device memorizes previous on/off state by default.</li> <li>2. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.</li> <li>3. Press emergency button and insert batteries at the same time; it will enter engineer testing mode.</li> </ol>

### Network Joining

Never join the network	<p>Turn on the device to search the network to join.</p> <p>The green indicator stays on for 5 seconds: Success</p> <p>The green indicator remains off: Fail</p>
Had joined the network (Not in the original setting)	<p>Turn on the device to search the previous network to join.</p> <p>The green indicator stays on for 5 seconds: Success</p> <p>The green indicator remains off: Fail</p>
Fail to join the network	Suggest checking device verification on gateway or consulting your platform server provider if the device fails to join the network.

### Emergency button

Press and hold for 5 seconds	<p>Restore to the original setting / Turn off</p> <p>The green indicator flashes 20 times: Success</p> <p>The green indicator remains off: Fail</p>
Emergency button	<p>Short press emergency button to send an alarm data (Default)</p> <p>Note: The pressing time of the alarm button can be configured through the command (0~4s)</p>

### Sleeping Mode

The device is turned on and join in the network	<p>Sleeping period: Min Interval.</p> <p>When the reportchange exceeds the default or the state of the device changes: send a data report according to Min Interval.</p>
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## Low Voltage Warning

Low Voltage	2.5V
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\*To save power, it is recommended to remove the batteries when the device is not in use.

## 5. Data Report

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

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

### Default setting:

Report MaxTime: 0x0E10 (3600s)

Report MinTime: 0x0E10 (3600s) // The current voltage value is detected every Min Interval by default

Battery Voltage Change: 0x01 (0.1V)

Shock Sensor Sensitivity: 0x14 (20) // Range: 0x00 to 0xFE ; 0xFF: Disable shock sensor

No Active Alarm Time: 0x003C (60 min)

Start Hour: 0x00 (00:00 AM) // Range: 0x00 to 0x17 (00:00~23:00)

End Hour: 0x06 (06:00 AM) // Range: 0x00 to 0x17 (00:00~23:00)

### Emergency button triggering:

By default, press the button briefly. After the red light flashes, release the button to report an alarm

Alarm status: 1                  Normal state: 0

### Long time inactivity detection function:

R309 series has a long-time inactivity detection function. When the vibration sensor on R309 detects the inactivity state has remained for more than the set time (default: 1 hour), it will report an inactivity detection alarm.

At the same time, R309 supports the setting of a specific time range to turn off the long-time inactivity detection alarm function, which is used to turn off the inactivity detection function at night (default: 00:00-06:00). The time synchronization will be automatically performed when the device is powered on. If the gateway does not support the DeviceTimeReq function, you can command SetSyncTimeReq to synchronize the time)

Configuring StartHour and EndHour to the same value can disable long-time inactivity detection function. For example, when the StartHour and EndHour are configured to be "00" or the ShockSensorSensitivity is configured to be "FF", the long-time inactivity detection function is disabled.

Note:

1. The pressing time of the alarm button can be configured through the command (0~4s)
2. The cycle of the device sending the data report is according to the default.
3. The interval between two reports must be the MinTime.

The device reported data parsing please refer to *Netvox LoraWAN Application Command document* and *Netvox Lora Command*

Resolver <http://cmddoc.netvoxcloud.com/cmddoc>

Data report configuration and sending period are as following:

Min Interval (Unit: second)	Max Interval (Unit: second)	Reportable Change	Current Change $\geq$ 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

## 5.1 Example of ReportDataCmd

FPort: 0x06

Bytes	1	1	1	Var(Fix=8 Bytes)
	Version	DeviceType	ReportType	NetvoxPayLoadData

**Version**– 1 byte –0x01—the Version of NetvoxLoRaWAN Application Command Version

**DeviceType**– 1 byte – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype doc

**ReportType** – 1 byte –the presentation of the NetvoxPayLoadData, according the devicetype

**NetvoxPayLoadData**– Fixed bytes (Fixed =8bytes)

### Tips

#### 1. Battery Voltage:

The voltage value is bit 0 ~ bit 6, bit 7=0 is normal voltage, and bit 7=1 is low voltage.

Battery=0x9E, binary=1001 1110, if bit 7= 1, it means low voltage.

The actual voltage is 0001 1110 = 0x1E = 30, 30\*0.1v =3.0v

#### 2. Version Packet:

When Report Type=0x00 is the version packet, such as 01D3000A01202207200000, the firmware version is 2020.07.20

#### 3. Data Packet:

When Report Type=0x01 is data packet.

Device	Version	Device Type	Report Type	NetvoxPayLoadData			
R309	0x01	0xD3	0x01	Battery (1Byte, unit: 0.1V)	EmergencyAlarm (1Byte) (0: noalarm, 1: alarm)	NoActiveAlarm (1Byte) (0: noalarm, 1: alarm)	Reserved (5Bytes, fixed 0x00)

Example of Uplink: 01D3011E01000000000000

1<sup>st</sup> byte (01): Version

2<sup>nd</sup> byte (D3): DeviceType 0xD3 — R309

3<sup>rd</sup> byte (01): ReportType

4<sup>th</sup> byte (1E): Battery – 3.0v, 1E Hex = 30 Dec 30\*0.1v = 3.0v

5<sup>th</sup> byte (01): Emergency Alarm – Alarm

6<sup>th</sup> byte (00): No Active Alarm – No Alarm

7<sup>th</sup> ~ 11<sup>th</sup> byte (0000000000): Reserved

## 5.2 Example of ConfigReportReq

FPort: 0x07

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	DeviceType	NetvoxPayLoadData			
Config ReportReq	R309	0x01	0xD3	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 R309 report parameters:

MinTime = 1min (0x3c), MaxTime = 1min (0x3c), BatteryChange = 0.1v (0x01)

Downlink: 01D3003C003C0100000000

Device return: 81D3000000000000000000 (configuration success)

81D3010000000000000000 (configuration failure)

(2) Read configuration:

Downlink: 02D3000000000000000000

Device return: 82D3003C003C0100000000 (Current configuration)

### 5.3 Example of SetShockSensorSensitivity

FPort: 0x07

ShockSensorSensitivity default = 20 (0x14)

Description	Device	CmdID	DeviceType	NetvoxPayLoadData	
SetShockSensor SensitivityReq	R309	0x03	0xD3	ShockSensorSensitivity (1Byte)	Reserved (8Bytes, Fixed 0x00)
SetShockSensor SensitivityRsp		0x83		Status (0x00_success)	Reserved (8Bytes, Fixed 0x00)
GetShockSensor SensitivityReq		0x04		Reserved (9Bytes, Fixed 0x00)	
GetShockSensor SensitivityRsp		0x84		ShockSensorSensitivity (1Byte)	Reserved (8Bytes, Fixed 0x00)

(3) Set Shock Sensor Sensitivity = 100 (0x64) // Range: 0x00 to 0xFE ; 0xFF: Disable shock sensor

Downlink: 03D364000000000000000000 // 64 Hex =100 Dec

Device return: 83D300000000000000000000 (configuration success)

83D301000000000000000000 (configuration failure)

(4) Get Shock Sensor Sensitivity

Downlink: 04D300000000000000000000

Device return: 84D364000000000000000000 (device current parameter)

### 5.4 Example of SetNoActiveTime

FPort: 0x07

NoActiveTime default = 60 min (0x3C)

Description	Device	CmdID	DeviceType	NetvoxPayLoadData	
SetNoActive TimeReq	R309	0x05	0xD3	NoActiveAlarmTime (2Byte, Unit: 1min )	Reserved (7Bytes, Fixed 0x00)
SetNoActive TimeRsp		0x85		Status (0x00_success)	
GetNoActive TimeReq		0x06		Reserved (9Bytes, Fixed 0x00)	
GetNoActive TimeReq		0x86		NoActiveAlarmTime (2Byte, Unit: 1Min )	Reserved (7Bytes, Fixed 0x00)

(5) Set NoActiveTime = 30 min (0x1E)

Downlink: 05D3001E0000000000000000 // 1E Hex =30 Dec 30\*1min = 30min

Device return: 85D3000000000000000000 (configuration success)

85D3010000000000000000 (configuration failure)

(6) Get NoActiveTime

Downlink: 06D300000000000000000000

Device return: 86D3001E0000000000000000 (device current parameter)

## 5.5 Example of SetShockNoWorkTime

**FPort: 0x07**

ShockNoWorkTime: StartHour default = 00:00 (0x00), EndHour default = 06:00 (0x06)

Description	Device	CmdID	DeviceType	NetvoxPayLoadData		
SetShock NoWorkTimeReq	R309	0x07	0xD3	StartHour (1byte) (24PM)	EndHour (1byte) (24PM)	Reserved (7Bytes, Fixed 0x00)
SetShock NoWorkTimeRsp		0x87		Status (0x00_success)	Reserved (8Bytes, Fixed 0x00)	
GetShock NoWorkTimeReq		0x08		Reserved (9Bytes, Fixed 0x00)		
GetShock NoWorkTimeRsp		0x88		StartHour (1byte) (24PM)	EndHour (1byte) (24PM)	Reserved (7Bytes, Fixed 0x00)

(7) Set ShockNoWorkTime StartHour= 23 (0x17), EndHour = 6 (0x06) // Range: 0x00 to 0x17, 24-hour format

Downlink: 07D317060000000000000000 // 23:00 to 06:00

Device return: 87D3000000000000000000 (configuration success)

87D3010000000000000000 (configuration failure)

(8) Get ShockNoWorkTime

Downlink: 08D300000000000000000000

Device return: 88D317060000000000000000 (device current parameter)

\*Downlink: 07D311000000000000000000 // 17:00 to 24:00 StartHour=17 (0x11), EndHour= 00 (0x00)

\*Downlink: 07D3160A0000000000000000 // 22:00 to 10:00 StarHour=22 (0x16), EndHour= 10 (0x0A)

## 5.6 Example of SyncTime

FPort: 0x07

Description	Device	CmdID	DeviceType	NetvoxPayLoadData	
SetSyncTimeReq	R309	0x09	0xD3	SyncTime (4Bytes) Seconds since gps epoch 1970.1.1	Reserved (5Bytes, Fixed 0x00)
SetSyncTimeRsp		0x89		Status (0x00_success)	Reserved (8Bytes, Fixed 0x00)
GetSyncTimeReq		0x0A		Reserved (9Bytes, Fixed 0x00)	
GetSyncTimeRsp		0x8A		SyncTime (4Bytes) Seconds since gps epoch 1970.1.1	Reserved (5Bytes, Fixed 0x00)

(9) Set SyncTime = 1351306191 (2022-11-01 02:49:33)

Downlink: 09D3508B4BCF0000000000 // 508B4BCF Hex =1351306191 Dec

Device return: 89D300000000000000000000 (configuration success)

89D301000000000000000000 (configuration failure)

(10) Get SyncTime

Downlink: 0AD300000000000000000000

Device return: 8AD3508B4BCF0000000000 (device current parameter)

Note:

1. Synchronized Time: Please convert the time to GPS time before configuring, for example, 2022-11-01 02:49:33 converts GPS time=1351306191
2. Reference website for GPS time conversion: <https://www.gw-openscience.org/gps/>
3. When converting GPS time, please pay attention to the different time zones in different countries

## 5.7 ConfigButtonPressTime

FPort: 0x0D

Press time default = 0x00

Description	CmdID	PayLoad(Var bytes)
SetButtonPressTimeReq	0x01	PressTime (1byte) 0x00_QuickPush_Less than 1 Second, 0x01_1 Second push, 0x02_2 Seconds push, 0x03_3 Seconds push, 0x04_4 Seconds push,

SetButtonPressTimeRsp	0x81	Status 0x00_Success 0x01_Failure
GetButtonPressTimeReq	0x02	Reserved (1Byte, Fixed 0x00)
GetButtonPressTimeRsp	0x82	PressTime(1byte) 0x00_QuickPush_Less then 1 Second, 0x01_1 Second push, 0x02_2 Seconds push, 0x03_3 Seconds push, 0x04_4 Seconds push,

(11) Set button press time = 2s

Downlink: 0102

Device return: 8100 (configuration success)

8101 (configuration failure)

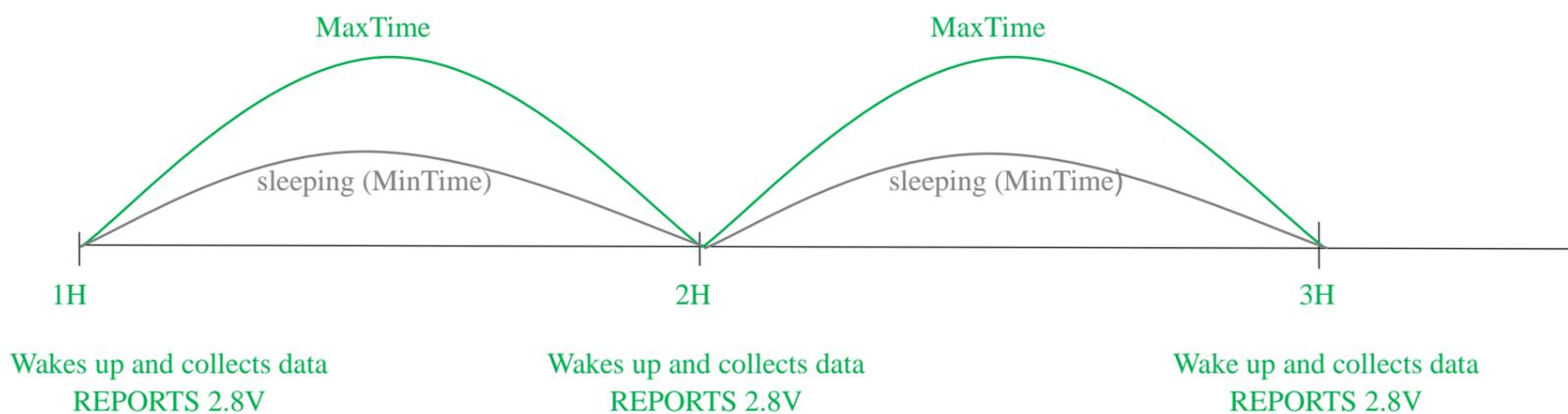
(12) Get button press time

Downlink: 0200

Device return: 8202 (device current parameter)

## 5.8 Example for MinTime/MaxTime logic

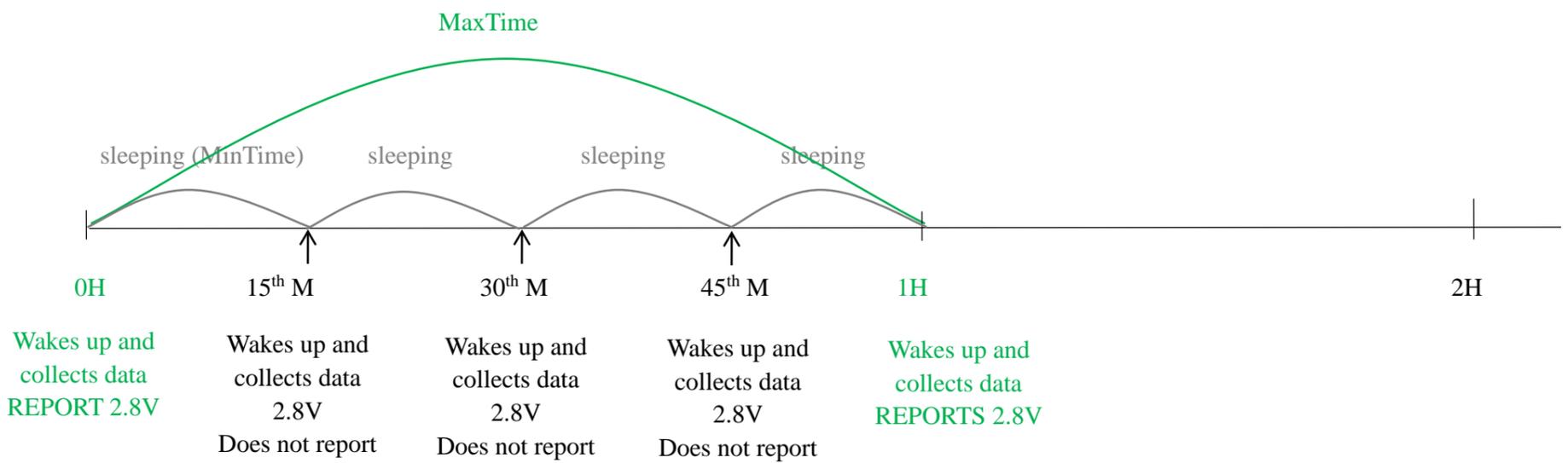
**Example#1** based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V



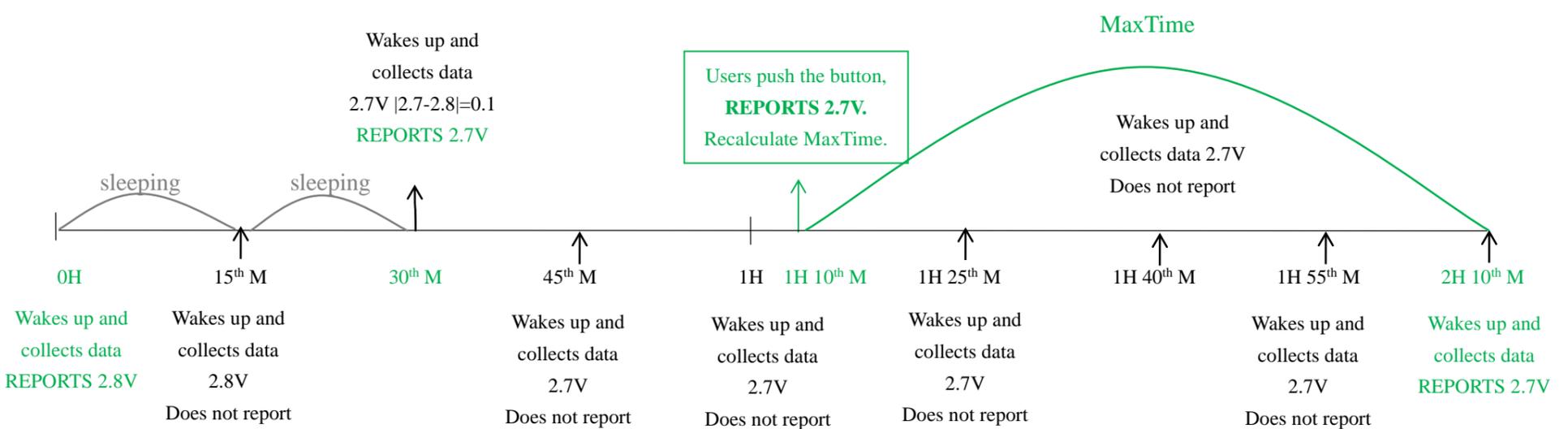
Note:

MaxTime=MinTime. Data will only be report 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 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. Precautions for Outdoor Installation

The R309 is IP67 rated device, which means it provides protection against dust and water immersion up to 1m. The test includes water immersion at a depth of at least 1m for 30 minutes or more. The IP67 rated products should be used in indoor environment and sheltered outdoor environment. High water pressure, high temperature, excessive humidity, long-time exposure to sunlight and rain could damage the device.

## 7. 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 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 high-temperature conditions. High temperature can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.
- Do not store in excessive low-temperature places. 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 device can destroy internal circuit boards and delicate structures.
- Do not clean the device with strong chemicals or 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 to prevent the battery from explosion. Damaged batteries may 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.