Magnet Contact Switch

Featuring LoRaWAN®

IOT-S500DCS

User Guide

Revision History

Date	Doc Version	Description
Apr. 13, 2021	V 1.0	Initial version
June 30, 2021	V 1.1	Delete power button features
Dec.9, 2021	V 1.2	1. Add D2D controller feature; 2. Delete low power alarm interval, device only uplinks once when battery level is lower than 10%.
Jan.13, 2023	V 1.3	1. Add Single-Channel mode; 2. Add D2D LoRa Uplink feature.

Contents

1. Product Introduction

1.1 Overview

IOT-S500DCS simply enables you to know when someone enters the office/building through a 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 to door/window or other objects. IOT-S500DCS can be easily mounted on the doors, panes, or cabinets, greatly providing real applications for smart homes, smart offices or smart factories.

Sensor data are transmitted in real-time using the standard LoRaWAN® protocol. LoRaWAN® enables encrypted radio transmissions over long distances while consuming very little power. The user can obtain sensor data and view the trend of data change through IoT Cloud or through the user's own Application Server.

1.2 Features

- Up to 15 km communication range
- Easy configuration via NFC
- Standard LoRaWAN® support
- Milesight IoT Cloud compliant
- Low power consumption with 1200mAh replaceable battery
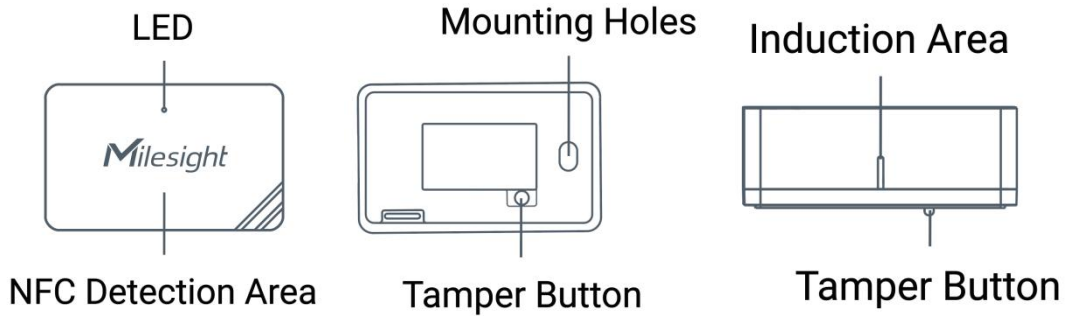
2. Hardware Introduction

2.1 Packing List

1 ×	2 ×	1 ×
WS301 Sensor	Mounting Screws	Quick Guide

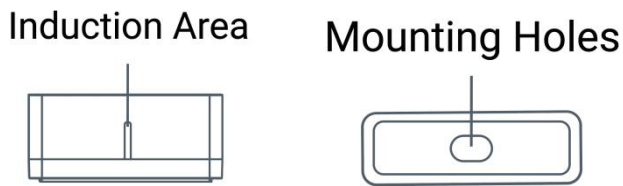⚠️ **If any of the above items is missing or damaged, please contact your sales representative.**

2.2 Hardware Overview

Sensor:

LED • Mounting Holes • Induction Area
NFC Detection Area • Tamper Button • Tamper Button

Magnet:

Induction Area • Mounting Holes

2.3 LED Patterns

Function	Action	LED Indicator
Door/Window Status	Switch On/Off (network unregistered)	Red, blink once
	Switch On/Off (network registered)	Green, blink once
Network Status	Send join network requests	Red, blink once
	Joined the network successfully	Green, blink twice
Tamper Detection	The device is un-installed (tamper is detected)	Red, blink 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

2.4 Dimensions (mm)

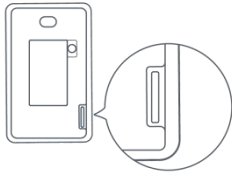31 ± 0.3 18.5 ± 0.2 50.5 ± 0.3 10 ± 0.2 13.5 30 ± 0.2
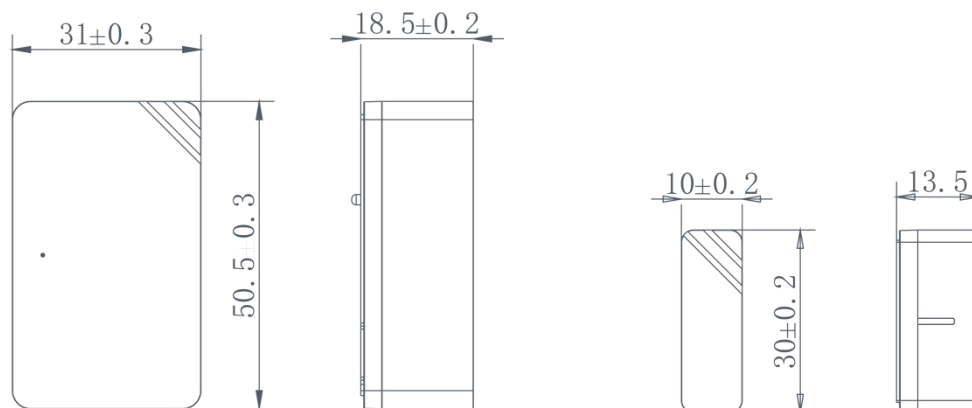
3. Operation Guide

3.1 NFC Configuration

IOT-S500DCS can be configured via a NFC supported mobile phone.

1. 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.

2. Download and install "ToolBox" App from Google Play or Apple Store.3.

Enable NFC on the smartphone and open Milesight ToolBox.

4. Attach the smartphone with NFC area to the device to read device information.
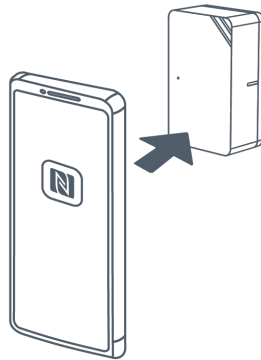
5. Basic information and settings of devices will be shown on ToolBox if it's recognized successfully. You can read and configure the device by tapping the Read/Write button on the App. In order to protect the security of devices, password validation is required when first configuration. The default password is **123456**.

Note:

1) Ensure the location of smartphone NFC area and it's recommended to take off phone case.

2) If the smartphone fails to read/write configurations via NFC, keep the phone away and back to try again.

3) IOT-S500DCS can also be configured by ToolBox software via a dedicated NFC reader provided by IoT, you can also configure it via TTL interface inside the device.
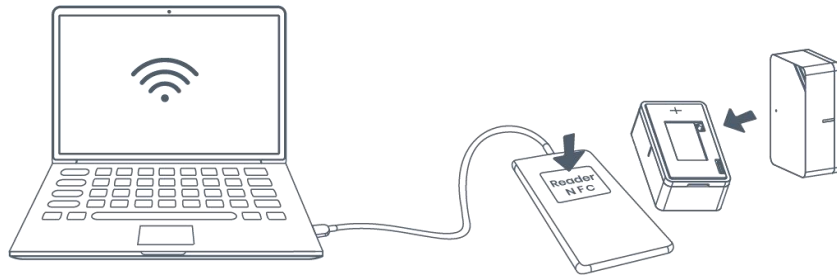
3.2 LoRaWAN Settings

Go to **Device > Setting > LoRaWAN Settings** of ToolBox App to configure join type, App EUI, App Key and other information. You can also keep all settings by default.

Parameters	Description
Device EUI	Unique ID of the device which can also be found on the label.
App EUI	Default App EUI is 24E124C0002A0001.
Application Port	The port used for sending and receiving data, default port is 85.
Join Type	OTAA and ABP modes are available.
LoRaWAN Version	V1.0.2, V1.0.3 are available.
Work Mode	It's fixed as Class A.
Application Key	Appkey for OTAA mode, default is 5572404C696E6B4C6F52613230313823.
Device Address	DevAddr for ABP mode, default is the 5th to 12th digits of SN.
Network Session Key	Nwkskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.

|	
Application Session Key	Appskey for ABP mode, default is 5572404C696E6B4C6F52613230313823.
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
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. Please enable Single-Channel mode if you connect device to DS7610.
Channel	Enable or disable the frequency to send uplinks. * Support Frequency EU868 868.1 868.3 868.5 863 If frequency is one of CN470/AU915/US915, enter the index of the channel that you want to enable and make them separated by commas. **Examples:** 1, 40: Enabling Channel 1and 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: Indicates that all channels are disabled * Support Frequency AU915 Enable Channel Index ⓘ 8–15 Index Frequency/MHz ⓘ 0 – 15 915.2 – 918.2 16 – 31 918.4 – 921.4 32 – 47 921.6 – 924.6 48 – 63 924.8 – 927.8 64 – 71 915.9 – 927.1

Spread Factor	If ADR is disabled, the device will send data via this spread factor.
Confirmed Mode	If the device does not receive ACK packet from network server, it will resend data 3 times at most.
Rejoin Mode	Reporting interval ≤ 30 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every 30 mins to validate connectivity; If there is no response, the device will re-join the network. Reporting interval > 30 mins: the device will send a specific number of LinkCheckReq MAC packets to the network server every reporting interval to validate connectivity; If there is no response, the device will re-join the network.
Set the number of packets sent	When rejoin mode is enabled, set the number of LinkCheckReq packets sent.
ADR Mode	Allow network server to adjust datarate of the device. This only works with Standard Channel Mode.
Tx Power	Transmit power of device.

Note:

1) Please contact sales for device EUI list if there are many units.

2) Please contact sales if you need random App keys before purchase.

3) Select OTAA mode if you use Milesight IoT cloud to manage devices.

4) Only OTAA mode supports rejoin mode.

5) For -868M model, the default frequency is EU868; for -915M model, the default frequency is AU915.

3.3 General Settings

Go to **Device > Setting > General Settings** of ToolBox App to change the reporting interval, etc.

Reporting Interval   - 1080 + min

LED Indicator ⓘ

Change Password
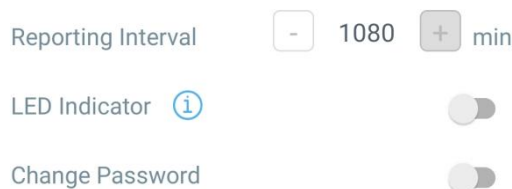
Parameters	Description
Reporting Interval	Reporting interval of magnet, tamper and battery level to network server. Default: 1080mins, Range: 1 - 1080 mins
	Note: WS301 will also transmit alarm when magnet status is changed or

	tamper button is activated.
LED Indicator	Enable or disable the light indicating in chapter 2.3. Note: The indicator of reset button is not allowed to disable.
Change Password	Change the password for ToolBox App to write this device.

3.4 Milesight D2D Settings

Milesight D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the Milesight D2D setting is enabled, WS301 can work as a Milesight D2D controller to send control commands to trigger Milesight D2D agent devices.

1. Configure RX2 datarate and RX2 frequency in LoRaWAN® settings, it is suggested to change the default value if there are many LoRaWAN® devices around.

2. Go to **Device > Settings > D2D Settings** to enable D2D function, and define an unique Milesight D2D key which is the same as Milesight D2D agent devices, then select the fr equency and spreading factor. (Default Milesight D2D Key: 5572404C696E6B4C6F5261323 0313823)

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** feature, LoRaWAN® uplink packet that contains the sensor's magnet status will be sent to gateway after the Milesight D2D control command is sent.

3.5 Maintenance

3.5.1 Upgrade

1. Download firmware from Milesight website to your smartphone.

2. Open Toolbox App and click **Browse** to import firmware and upgrade the device.

Note:

1) Operation on ToolBox is not supported during an upgrade.

2) Only Android version ToolBox supports the upgrade feature.

Status	Setting	Maintenance

SN	6141B1214129
Model	WS301-915M
Firmware Version	V1.2
Hardware Version	V1.0
Manual Upgrade	

Browse

3.5.2 Backup

WS301 supports configuration backup for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRa frequency band.

1. Go to **Template** page on the App and save current settings as a template. You can also edit the template file.

2. Select one template file that saved in the smartphone and click **Write**, then attach it to another device to write configuration.
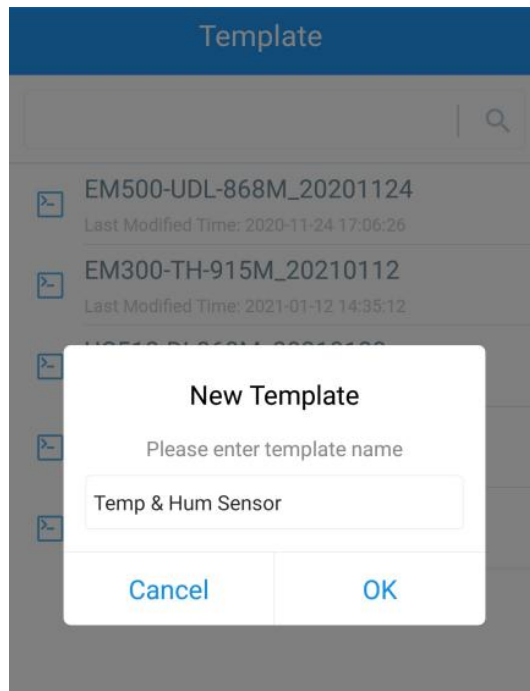
Note: Slide the template item left to edit or delete the template. Click the template to edit the configurations.
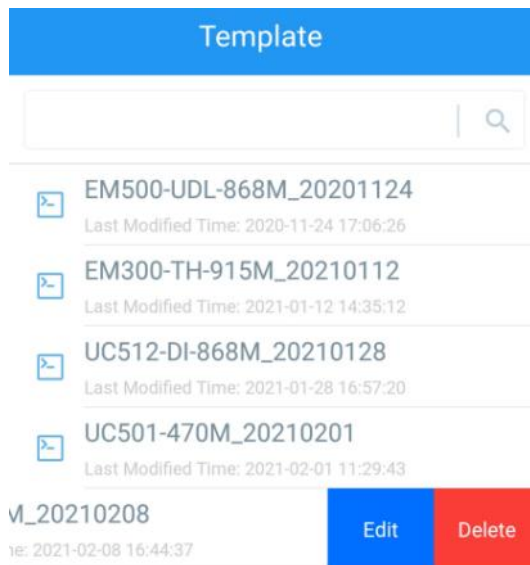
3.5.3 Reset to Factory Default

Please select one of the following methods to reset device:

Via Hardware: Hold on the reset button inside the device for more than 10s. After reset complete, the indicator will blink in green twice and device will reboot.

Via ToolBox App: Go to **Device > Maintenance** to click **Reset**, then attach smartphone with NFC area to device to complete reset.

Status	Setting	Maintenance

SN	6141B1214129
Model	WS301-915M
Firmware Version	V1.2
Hardware Version	V1.0

Manual Upgrade

Browse

Restore Factory Default

Reset

4. Installation

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.
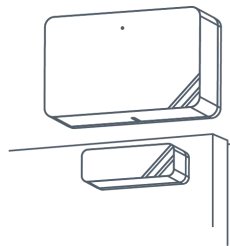
Screw Fix:

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

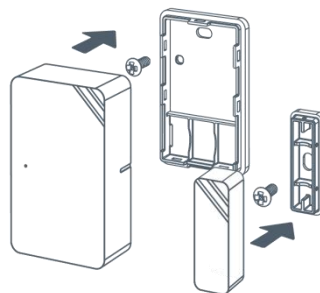1. The notch side of magnet should face the notch side of sensor, otherwise it may affect the sensitivity of on/off detection.
2. The plane distance between sensor and magnet should not be more than 15mm, and the height difference should be less than 7.5 mm.

5. Device Payload

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

Channel1	Type1	Data1	Channel2	Type2	Data2	Channel 3	...
1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	1 Byte	...

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

5.1 Basic Information

WS301 reports basic information of sensor whenever joining the network.

Channel	Type	Description
ff	01(Protocol Version)	01=> V1
	08 (Device SN)	12 digits
	09 (Hardware Version)	01 40 => V1.4
	0a (Software Version)	01 14 => V1.14
	0b (Power On)	Device is on
	0f (Device Type)	00: Class A, 01: Class B, 02: Class C

Example:

ff0bff ff0101 ff086538b2232131 ff090100 ff0a0102 ff0f00					
Channel	Type	Value	Channel	Type	Value
ff	0b (Power On)	ff (Reserved)	ff	01 (Protocol Version)	01 (V1)
Channel	Type	Value	Channel	Type	Value
ff	08(Device SN)	6538b2232131	ff	09 (Hardware version)	0100 (V1.0)
Channel	Type	Value	Channel	Type	Value
ff	0a (Software version)	0102 (V1.2)	ff	0f (Device Type)	00 (Class A)

5.2 Sensor Data

IOT-S500DCS reports open/close status and tamper status as follows:●
According to reporting interval;

- When magnet or tamper status has changed.

Channel	Type	Description
01	75(Battery Level)	UINT8, Unit: %
03	00(Magnet Status)	00=>Switch close 01=>Switch open
04	00(Tamper Status)	00=>Device is installed 01=>Device is un-installed

Example:

01 75 64 03 00 00 04 00 01					
Channel	Type	Value	Channel	Type	Value
01	75 (Battery)	64 => 100%	03	00 (Magnet Status)	00 (Close)
Channel	Type	Value			
04	00 (Tamper Status)	01 (Un-installed)			

5.3 Downlink Commands

IOT-S500DCS supports downlink commands to configure the device. The application port is 85 by default.

Channel	Type	Description
ff	03 (Set Reporting Interval)	2 Bytes, unit: s

Example: Set reporting interval as 20 minutes.

ff03b004		
Channel	Type	Value
ff	03 (Set Reporting Interval)	b0 04 => 04 b0 = 1200s = 20 minutes

-END-