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^{TM} Class A

- Frequency hopping spread spectrum technology

- 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 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) *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:	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. 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. 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)	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 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: green indicator flashes once and sends a report The device is not in the network: 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.

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:

MaxTime: 0x0E10 (3600s)

MinTime: 0x0E10 (3600s)

BatteryChange: 0x01 (0.1V)

Illuminance Threshold: 0x00FF (255 LUX)   // Range is 0x0000-0x0BB8 (0~3000 LUX)

Illuminance Threshold:

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

report will be sent.

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 (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	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)

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=0x98, binary=1001 1000, if bit 7= 1, it means low voltage.

   The actual voltage is 0001 1000 = 0x18 = 24, 24*0.1v =2.4v

2. **Version Packet:**

   When Report Type=0x00 is the version packet, such as 014B000A0B202005200000, the firmware version is 2020.05.20

3. **Data Packet:**

   When Report Type=0x01 is data packet.

Device	DeviceType	ReportType	NetvoxPayLoadData			
R313B	0x4B	0x00	SoftwareVersion (1Byte) Eg.0x0A—V1.0	HardwareVersion (1Byte)	DateCode (4Bytes,eg0x20170503)	Reserved (2Bytes,fixed 0x00)
		0x01	Battery (1Byte, unit:0.1V)	illuminance (2Bytes,unit:1Lux)		Reserved (5Bytes,fixed 0x00)

Uplink: 014B011C03840000000000

1st byte (01): Version

2nd byte (4B): DeviceType 0x4B － R313B

3rd byte (01): Report Type

4th byte (1C): Battery－2.8v , 1C Hex=28 Dec   28*0.1v=2.8v

5th 6th byte (0384): illuminance－900 LUX,   384 Hex=900 Dec

7th ~ 11th byte (0000000000): Reserved

5.2 Example of ConfigureCmd

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		0x01		MinTime (2Bytes Unit:s)	MaxTime (2Bytes Unit:s)	BatteryChange (1Byte Unit:0.1v)	Illuminancethreshold (2Bytes Unit：1Lux)	Reserved (2Bytes,Fixed 0x00)
Config ReportRsp	R313B	0x81	0x4B	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)	Illuminancethreshold (2Bytes Unit：1Lux)	Reserved (2Bytes,Fixed 0x00)

(1) Command Configuration:

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

Downlink： 014B003C003C0100C80000   003C(H_{ex}) = 60(D_{ec}) , C8(H_{ex}) = 200(D_{ec})

Response：

814B000000000000000000 (Configuration success)

814B010000000000000000 (Configuration failure)

(2) Read Configuration:

Downlink： 024B000000000000000000

Response：

824B003C003C0100C80000 (Current configuration)

5.3 Example of NetvoxLoRaWANRejoin

Check if the device is still in the network. If the device is disconnected, it will automatically rejoin back to the network.

Fport: 0x20

CmdDescriptor	CmdID (1 byte)	Payload (5 bytes)	
SetNetvoxLoRaWANRejoinReq	0x01	RejoinCheckPeriod(4 Bytes, Unit: 1s)	RejoinThreshold(1 Byte)
SetNetvoxLoRaWANRejoinRsp	0x81	Status (1 Byte, 0x00_success)	Reserved (4 Bytes, Fixed 0x00)
GetNetvoxLoRaWANRejoinReq	0x02	Reserved (5 Bytes, Fixed 0x00)	
GetNetvoxLoRaWANRejoinRsp	0x82	RejoinCheckPeriod (4 Bytes, Unit: 1s)	RejoinThreshold (1Byte)

Note:

　　a. Set RejoinCheckThreshold as 0xFFFFFFFF to stop the device from rejoining the network.

　　b. The last configuration would be kept as user reset the device back to the factory setting.

　　c. Default setting: RejoinCheckPeriod = 2 (hr) and RejoinThreshold = 3 (times)

　　d. Firmware after 2024.4.12 supports SetNetvoxLoRaWANRejoinReq.

(1) Command Configuration

　　Set RejoinCheckPeriod = 3600s (0x00000E10), RejoinThreshold = 3 times

　　Downlink: 0100000E1003

　　Response:

　　　　　　810000000000 (Configuration success)

　　　　　　810100000000 (Configuration failure)
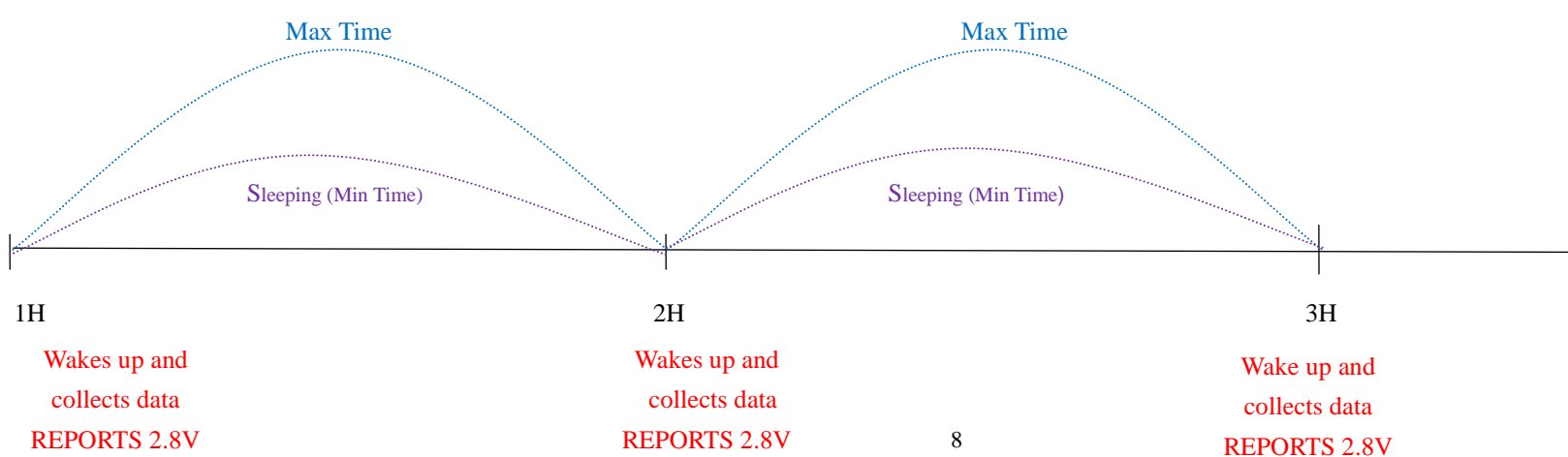
(2) Read current configuration

　　RejoinCheckPeriod, RejoinThreshold

　　Downlink: 020000000000

　　Rthe esponse: 8200000E1003
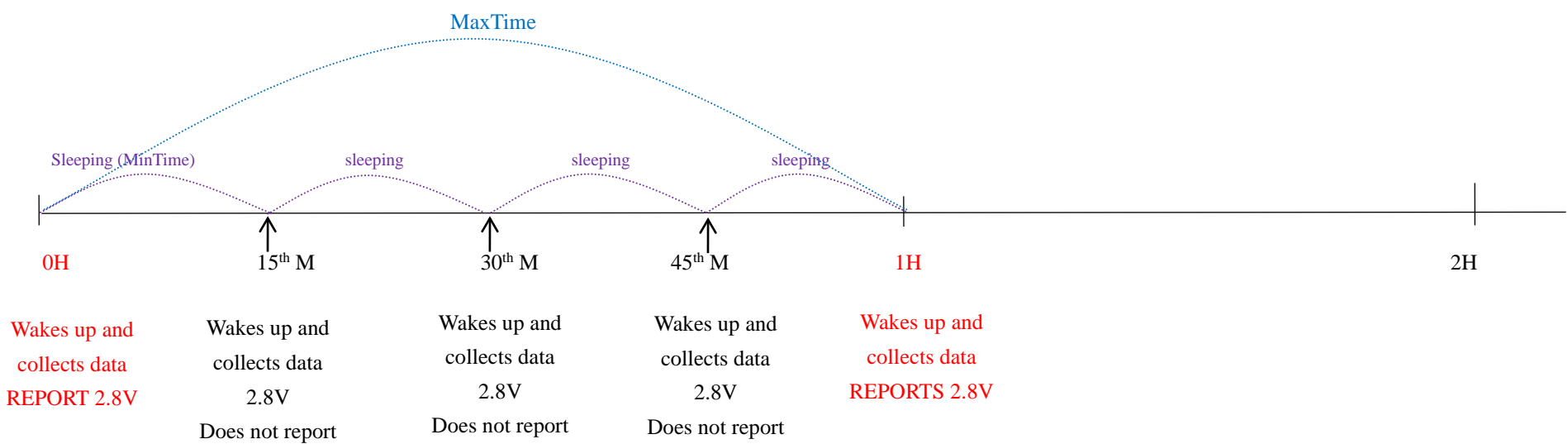
5.4 Example for MinTime/MaxTime logic

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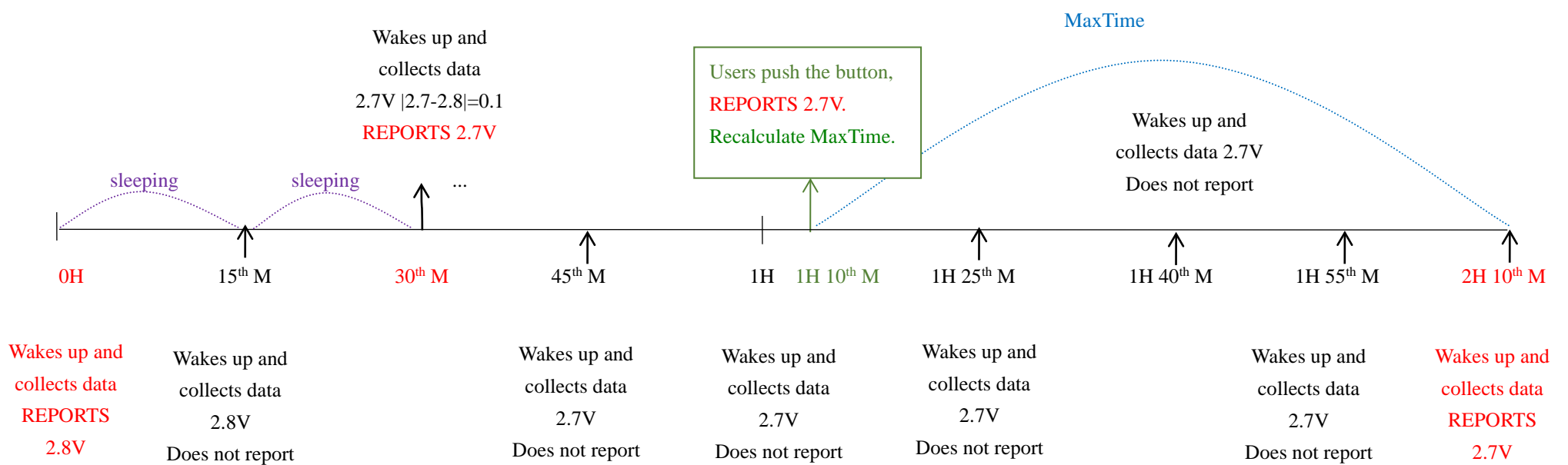
Note:

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	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 REPORTS 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	1H 40th M	1H 55th M	2H 10th M

Wakes up and collects data REPORTS 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 REPORTS 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 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.

5.5 Difference between R313B and R313G
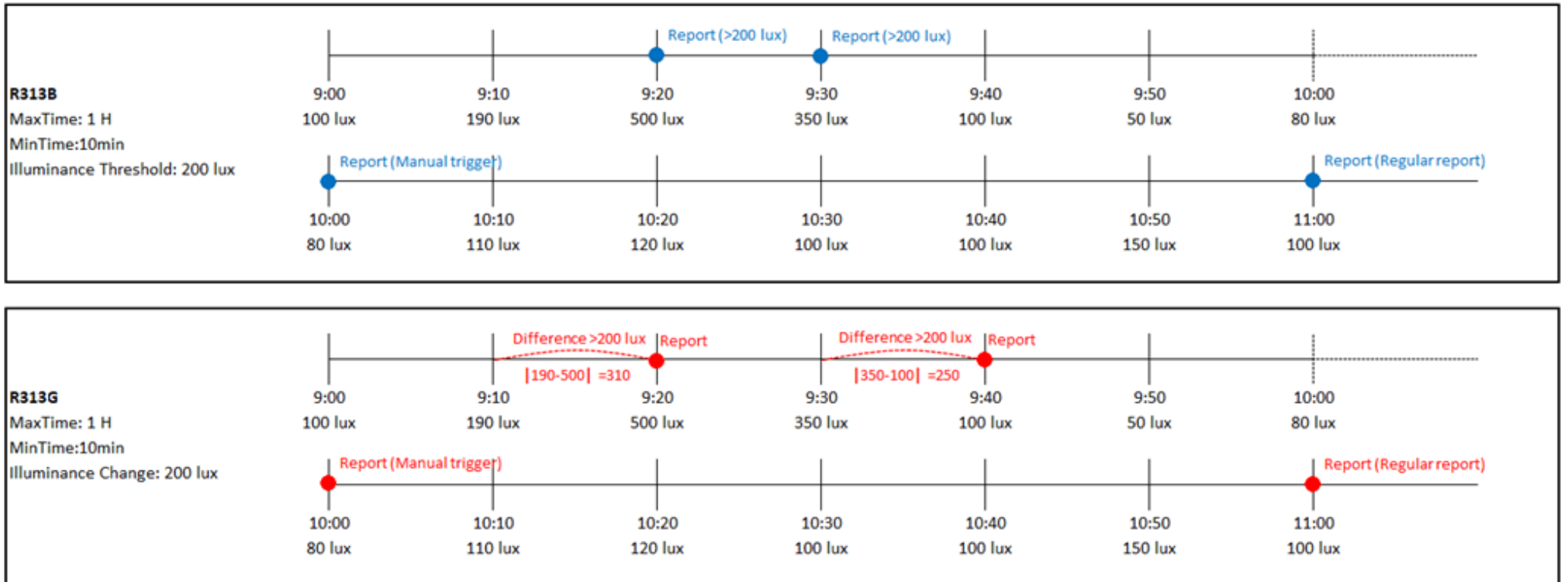
6. Installation

(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.

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

This figure shows the scene where the light sensor (R313B) is applied in the office.
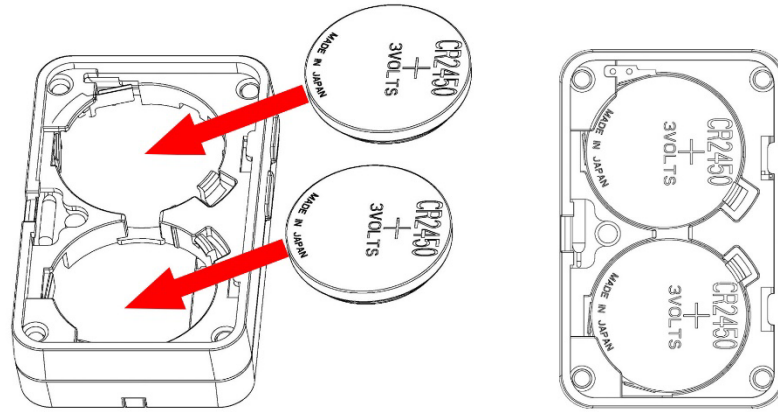
It can also be applied to the following scenarios:

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

Places which need to detect the illumination value

(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.