Wireless Liquefied Petroleum Gas Detector

RA02D1
User Manual

Table of Contents

1. Introduction 2

2. Appearance 3

3. Features 3

4. Set up Instructions 4

5. Data Report 5

5.1 Example of ReportDataCmd 6

5.2 Example of Report Configuration 7

5.3 Example of NetvoxLoRaWANRejoin 8

5.4 Example for MinTime/MaxTime logic 9

6. Installation 11

7. Important Maintenance Instructions 12

1. Introduction

RA02D1 is a liquefied petroleum gas detector which is the Class C device based on LoRa private protocol of Netvox. It is compatible with the Netvox LoRa protocol.

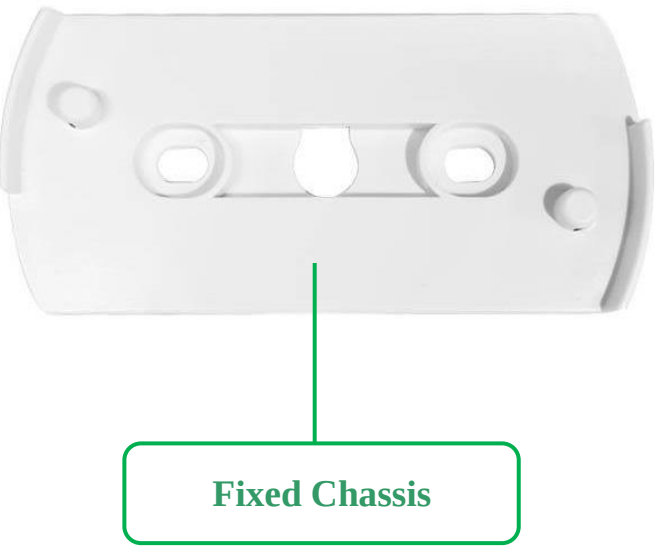
LoRa Wireless Technology:

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 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



3. Features

- Power supplied by 12V power adapter
- Liquefied Petroleum Gas (LPG) and temperature detection
- Compatible with LoRa Class C
- Frequency hopping spread spectrum
- Applicable to third-party platforms: Actility/ThingPark, TTN, MyDevices/Cayenne

4. Set up Instructions

On/Off

Turn on	Plug in the power adapter.
Restart (back to factory setting)	Press the function key for 5 seconds and the green indicator will flash 20 times.
Power off	Unplug the device.
Note	1. The device will be off by default when the power adapter is unplugged. 2. 5 seconds after powering on, the device will enter the engineering test mode. 3. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components. 4. Please do not press any buttons while the device is plugging in or it will be in 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 (not back to factory setting)	Turn on the device to search the previous network. The green indicator stays on: Success The green indicator remains off: Fail
Fail to join the network	Please check the device verification information on the gateway or consult your platform server provider.

Function Key

Press and hold the function key for 5 seconds	Restart the device The green indicator flashes 20 times: Success The green indicator remains off: Fail
Short press the function key	The device is in the network: The green indicator flashes once and sends a data packet. The device is not in the network: The green indicator remains off.

5. Data Report

The device will immediately send a version packet report and a data packet with the LPGAlarm, HighTempAlarm, and temperature.

Data will be reported by default setting before any configuration.

Max Time: Max Interval

Min Time: Min Interval Note: Data are reported based on default firmware (MaxTime).

LPGAlarm Trigger:

The device samples the concentration of LPG every 30 seconds after it is on.

LPG Concentration > **5% LEL**	The red indicator flashes and the buzzer sounds. The device sends a report. (LPGAlarm bit = 1)
LPG Concentration < **2% LEL**	The red indicator stops flashing and the buzzer stops sounding. The device sends a report.

HighTempAlarm Trigger:

1 minute after the device is in the network, the temperature would be sampled.

Temperature > **60**°C	The red indicator flashes and the buzzer sounds. The device sends a report. (HighTempAlarm bit = 1)
Temperature < **60**°C	The red indicator stops flashing and the buzzer stops sounding. The device sends a report.

Note: (1) Users need to preheat the device for 48 hours to stabilize the sensitivity if it is used for the first time.

(2) RA02D1 can still detect LPG when it is not in the network.

Please visit Netvox *Lorawan Application Command document* and *Netvox Lora Command Resolver* http://www.netvox.com.cn:8888/cmddoc to resolve uplink data.

5.1 Example of ReportDataCmd

FPort: 0x06

Bytes	1	1	1	Var (Fix =9 Bytes)
	CmdID	DeviceType	ReportType	NetvoxPayLoadData

CmdID– 1 byte

DeviceType– 1 byte – Device Type of Device

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

NetvoxPayLoadData– var bytes (Max=9bytes)

Tips

1. Battery Voltage:

If the battery is equal to 0x00, it means that the device is powered by a DC power supply.

2. Version Packet:

When Report Type=0x00 is the version packet, such as 01D6000A15202305150000, the firmware version is 2023.05.15.

3. Data Packet:

When Report Type=0x01 is the data packet.

4. Signed Value:

When the temperature is negative, 2's complement should be calculated.

Device	**Device Type**	**Report Type**	**NetvoxPayLoadData**				
RA02D1	0x D6	0x00	SoftwareVersion (1Byte) Eg.0x0A—V1.0	HardwareVersion (1Byte)	DateCode (4Bytes,eg 0x20170503)		Reserved (2Bytes,fixed 0x00)
		0x01	Battery (1Byte, unit:0.1V)	LPGAlarm (1Byte 0:noalarm 1:alarm)	HighTempAlarm (1Byte 0:noalarm 1:alarm)	Temperature (Signed2Bytes, unit:0.1°C)	Reserved (3Bytes,fixed 0x00)

Example of Uplink: 01D601000100010E000000

1st byte (01): Version

2nd byte (D6): DeviceType 0xD6－RA02D1

3rd byte (01): ReportType

4th byte (00): Battery－0.0v, 00 (HEX) = 0 (DEC), 0*0.1v = 0.0v // DC power supply

5th byte (01): LPGAlarm－alarm

6th byte (00): HighTempAlarm－noalarm

7th –8th byte (010E): Temperature－27.0℃ 10E (HEX) = 270 (DEC), 270*0.1℃ = 27.0℃

9th–11th byte (000000): Reserved

5.2 Example of Report Configuration

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**		
ConfigReportReq	RA02D1	0x01	0xD6	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	Reserved (5Bytes,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)	Reserved (5Bytes,Fixed 0x00)

(1) Command Configuration

MinTime = 15min (0x384), MaxTime = 15min (0x384)

Downlink: 01D6038403840000000000

Response:

81D6000000000000000000 (Configuration success)

81D6010000000000000000 (Configuration failure)

(1) Read Configuration

Downlink: 02D6000000000000000000

Response:

82D6038403840000000000 (Current configuration)

5.3 Example of NetvoxLoRaWANRejoin

(NetvoxLoRaWANRejoin command is to 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 0XFFFFFFFF Disable NetvoxLoRaWANRejoinFunction)	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 (1 Byte)

(1) Configure parameters

RejoinCheckPeriod = 0x00000E10 (60 min); RejoinThreshold = 0x03 (3 times)

Downlink: 0100000E1003

Response: 810000000000 (configuration succeed)

810100000000 (configuration fail)

(2) Read configuration

Downlink: 020000000000

Response: 8200000E1003

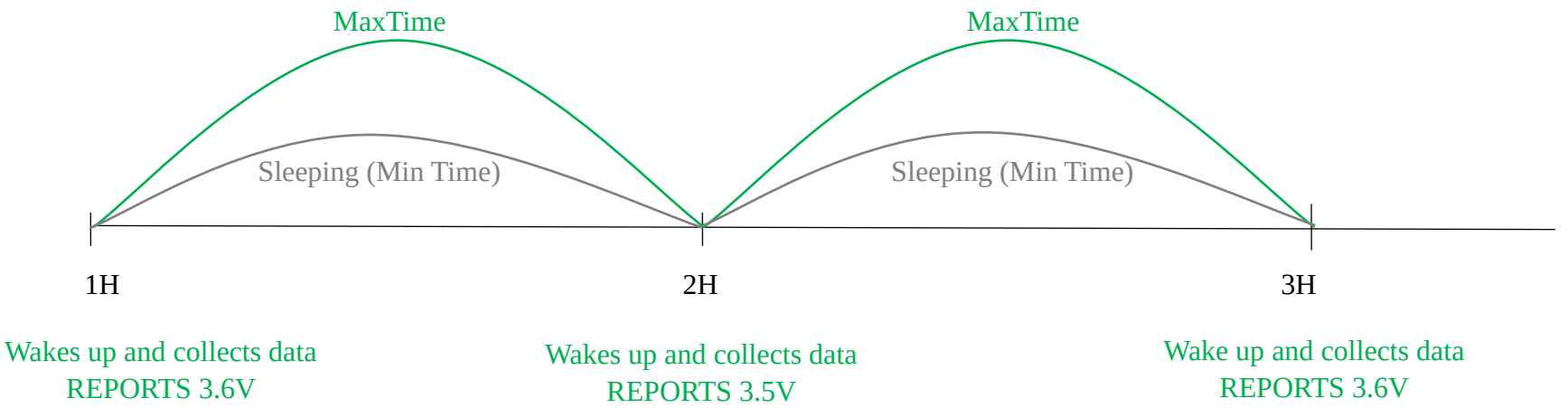
Note: a. Set RejoinCheckThreshold as 0xFFFFFFFF to stop the device from rejoining the network.

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)

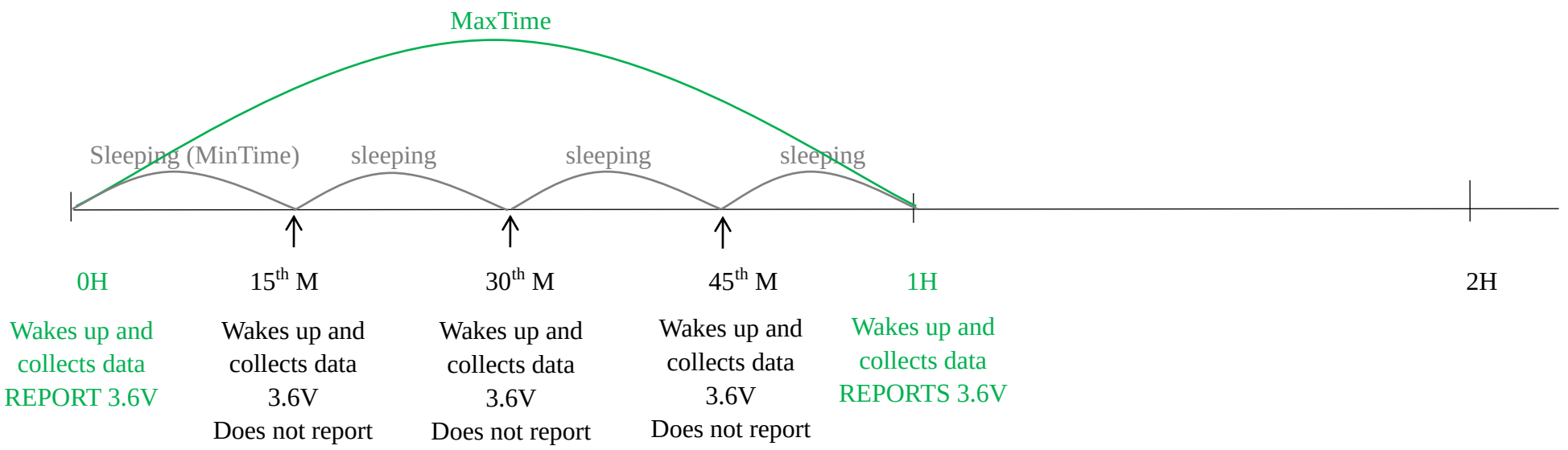
5.4 Example for MinTime/MaxTime logic

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

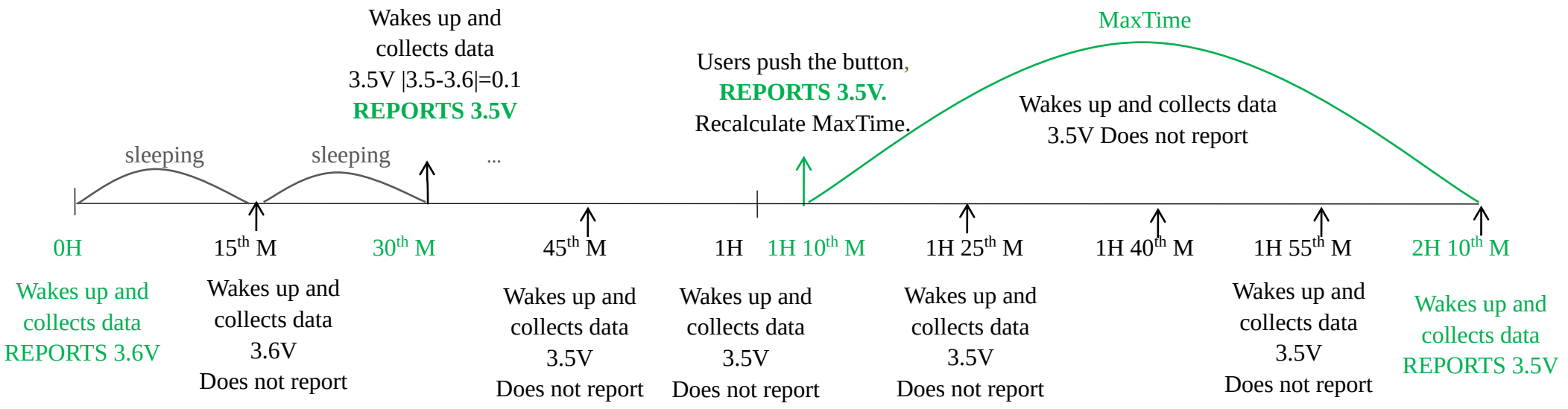


MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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.

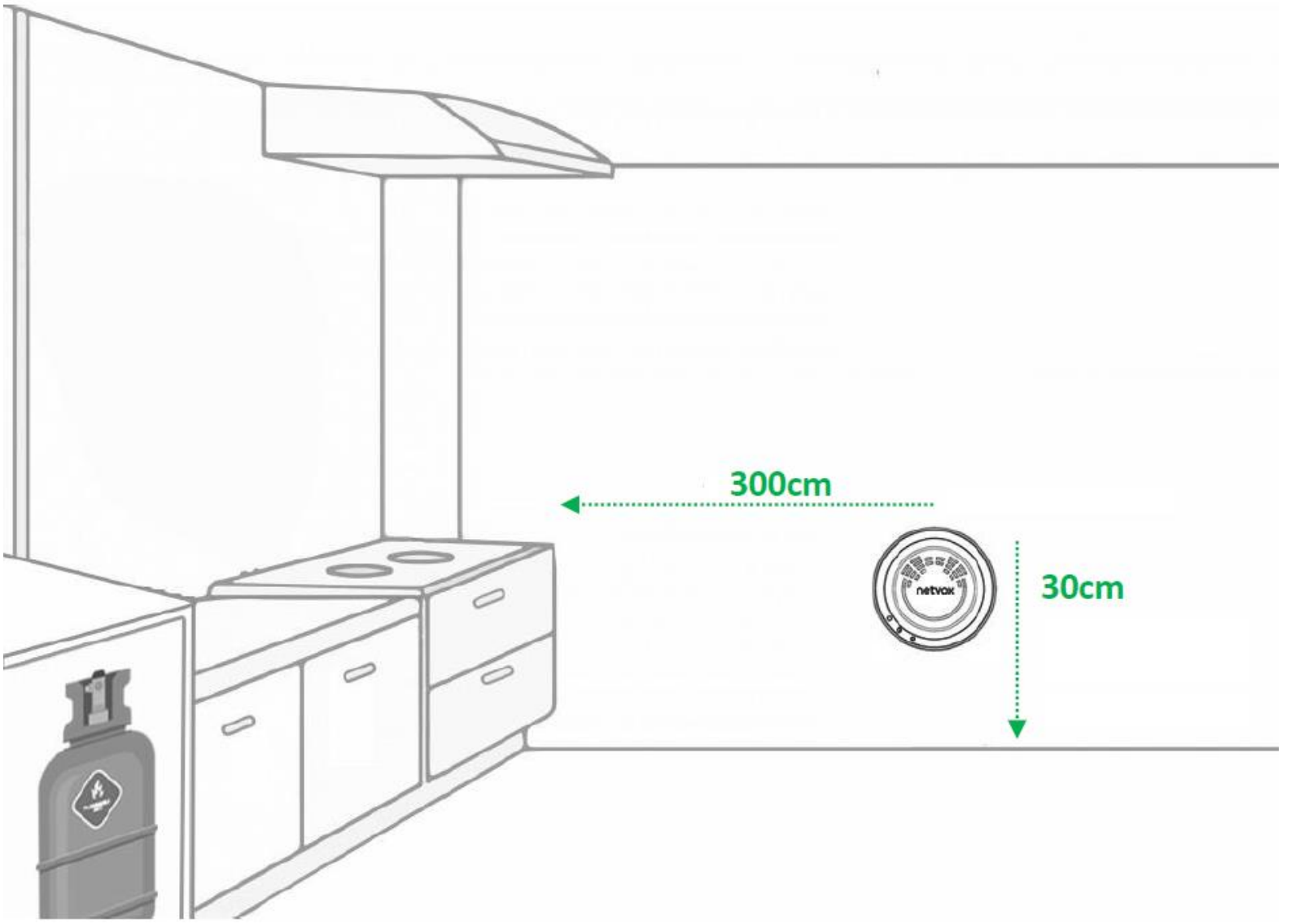
2) The data collected is compared with the last data reported. If the data change value is greater than the ReportableChange value, the device reports according to MinTime interval. If the data variation is not greater than the last data reported, the device reports according to MaxTime interval.

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. Installation

Please install RA02D1 (1) 30cm from the floor and (2) 300cm away from the gas source.



7. Important Maintenance Instructions

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 a 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 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.