Wireless Smoke Detector

RA02A
User Manual

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1. Introduction

RA02A is a smoke sensor which is the Class A device based on LoRa private protocol of Netvox. It is compatible with the Netvox LoRa protocol.

Note: RA02A is an auxiliary smart smoke sensor which must be installed with the fire-fighting smoke sensor. RA02A cannot be used to replace the fire-fighting smoke sensor.

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 extends 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, and 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. This device has been certified by the LoRa Alliance and is allowed to use the following logo on the product:

2. Appearance

Indicator

Function Key

Test Key

Battery Casing

Fixed Chassis
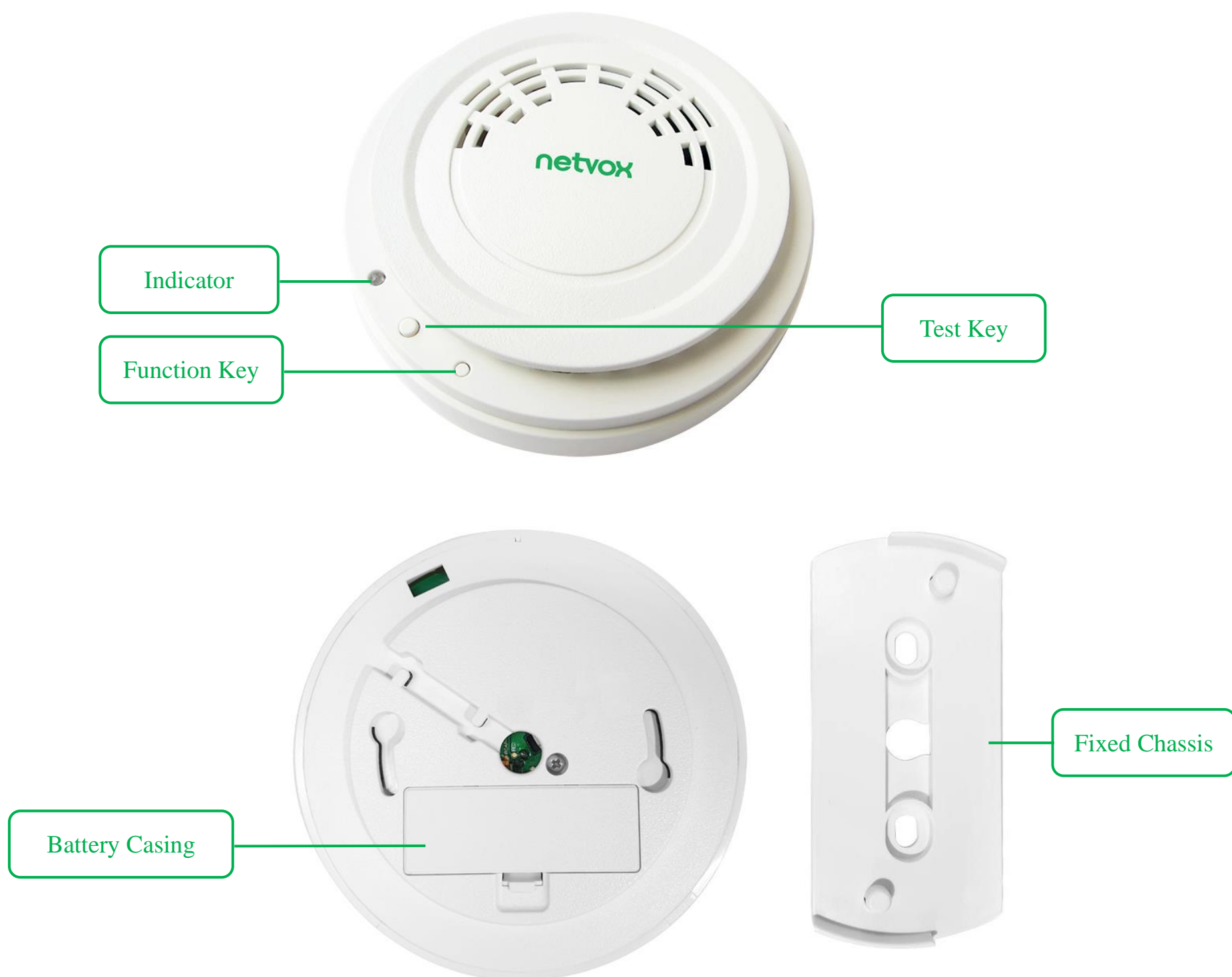
3. Features

- 2 x 1.5V AAA size alkaline batteries

- Smoke alarm and temperature detection

- 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 the third-party platforms: 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 various types of batteries in different configurations.

4. Set up Instruction

On/Off

Power on	Insert batteries. (Users may need a screwdriver to open the cover.)
Turn on	Press any function key until the green indicator flashes once.
Turn off (Restore to factory setting)	After pressing the two function keys at the same time for 5 seconds, the green indicator will keep flashing. Then, release the function keys, the indicator will flash 20 times, and the device will automatically turn off.
Power off	Remove Batteries.
Note	1. After remove and insert the battery, the device memorizes the 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. Do not power on the device while any function key is pressed, otherwise the device will enter the engineering test 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	Suggest to check the device verification information on the gateway or consult your platform server provider.

Function Key

Press the function key and test key for 5 seconds	Restore to factory setting / Turn off The green indicator flashes 20 times: Success The green indicator remains off: Fail
Press the function key 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

Press the test key once	The device is in the network:
	    The red indicator flashes and the buzzer sounds. The device sends a report of alarm=0x01.
	    7 seconds later, the device sends a report of alarm=0x00 and ceases flashing and sounding.
	The device is not in the network: the red indicator flashes and the buzzer sounds

Sleeping Mode

The device is on and in the network	Sleeping period: Min Interval. When the reportchange exceeds setting value or the state changes, a data report will be sent according to Min Interval.

Low Voltage Warning

Low Voltage	2.4V

5. Data Report

The device will immediately send a version packet report and a data report with the temperature and voltage.

Data will be reported by default setting before any configuration.

Default setting:

Max Interval = 0x0E10 (3600s)

Min Interval = 0x0E10 (3600s) (The voltage is detected every Min Interval by default.)

BatteryVoltageChange: 0x01 (0.1V)

Smoke Trigger:

When the device is powered on, it starts smoke detection. When the smoke status changes, the buzzer alarms, the red indicator flashes, and the device immediately sends a report. (The fire alarm bit is 1.) When the alarm is over, it sends a report. (The fire alarm bit is 0.)

High Temperature Alarm:

After the device is successfully connected to the network, the temperature will be sampled once every 1 minute. When the temperature is higher than 60 degrees Celsius, the buzzer will alarm, the red indicator will flash, and a report will be sent immediately. (The fire alarm bit is 1.) If the alarm continues, the report will be sent every 1 minute. When the alarm is over, that is, when the temperature is below 60 degrees Celsius, a report is sent. (The fire alarm bit is 0.)

Note:

(1) The device report interval will be programmed based on the default firmware.

(2) The interval between two reports must be the minimum time.

(3) Low voltage caused by the varying loading of batteries may restart your device as the test key is pressed or the buzzer sounds. Users shall insert new batteries when the situation occurred.

(4) The buzzer and the red indicator remain off when all alarms stop sounding.

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

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

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	Var (Fix =9 Bytes)
	CmdID	DeviceType	NetvoxPayLoadData

CmdID– 1 byte

DeviceType– 1 byte – Device Type of Device

NetvoxPayLoadData– var bytes (Max=9bytes)

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 010A000A15202303310000, the firmware version is 2023.03.31. **3. Data Packet:** When Report Type=0x01 is data packet.

Device	Device Type	Report Type	NetvoxPayLoadData				
			Battery (1Byte, unit:0.1V)	FireAlarm (1Byte 0:noalarm 1:alarm)	HighTempAlarm (1Byte 0:noalarm 1:alarm)	Temperature2 (Signed 2Bytes, unit:0.1°C)	Reserved (3Bytes, fixed 0x00)
RA02A	0x0A	0x01					

Example of Uplink: 010A019800000104000000

1st byte (01): Version

2nd byte (0A): DeviceType 0x0A－RA02A

3rd byte (01): ReportType

4th byte (98): Battery－2.4v, 98 (HEX) =24 (DEC), 24*0.1v=2.4v // Low battery

5th byte (00): FireAlarm－noalarm

6th byte (00): HighTempAlarm－noalarm

7th 8th byte (0104): Temperature－26.0℃, 0104 (HEX) = 260 (DEC), 260*0.1℃=26.0℃

9th 11th byte (000000): Reserved

5.2 Example of Report Configuration

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			
ConfigReportReq	RA02A	0x01	0x0A	MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit: 0.1v)	Reserved (4Bytes, Fixed 0x00)
ConfigReportRsp		0x81		Status (0x00_success)		Reserved (8Bytes, Fixed 0x00)	
ReadConfigReportReq		0x02		Reserved (9Bytes, Fixed 0x00)			
ReadConfigReportRsp		0x82		MinTime (2bytes Unit: s)	MaxTime (2bytes Unit: s)	BatteryChange (1byte Unit: 0.1v)	Reserved (4Bytes, Fixed 0x00)

(1) Command Configuration:

MinTime = 60min (0E10), MaxTime = 60min (0E10), BatteryChange = 0.1v (0x01)

Downlink: 010A0E100E100100000000

Response:

810A000000000000000000 (Configuration success)

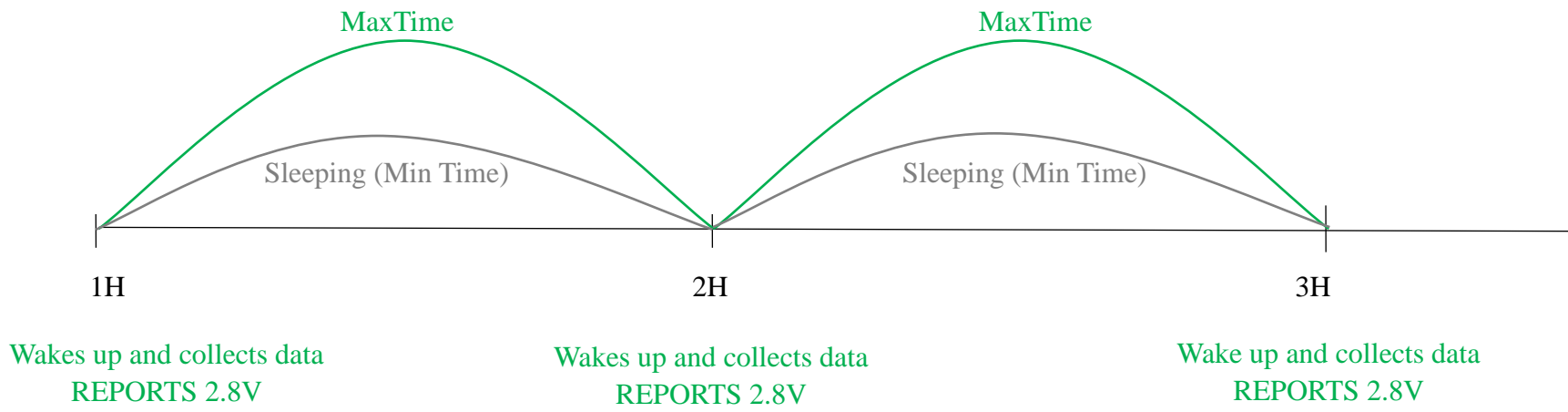810A010000000000000000 (Configuration failure)

(2) Read Configuration:

Downlink: 020A000000000000000000

Response:

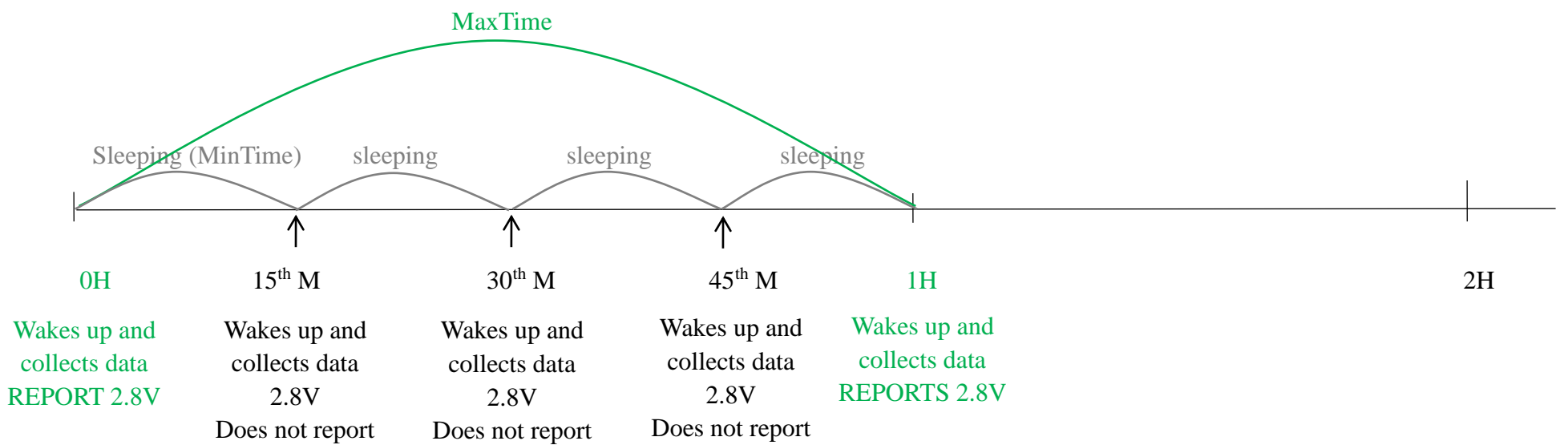820A0E100E100100000000 (Current configuration)

5.3 Example for MinTime/MaxTime logic

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

MaxTime   MaxTime

Sleeping (Min Time)   Sleeping (Min Time)

1H   2H   3H

Wakes up and collects data REPORTS 2.8V   Wakes up and collects data REPORTS 2.8V   Wake up and collects data REPORTS 2.8V
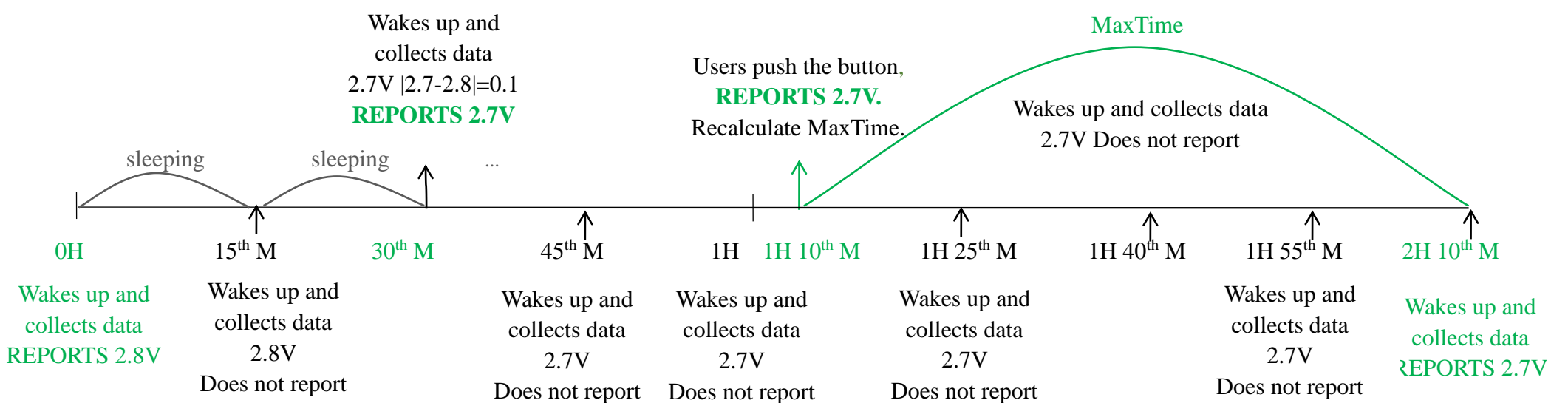
MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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.

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.

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

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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 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. Installation

1. Use screws to secure the RA02A base to the wall. After installation, rotate the RA02A base counterclockwise to lock it in place.

2. When the smoke sensor detects that the smoke concentration exceeds the set value or the temperature exceeds 60°C, the device will send an "alarm" message. When the smoke concentration falls below the set value and the regular reporting time is reached, the device will return to the normal state and send a "normal" message.
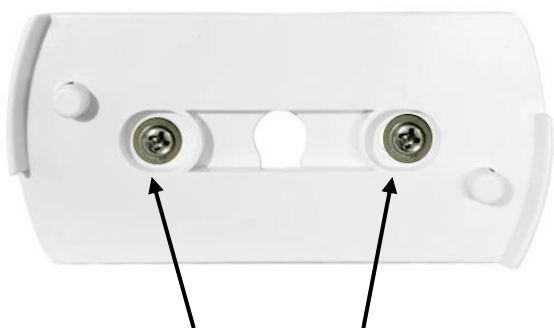
Secure the screws

Lock

3. RA02A is suitable for the following scenarios:

- Residential
- Hotel
- Apartment
- Ballroom
- Coffee shop
- Smart cities or smart buildings

4. RA02A is **not suitable** for the following scenarios

- Places with a large amount of dust, powder, and water mist
- Places where steam and oil mist may be generated
- Kitchens and places where smoke stays under normal circumstances
- Places with excessive temperature and humidity

5. Installation height: Within 4 meters.

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.