Wireless Temperature Sensor

R718AD
User Manual

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1. Introduction

R718AD, mainly used to detect the temperature. It collects data over LoRa network and sends it to devices to be shown, fully compatible with LoRa protocol.

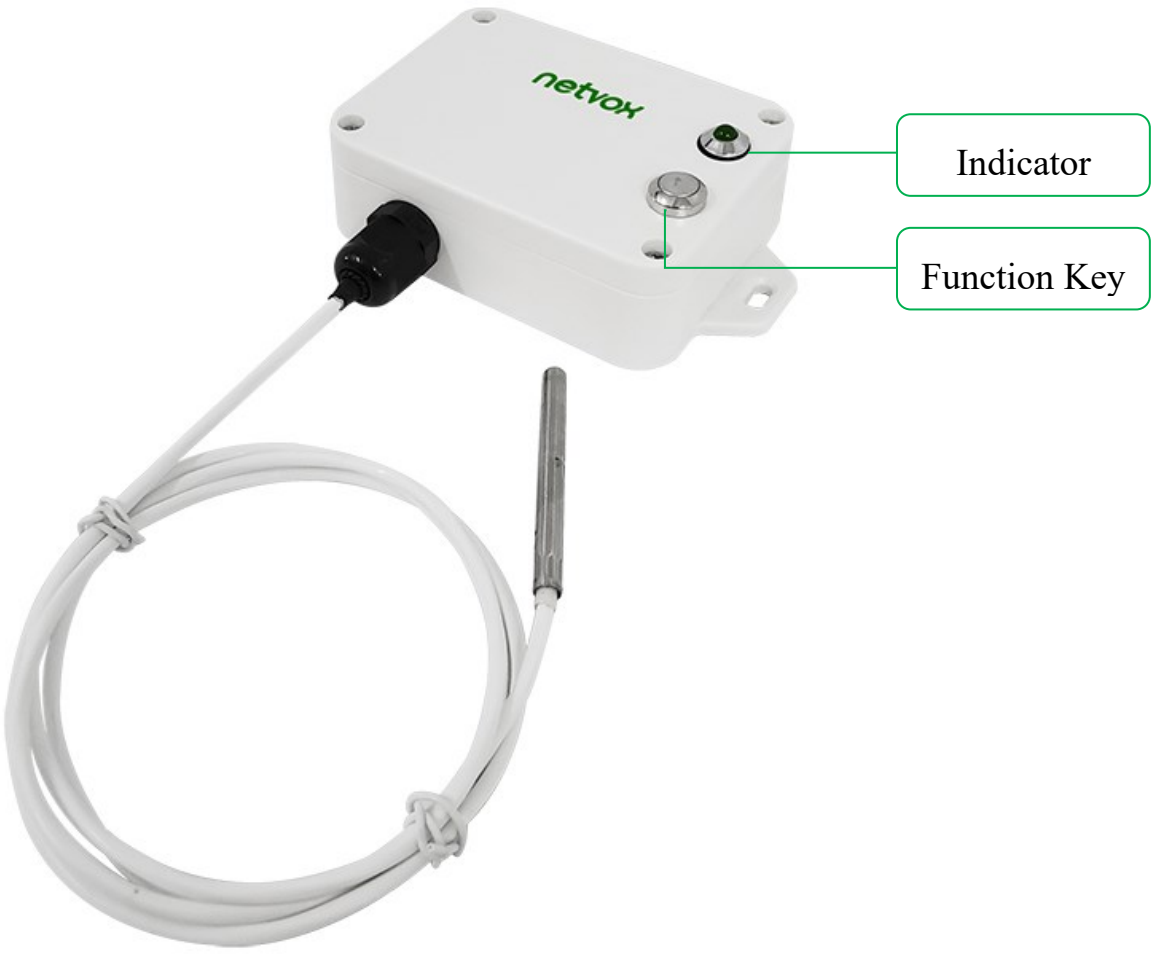
LoRa Wireless Technology:

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 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 ER14505 lithium batteries in parallel
- Temperature of gas / solid / liquid detection
- Simple operation and setting
- Protection class IP65
- Compatible with LoRaWAN™ Class A
- Frequency hopping spread spectrum
- Applicable to 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 battery life of various models in 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:	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 the 1st- 5th second after power on, the device will be in 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

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	3.2V

5. Data Report

The device will immediately send a version package report and a report data with temperature and voltage values after the device is powered on.

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

Default setting

Max Interval: 0x0384 (900s)

Min Interval: 0x0384 (900s)

Battery Change = 0x01 (0.1V)

Temperature Change = 0x0064 (1 ℃)

Note:

1. The data transmission cycle of the device is subject to the real programming configuration before shipment.
2. The interval between two reports must be the minimum time(if there is special custom shipment, the setting will be changed according to customer requirements)

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	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)

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=0xA0, binary=1010 0000, if bit 7= 1, it means low voltage.

   The actual voltage is 0010 0000 = 0x20 = 32, 32*0.1v =3.2v

2. **Version Packet:**

   When Report Type=0x00 is the version packet, such as 019C000A0B202005200000, the firmware version is 2020.05.20

3. **Data Packet:**

   When Report Type=0x01 is data packet.

4. **Signed Value:**

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

Device	Device Type	Report Type	NetvoxPayLoadData			
R718AD	0x9C	0x00	SoftwareVersion (1Byte) Eg.0x0A—V1.0	Hardware Version (1Byte)	DateCode (4Bytes,eg 0x20170503)	Reserved (2Bytes,fixed 0x00)
		0x01	Battery (1Byte, unit:0.1V)	Temperature (Signed2Bytes,unit:0.01°C)	Reserved (5Bytes,fixed 0x00)	

Example 1 of Uplink: 019C012406700000000000

1st byte (01): Version

2nd byte (9C): DeviceType 0x9C — R718AD

3rd byte (01): ReportType

4th byte (24): Battery — 3.6V, 24(Hex) = 36(Dec), 36x0.1v=3.6v

5th 6th byte (0670): Temperature — 16.48 °C , 0670(Hex)=1648(Dec), 1648x0.01=16.48°C

7th -11th byte (0000000000): Reserved

Example 2 of Uplink: 019C019FFF390000000000

1st byte (01): Version

2nd byte (9C): DeviceType 0x9C — R718AD

3rd byte (01): ReportType

4th byte (9F): Battery — 3.1V, 1F(Hex) = 31(Dec), 31x0.1v=3.1v // Low battery

5th 6th byte (FF39): Temperature — -1.99°C

0x10000-0xFF39=0xC7 (Hex) = 199(Dec) , 199x0.01=1.99°C

7th -11th 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**	**Cmd ID**	**Device Type**	**NetvoxPayLoadData**				
ConfigReport Req	R718AD	0x01	0x9C	MinTime (2bytes Unit:s)	MaxTime (2bytes Unit:s)	BatteryChange (1byte Unit:0.1v)	Temperature Change (2byte Unit:0.01°C)	Reserved (2Bytes,Fixed 0x00)
ConfigReport Rsp		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)	Temperature Change (2byte Unit:0.01°C)	Reserved (2Bytes,Fixed 0x00)

1. Configuration MinTime = 1min、MaxTime = 1min、BatteryChange = 0.1v、TemperatureChange = 1°C

   Downlink: 019C003C003C0100640000

   Response:

   819C000000000000000000（Configuration success）

   819C010000000000000000（Configuration failure）

2. Read Configuration:

   Downlink: 029C000000000000000000

   Response: 829C003C003C0100640000（Current configuration setting）

5.3 Example of GlobalCalibrateCmd

FPort: 0x0E

Description	CmdID	Sensor Type	PayLoad (Fix = 9 Bytes)				
SetGlobal CalibrateReq	0x01	See below	Channel (1 Byte) 0_Channel1 1_Channel2, etc.	Multiplier (2 Bytes, unsigned)	Divisor (2 Bytes, unsigned)	DeltValue (2 Bytes, signed)	Reserved (2 Bytes, fixed 0x00)
SetGlobal CalibrateRsp	0x81		Channel (1 Byte) 0_Channel1 1_Channel2, etc.	Status (1 Byte, 0x00_success)	Reserved (7 Bytes, fixed 0x00)		
GetGlobal CalibrateReq	0x02		Channel (1 Byte) 0_Channel1 1_Channel2, etc.	Reserved (8 Bytes, fixed 0x00)			
GetGlobal CalibrateRsp	0x82		Channel (1 Byte) 0_Channel1 1_Channel2, etc.	Multiplier (2 Bytes, unsigned)	Divisor (2 Bytes, unsigned)	DeltValue (2 Bytes, signed)	Reserved (2 Bytes, fixed 0x00)
ClearGlobal CalibrateReq	0x03	Reserved (10 Bytes, fixed 0x00)					
ClearGlobal CalibrateRsp	0x83	Status (1 Byte, 0x00_success)	Reserved (9 Bytes, fixed 0x00)				

Sensor Type: 0x01_Temperature Sensor, Channel: 0x00

(1) Device reports 28.15℃ when the actual temperature is 38.15℃. → Calibration should increase 10℃ (unit: 0.01℃).

SetGlobalCalibrateReq:

SensorType = 0x01; Channel = 0x00; Multiplier =0x0001; Divisor = 0x0001; DeltValue = 0x03E8

Downlink: 01010000010000103E80000

Response: 810100000000000000000

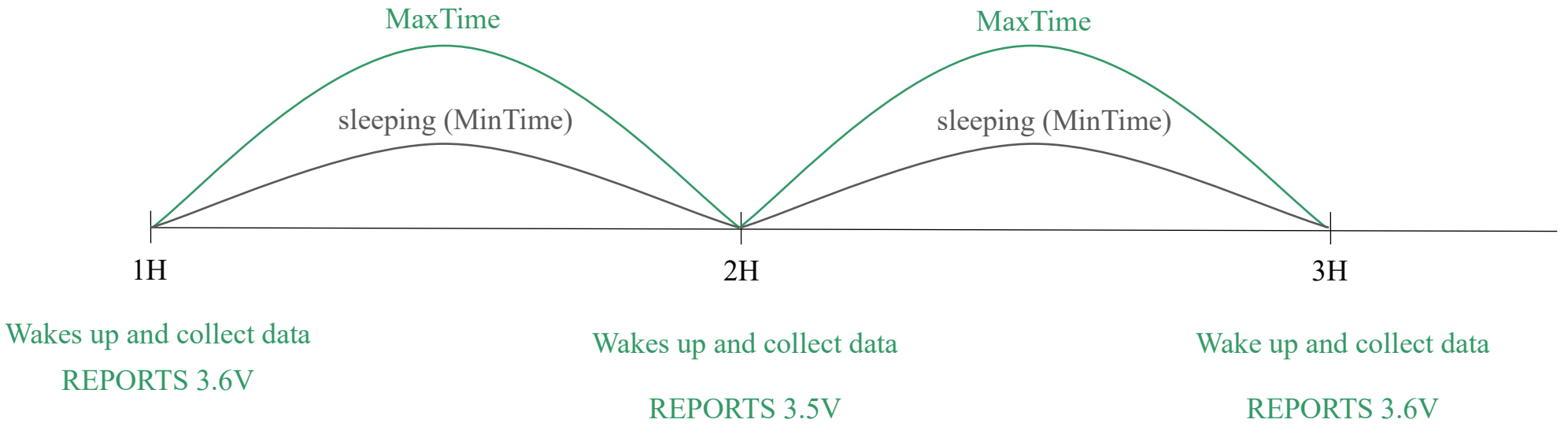
GetGlobalCalibrateReq

Downlink: 020100000000000000000

Response: 82010000010000103E80000

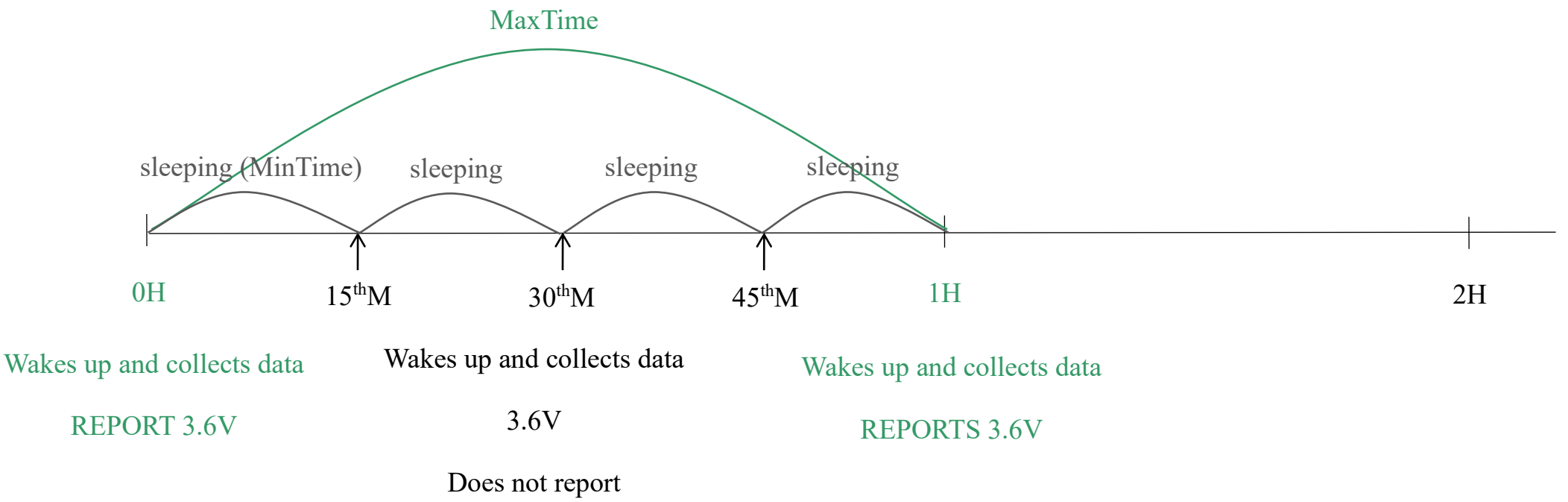
5.4 Example for MinTime/MaxTime logic

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

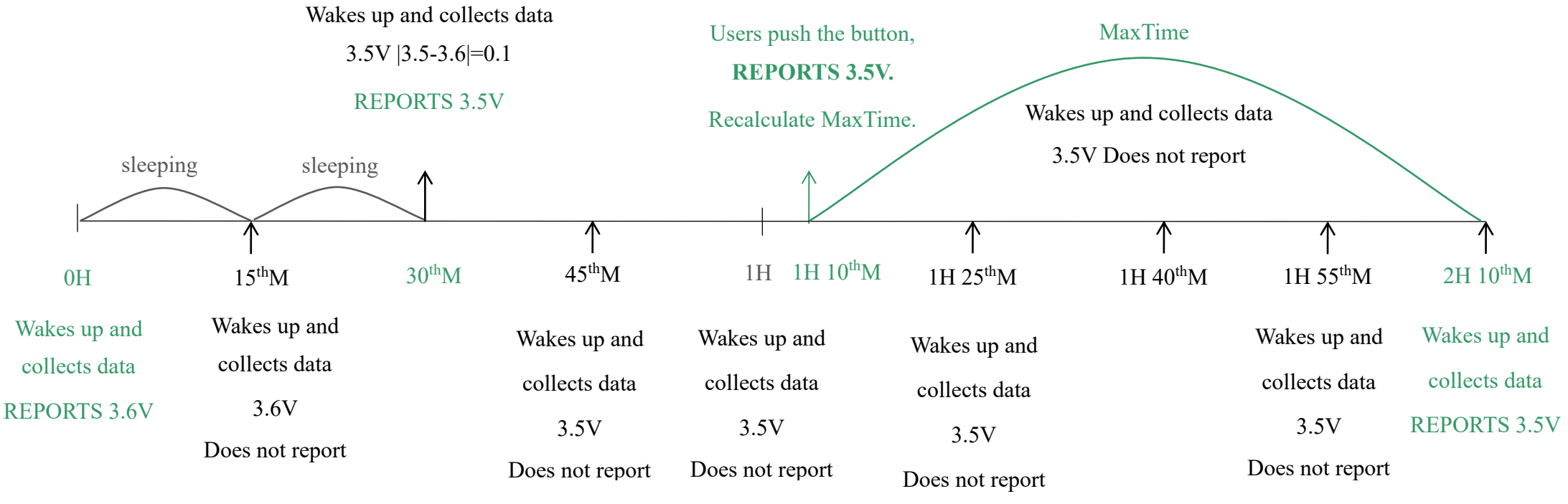


Note: MaxTime = MinTime. Data will only be reported according to MaxTime (MinTime) duration regardless Battery Voltage Change value.

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.

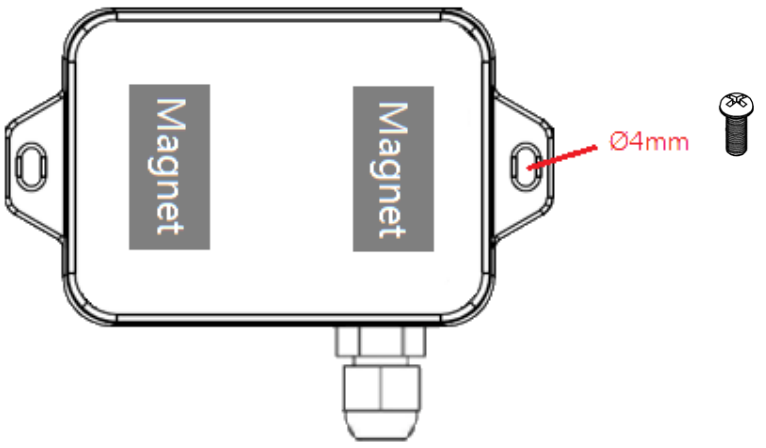
(3) We do not recommend to set the MinTime Interval value too low. If the MinTime Interval is too low, the device wakes up frequently and the battery will be drained soon.

(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. Installation

1. The Wireless Temperature Sensor (R718AD) has a built-in magnet. When installed, it can be attached to the surface of an object with iron which is convenient and quick. To make the installation more secure, use screws (purchased) to secure the unit to a wall or other surface.

Note: Do not install the device in a metal shielded box or in an environment with other electrical equipment around it to avoid affecting the wireless transmission of the device.



Screw hole diameter: Ø4mm

2. When R718AD is compared with the last reported values, the temperature change is exceeded 1°C (default), it will report values at the MinTime interval; If does not exceed 1°C (default), it will report values at the MaxTime interval.

3. Put only 30mm of the stainless probe into the liquid. Sinking the probe into the liquid could damage the sealing compound and thus cause the liquid to get inside the PCB.

Note:

Do not sink the probe into chemical solutions, such as alcohol, ketone, ester, acid, and alkali.

Applications:

- Oven
- Industrial control equipment

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.