Wireless Surface-Mounted Parking Sensor

R719A
User Manual

Table of Contents

1. Introduction

The R719A is a parking monitoring device which is the Class A device based on the LoRaWAN™ protocol of Netvox.

It can monitor whether there is a parking space available in the parking lot. It is compatible with the LoRaWAN protocol.

LoRa Wireless Technology:

LoRa is a wireless communication technology famous for its long-distance transmission and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation technique greatly extend the communication distance. It can be widely used in any use case that requires long-distance and low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. It has features like small size, low power consumption, long transmission distance, strong 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

Magnetic sensing spot

3. Features

- SX1276 wireless communication module

- The magnet approach to the top cover to turn on/off

- 2 ER18505 battery (3.6V/section) in parallel

- Geomagnetic and radar sensor detection

- IP67 rating

- Compatible with LoRaWAN^{TM} Class A

- Frequency hopping spread spectrum

- Configuration parameters can be configured via a third-party software platform, data can be read and alerts can be set via SMS text and email (optional)

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

- Improved power management for longer battery life

Note: Please refer to http://www.netvox.com.tw/electric/electric_calc.html. At this website, users can find battery life for various models at different configurations.

1. Actual range may vary depending on the environment.

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

4. Set up Instruction

On/Off

Power on	Insert batteries. (Users may need a screwdriver to open battery cover.)
Turn on	The magnet approach to the top cover for 3 seconds. Note: The device is in the geomagnetic initialization state within 3 minutes after turning on. Please do not move the device or cause changes in the surrounding magnetic field.
Turn off (factory resetting)	The magnet approach to the top cover for 10 seconds
Power off	Remove Batteries.
Note	1. The device will be off after removing the battery and insert it again. 2. It is suggested to wait for at least 10 seconds between turning the device on and off. 3. To enter the engineering test mode: At 1st to 5th second after power on

Network Joining

Never joined the network	Turn on the device, and it will search for the network to join.
Had joined the network (not back to factory setting)	Turn on the device, and it will search for the previous network to join.

Reed Switch Function

The magnet close to the top cover for 10 seconds	Restore to factory setting / Turn off
The magnet close to the top cover shortly	The device is in the network: sends a report

Sleeping Mode

The device is on and in the network	Sleeping period: Min Interval. When the reportchange exceeds setting value: send a data report according to Min Interval. Note: Suggest to remove batteries if the device is not in use Suggest to check device verification on the gateway.

Low Battery Threshold

Low Voltage	3.2 V

Note: Could use the magnet of R311A as the magnet mentioned in the article. For specific operation, please refer to the installation

instruction picture below.

5. Data Report

Data report configuration and sending period are as follows:

When the device is turned on, it will immediately send a version package and a data report of parking status and battery voltage.

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

Default setting:

ReportMaxTime: 0xE10 (3600s)

ReportMinTime: 0xE10 (3600s) (to detect the current voltage value per Min Interval)

Battery voltage: 0x01 (0.1V)

Geomagnetic Detect Threshold: 0x28 (40)　　　*Range:0x14-0xFFFF (0x14 is the most sensitivity)

Vehicle parking trigger:

When a car parked, 15 seconds later, sensor would send a data "CarOnOff" =01, which means that the space is parked.

When a car left, 15 seconds later, sensor would send a data "CarOnOff" =00, which means that the space is empty to park.

The parking space status will be reported according to configuration.

Note:

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

The interval between two reports must be ReportMinTime.

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

http://cmddoc.netvoxcloud.com/cmddoc to resolve uplink data.

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

5.1 Example of ReportDataCmd

FPort: 0x06

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

Version– 1 bytes –0x01——the Version of NetvoxLoRaWAN Application Command Version

DeviceType– 1 byte – Device Type of Device

The devicetype is listed in Netvox LoRaWAN Application Devicetype V1.9.doc

ReportType – 1 byte – the Presention of the NetvoxPayLoadData，according the devicetype

NetvoxPayLoadData– Fixed bytes (Fixed =8bytes)

5

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=0xA0, binary=1010 0000, if bit 7= 1, it means low voltage.

   The actual voltage is 0010 0000 = 0x20 = 32, 32*0.1v =3.2v

2. **Version Packet:**

   When Report Type=0x00 is the version packet, such as 0159000A0B202005200000, the firmware version is 2020.05.20.

3. **Data Packet:**

   When Report Type=0x01 is data packet.

Device	DeviceType	ReportType	NetvoxPayLoadData					
R719A	0x59	0x01	Battery (1Byte, unit:0.1V)	CarOnOff (1Byte 0:off 1:on)	Reserved For Netvox Internal Use (1Byte) (It can be ignored in user's payload decoder)	Reserved For Netvox Internal Use (3Byte) (It can be ignored in user's payload decoder)	Reserved For Netvox Internal Use (2Bytes) (It can be ignored in user's payload decoder)

Example of Uplink: 015901240100000000000

1st byte (01): Version

2nd byte (59): DeviceType   0x59 — R719A

3rd byte (01): ReportType

4th byte (24): 3.6 V — 24(Hex) = 36 (Dec), 36*0.1v = 3.6v

5th byte (01): CarOnOff — on

6th byte (00): Reserved For Netvox Internal Use

7th ~ 9th byte (000000): Reserved For Netvox Internal Use

10th ~ 11th byte (0000): Reserved For Netvox Internal Use

5.2 Example of Report Configuration

Bytes	1	1	Var (Fix=8 Bytes)
	CmdID	DeviceType	NetvoxPayLoadData

CmdID– 1 byte

DeviceType– 1 byte – Device Type of Device

　　　　The devicetype is listed in Netvox LoRaWAN Application Devicetype.doc

NetvoxPayLoadData– var bytes (Max=9bytes)

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData			
Config ReportReq	R719A	0x01	0x59	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 (003C), MaxTime = 1min (003C), BatteryChange = 0.1v (01),

　　Downlink: 0159003C003C0100000000

　　The device returns:

　　　　　　81590000000000000000000 (configuration successful)

　　　　　　8159010000000000000000000 (configuration failed)

(2) Read device parameters

　　Downlink: 0259000000000000000000

　　The device returns:

　　　　　　8259003C003C0100000000 (current device configuration parameters)

5.3 Geomagnetic Threshold Configuration

Fport: 0x07 (It is not recommended to modify the default settings of the device to prevent incorrect setting, which will cause false detection of parking status)

Description	Device	Cmd ID	Device Type	NetvoxPayLoadData	Description
SetDetect ThresholdReq	R719A	0x03	0x59	DetectThreshold(2bytes)	Reserved (7Bytes,Fixed 0x00)
SetDetect ThresholdRsp		0x83		Status(0x00_success)	Reserved (8Bytes,Fixed 0x00)
GetDetect ThresholdReq		0x04		Reserved (9Bytes,Fixed 0x00)	
GetDetect ThresholdRsp		0x84		DetectThreshold(2bytes)	Reserved (7Bytes,Fixed 0x00)

(1) Configure the device geomagnetic threshold parameter to 50 (default is 40)

Downlink: 0359003200000000000000

The device returns:

8359000000000000000000 (configuration successful)

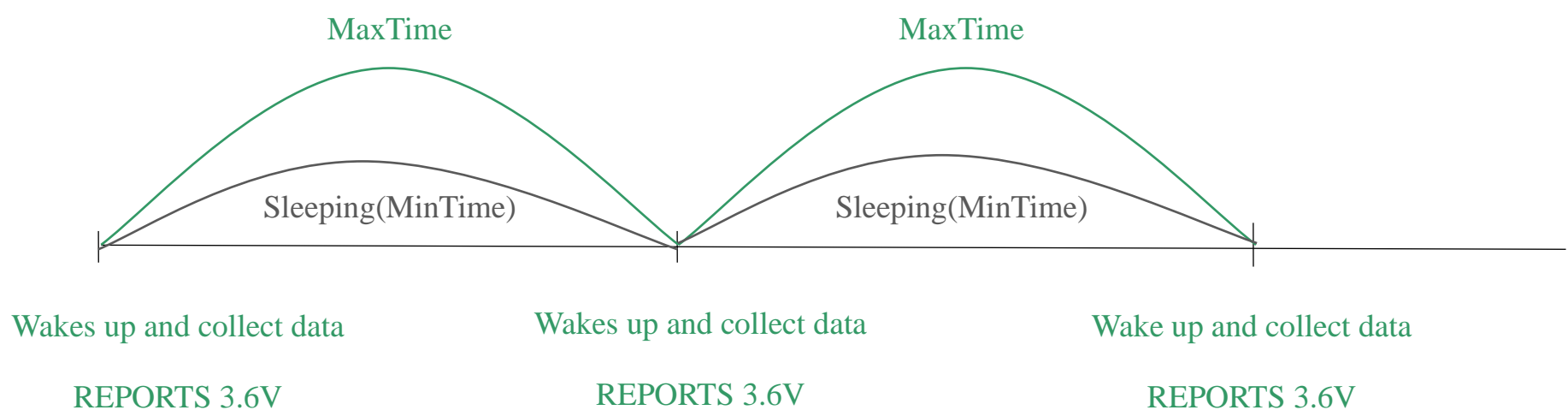8359010000000000000000 (configuration failed)

(2) Read device parameters

Downlink: 0459000000000000000000

The device returns:

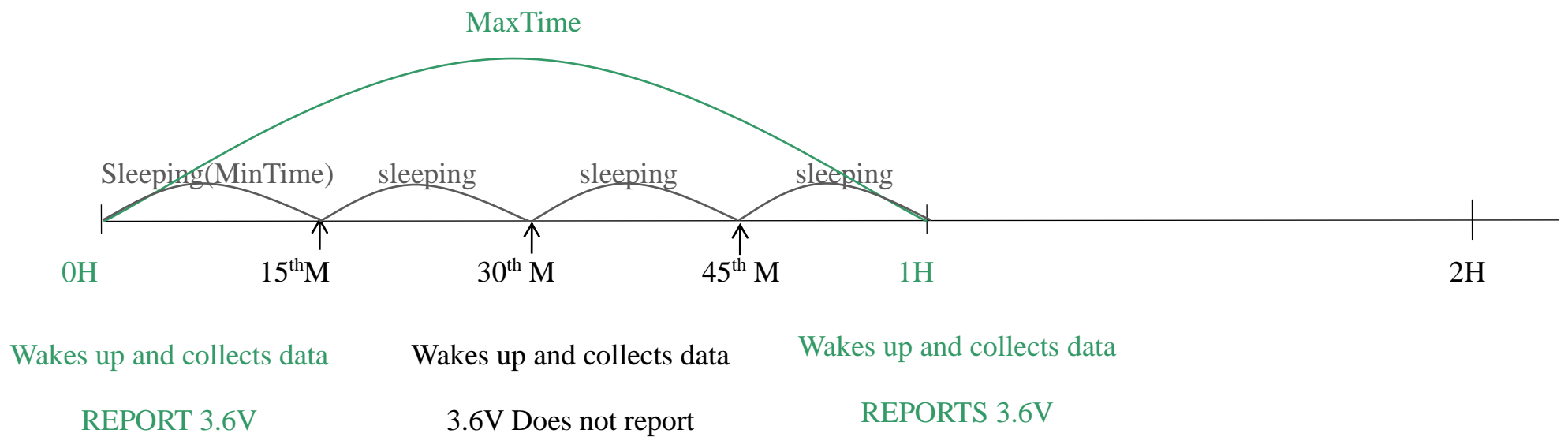8459003200000000000000 (current device configuration parameters)

5.4 Example for MinTime/MaxTime logic

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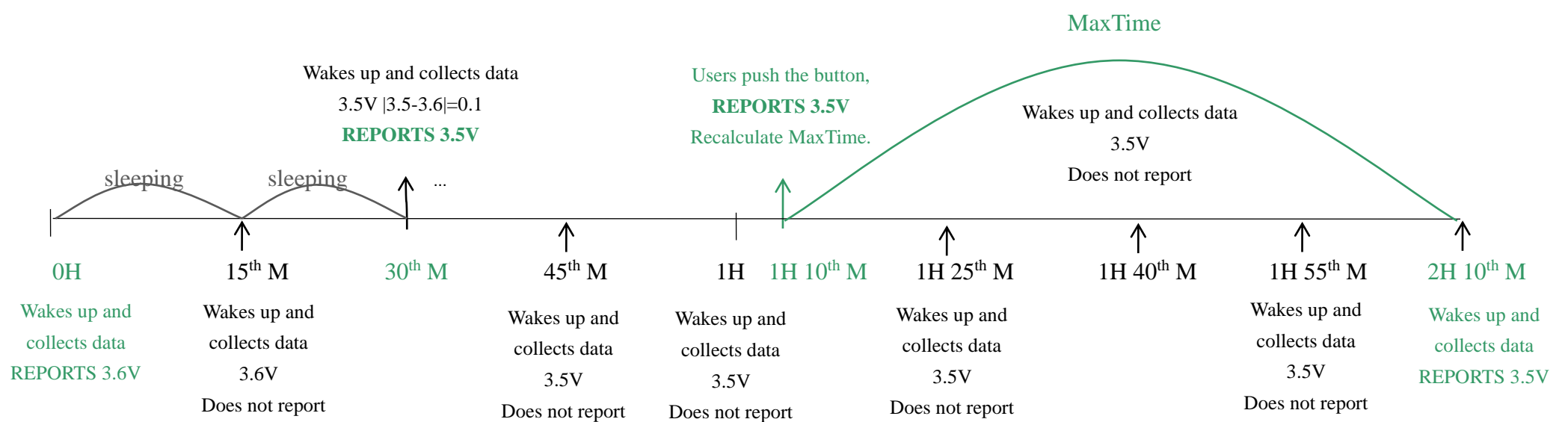

Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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

MaxTime

Sleeping(MinTime)   sleeping   sleeping   sleeping

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

Wakes up and collects data   Wakes up and collects data   Wakes up and collects data

REPORT 3.6V   3.6V Does not report   REPORTS 3.6V

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

MaxTime

Wakes up and collects data   Users push the button,   Wakes up and collects data
3.5V |3.5-3.6|=0.1   REPORTS 3.5V   3.5V
REPORTS 3.5V   Recalculate MaxTime.   Does not report

sleeping   sleeping   ...

0H   15th M   30th M   45th M   1H   1H 10th M   1H 25th M   1H 40th M   1H 55th M   2H 10th M

Wakes up and   Wakes up and   Wakes up and   Wakes up and   Wakes up and   Wakes up and   Wakes up and
collects data   collects data   collects data   collects data   collects data   collects data   collects data
REPORTS 3.6V   3.6V   3.5V   3.5V   3.5V   3.5V   REPORTS 3.5V
                     Does not report   Does not report   Does not report   Does not report   Does not report

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 <u>reported</u>. If the data variation 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. R719A is installed in the middle of the parking space with 4 screws (purchased by users).

Screw Fixation
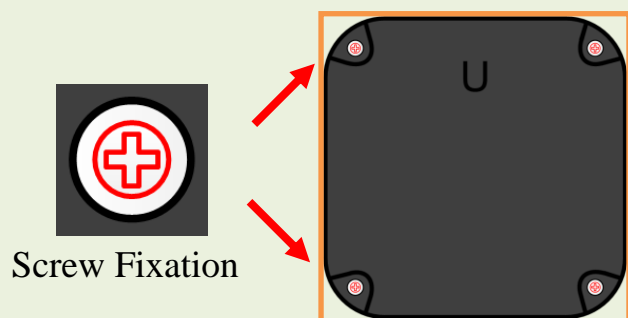
Note:

- It is recommended to install the device in the middle of the parking space for the best results.

- Make sure that there is no obstruction above the device when the device is turned on.

- The device is turned off by default. After the device is installed and turned on, the device needs <u>three minutes to warm up</u>. After three minutes, the geomagnetic field can work normally.

- After fixed installation and startup, do not use magnetic objects near the device. Otherwise, it will affect the initialization of the device and cause the device to malfunction.

- If users need to move the device, please power off the device, restart it after fixed installation, and wait for the device to initialize.

- Ensure that when the device is turned on and the geomagnetism configures the initial magnetic field within three minutes, it cannot be parked above the device, and there is no interference source within 5 meters of the surrounding area.

2. Place a magnet above the reed switch (the U-shaped part of the device) for 3 seconds to turn it on, connect to the network, join to the gateway to check if the device is operating normally and detecting the vehicle correctly, and the installation is completed.

Note: The magnet is a magnet accessory that comes with the batch.

3. When the device detects that the car has entered the parking space for 15 seconds, the reported data-CarOnOff bit is "01". When the car leaves the parking space for 15 seconds, the reported data-- CarOnOff bit is "00".

4. R719A can be applied to the smart parking lot.

7. Information about Battery Installation

Warning: 1. When replacing the battery, it must be operated by professionals.

2. Please use two ER18505 batteries for the device, and a single battery is 3.6V.

3. Please note that the positive and negative poles of the battery are not reversed.

Step 1: Unscrew the six screws of the rear lock cover on the back of the device with a screwdriver as the red area in Figure 1.
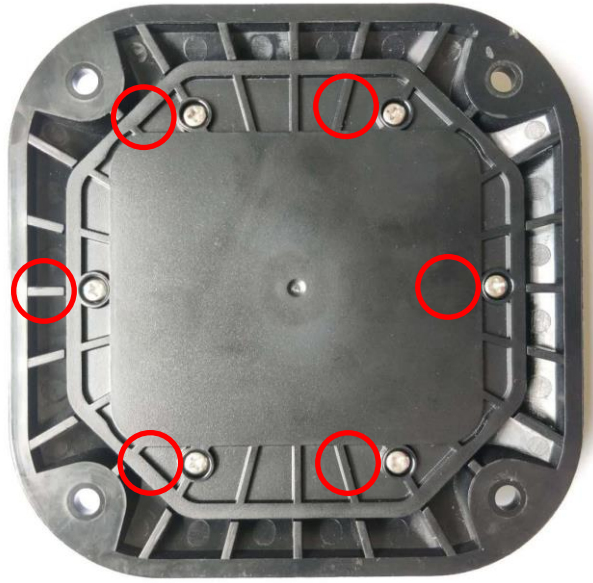

Figure 1

Step 2: Remove the middle plastic cover. The plastic cover is shown in the red area in Figure 2.

Please note that the plastic cover is rectangular and pay attention to the direction when placing it.
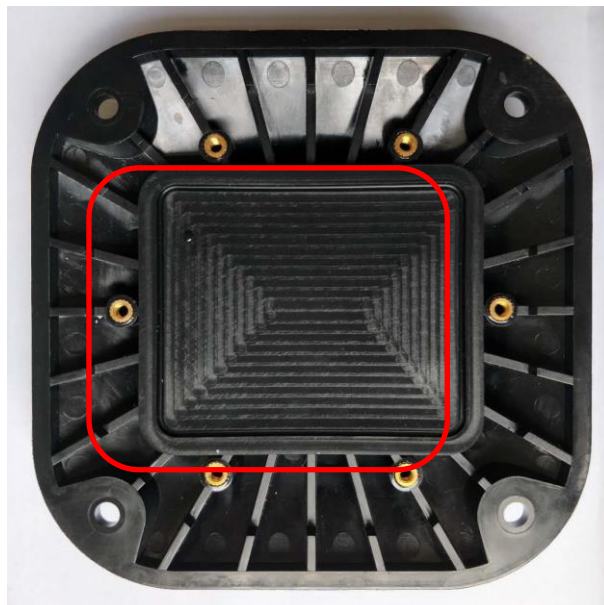
Figure 2

Step 3: Put the battery into the battery slot of the device. The side of the battery slot marked with ⊕ is the positive pole, and the side marked with ⊖ is the negative pole (with a spring). The side with ⊕ of the battery is the positive electrode, and the side with ⊖ is the negative electrode as Figure 3. Please note that the positive and negative poles of the battery should not be reversed.
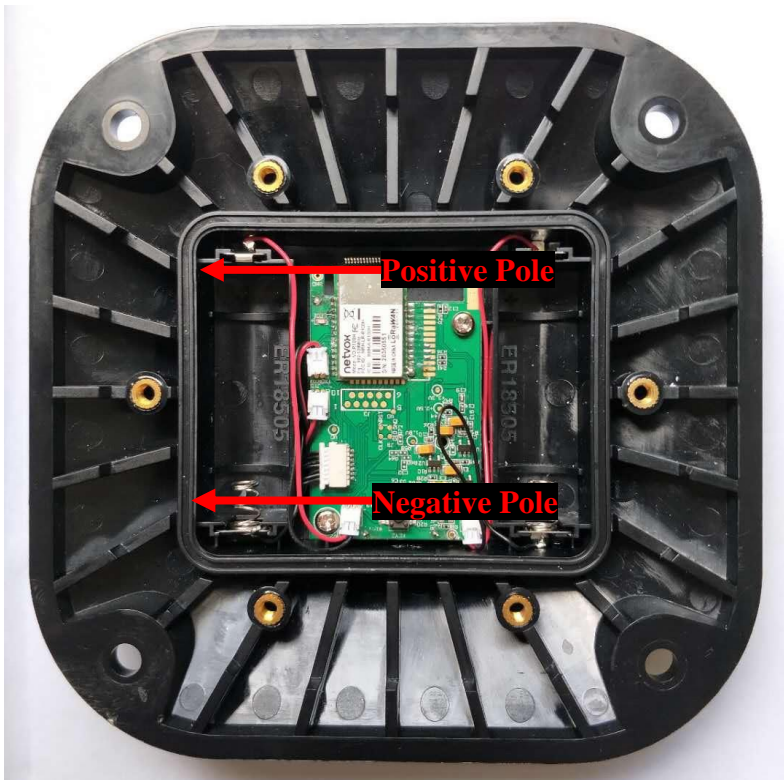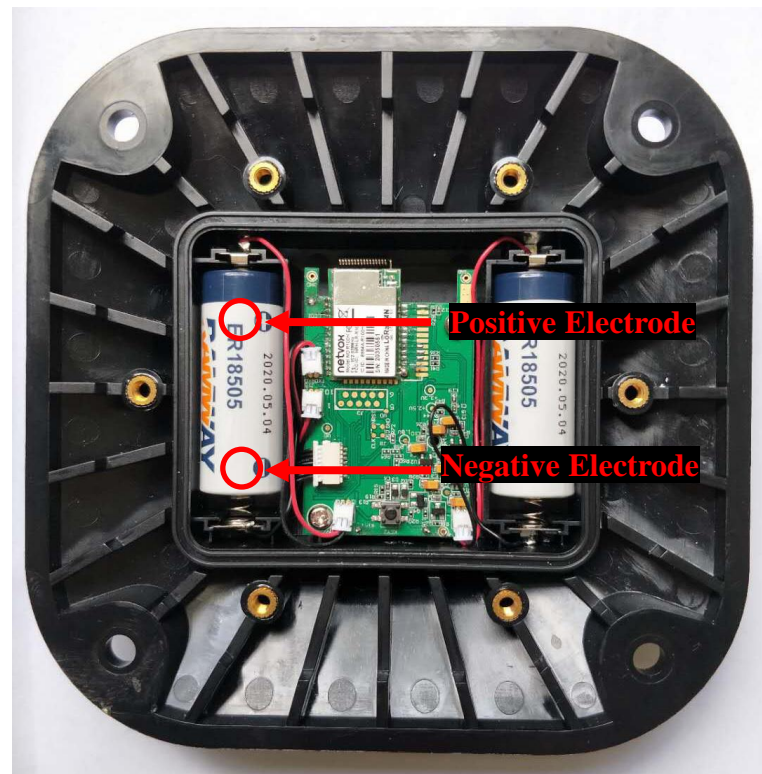

Figure 3

Figure4

Step 4: After installing the battery as Figure 5. Close the plastic cover and the back cover again, and tighten the M6 hex expansion screws as Figure 6.
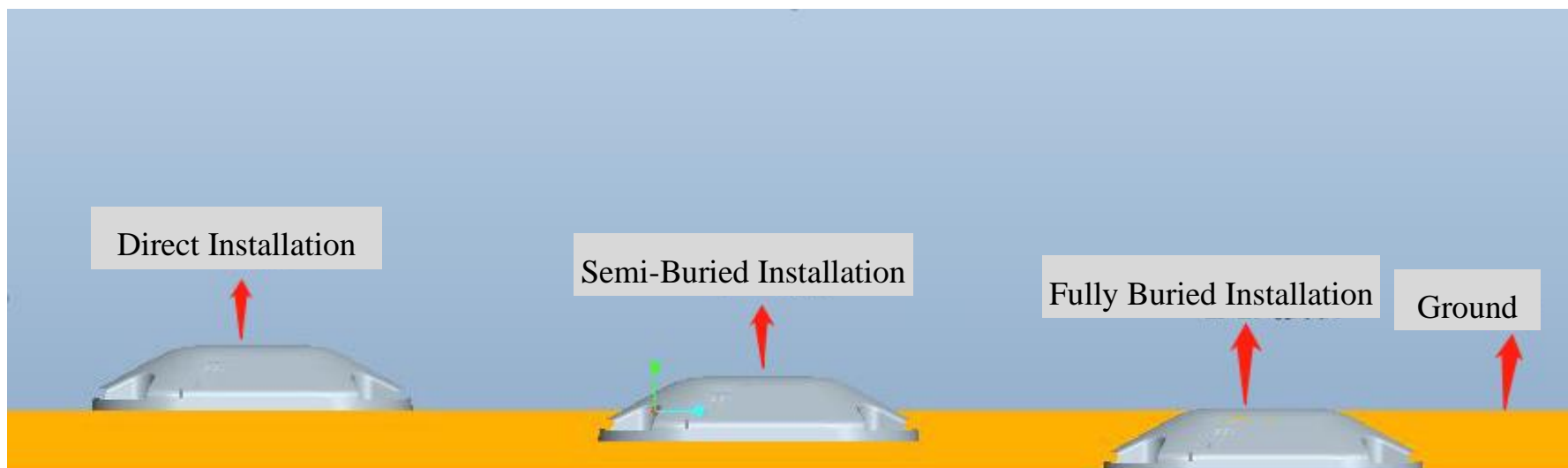

Figure 5

Figure 6

7.1 Installation Methods

There are three installation methods: fully buried installation, semi-buried installation and direct installation.

The installation methods are as follows.

Note: To install the R719A on concrete or asphalt, users need to screw the M6 hex expansion screws for direct installation and drilling. Users could use the resin to fill the holes after drilling.

7.2. Device Interference Source

1. Metal materials such as aluminum alloy, ironware and copper plate shall not appear around and above the device.

2. There shall be no ponding or snow around the device, and there shall be no objects with water above the device, such as wet leaves, wet paper towels, etc.

3. The surrounding environment of the device shall be kept clean and the covering above the device shall be avoided as far as possible.

4. Interference Test Scenario:

Interference Test Scenario	Result	Conclusion
1. Cover with foam board/ plastic sheets/ cardboard/ wooden boards/ plastic cover/ foam mats/ dry branches, or there is aluminum alloy around.	When vehicles enter and exit, the parking space status can be reported normally, and the reported parking space status is consistent with the actual parking space status.	✓
2. Covered with aluminum alloy/ iron	If the vehicle is not parked, it reports that there is a car in the parking space.	✕
3. Covered with ice (about 5cm thickness)	The parking space status can be reported when vehicles enter and leave, but sometimes the radar signal.	Δ
4. Covered with copper board	The radar is covered and the signal is interfered.	✕
5. Covered with wet branches and flooded	The radar signal is shielded and there is no signal.	✕

7.3 Precautions For Battery Use

If the battery needs to be replaced within 10 minutes after the device is turned on, users need to the magnet approach to the top cover for 10 seconds to restore the factory settings after replacing the battery. (The hardware has its own anti-battery passivation power supply to actively eliminate the battery hysteresis.) Then, turn on the device, and it can work normally.

Note:

Please do not disassemble the device unless it is required to replace the batteries.

Do not touch the waterproof gasket 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.

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.