WS301

Magnetic Contact Switch

User Guide

Contents

Chapter 1. Preface

Copyright Statement

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 remodeled in any way.
- In order to protect the security of the device, please change device the 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 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 reverse or wrong model.
- The device must never be subjected to shocks or impacts.

Revision History

Release Date	Version	Description
Apr. 13, 2021	V 1.0	Initial version
June 30, 2021	V 1.1	Delete power button features

Release Date	Version	Description
Dec.9, 2021	V 1.2	1. Add Milesight D2D controller feature; 2. Delete low power alarm interval, device only uplinks once when battery level drops to 1%.
Jan.13, 2023	V 1.3	1. Add Single-Channel mode; 2. Add Milesight D2D LoRa Uplink feature.

Chapter 2. Product Introduction

Overview

Milesight WS301 simply enables you to know when someone enters the office/building through door/window or something has been moved. The minimal magnet is placed inside the portable part, while the sensor is inside the fixed part that can be attached on door/window or other objects. With LoRa technology, one of the most low power consumption technologies, Milesight WS301 can work up to almost 2 years without bothering to replace battery. Compliant with Milesight LoRaWAN® gateway and Milesight Development Platform, WS301 will surely monitor the real-time open/close status and receive alarms.

With a style of minimalism and compact size, the wire-free WS301 can be easily mounted on the doors, panes, or cabinets, greatly providing real applications for smart homes, smart office or smart factories.

Features

- Suitable for various doors/windows of different materials
- Support mounting tamper detection
- LED for network status, open/close status, tamper and low battery indication
- Ultra-wide-distance transmission up to line of sight of 15 km
- Built-in 1200 mAh replaceable battery can work continuously for more than 5 years
- Equipped with NFC for one touch configuration
- Support Milesight D2D protocol to enable ultra-low latency and directly control without gateway
- Function well with standard LoRaWAN® gateways and network servers
- Compliant with Milesight IoT Cloud and Milesight Development Platform

Chapter 3. Hardware Introduction

Packing List

1 × WS301 Device

2 × Mounting Screws

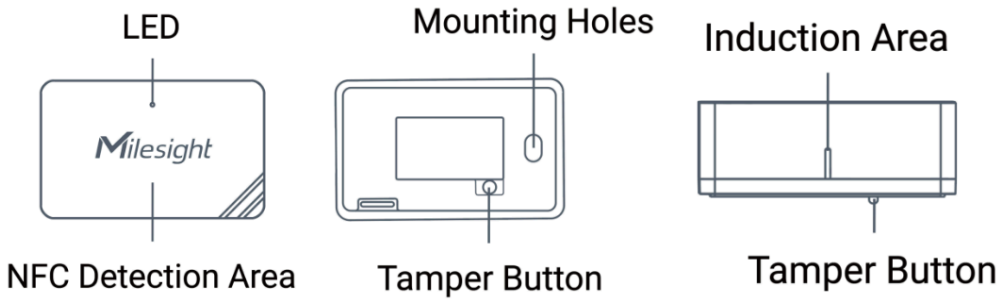
1 × Quick Guide

1 × Warranty Card

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

Hardware Overview

Sensor



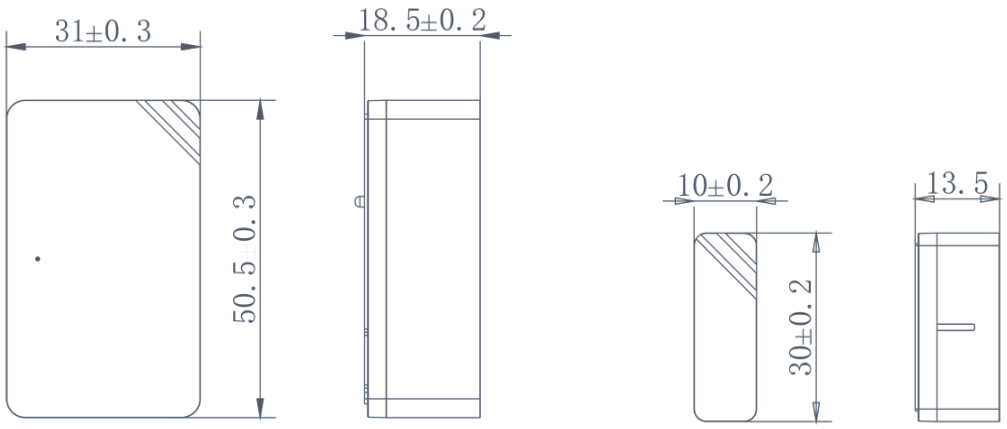
Magnet

LED Indicator

Function	Action	LED Indicator
Door/Window Status	Switch On/Off (network unregistered)	Red, blinks once

Function	Action	LED Indicator
	Switch On/Off (network registered)	Green, blink once
Network Status	Send join network requests	Red, blinks once
	Joined the network successfully	Green, blink twice
Tamper Detection	The device is un-installed (tamper is detected)	Red, blinks once
	The device is installed	Green, blink once
Reboot	Press and hold the reset button (internal) for more than 3 seconds	Slowly Blinks
Reset to Factory Default	Press and hold the reset button (internal) for more than 10 seconds	Quickly Blinks

Dimensions(mm)

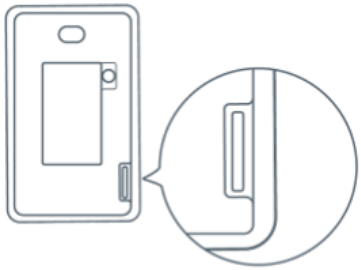


Chapter 4. Quick Start

This chapter describes how to access the status and configuration page of the device.

Power On

Pull out the battery insulating sheet to power on the device. The indicator will light up in green for 3 seconds when device turns on.

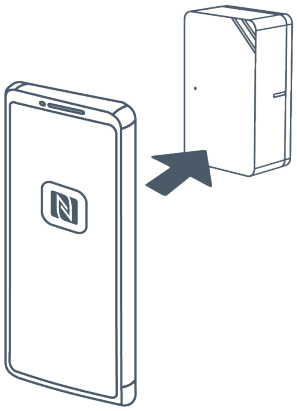


Access the Sensor via NFC

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.



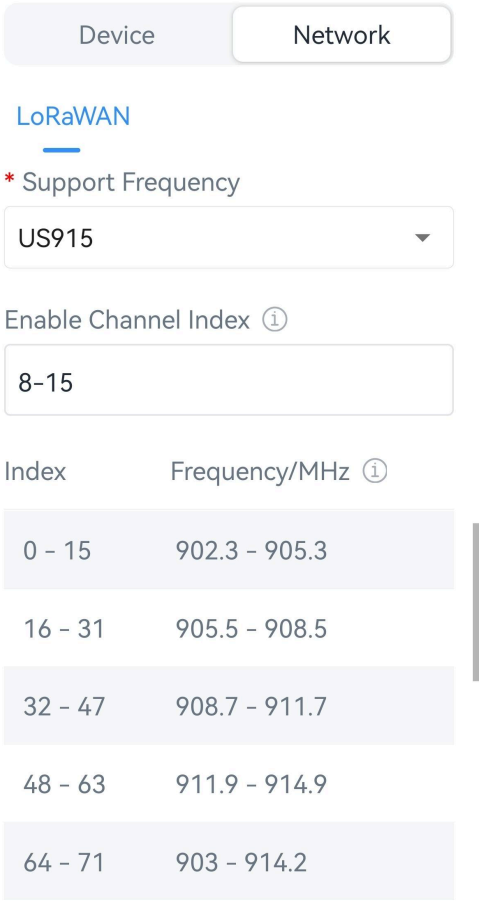
Configure the Network Setting

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.



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

Chapter 5. Operation Guide

LoRaWAN® Settings

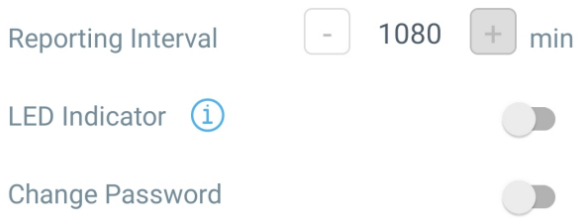
This chapter describes the LoRaWAN® network settings of device.

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 5th to 12th 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 an 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



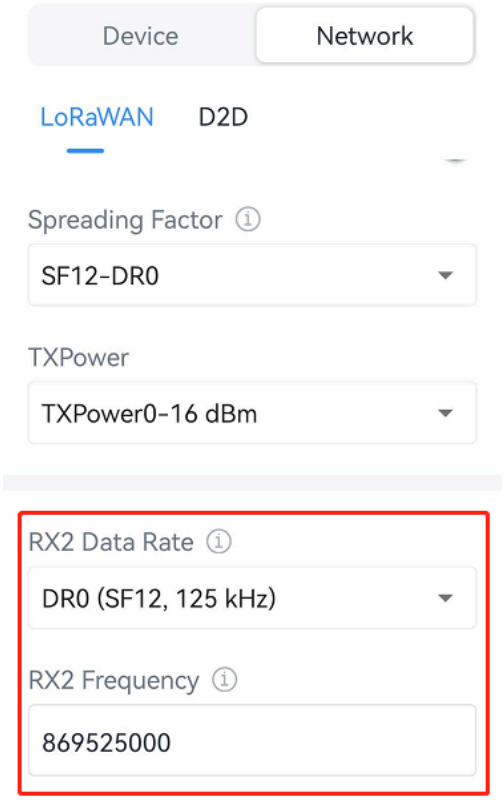
Parameters	Description
Reporting Interval	Reporting interval of magnet, tamper and battery level to network server. Default: 1080mins, Range: 1 - 1080 mins. **Note:** WS301 will also transmit alarm when magnet or tamper status changes.
LED Indicator	Enable or disable the light indicating. **Note:** The indicator of reset feature is not allowed to disable.
Change Password	Change the password for ToolBox App to write this device.

Milesight D2D Setting

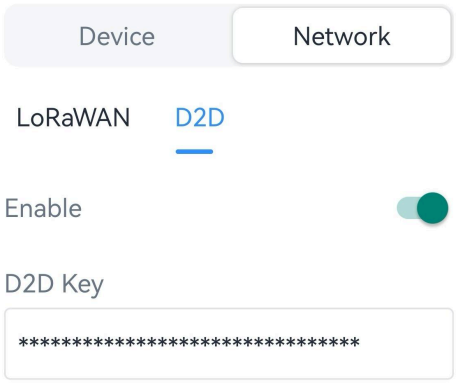
Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the Milesight D2D settings is enabled, the device can work as a D2D controller to send control commands to trigger Milesight D2D agent devices.

1. Configure the RX2 datarate and RX2 frequency.

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



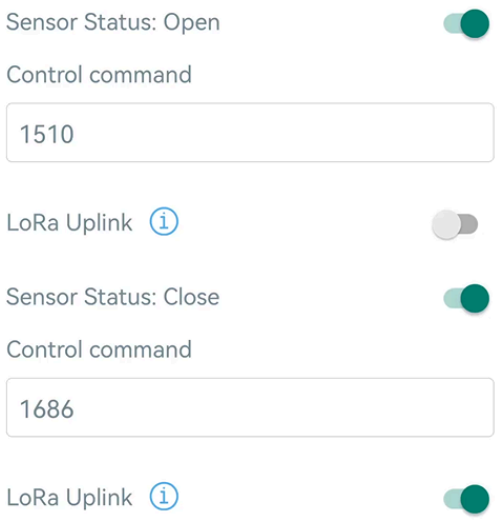
2. Enable Milesight D2D feature and define a unique D2D key that is the same as Milesight D2D agent devices. (Default D2D key: 5572404C696E6B4C6F52613230313823)



3. Enable one of WS301 status and configure a 2-byte hexadecimal command (This command is pre-defined in Milesight D2D agent device). When WS301 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 WS301 detects the sensor status is open, it will send the command 1510 to Milesight D2D agent devices. When WS301 detects the sensor status is close, it will send the command 1686 to Milesight D2D agent devices.



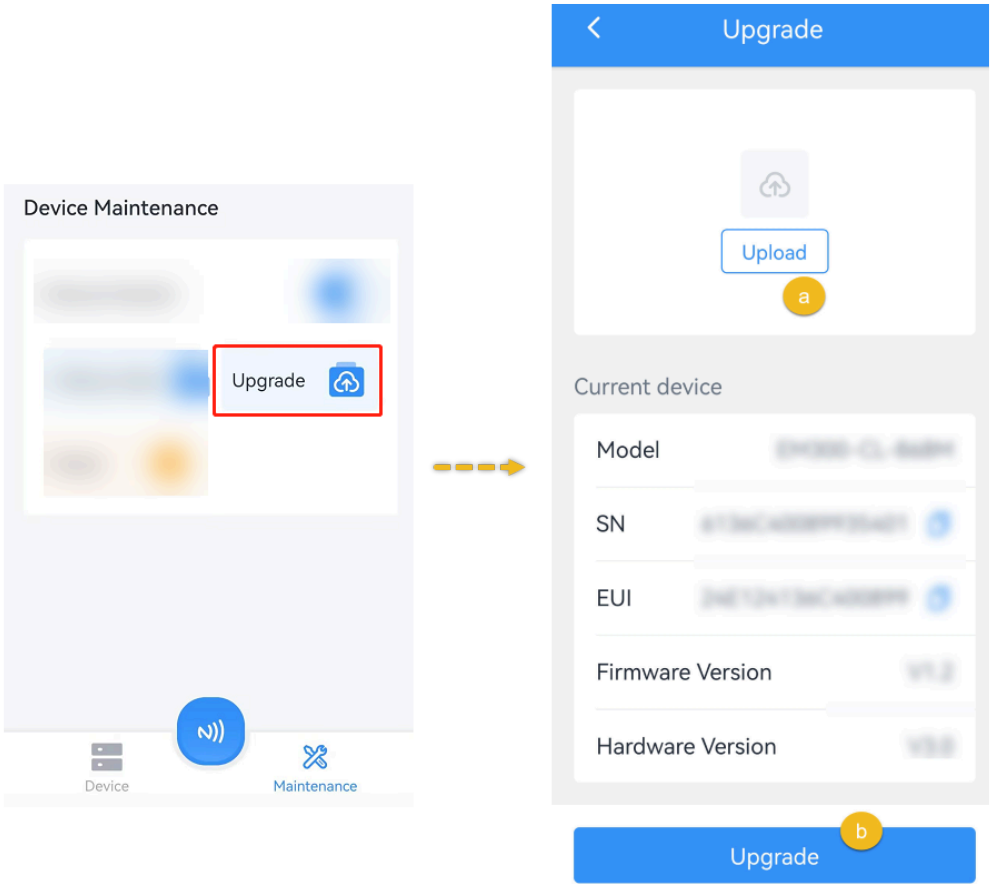
Maintenance

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.



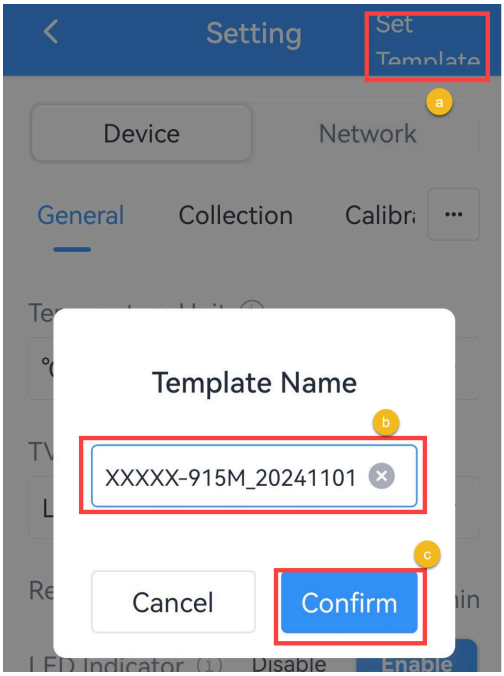
Backup and Restore

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.

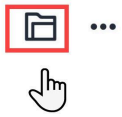
Backup and Restore

1. Launch ToolBox App, attach the NFC area of smartphone to the device to read the configuration.

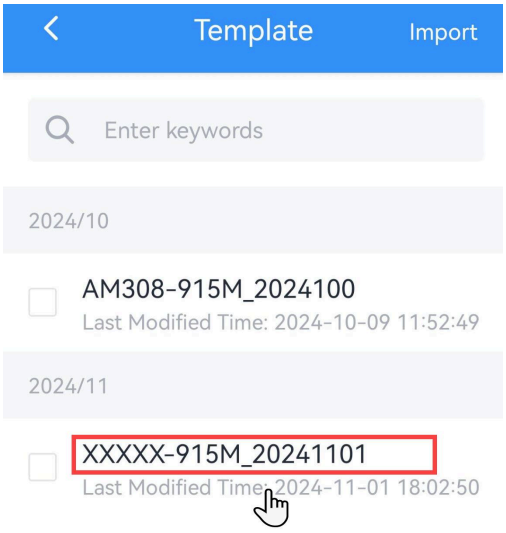
2. Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.



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



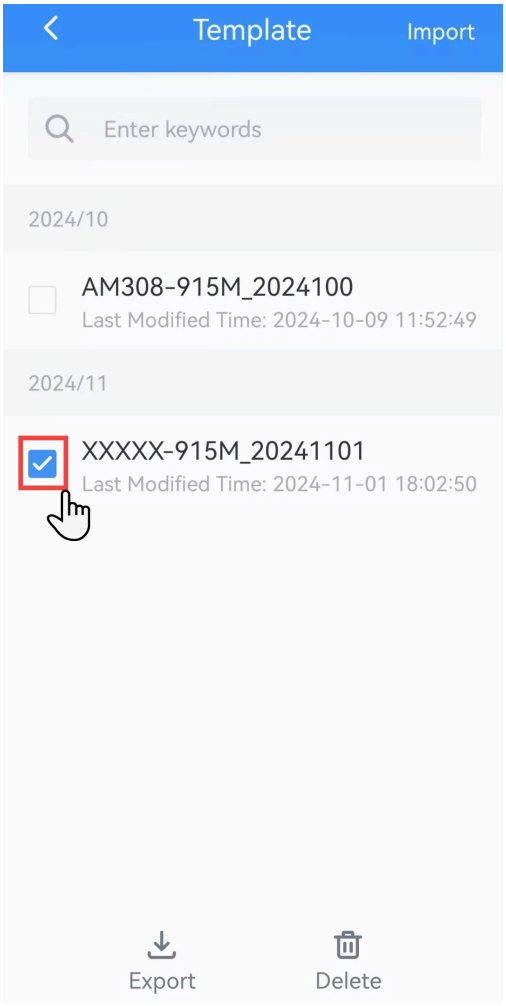
4. Select and click the target template, click **Write** to import the configuration to target devices.



Export and Delete Template

1. Check the box of the target template.

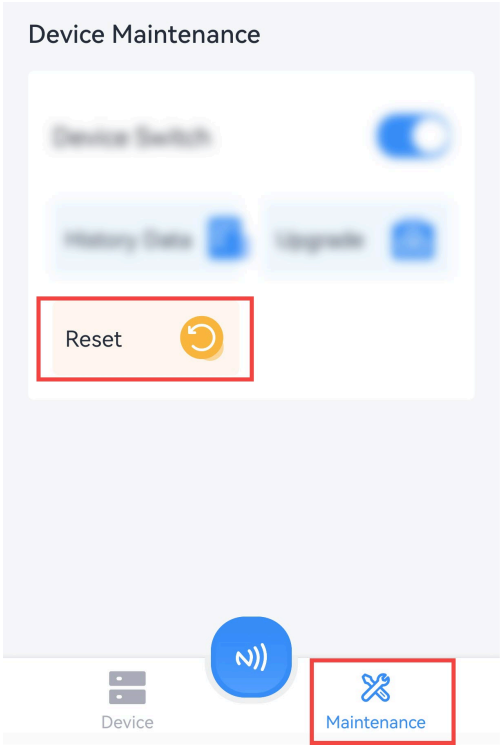
2. Click **Export** to export this template as JSON format file and save it to the smartphone, click **Delete** to delete this template from your ToolBox App.



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.


Device Maintenance
Reset
Device
Maintenance

Chapter 6. Installation

Installation Note

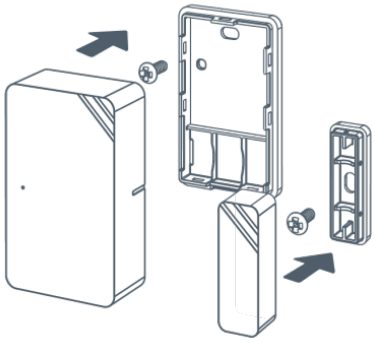
In order to ensure the best detection, please install the device as follows:

- The notch side of magnet should face the notch side of sensor, otherwise it may affect the sensitivity of on/off detection.
- The plane distance between sensor and magnet should not be more than 15mm, and the height difference should be less than 7.5 mm.

Installation Step

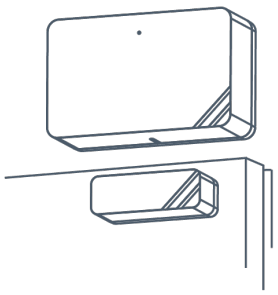
Screw Fix

Remove the cover of both parts, screw the covers on the mounting positions, then install back the devices.



3M Tapes Fix

Tear the 3M tapes of both parts, then make sure the magnet part is placed inside the door (portable part) and sensor is inside the door frame (fixed part). For double doors, put every part on each door.



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, such as screw fixation.

Chapter 7. 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

This chapter describes the reported data of the device.

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	08	6	12 digits
Battery Level	01	75	1	UINT8, Unit: %
Magnet Status	03	00	1	00=>Switch close, 01=>Switch open
Tamper Status	04	00	1	00=>Device is installed 01=>Device is un-installed

Basic Information

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

Example:

ff0bff ff0101 ff086538b2232131 ff090100 ff0a0102 ff0f00		
Channel	**Type**	**Value**
ff	0b	Power On: ff
ff	01	Protocol Version: 01=V1
ff	08	Serial Number: 6538b2232131
ff	09	Hardware Version: 0100=V1.0
ff	0a	Software Version: 0102=V1.2
ff	0f	00: Class A

Sensor Data Report

WS301 reports sensor data according to reporting interval and changes in magnet or tamper status.

Example:

01 75 64 03 00 00 04 00 01		
Channel	**Type**	**Value**
01	75	Battery Level: 64 => 100%
03	00	Magnet Status: 00 => Switch close
04	00	Tamper Status: 01=>Device is un-installed

Low Battery Alarm Report

When battery level drops to 1%, the device will upload battery packet once.

Example:

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.

Item	Channel	Type	Byte	Description
Reboot	ff	10	1	ff
Report Interval	ff	03	2	UINT16, Unit: s

Example:

1. Reboot the device.

ff10ff

2. Set report interval as 20 minutes.

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

Chapter 8. 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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