

**Wireless Light Sensor**

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# **Wireless Light Sensor**

## **R313B**

## **User Manual**

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# 1. Introduction

R313B is a long-distance Wireless Light Sensor based on the LoRaWAN open protocol (Class A).

When the illuminance exceeds the set threshold, a report will be sent immediately.

## **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



## 3. Main Features

- Compatible with LoRaWAN
- 2 sections of 3V CR2450 button battery power supply
- Illuminance detection
- Simple operation and setting
- Protection level IP30
- 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
- Low power consumption and long battery life

Note\*:

Battery life is determined by the sensor reporting frequency and other variables, please refer to

[http://www.netvox.com.tw/electric/electric\\_calc.html](http://www.netvox.com.tw/electric/electric_calc.html) On this website, users can find battery life time for varied models at different configurations.

## 4. Set up Instruction

### On/Off

|                                       |  |
|---------------------------------------|--|
| Power on                              | Insert batteries. (users may need a screwdriver to open) ;<br>Insert two sections of 3V CR2450 button batteries and close the battery cover.)  |
| Turn on                               | Press any function key till green and red indicator flashes once.  |
| Turn off (Restore to factory setting) | Press and hold the function key for 5 seconds till green indicator flashes for 20 times.   |
| 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 any function key and insert batteries at the same time; it will enter engineer testing mode.</li> </ol> |

### Network Joining

|   |   |
|---|---|
| Never joined the network                            | <p>Turn on the device to search the network.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>          |
| Had joined the network                              | <p>Turn on the device to search the previous network.</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<br>(when the device is on) | Suggest to check the device verification information on the gateway or consult your platform server provider.   |

### Function Key

|                              |   |
|------------------------------|---|
| Press and hold for 5 seconds | <p>Restore to factory setting / Turn off</p> <p>The green indicator flashes for 20 times: success</p> <p>The green indicator remains off: fail</p>        |
| Press once                   | <p>The device is in the network: green indicator flashes once and sends a report</p> <p>The device is not in the network: green indicator remains off</p> |

### Sleeping Mode

|                                     |  |
|-------------------------------------|--|
| The device is on and in the network | <p>Sleeping period: Min Interval.</p> <p>When the reportchange exceeds setting value or the state changes: send a data report according to Min Interval.</p> |
|-------------------------------------|--|

### Low Voltage Warning

|             |      |
|-------------|------|
| Low Voltage | 2.4V |
|-------------|------|

## 5. Data Report

When the device is powered on and activated, it will immediately send a version package.

Data will be reported once per hour by default setting.

### Default setting:

Maximum time: 3600s

Minimum time: 3600s

BatteryChange: 0x01 (0.1V)

### Illuminance Threshold:

The device samples the illumination according to the Min Interval. When the illumination exceeds the set threshold, a report will be sent.

Illuminance Threshold: 0x00FF (255 LUX) // The threshold setting range is 0x0000-0x0BB8 (0~3000 LUX)

Note:

The reported data is decoded by the Netvox LoRaWAN Application Command document and

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

Data report configuration and sending period are as following:

| Min Interval<br>(Unit:second) | Max Interval<br>(Unit:second) | Reportable Change | Current Change $\geq$<br>Reportable Change | Current Change $<$<br>Reportable Change |
|-------------------------------|-------------------------------|-------------------|--|---|
| Any number between<br>1~65535 | Any number between<br>1~65535 | Can not be 0.     | Report<br>per Min Interval                 | Report<br>per Max Interval              |

### 5.1 Example of ReportDataCmd

FPort: 0x06

| Bytes | 1       | 1          | 1           | Var(Fix=8 Bytes)  |
|-------|---------|------------|-------------|-------------------|
|       | Version | DeviceType | Report Type | NetvoxPayloadData |

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

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

The device type is listed in Netvox LoRaWAN Application Devicetype doc

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

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

| Device | DeviceType | ReportType | NetvoxPayLoadData             |                                   |                                  |
|--------|------------|------------|-------------------------------|-----------------------------------|----------------------------------|
| R313B  | 0x4B       | 0x01       | Battery<br>(1Byte, unit:0.1V) | illuminance<br>(2Bytes,unit:1Lux) | Reserved<br>(5Bytes, fixed 0x00) |

Uplink: 014B011C03840000000000

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

2<sup>nd</sup> byte (4B): DeviceType 0x4B — R313B

3<sup>rd</sup> byte (01): Report Type

4<sup>th</sup> byte (1C): Battery — 2.8v , 1C Hex=28 Dec 28\*0.1v=2.8v

5<sup>th</sup> 6<sup>th</sup> byte (0384): illuminance — 900 LUX, 384 Hex=900 Dec

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

## 5.2 Example of ConfigureCmd

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 | Device Type | NetvoxPayLoadData               |                            |                                    |   |                                 |  |
|----------------------|--------|-------|-------------|---------------------------------|----------------------------|------------------------------------|---|---------------------------------|--|
| Config ReportReq     | R313B  | 0x01  | 0x4B        | MinTime<br>(2bytes Unit:s)      | MaxTime<br>(2bytes Unit:s) | BatteryChange<br>(1byte Unit:0.1v) | Illuminancethreshold<br>(2bytes Unit: 1Lux) | Reserved<br>(2Bytes,Fixed 0x00) |  |
| Config ReportRsp     |        | 0x81  |             | Status<br>(0x00_success)        |                            |                                    | Reserved<br>(8Bytes,Fixed 0x00)             |                                 |  |
| ReadConfig ReportReq |        | 0x02  |             | Reserved<br>(9Bytes,Fixed 0x00) |                            |                                    |   |                                 |  |
| ReadConfig ReportRsp |        | 0x82  |             | MinTime<br>(2bytes Unit:s)      | MaxTime<br>(2bytes Unit:s) | BatteryChange<br>(1byte Unit:0.1v) | Illuminancethreshold<br>(2bytes Unit: 1Lux) | Reserved<br>(2Bytes,Fixed 0x00) |  |

### (1) Command Configuration:

MinTime = 1min、MaxTime = 1min、BatteryChange = 0.1v、IlluminanceThreshold= 200 lux

Downlink: 014B003C003C0100C80000 003C(H<sub>ex</sub>) = 60(D<sub>ec</sub>), C8(H<sub>ex</sub>) = 200(D<sub>ec</sub>)

Response:

814B00000000000000000000 (Configuration success)

814B01000000000000000000 (Configuration failure)

**(2) Read Configuration:**

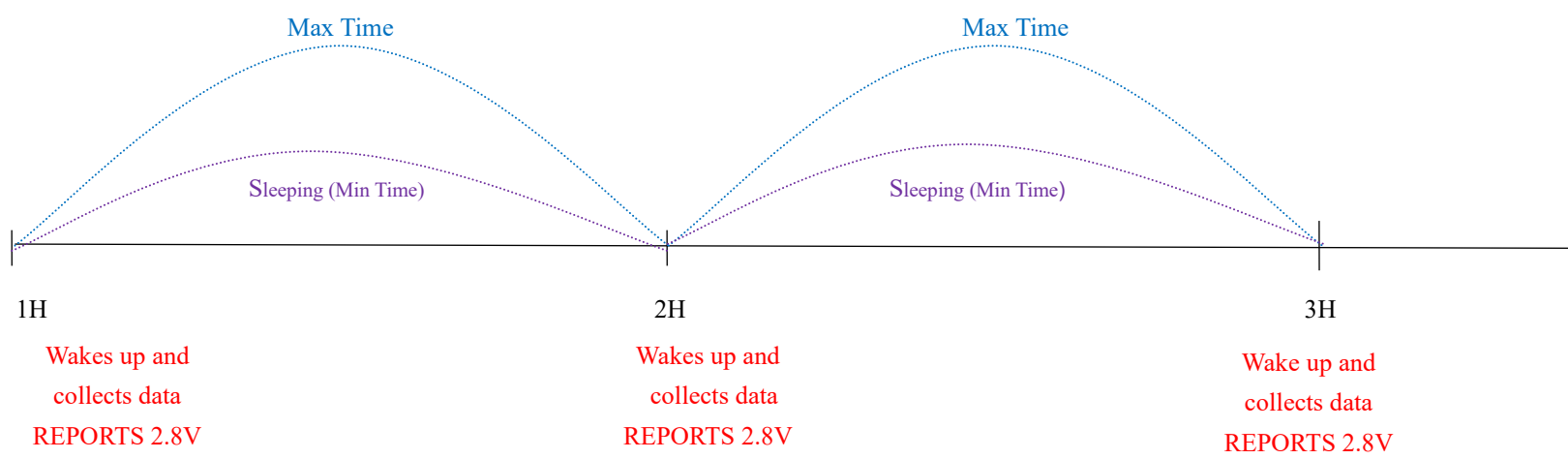
Downlink: 024B000000000000000000

Response:

824B003C003C0100C80000 (Current configuration)

**5.3 Example for MinTime/MaxTime logic**

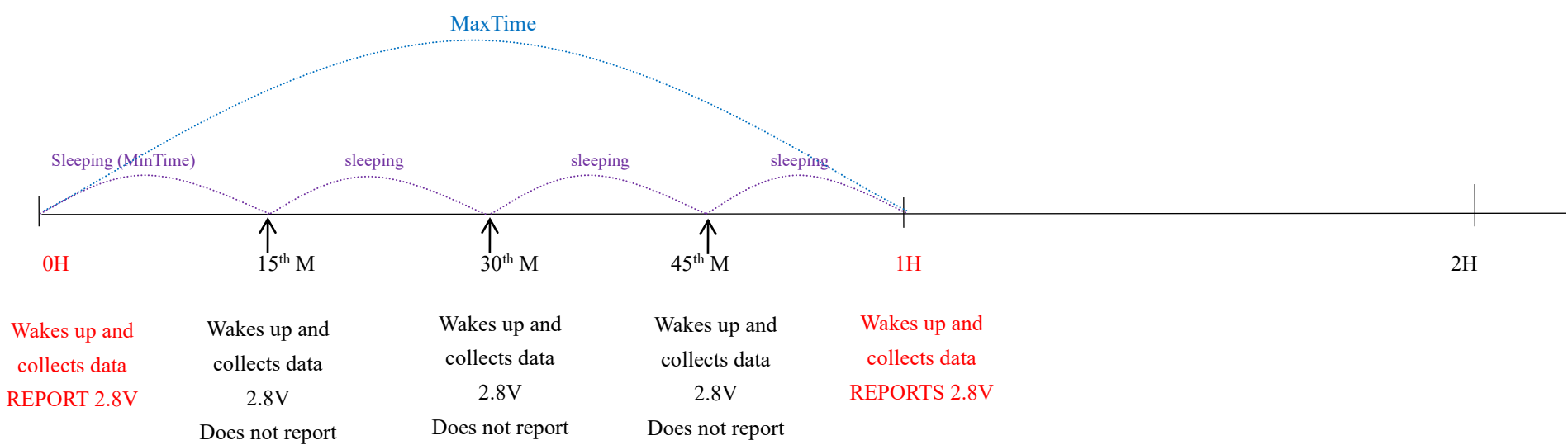
**Example#1** based on MinTime = 1 Hour, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange=0.1V



Note:

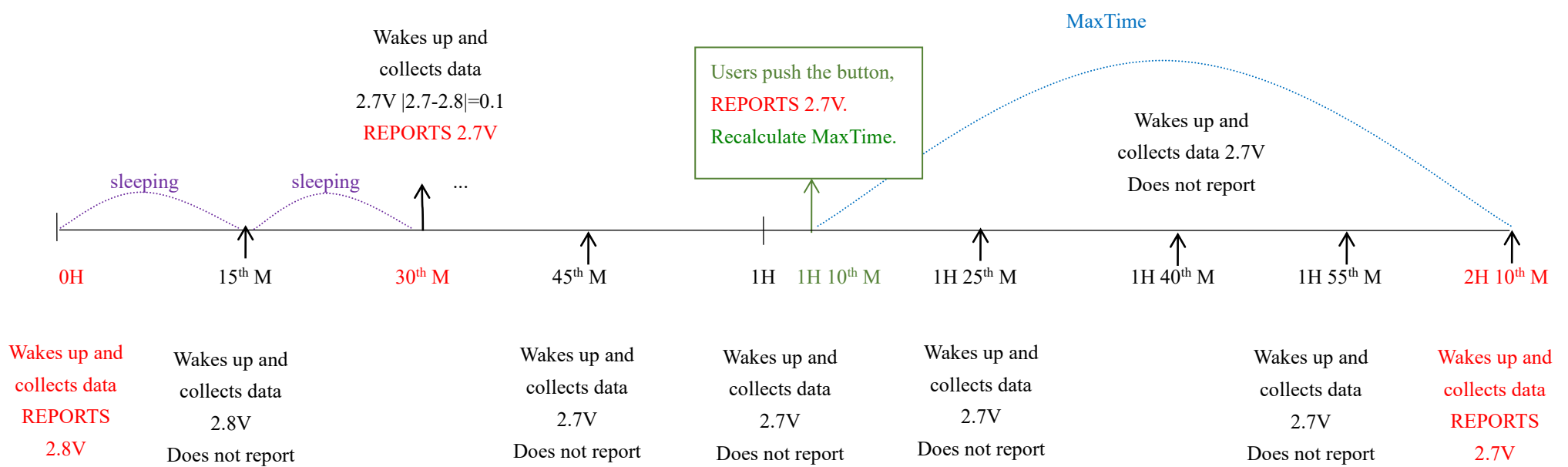
MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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





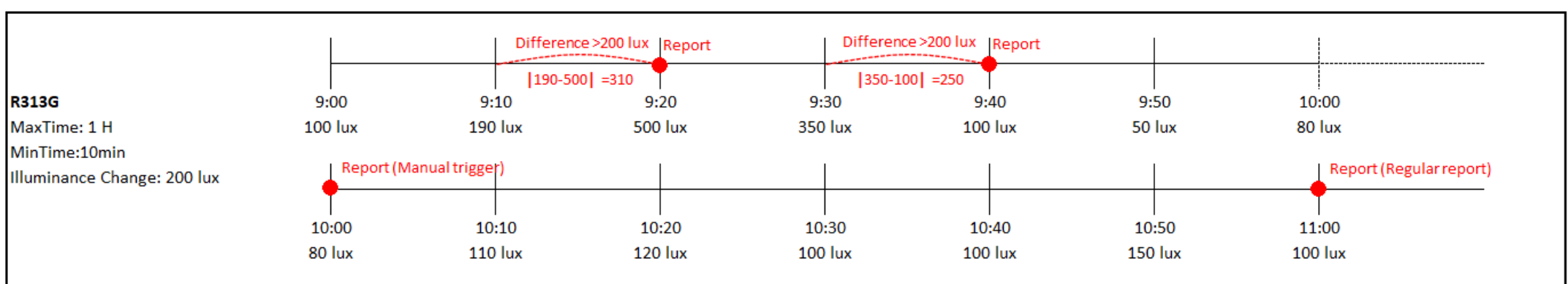
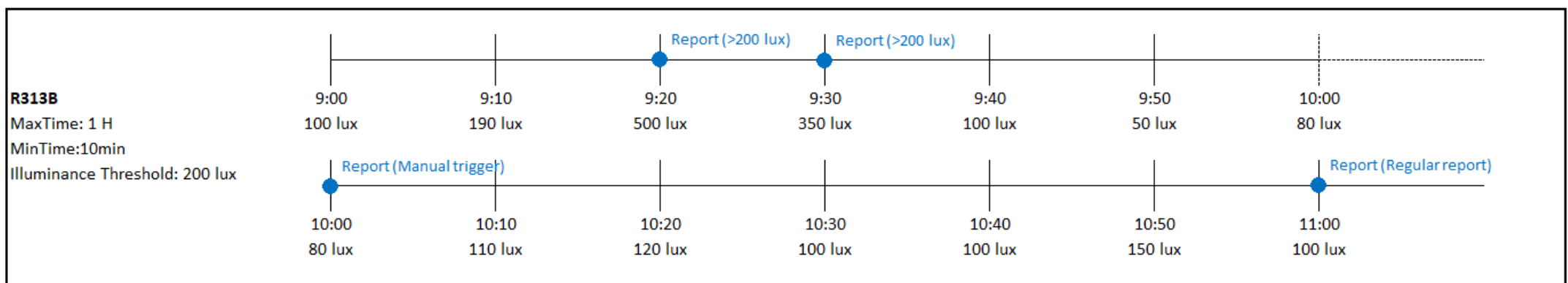
**Example#3** based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.



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.

### 5.4 Difference between R313B and R313G



## 6. Installation

- (1) This product does not have a waterproof function. After the joining is completed, please place it indoors.
- (2) The dust in the installation position of the equipment needs to be wiped clean and then affixed to the equipment.

1. Remove the 3M adhesive on the back of the light sensor and attach the device to the position where the light value needs to be detected (please do not stick it to a rough surface to prevent the device from falling off after a long time).

Note:

- (1) Wipe the surface clean before installation to avoid dust on the surface and affect the adhesion of the device.
- (2) 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.



This figure shows the scene where the light sensor (R313B) is applied in the office.

It can also be applied to the following scenarios:

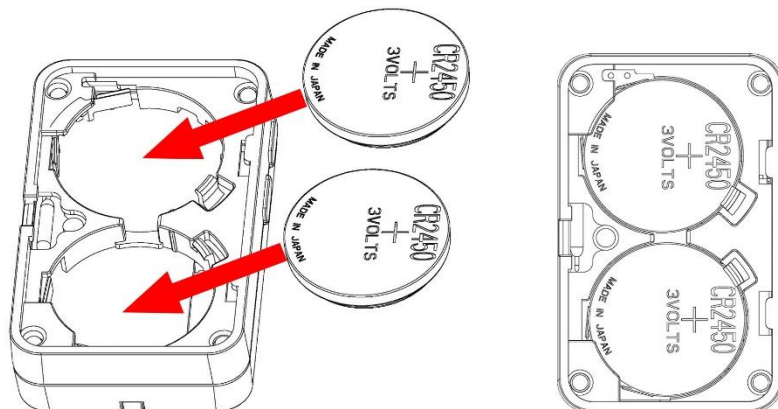
- Home
- School
- Storage room
- Hospital
- Bar
- Stairs
- Agricultural greenhouse

Places which need to detect the illumination value

2. When the illuminance exceeds the set threshold (default is 255 LUX), a report will be sent immediately.



- (3) The battery installation method is shown in the figure below (battery with "+" facing outward).



Note:

To install the battery, use a screwdriver or similar tool to assist in opening the battery cover.

## 7. 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.