



WS303

Mini Leak Detection Sensor

User Guide

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Chapter 1. Preface

Copyright Statement

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Milesight reserves the right to change this guide and the specifications without prior notice. The latest specifications and user documentation for all Milesight products are available on our official website <http://www.milesight.com>

Safety Instruction

These instructions are intended to ensure that user can use the product correctly to avoid danger or property loss. Milesight will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.



CAUTION:

Injury or equipment damage may be caused if any of these cautions are neglected.

- The device must not be disassembled or remodeled in any way.
- In order to protect the security of the device, please change the device password when first configuration. The default password is 123456.
- Do not place the device close to objects with naked flames.
- Do not place the device in where the temperature is below/above the operating range.
- Make sure electronic components do not drop out of the enclosure while opening.
- When installing the battery, please install it accurately, and do not install the inverse or wrong model.
- The device must never be subjected to shocks or impacts.
- Not suitable for deep water use. Water ingress at the top will damage the device.

Revision History

Date	Version	Description
March 29, 2023	V1.0	Initial version

Chapter 2. Product Introduction

Overview

WS303 is a tiny and mighty leakage detection sensor for detecting presence of water leaks and transmitting an alarm using LoRaWAN[®] technology. With this low power consumption technology, WS303 can work up to 5 years with a 590mAh battery. Compliant with Milesight D2D protocol, it can directly link with other Milesight devices to realize danger prevention and effectively prevent unnecessary loss.

Users can receive real-time alarms locally and remotely. Combining with Milesight LoRaWAN[®] gateway and Milesight Development Platform, users can manage all sensor data remotely.

The wire-free WS303 can be easily used in smart offices, buildings, and houses.

Feature

- Detect the presence of conductive liquids using a small water probe
- A replaceable built-in 590mAh battery with up to 5 years of life for wire-free power supply
- IP67 waterproof enclosure for harsh environment applications
- Embedded with a buzzer for real-time alarming
- Support Milesight D2D protocol to enable ultra-low latency and direct control without gateways
- Equipped with NFC for easy configuration
- Compliant with standard LoRaWAN[®] gateways and network servers
- Quick and easy management with Milesight IoT Cloud solution and Milesight Development Platform

Chapter 3. Hardware Introduction

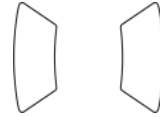
Packing List



1 × WS303 Device



1 × CR2450 Battery



2 × 3M Tapes



1 × Quick Guide



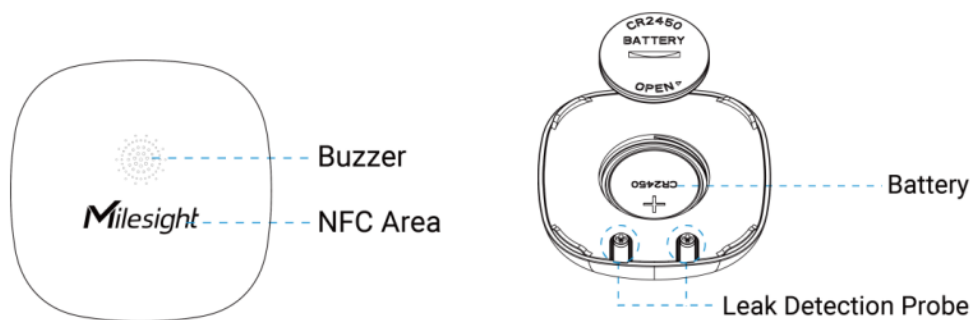
1 × Warranty Card



Note:

If any of the above items is missing or damaged, please contact your sales Representative.

Hardware Overview



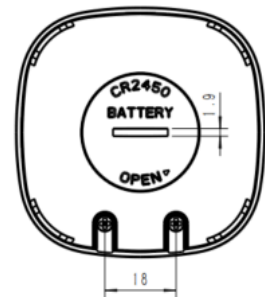
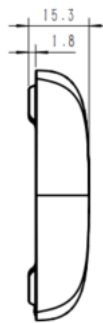
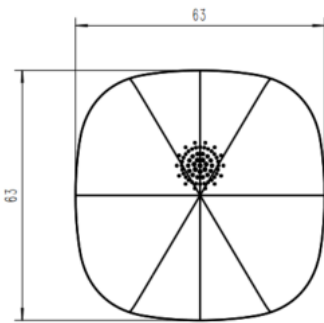
Button & Buzzer Patterns

The sensor equips with a reset button inside the device for emergency reset or reboot even if the battery is removed. Usually, users can use NFC to complete all steps.

Function	Action	Buzzer
Turn On	Insert the battery.	Buzzes for one time
Reboot	Press and hold the button for more than 3 seconds.	Buzzes for every second
Reset to Factory Default	Press and hold the button for more than 10 seconds.	Buzzes for every 0.5 second
Leakage Alarm	Detect the leakage	Buzzes 3 times, pauses for 1 minute, then repeats above sequence 5 times

**Tip:**

The leakage alarm buzzer can be stopped when it detects not leaking or by the downlink command.

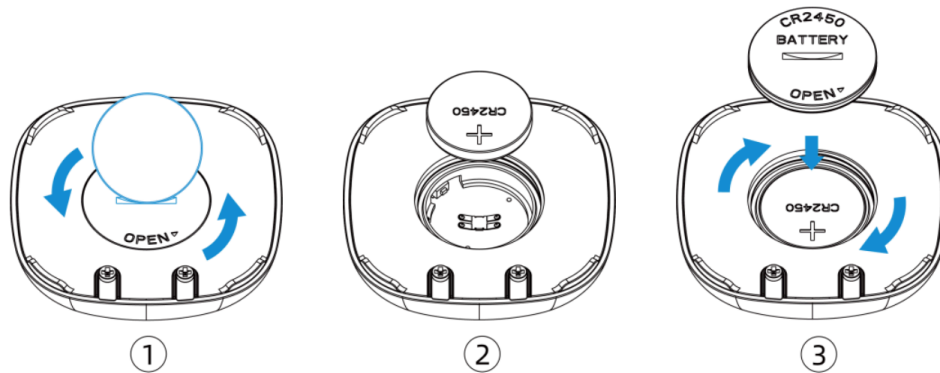
Dimensions(mm)

Chapter 4. Power Supply

Step 1: Put the coin (or any other tool with a suitable size) into the groove of the battery back cover, turn the battery back cover and remove it.

Step 2: Insert the battery into the sensor with the positive facing up. After inserting, the device will power on automatically.

Step 3: Put the battery cover back onto the device and tighten it.



Chapter 5. Quick Start

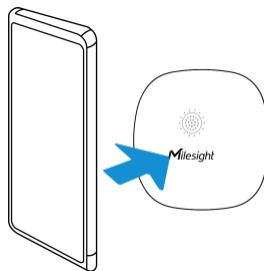
Access the Sensor via NFC

1. Download and install "Milesight ToolBox" App from Google Play or Apple Store on an NFC-supported smartphone.
2. Enable NFC function on the smartphone.
3. Launch Milesight ToolBox, and select the default mode as NFC.
4. Attach the smart phone with NFC area to the device and click  to read device information. Basic information, data, and settings of the device will be shown on the Milesight ToolBox App if it's recognized successfully.
5. Adjust the settings on the App, then attach the smartphone with NFC area to the device and click **Write** to write the settings. After writing, reread the device to check if the configuration is written well.



Note:

- Ensure the location of smartphone NFC area and it's recommended to take off phone case.
- If the smart phone fails to read/write configurations via NFC, keep the phone away and back to try again.
- The default device password is 123456. Please change a new password for security.



Configure the Network Setting

1. Go to **Network** settings page, select the join type as OTAA or ABP as required.

**Note:**

OTAA mode is required if you connect device to Milesight IoT Cloud or Milesight Development Platform.

2. Select supported frequency the same as LoRaWAN[®] gateway.

**Note:**

Set the channel index as 8-15 for US915 or AU915 if using default settings of Milesight gateways.

Device

Network

LoRaWAN

* Support Frequency

US915

Enable Channel Index ⓘ

8-15

Index	Frequency/MHz ⓘ
0 - 15	902.3 - 905.3
16 - 31	905.5 - 908.5
32 - 47	908.7 - 911.7
48 - 63	911.9 - 914.9
64 - 71	903 - 914.2

3. Keep other settings by default and click **Write** to save the settings.

Chapter 6. Operation Guide

LoRaWAN[®] Settings

This chapter describes the LoRaWAN[®] network settings of device.

Parameter	Description
Device EUI	Unique ID of the device which can be found on the device.  Note: please contact sales for device EUI list if you have many units.
App EUI	The default App EUI (join EUI) is 24E124C0002A0001.
Application Port	The port used for sending and receiving data, the default port is 85.
LoRaWAN [®] Version	V1.0.2 and V1.0.3 are available.
Work Mode	It's fixed as Class A.
Confirmed Mode	If the device does not receive ACK packet from network server, it will resend data once.
Join Type	OTAA and ABP mode are available.  Note: it's necessary to select OTAA mode if connecting device to Milesight IoT Cloud or Milesight Development Platform.
Application Key	Appkey for OTAA mode, default value: "Device EUI" + "Device EUI" (since Q4 of 2025). Example: 24e124123456789024e1241234567890

Parameter	Description
	 Note: • The default value of earlier devices is 5572404C696E6B4C6F52613230313823. • Please contact sales before purchase if you require random App Keys.
Network Session Key	Nwkskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Application Session Key	Appskey for ABP mode, the default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5 th to 12 th digits of SN.
Rejoin Mode	Reporting interval ≤ 35 mins: the device will send a specific number of Link-CheckReq MAC packets to the network server every reporting interval or every double reporting interval to validate connectivity; If there is no response, the device will re-join the network. Reporting interval > 35 mins: the device will send a specific number of Link-CheckReq MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network.  Note: 1. Only OTAA mode supports rejoin mode. 2. The actual sending number is Set the number of packets sent +1.
Channel Mode	Select Standard-Channel mode or Single-Channel mode. When Single-Channel mode is enabled, only one channel can be selected to send uplinks.
Supported Frequency	Enable or disable the frequency to send uplinks. If frequency is one of CN470/AU915/US915, enter the index of the channel to enable in the input box, making them separated by commas.

Parameter	Description
	Examples: 1, 40: Enabling Channel 1 and Channel 40 1-40: Enabling Channel 1 to Channel 40 1-40, 60: Enabling Channel 1 to Channel 40 and Channel 60 All: Enabling all channels Null: Indicate that all channels are disabled
ADR Mode	Enable or disable network server to adjust Spreading Factor, Bandwidth and Tx Power to optimize data rates, airtime and energy consumption in the network.
Spreading Factor	If ADR mode is disabled, the device will send uplink data following this SF parameter. The higher the spreading factor, the longer the transmission distance, the slower the transmission speed and the more the consumption.
Tx Power	Tx power (transmit power) refers to the strength of the outgoing signal transmitted by the device. This is defined by LoRa alliance.
RX2 Data Rate	RX2 data rate to receive downlinks or send D2D commands.
RX2 Frequency	RX2 frequency to receive downlinks or send D2D commands. Unit: Hz

General Settings

Reporting Interval min

Buzzer ☒

Change Password ☐

Parameters	Description
Reporting Interval	Reporting interval of transmitting data to the network server. Range: 10~1080mins; Default: 1080mins

Parameters	Description
Buzzer	Enable or disable the buzzer for alarming when the sensor detects leakage.
Change Password	Change the password for ToolBox App to write this device.

Alarm Settings

When the sensor detects water leakage, it will report the alarm according to reporting interval and reporting times settings.

Alarm Reporting



If water leakage occurs, the alarm reporting interval and the alarm reporting times can be set as follows

Alarm Reporting Interval 1 min

Alarm Reporting Times 2

Parameter	Description
Alarm Reporting Interval	Reporting interval of sending alarm packet. Default: 1min
Alarm Reporting Times	The times of reporting alarm packet. Range: 2~1000; Default: 2

Milesight D2D Setting

Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the Milesight D2D settings is enabled, the device can work as a D2D controller to send control commands to trigger Milesight D2D agent devices.

1. Configure the RX2 datarate and RX2 frequency.



Note:

It is suggested to change the default values if there are many LoRaWAN[®] devices around.

Device

Network

LoRaWAN

D2D

Spreading Factor ⓘ

SF12-DR0

TXPower

TXPower0-16 dBm

RX2 Data Rate ⓘ

DR0 (SF12, 125 kHz)

RX2 Frequency ⓘ

869525000

2. Enable Milesight D2D feature and define a unique D2D key that is the same as Milesight D2D agent devices. (Default D2D key: 5572404C696E6B4C6F52613230313823)

Device

Network

LoRaWAN

D2D

Enable

☒

D2D Key

3. Enable one of WS303 statuses and configure a 2-byte hexadecimal command (This command is pre-defined in Milesight D2D agent device). When WS303 detects this status, it will send the control command to corresponding Milesight D2D agent devices.

**Note:**

If you enable **LoRa Uplink**, a LoRaWAN[®] uplink packet that contains corresponding alarm status will be sent to gateway after the Milesight D2D command packet. Otherwise, the alarm packet will not send to LoRaWAN[®] gateway.

Example:

When WS303 detects the sensor status is leak, it will send the command 1234 to Milesight D2D agent devices.

Sensor Status: Leak	☒
Control command	
	1234
LoRa Uplink 	☐
Sensor Status: No Leak	☐

Maintenance

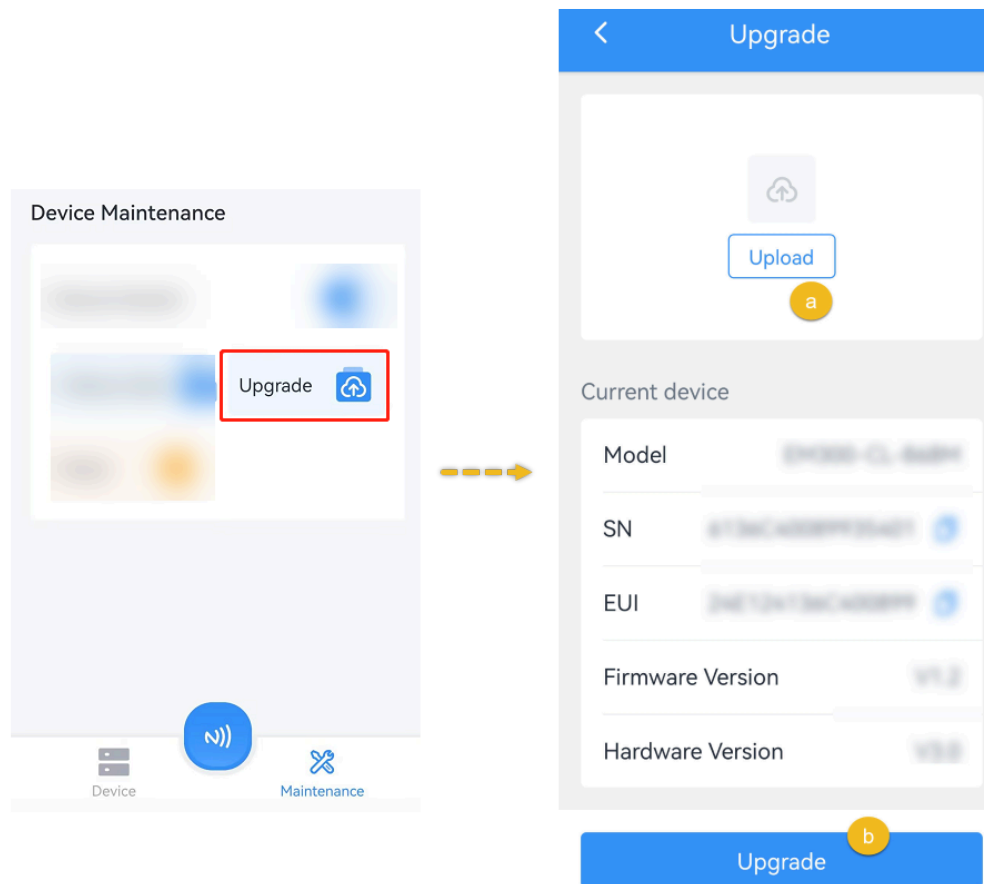
Upgrade

This chapter describes the steps to upgrade the device via ToolBox App.

1. Download firmware from Milesight official website to your smartphone.
2. Read the target device via ToolBox App, click **Upgrade** to upload the firmware file.
3. Click **Upgrade** to upgrade the device.

**Note:**

- Operation on ToolBox is not supported during an upgrade.
- Only Android version ToolBox supports the upgrade feature.

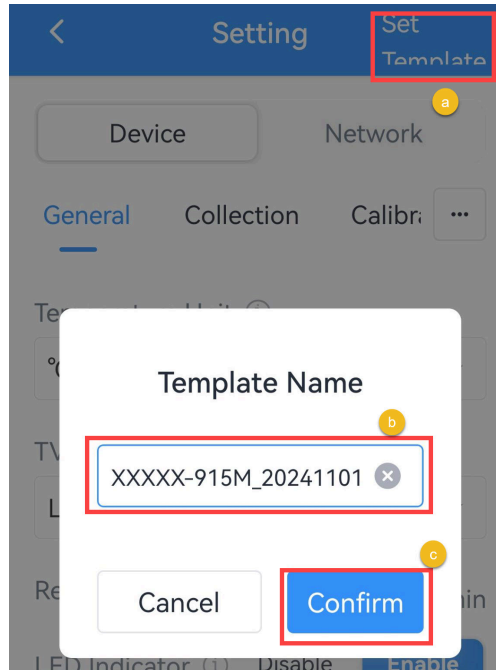


Backup and Restore

This device supports configuration backup for easy and quick device configuration in bulks. Backup and restore is allowed only for devices with the same model and frequency band.

Backup and Restore

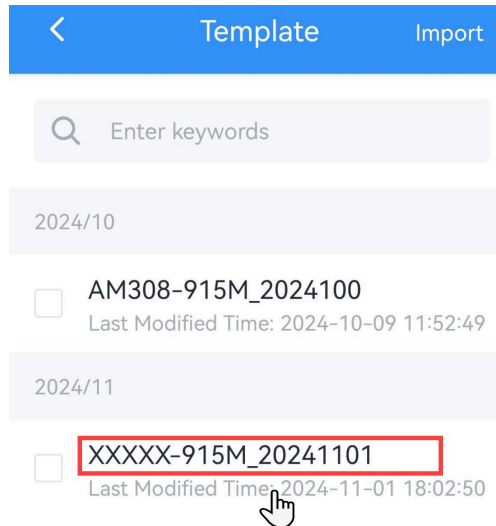
1. Launch ToolBox App, attach the NFC area of smartphone to the device to read the configuration.
2. Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.



3. Go to **Device >Template** page.

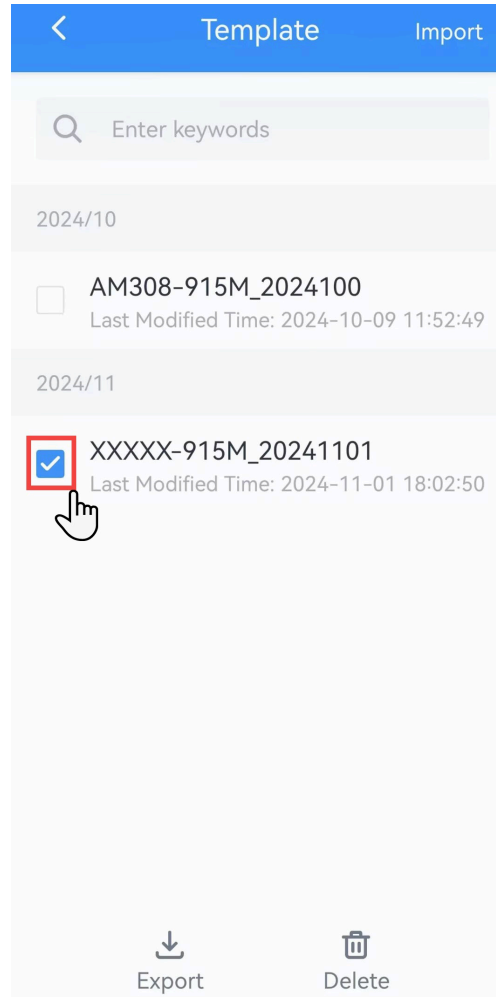


4. Select and click the target template, click **Write** to import the configuration to target devices.



Export and Delete Template

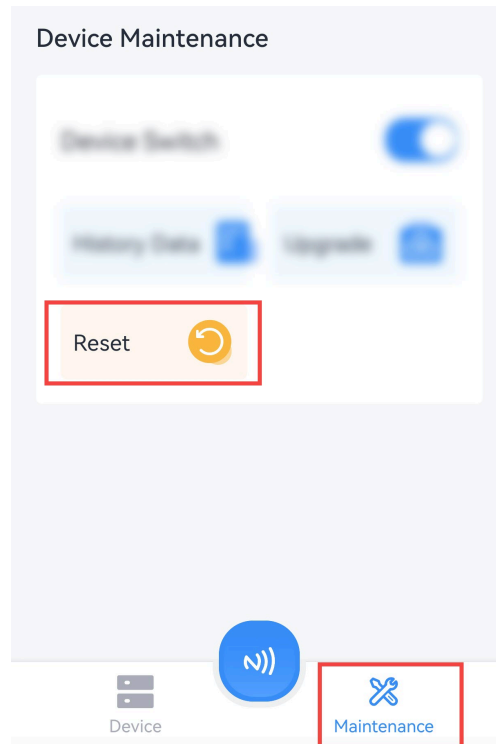
1. Check the box of the target template.
2. Click **Export** to export this template as JSON format file and save it to the smartphone, click **Delete** to delete this template from your ToolBox App.



Reset to Factory Default

Via Hardware: Hold on the reset button for more than 10s until the LED indicator quickly blinks.

Via ToolBox App: Click **Reset** and attach the smartphone to device to reset the device.



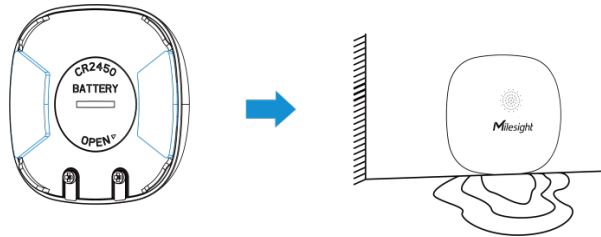
Chapter 7. Installation

Installation Location

- Open areas to avoid the metal objects or obstacles to affect LoRaWAN[®] wireless transmission;
- The location where water will reach first or where it is easy to accumulate when leaking. Otherwise, it is recommended to install multiple devices to cover the potential leakage locations.

Fixed by 3M Tape

Paste 3M tape to the back cover, then tear off the other side and place it on the wall near the detection area (please make sure the two leak detection probe is straight down).



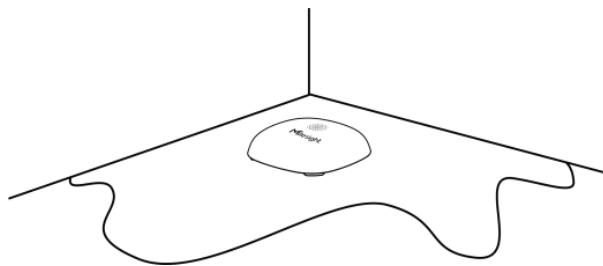
Note:

To ensure the devices are securely installed and prevent them from falling due to adhesive peeling, please strictly adhere to the following requirements.

1. Do not install the device on rough, damp, crumbling, greasy, or wallpapered walls.
2. Before installation, wipe the wall with a clean cloth to ensure it is free of dust and grease.
3. After adhering the device to the wall, press firmly to ensure it is fully adhered. Allow 24 hours for the best adhesion results.
4. If the wall conditions do not meet the above requirements, choose an alternative installation method.

Placement Installation

Place the sensor facing up and horizontally in the detection area.



Chapter 8. Uplink and Downlink

Overview

All messages are based on following format (HEX), the Data field should follow little-endian:

Channel1	Type1	Data1	Channel2	Type2	Data2	Channel3	...
1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	N Bytes	1 Byte	...

For decoder examples please find files on <https://github.com/Milesight-IoT/SensorDecoders>.

Uplink Data

Item	Channel	Type	Byte	Description
Power On	ff	0b	1	Device is on
Protocol Version	ff	01	1	Example: 01=V1
Hardware Version	ff	09	2	Example: 03 10 = V3.1
Software Version	ff	0a	2	Example: 03 01 = V3.1
Device Type	ff	0f	1	00: Class A, 01: Class B, 02: Class C, 03: Class C to B
Serial Number	ff	16	8	16 digits
Battery Level	01	75	1	UINT8, Unit: %
Leakage Status	03	00	1	00: No leak, 01: Leaking detected

Basic Information

The device will report a basic information packet whenever joining the network.

Example:

ff0bff ff0101 ff166993c52763220003 ff090100 ff0a0101 ff0f00		
Channel	Type	Value
ff	0b	Power On: ff

ff0bff ff0101 ff166993c52763220003 ff090100 ff0a0101 ff0f00		
Channel	Type	Value
ff	01	Protocol Version: 01=V1
ff	16	SN: 6993c52763220003
ff	09	Hardware Version: 0100=V1.0
ff	0a	Software Version: 0102=V1.1
ff	0f	00: Class A

Periodic Report

The device supports the sensor data according to reporting interval (1080mins by default).

Example:

017563 030001		
Channel	Type	Value
01	75	Battery Level: 63 => 99%
03	00	Leakage Status: 01 => Leaking detected

Alarm Report

The device supports to report below types of alarm report packets.

Example:

1. Water leakage alarm or alarm dismiss: report when leakage status changes.

030001		
Channel	Type	Value
03	00	Leakage Status: 01 => Leaking detected

2. Low battery alarm: report when battery level drops to 1%.

017501		
Channel	Type	Value
01	75	Battery Level: 01 => 1%

Downlink Command

This device supports downlink commands for configuration and control. The downlink application port is 85 by default.

General Settings

Item	Channel	Type	Byte	Description
Reboot	ff	10	1	ff
Report Interval	ff	03	2	UINT16, Unit: s
Buzzer	ff	3e	1	00: Disable, 01: Enable
Stop Buzzing	ff	3d	1	ff
Searching Device	ff	7f	1	00 = Not Search; 01 = Search  Note: - The device will buzz for a specific time after receiving this downlink command. - You can stop the buzzer on ToolBox or by sending the not search downlink command.

Item	Channel	Type	Byte	Description
				 3. Disabling the buzzer on Tool-box will not stop the buzzing under searching device feature.
Buzzing Time when Searching	ff	80	2	Range: 60~64800; Default: 300s

Example:

1. Reboot the device.

ff10ff

2. Set report interval as 20 minutes.

ff03b004		
Channel	Type	Value
ff	03	b004=>04b0=1200s=20 minutes

3. Enable buzzer for leakage alarming.

ff3e01		
Channel	Type	Value
ff	3e	01=>Enable Buzzer

Alarm Settings

Channel	Type	Byte	Description
ff	7e	5	Alarm Reporting(1 Byte)+Interval(2 Bytes)+ Times(2 Bytes)

Channel	Type	Byte	Description
			Alarm Reporting: 00 = Disable; 01 = Enable Alarm Reporting Interval: unit --s Alarm Reporting Times: range --2~1000

Example:

Enable alarming reporting, set the interval as 10 minutes and set the reporting times as 3.

ff7e 01 5802 0300		
Channel	Type	Value
ff	7e	01=> Enable Alarm Reporting 58 02 => 02 58 = 600s = 10 minutes 03 00 => 00 03 =3

D2D Settings

Item	Channel	Type	Byte	Description
D2D Function	ff	84	1	00: Disable, 01: Enable
LoRa Uplink	ff	81	2	Status(1 Byte)+Function(1 Byte) Status: 00 = No Leak; 01 = Leak Function: 00 -Only Use LoRaWAN 01 -Only Use D2D 03 -Use D2D&LoRaWAN Uplink
D2D Command	ff	83	3	Status(1 Byte)+Command(2 Bytes)

Item	Channel	Type	Byte	Description
				Status: 00=No Leak; 01=Leak

Example:

1. Set leak status using both D2D&LoRa uplink.

ff81 01 03		
Channel	Type	Value
ff	81	Status: 01=> Leak Function: 03=> Use D2D & LoRa

2. Set the D2D command of leak as 0110.

ff83 01 1001		
Channel	Type	Value
ff	83	Status: 01=> Leak Command: 10 01=>01 10

Chapter 9. Services

Milesight provides customers with timely and comprehensive technical support services. End-users can contact your local dealer to obtain technical support. Distributors and resellers can contact directly with Milesight for technical support.

Technical Support Mailbox: iot.support@milesight.com

Online Support Portal: <https://support.milesight-iot.com>

Resource Download Center: <https://www.milesight.com/iot/resources/download-center/>

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