Wireless Toilet Water Tank Leakage sensor

R720 FLT
User Manual

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1. Introduction

R720FLT is a wireless communication device for netvox ClassA device based on LoRaWAN open protocol.

The device is connected with two electrode rods to detect the water make-up of the toilet water tank, detect the daily water make-up times and whether the water tank is faulty, and transmit the detected data to other devices through the wireless network for display; Compatible with LoRaWAN protocol. The toilet water tank leakage detection device can cut the electrode rod to the required length as required.

① The status of the toilet water tank is determined according to the configured water make-up time (default is 5 minutes). When the actual water make-up time of the toilet exceeds the preset time, the toilet water tank is in an abnormal state, and a data package of the current voltage value, the current water make-up times and the status is reported.

② Press the key to immediately detect the current voltage value, the current number and status of toilet water tank replenishment, and report a current detected data packet.

③ Check the water supplement times every 24 hours. If the preset times are exceeded (50 times by default), the toilet water tank is in an abnormal state, and report a data package of the current voltage value, current water supplement times and state of the toilet water tank.

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

Function Key

Indicator

Electrode Rod
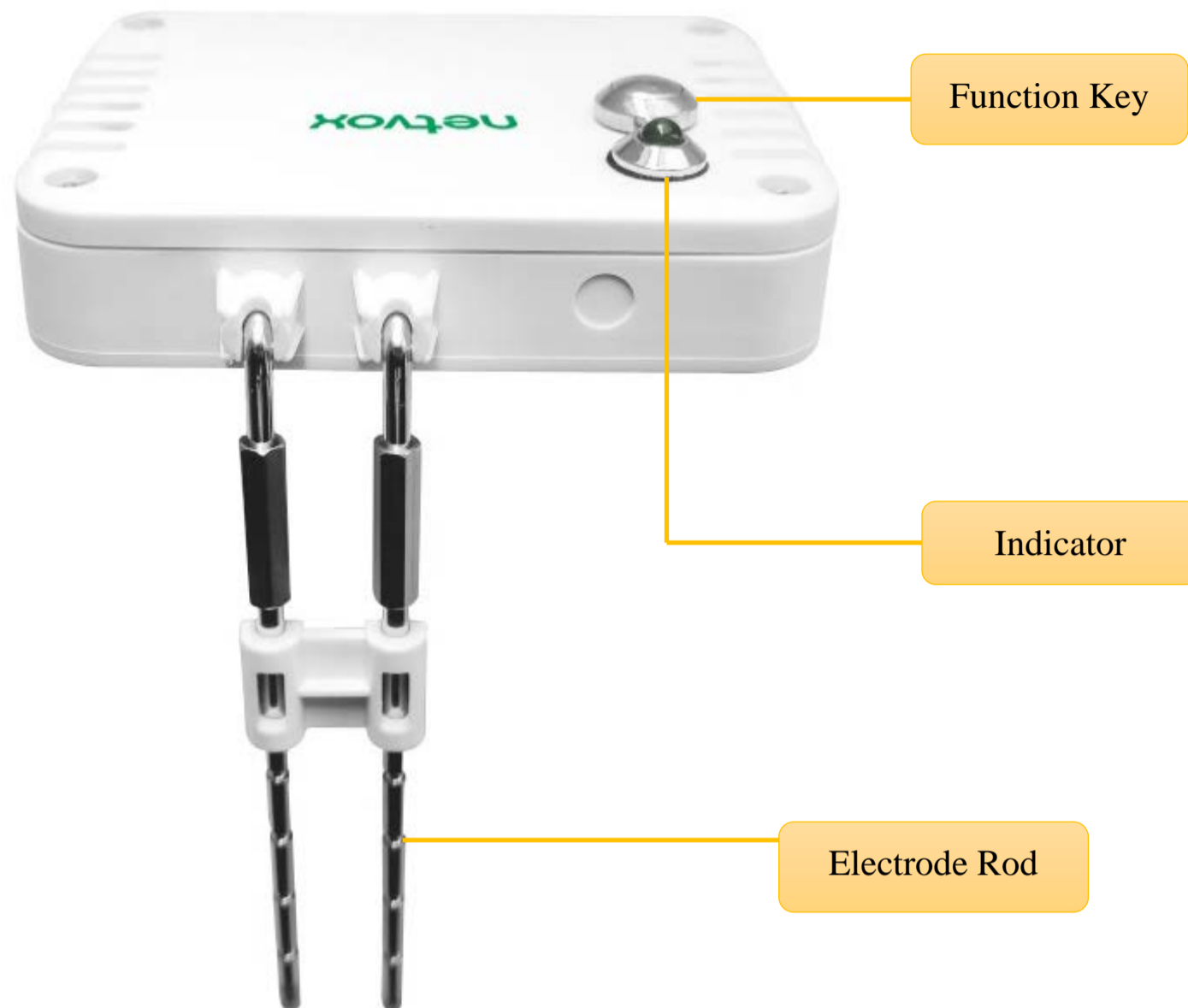
3. Main Features

- Apply SX1276 wireless communication module.

- 2 ER14505 lithium batteries (3.6V / section) in parallel

- Detect the number and status of make-up water of toilet water tank.

- Protection Class IP65

- Compatible with LoRaWAN^{TM} 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 lifetime 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 and the green indicator flashes 20 times.
Power Off	Remove Batteries
Note	1. Remove and insert the battery: the device is in the turn-off state by default. 2. After 5 seconds of powering on, the device is in engineering testing mode. 3. On/off interval is suggested to be about 10 seconds to avoid the interference of capacitor inductance and other energy storage components.

Network Joining

Never Join 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 and hold for 5 seconds	Restore to factory setting / Turn off The green indicator flashes 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

Low Voltage Threshold Alarm

Low Voltage	3.2 V

5. Data Report

After power on, the device will immediately send a version packet report and a data report including the device battery voltage, the number and status of toilet water tank replenishment.

Default setting:

    Max Interval: 0x0E10 (3600s)

    Min Interval: 0x0E10 (3600s)   // Every Min Interval will detect the current voltage one time

    Battery Change: 0x01 (0.1v)

    Daily Replenish water Alarm count: 0x0032 (50 times)

    Fault Check Time: 0x012C (300s)

   * If there is a special customized order, the setting of the device will change according to customer's requirements

Fault Alarm:

  FaultAlarm is reported as 0, indicating that the single water supplement of the toilet water tank is normal.

  FaultAlarm is reported as 1, indicating that the single water supplement of the toilet water tank is abnormal.

Tank Leak Alarm:

  TankLeakAlarm is reported as 0, indicating that the number of water replenishments in the toilet water tank within 24 hours is normal.

  TankLeakAlarm is reported as 1, indicating that the number of water replenishments in the toilet water tank within 24 hours is abnormal.

Replenish water count:

  Replenishwatercount is the cumulative make-up times of the toilet water tank.

  When the device is powered off, clear or issue a command to clear (ClearReplenishwatercountReq)

Note:

    1. The cycle of the device sending the data report is according to the default.

    2. The interval between two reports must be the MinTime.

    3. The device reported data parsing please refer to Netvox LoRaWAN Application Command document and Netvox Lora Command Resolver http://cmddoc.netvoxcloud.com/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	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				
R720FLT	0xD4	0x00	SoftwareVersion(1Byte) Eg.0x0A—V1.0	HardwareVersion (1Byte)		DateCode (4Bytes,eg0x20170503)	Reserved (2Bytes,fixed 0x00)
		0x01	Battery (1Byte) unit:0.1V	Replenish water count (4Bytes)	Fault Alarm (1Byte) 0:off 1:on	Tank Leak Alarm (1Byte) 0x00_noleak0x01_leak	Reserved (1Byte) fixed 0x00

Example 1 of uplink: 01D401240000002F000000

1st byte (01): Version

2nd byte(D4): DeviceType 0xD4 － R720FLT

3rd byte (01): ReportType

4th byte (24): Battery, 24 (Hex)=36 (Dec) 36*0.1v=3.6v

5th 6th 7th 8th Byte (0000002F): Replenish water count, 2F (Hex)=47 (Dec)

9th byte (00): Fault Alarm, no alarm

10th byte (00): Tank Leak Alarm, no alarm

11th byte (00): Reserved

Example 2 of uplink: 01D4019F00000168010000

1st byte (01): Version

2nd byte(D4): DeviceType 0xD4 － R720FLT

3rd byte (01): ReportType

4th byte (9F): Battery－3.1V (Low battery), 1F(Hex)=31 (Dec) 31*0.1v=3.1v

   // Battery Bit7 represent low battery   Bit6-0 represent battery voltage

5th 6th 7th 8th byte (00000168): Replenish water count－360 times, 168(Hex)=360(Dec)

9th byte (01): Fault Alarm, alarm

10th byte (00): Tank Leak Alarm, no alarm

11th byte (00): 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	R720FLT	0x01	0xD4	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)

(1) Configure R720 FLT device parameter MinTime = 1min、MaxTime = 1min、BatteryChange = 0.1v

Downlink: 01D4003C003C0100000000   // 3C(Hex)=60(Dec)

Device return：

81D40000000000000000000 (configuration success)

81D40100000000000000000 (configuration failure)

(2) Read R720 FLT device parameter

Downlink: 02D4000000000000000000

Device return：

82D4003C003C0100000000 (device current parameter)

Description	Device	CmdID	Device Type	NetvoxPayLoadData	
SetFaultCheckTimeReq (Remain last config when reset to factory)	R720FLT	0x03	0xD4	FalutCheckTime (2Byte,Unit:1s)	Reserved (7Bytes,Fixed 0x00)
SetFault CheckTimeRsp		0x83		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)
GetFault CheckTimeReq		0x04		Reserved (9Bytes,Fixed 0x00)	

GetFault CheckTimeRsp		0x84		FalutCheckTime (2Byte,Unit:1s)	Reserved (7Bytes,Fixed 0x00)	
Clear ReplenishwatercountReq		0x05		Reserved (9Bytes,Fixed 0x00)		
Clear ReplenishwatercountRsp		0x85		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)	
SetDailyReplenishwater AlarmcountReq (Remain last config when reset to factory)		0x06		DailyReplenishwater Alarmcount(2Byte)	Reserved (7Bytes,Fixed 0x00)	
SetDailyReplenishwater AlarmcountRsp		0x86		Status (0x00_success)	Reserved (8Bytes,Fixed 0x00)	
GetDailyReplenishwater AlarmcountReq		0x07		Reserved (9Bytes,Fixed 0x00)		
GetDailyReplenishwater AlarmcountRsp		0x87		DailyReplenishwater Alarmcount (2Byte)	Reserved (7Bytes,Fixed 0x00)	

(1) Set fault check time is 180s

Downlink: 03D400B400000000000000   // B4(Hex)=180(Dec)

Device return：

　　　83D4000000000000000000 (configuration success)

　　　83D4010000000000000000 (configuration failure)

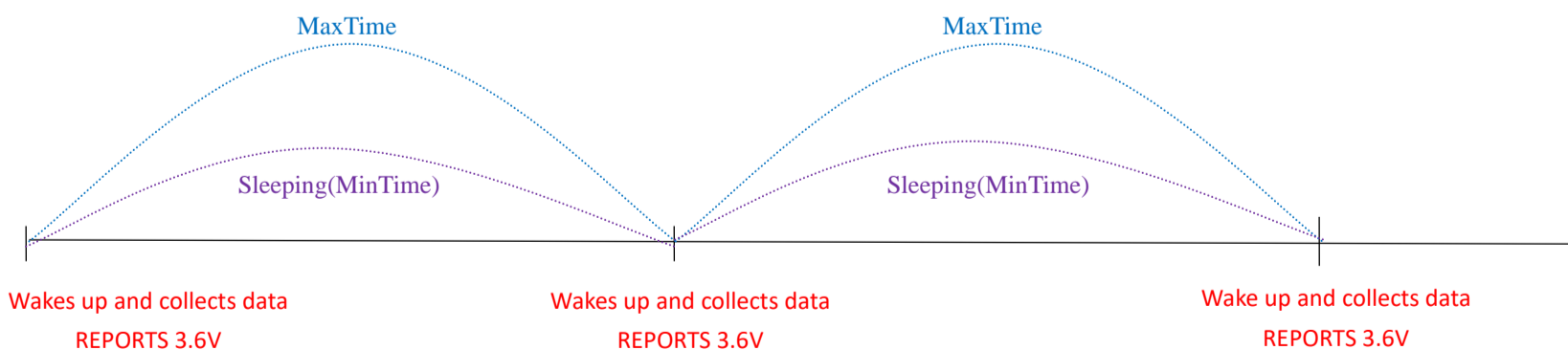(2) Clear replenish water count

Downlink: 05D4000000000000000000

Device return：

　　　85D4000000000000000000 (configuration success)

　　　85D4010000000000000000 (configuration failure)

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(MinTime)   Sleeping(MinTime)

Wakes up and collects data   Wakes up and collects data   Wake up and collects data
REPORTS 3.6V   REPORTS 3.6V   REPORTS 3.6V

Note: MaxTime=MinTime. Data will only be report according to MaxTime (MinTime) duration regardless BatteryVoltageChange value.
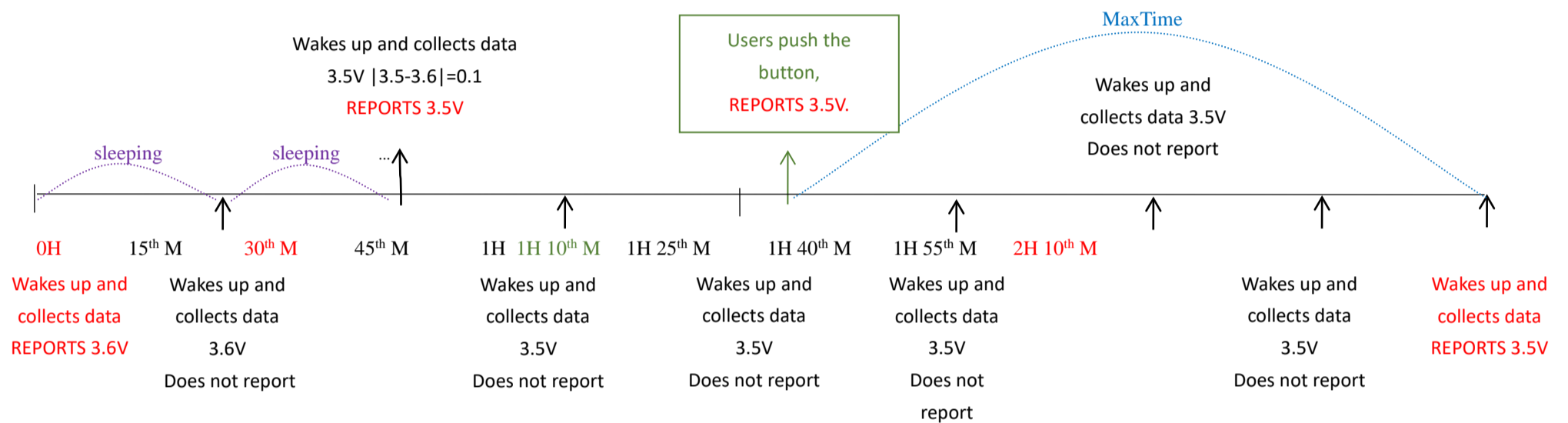
Example#2 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.

MaxTime

Sleeping(MinTime)   sleeping   sleeping   sleeping

| 0H | 15th M | 30th M | 45th M | 1H | | 2H | |

| Wakes up and collects data REPORT 3.6V | Wakes up and collects data 3.6V Does not report | Wakes up and collects data 3.6V Does not report | Wakes up and collects data 3.6V Does not report | Wakes up and collects data REPORTS 3.6V |
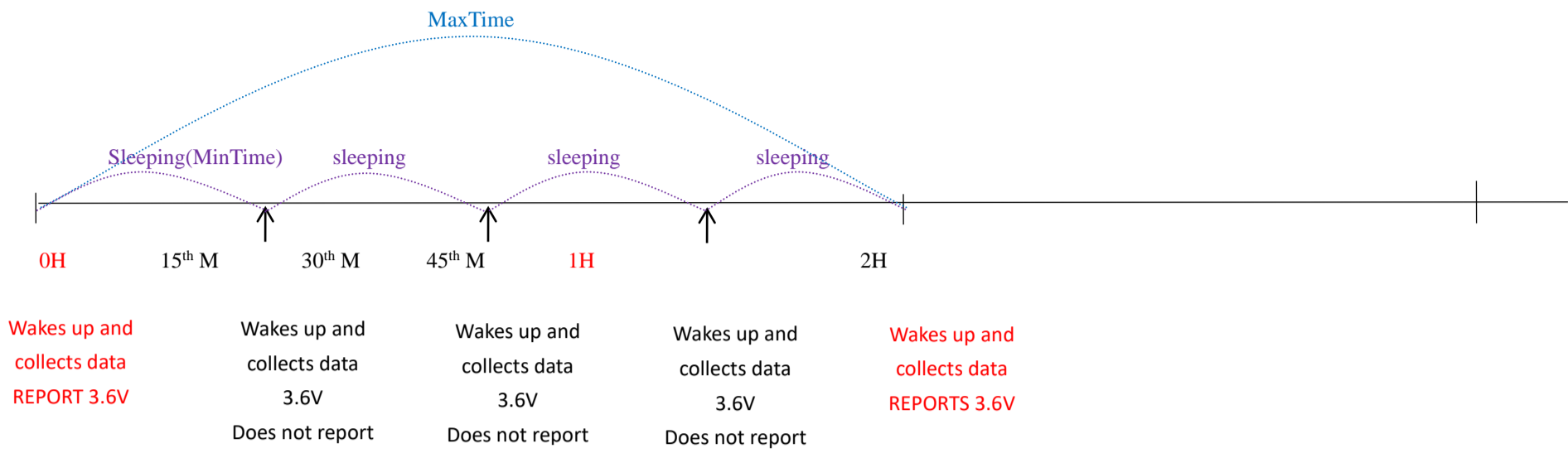
Example#3 based on MinTime = 15 Minutes, MaxTime= 1 Hour, Reportable Change i.e. BatteryVoltageChange= 0.1V.

Wakes up and collects data
3.5V |3.5-3.6|=0.1
REPORTS 3.5V

Users push the button,
REPORTS 3.5V.

MaxTime

Wakes up and collects data 3.5V
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 3.6V | Wakes up and collects data 3.6V Does not report | | | Wakes up and collects data 3.5V Does not report | | Wakes up and collects data 3.5V Does not report | Wakes up and collects data 3.5V Does not report | | Wakes up and collects data 3.5V Does not report | Wakes up and collects data REPORTS 3.5V |

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 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 of data variation, button push, or MaxTime interval, another cycle of MinTime/MaxTime calculation is started.

6. Installation

**Installation Method of Toilet Water Tank Leakage Detection Device**

1. Bracket Installation

Step1. Open the toilet water tank cover, and put the R720FLT and the bracket into the toilet tank for comparison, find the proper installation position and avoid the water inlet valve, drain valve, and flush button.
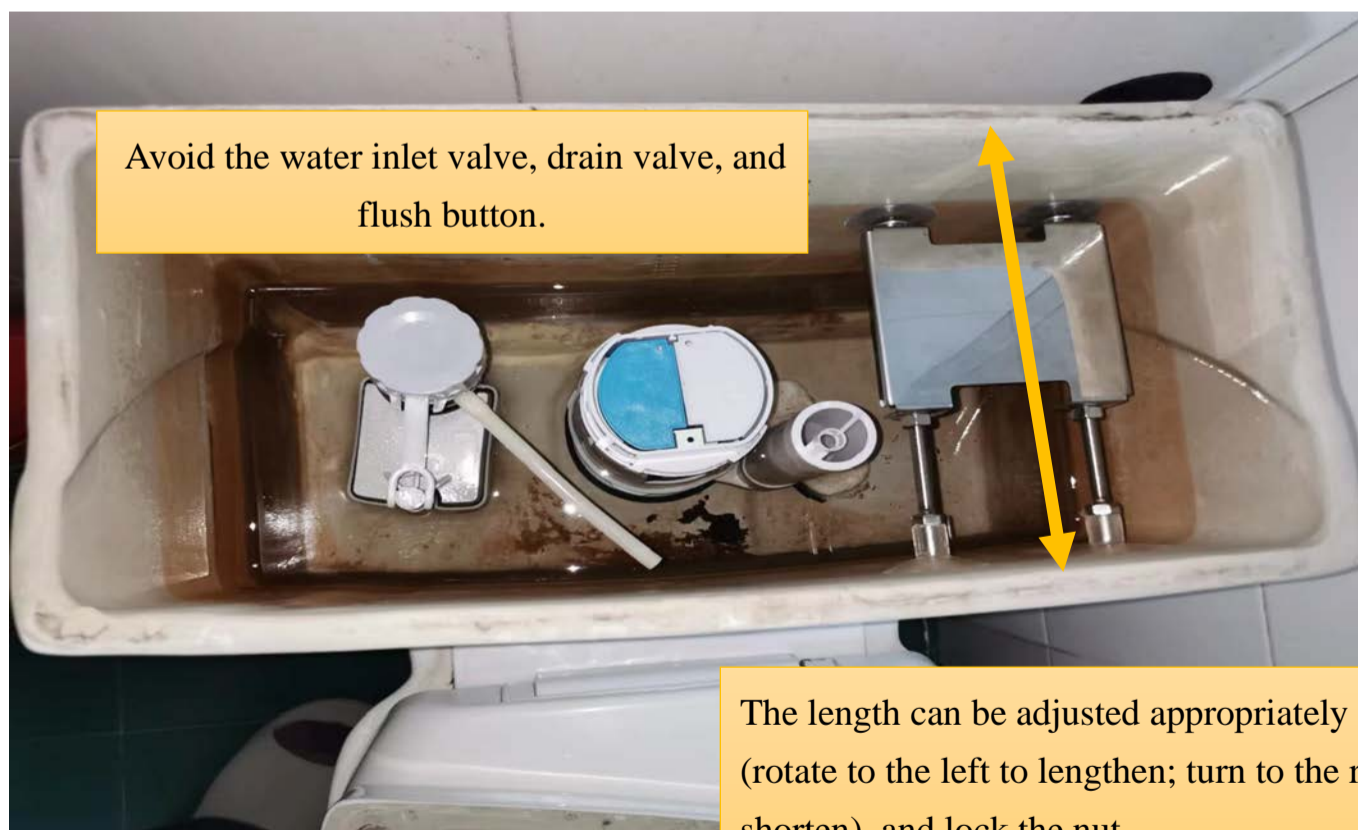
Step2. After confirming the location, put the R720FLT aside and start fixing the bracket first.

Step3. Adjust the width of the bracket to be slightly smaller than the width of the toilet tank.

(The suction cup of the bracket has one side fixed and non-adjustable, and the other side adjustable)

Adjusting bolt

Lock nut
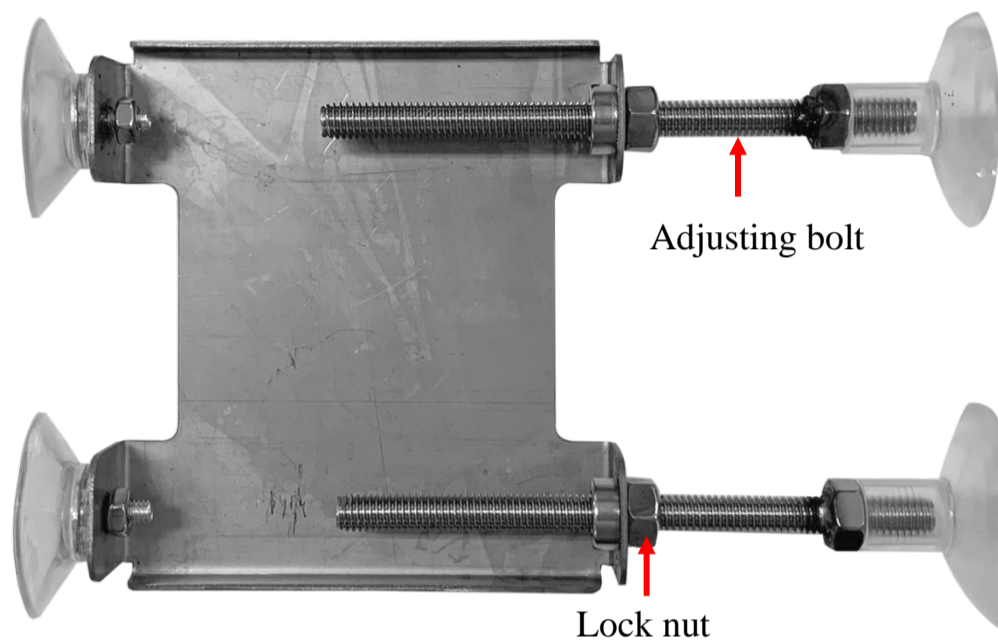
Adjust the length of the bolt so that the product can stick to the wall of the water tank without loosening, and then lock the nut to fix it.

Avoid the water inlet valve, drain valve, and flush button.

The length can be adjusted appropriately (rotate to the left to lengthen; turn to the right to shorten), and lock the nut.

Step4. Put the fixed suction cup of the bracket against the side of the toilet tank wall and keep the bracket parallel.

Step5. Turn the stud of the adjustable suction cup by hand until it cannot be turned.

(Be careful not to forcefully lock and cause the toilet tank to rupture)

Step6. Tighten the nut to fix the bracket to ensure that the bracket will not fall and the installation is complete.

2. R720FLT Device Installation

Step1. Gently press the flush button to start releasing water until the toilet starts to replenish water, and record the water level at this time, that is, the water replenishment level.

Step2. When the water supply stops, record the water level at this time, that is, the full water level.

Full water level

Replenishment water level
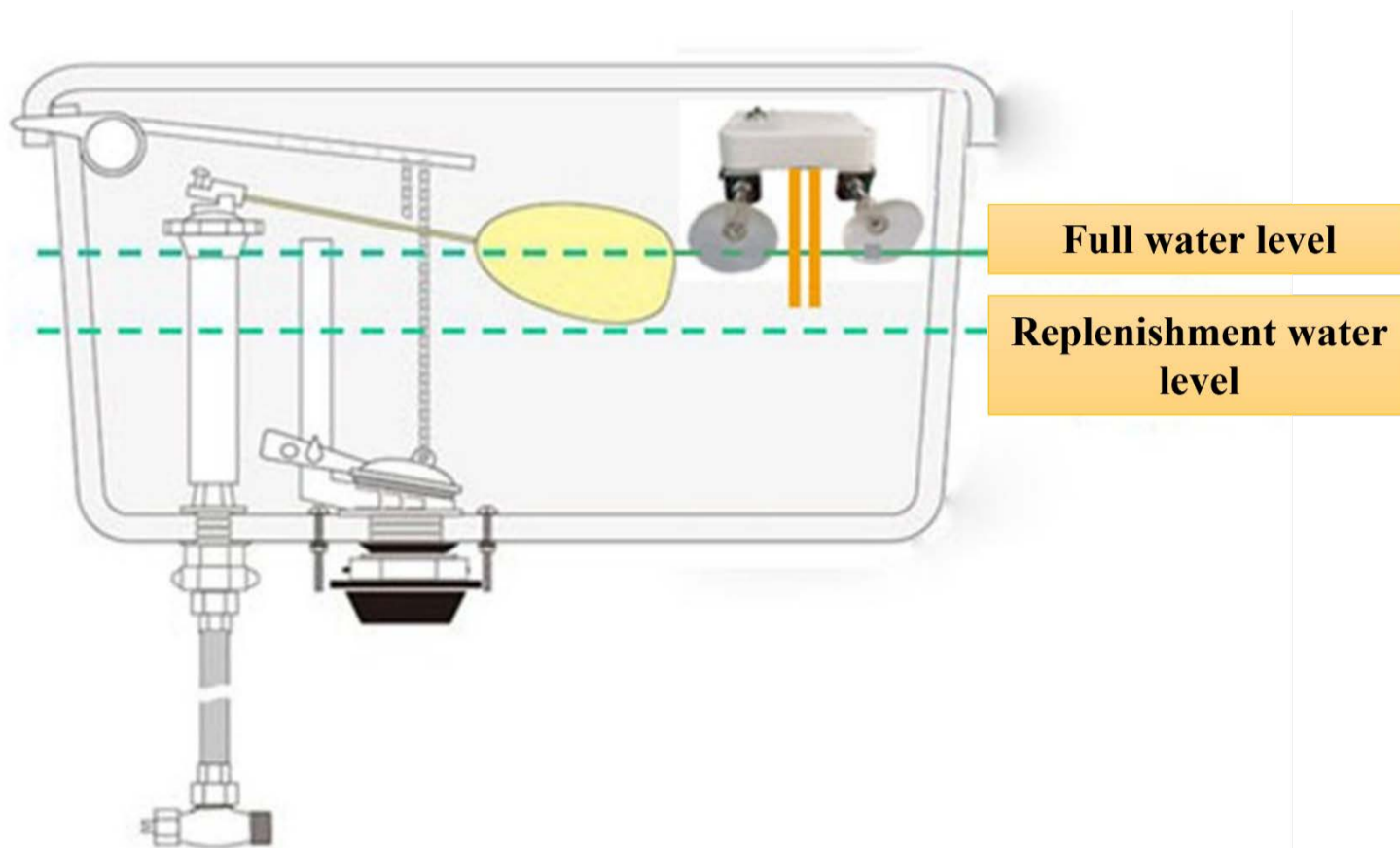
Please press the flush button continuously and lightly, instead of pressing it all at once, this is for the convenience of recording when the water tank is replenished.

Step3. Trim the length of the R720FLT electrode rod, and the tail end must be between the replenishment water level and the full water level.

Step4. After testing the normal operation of the device, tear off the release paper with double-sided adhesive on the back of the device, and lay it flat on the bracket steel plate.

After tearing off the double-sided tape on the back of the R720FLT device, place the device on the bracket steel plate.

Replace The Electrode Rods

When the parts of the toilet water tank are aging, resulting in the change of water make-up or full liquid level, and the probe length is insufficient. It is not necessary to purchase a new R720FLT, just remove the old probe, replace it with a new one, and adjust the probe length according to the installation steps.

Connecting Nut

Fixed Bracket

Electrode Rod
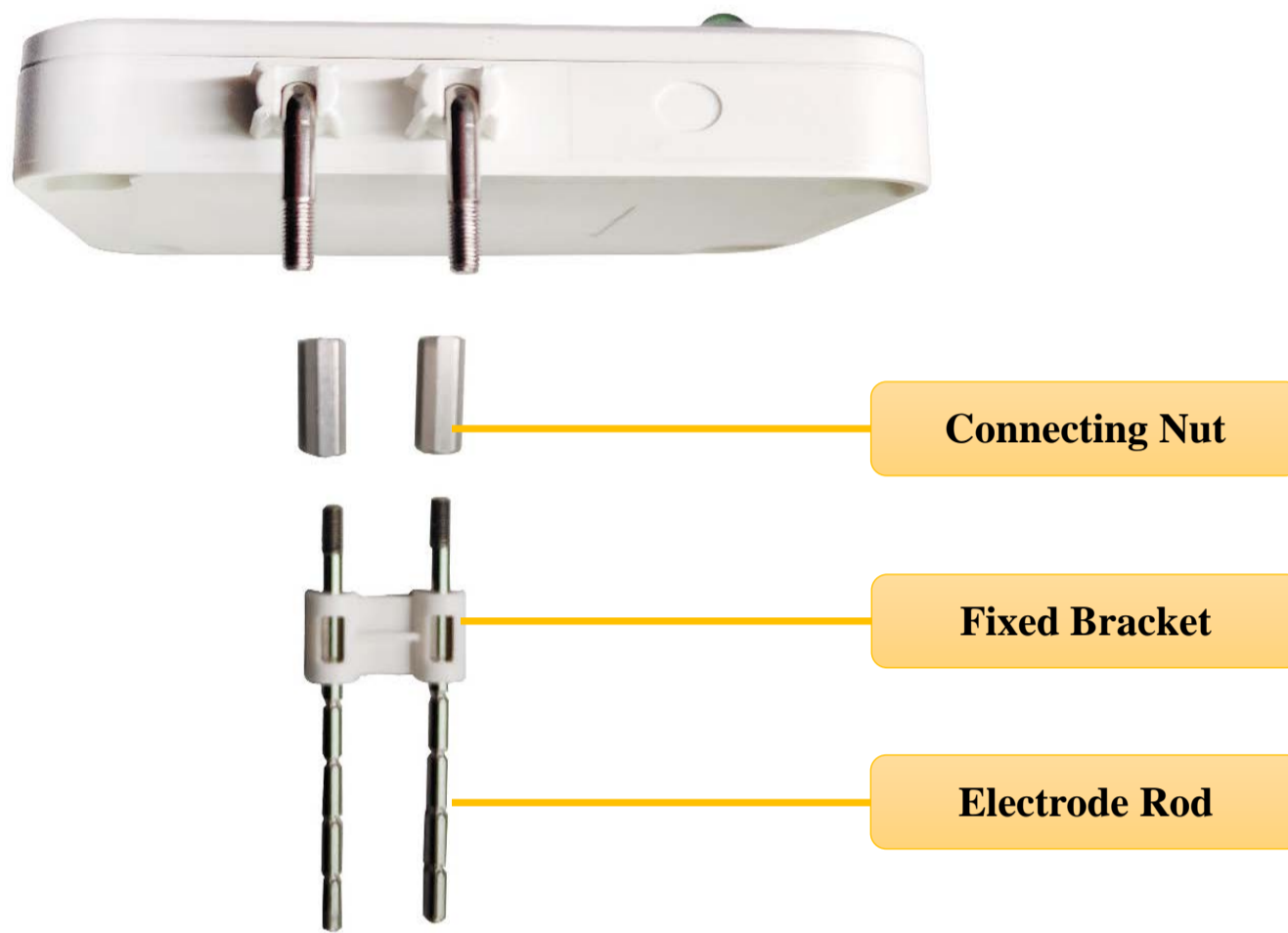
7. Information about Battery Passivation

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 a 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

The device is a product with superior design and craftsmanship and should be used with care.

The following suggestions will help you use the warranty service effectively.

• Keep the equipment dry. Rain, moisture and various liquids or water may contain minerals that can corrode electronic circuits. In case the device is wet, please dry it completely.

• Do not use or store in dusty or dirty areas. This way can damage its detachable parts and electronic components.

• Do not store in excessive heat place. High temperatures can shorten the life of electronic devices, destroy batteries, and deform or melt some plastic parts.

• Do not store in excessive cold place. 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. Treating equipment roughly can destroy internal circuit boards and delicate structures.

• Do not wash with strong chemicals, detergents, or strong detergents.

• Do not paint the device. Smudges can make debris block detachable parts up and affect normal operation.

• Do not throw the battery into the fire to prevent the battery from exploding. Damaged batteries may also explode.

All the above suggestions apply equally to your device, batteries, and accessories.

If any device is not operating properly, please take it to the nearest authorized service facility for repairing.

9. Description of Waterproof Grade

1: According to Enclosure Protection Class

This standard is equivalent to IEC 60529:2001 Degrees of Protection Provided by Enclosures (IP Code) (English version)

2: The test method of IP65 waterproof grade is: to spray the device in all directions under 12.5L/min water flow for 3min, and the internal electronic function is normal.

The test method of IP67 waterproof grade is: the device is immersed in 1m deep water for 30min, and the internal electronic function is normal.

IP65, is dust-proof and prevents damage caused by water from nozzles in all directions from invading electrical appliances. It can be used in the general indoor environment and sheltered outdoor environment. It is not suitable for use in environments with high water pressure, high temperature, and high humidity, such as long time direct sunlight outdoors and possible direct exposure to rainstorms. If it is really necessary to install in harsh environments, it is recommended to add sunscreen and rainproof shields when installing.