

Wireless Toilet Occupancy Sensor

R718PQA User Manual

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1. Introduction

R718PQA is a long-range wireless occupancy and door sensor for Netvox Class A type devices based on LoRaWAN open protocol.

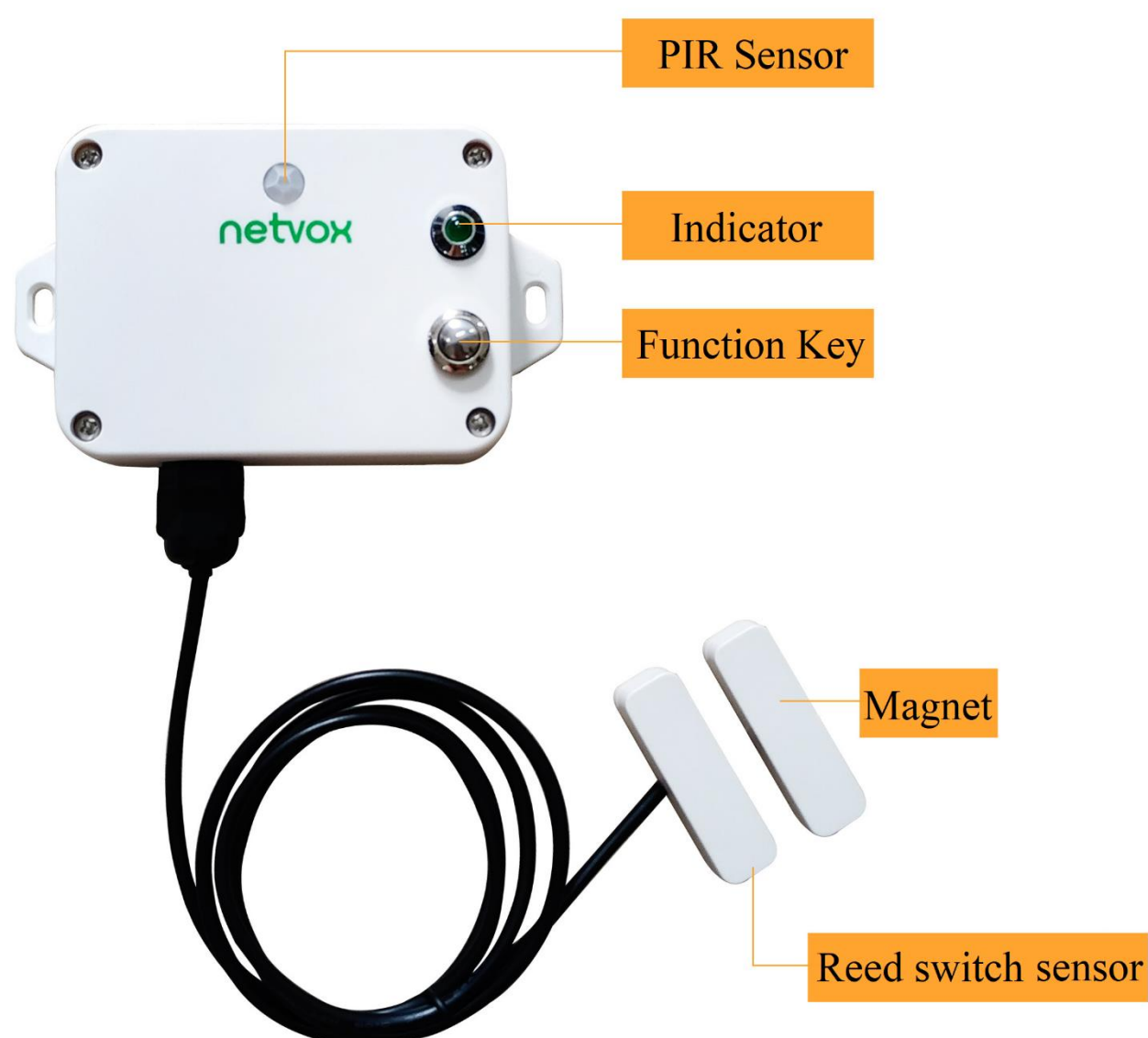
LoRa Wireless Technology:

LoRa is a wireless communication technology dedicated to long distance and low power consumption. Compared with other communication methods, LoRa spread spectrum modulation method greatly increases to expand the communication distance. Widely used in long-distance, low-data wireless communications. For example, automatic meter reading, building automation equipment, wireless security systems, industrial monitoring. Main features include small size, low power consumption, transmission distance, 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 protocol
- 2 sections ER14505 3.6V AA size Lithium battery
- Detect occupancy status
- Simple operation and setting
- Protection level IP65 / IP67 (optional)
- 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

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)
Turn on	Press and hold the function key for 3 seconds till the green 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"> 1. Remove and insert the battery; the device is at 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. At 1st -5th second after power on, the device will be in engineering test mode.

Network Joining

Never joined the network	<p>Turn on the device to search the network to join.</p> <p>The green indicator stays on for 5 seconds: success</p> <p>The green indicator remains off: fail</p>
Had joined the network (not at factory setting)	<p>Turn on the device to search the previous network to join.</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 (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>
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Low Voltage Warning

Low Voltage	3.2V
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5. Data Report

The device will immediately send a version packet report along with an uplink packet including occupied status.

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

Default setting:

Maximum time: 3600s (1H)

Minimum time: 3600s (1H) (The current voltage and occupied are detected every Min Interval)

Battery change: 0x01 (0.1V)

Disable time: 30s

Detection time: 5min

* If there is special custom shipment, the setting is changed according to customer's requirements.

* IRDisableTime must ≥ 5 s and IRDectionTime \geq IRDisableTime

Occupancy alarm:

If there are movements of people, animals or any organism in the detected area, the infrared sensor detects the infrared signal. And, if the closing event happen in the following 10seconds, the device will report Occupy status.

Occupy status = 1

Unoccupy. status = 0

Note:

The data transmission period of the device is subject to the programming configuration before shipment.

The interval between two reports must be the mintime

The data parsing reported by the device is referenced by the *Netvox LoraWAN Application Command document* and

<http://www.netvox.com.cn:8888/page/index>

Data report configuration and sending period are as following:

Min Interval (Unit:second)	Max Interval (Unit:second)	Reportable Change	Current Change \geq 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 byte –0x01—the Version of NetvoxLoRaWAN Application Command Version

DeviceType– 1 byte – Device Type of Device

The devicetype 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	Device Type	Report Type	NetvoxPayLoadData		
R718PQ	0x97	0x01	Battery (1Byte, unit:0.1V)	Status (1Byte 0:off 1:on)	Reserved (6Bytes, fixed 0x00)

Uplink :0197012201000000000000

Byte	Value	Attribute	Result	Resolution
1st	01	Version	1	-
2nd	97	DeviceType	97	-
3rd	01	ReportType	1	-
4th	22	Battery	3.4v	22(HEX)=34(DEC),34*0.1v=3.4v
5th	01	Status	on	-
6th~11th	000000000000	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	Cmd ID	Device Type	NetvoxPayLoadData			
Config ReportReq	R718PQA	0x01	0x97	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)
Set IRDisableTimeReq		0x03		IRDisableTime (2bytes Unit:s)	IRDectionTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)	
Set IRDisableTimeRsp		0x83		Status (0x00_success)		Reserved (8Bytes,Fixed 0x00)	
Get IRDisableTimeReq		0x04		Reserved (9Bytes,Fixed 0x00)			
Get IRDisableTimeRsp		0x84		IRDisableTime (2bytes Unit:s)	IRDectionTime (2bytes Unit:s)	Reserved (5Bytes,Fixed 0x00)	

(1) Configure device parameters MinTime = 1min, MaxTime = 1min, BatteryChange = 0.1v

Downlink: 0197003C003C0100000000

Device returns:

819700000000000000000000 (configuration succeeded)

819701000000000000000000 (configuration failed)

(2) Read device parameters

Downlink: 029700000000000000000000

Device returns:

8297003C003C0100000000 (device current configuration parameter)

(3) Configure IRDisableTime and IRDectionTime

IRDisableTime= 30s、 IRDectionTime= 30s // IRDectionTime >= IRDisableTime

Downlink: 0397001E001E0000000000

Devices return:

849700000000000000000000 (the configuration is successful)

849701000000000000000000 (the configuration is failed)

(4) Read IRDisableTime and IRDectionTime

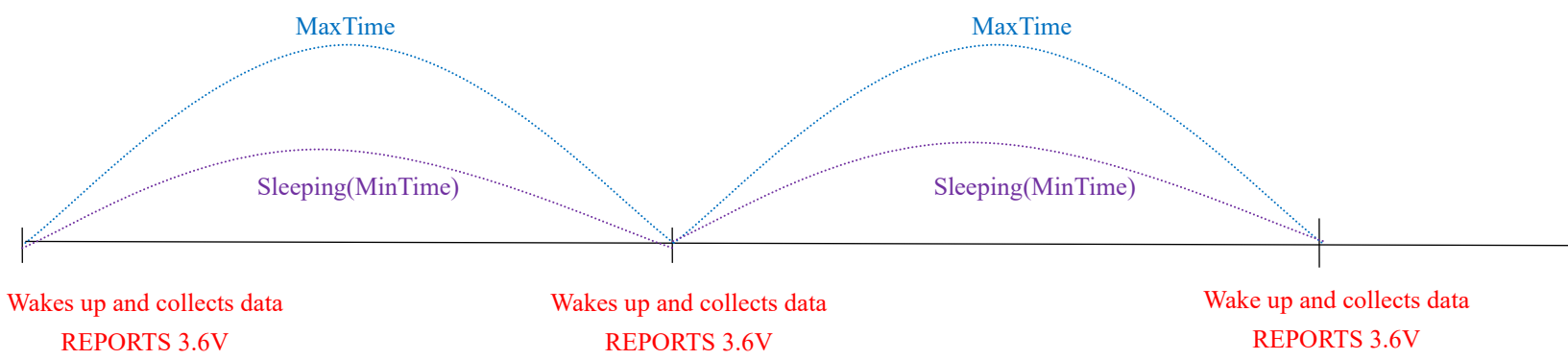
Downlink: 04970000000000000000

Devices return:

8497001E001E0000000000 (current device configuration parameters)

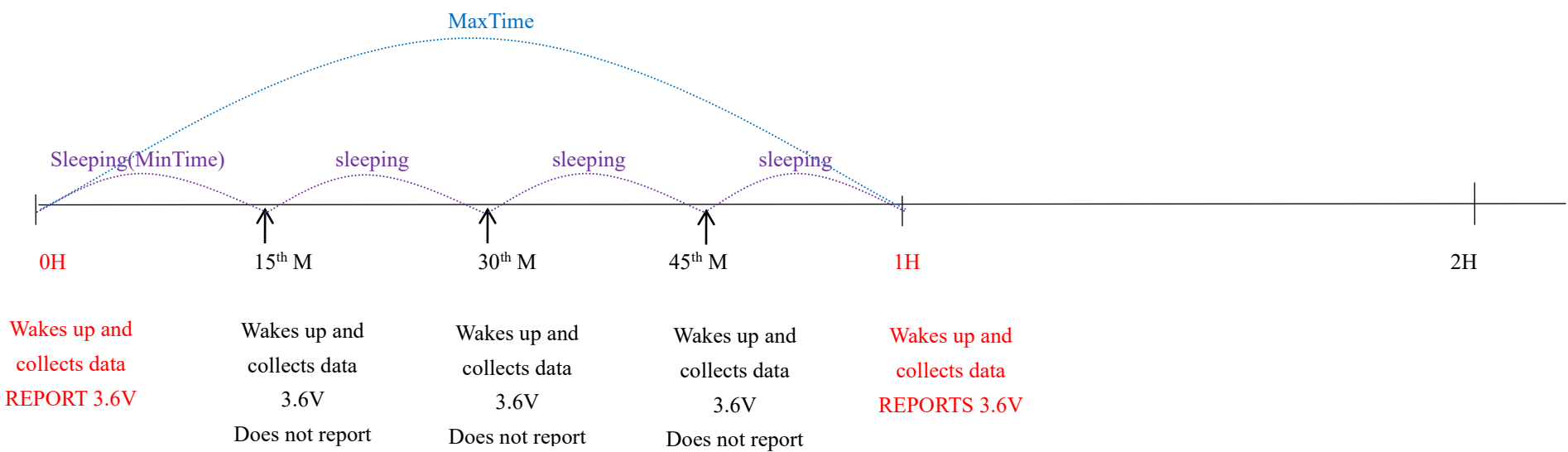
5.3 Example for MinTime/MaxTime logic

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

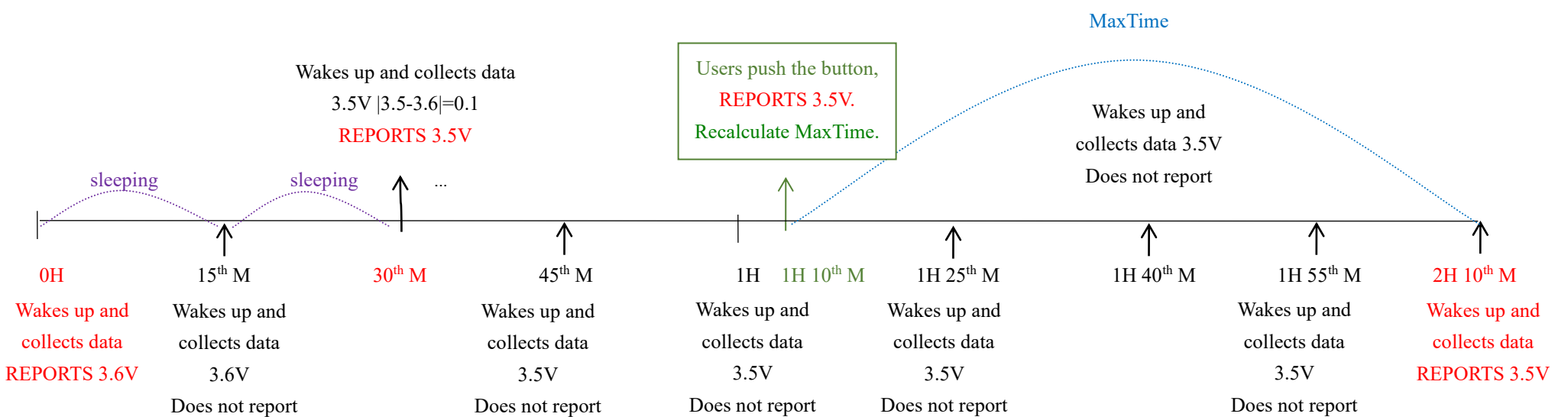


Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.

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 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. IR Disable Time and Detection Time

If there are movements of people, animals or any organism in the detected area, the infrared sensor detects the infrared signal.

And, if the closing event happen in the following 10seconds, the device will report occupy status=1.

After IRDetectionTime(Default 30s), if there is to no longer people, animals or any organism movement detected by the R718PQA within the monitoring range and the reed switch status is detected as open, the device will report occupy status=0.

To save the power, when R718PQA detects the infrared signal, it will enter IRDetectionTime period. If there is no infrared signal detected in IRDetectionTime period. It will report un-occupy.

IRDisableTime is the sampling period during IRDetectionTime (IRDisableTime are 30 seconds by default setting that PIR is off for first 70% of the period; on for rest 30% of the period).

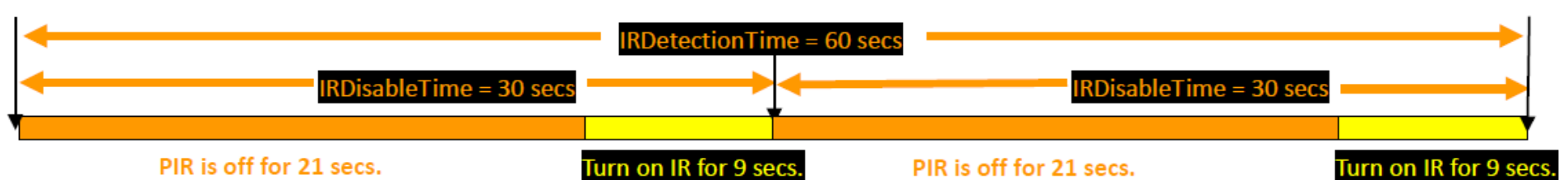
For example, after triggered, the PIR will turn off the infrared probe for 21 (30 * 70%) seconds to save the power, living objects within this period will not be detected. PIR will re-open detection function after 21 seconds, if it detects living objects in this period, the IR delay time will be extended for another 30 seconds till no infrared signal is detected and IRDetectionTime period is due and R718PQA will then report un-occupy

Note: IRDisableTime >=5 s, IRDetectionTime>= IRDisableTime

Default disabletime: 30s detectiontime: 5min

Example1:

The IRDetectionTime is 60 seconds and the IRDisableTime is 30 seconds, no living creature is detected during the two 9-second detection period (the yellow parts shown below). R718PQA will report “unoccupied” after 60 seconds (IRDetectTime).



Example2:

The IRDetectionTime is 60 seconds and IRDisableTime is 30 seconds, living creature is detected at the 25th second of the first 30 seconds. R718PQA will restart the IR detecting procedure (IRDetectionTime).

No living creature is detected during the next IRDetectionTime and R718PQA therefore report “unoccupied.”



Note: Occupancy status (status =1) requires both reed switch and infrared to detect close/someone and interval between both less than 10 seconds.

7. Information about Battery Passivation

Many of Netvox devices are powered by 3.6V ER14505 Li-SOCl₂ (lithium-thionyl chloride) batteries that offer many advantages including low self-discharge rate and high energy density.

However, primary lithium batteries like Li-SOCl₂ batteries will form a passivation layer as a reaction between the lithium anode and thionyl chloride if they are in storage for a long time or if the storage temperature is too high. This lithium chloride layer prevents rapid self-discharge caused by continuous reaction between lithium and thionyl chloride, but battery passivation may also lead to voltage delay when the batteries are put into operation, and our devices may not work correctly in this situation.

As a result, please make sure to source batteries from reliable vendors, and it is suggested that if the storage period is more than one month from the date of battery production, all the batteries should be activated.

If encountering the situation of battery passivation, users can activate the battery to eliminate the battery hysteresis.

ER14505 Battery Passivation:

7.1 To determine whether a battery requires activation

Connect a new ER14505 battery to a resistor in parallel, and check the voltage of the circuit.

If the voltage is below 3.3V, it means the battery requires activation.

7.2 How to activate the battery

- a. Connect a battery to a resistor in parallel
- b. Keep the connection for 5~8 minutes
- c. The voltage of the circuit should be ≥ 3.3 , indicating successful activation.

Brand	Load Resistance	Activation Time	Activation Current
NHTONE	165 Ω	5 minutes	20mA
RAMWAY	67 Ω	8 minutes	50mA
EVE	67 Ω	8 minutes	50mA
SAFT	67 Ω	8 minutes	50mA

Note:

If you buy batteries from other than the above four manufacturers, then the battery activation time, activation current, and required load resistance shall be mainly subject to the announcement of each manufacturer.

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.