PIR & Light Sensor

Featuring LoRaWAN®

WS202

User Guide

Milesight IoT

Safety Precautions

Milesight will not shoulder responsibility for any losses or damages resulting from not following the instructions of this operating guide.

- The device must not be modified in any way.
- Do not expose the PIR lens to direct sunlight.
- Do not paint or clean the PIR lens, or it will affect the detection of the device.
- Do not place the device where the temperature is below/above the operating range.
- Do not place the device close to objects with naked flames, heat source (oven or sunlight), cold source, liquid and extreme temperature changes.
- The device is not intended to be used as a reference sensor, and Milesight will not take responsibility for any damages which may result from inaccurate readings.
- When installing the battery, please install it accurately, and do not install the reverse or wrong model.
- Remove the battery if the device will not be used for a long time. Otherwise, the battery will leak and damage the device.
- The device must never be subjected to shocks or impacts.

Declaration of Conformity

WS202 conforms with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.

FCC Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning

the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.
Note 2:
1. Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. The minimum separation generally be used is at least 20 cm.

For assistance, please contact
Milesight technical support:
Email: iot.support@milesight.com
Tel: 86-592-5085280
Fax: 86-592-5023065
Address: 4/F, No.63-2 Wanghai Road,
2nd Software Park, Xiamen, China

Revision History

Date	Doc Version	Description
July 15, 2021	V 1.0	Initial version
Sept. 10, 2021	V 1.1	1. Add LoRa D2D feature; 2. Support light collection enabled/disabled.

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OPERATING FREQUENCY:
863.1MHz ~ 869.9MHz for LORA
13.56MHz for NFC
EIRP (MAX.):
13.92dBm for LORA(Maximum)
-37.50dBuA/m at 10m, or
39.50dBuV/m at 3m for NFC(Maximum)
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Contents

1. Product Introduction

1.1 Overview

WS202 is a PIR sensor based on passive infrared technology to detect a motion or occupancy. WS202 can detect whether there is a movement within the range of 6-8 m. Besides, WS202 equips with a light sensor which can link PIR detection results to trigger scenes. WS202 can be widely used in smart homes, smart offices, schools, warehouses, etc.

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 get an alarm through Milesight IoT Cloud or through the user's own Application Server.

1.2 Features

- Built-in light sensor, combine PIR sensor to achieve triggers
- Up to 15 km communication range
- Easy configuration via NFC
- Standard LoRaWAN® support
- Compatible with Milesight IoT Cloud

2. Hardware Introduction

2.1 Packing List

1 ×

WS202 Sensor

2 ×

Wall Mounting Kits

1 ×

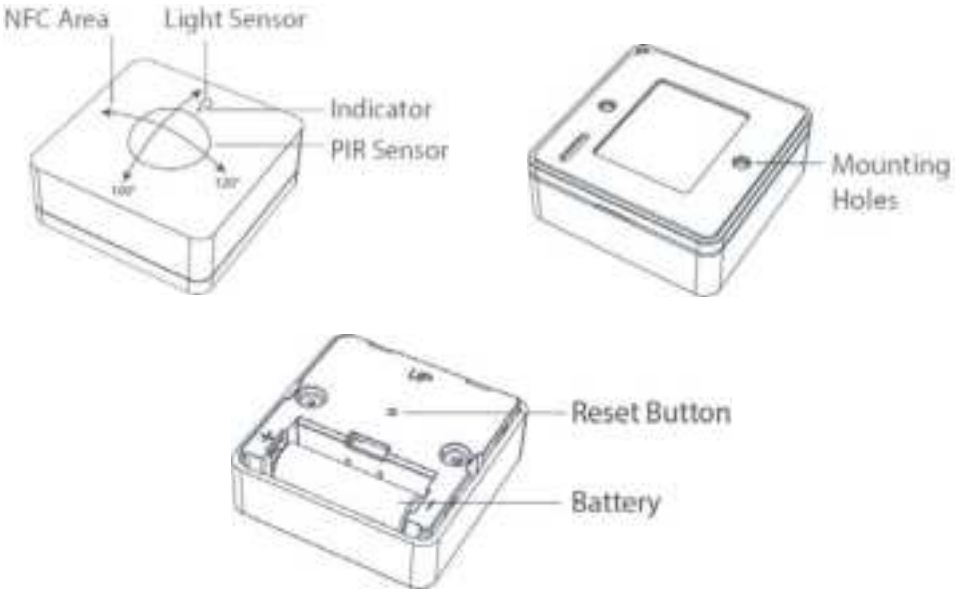
3M Tape

1 ×

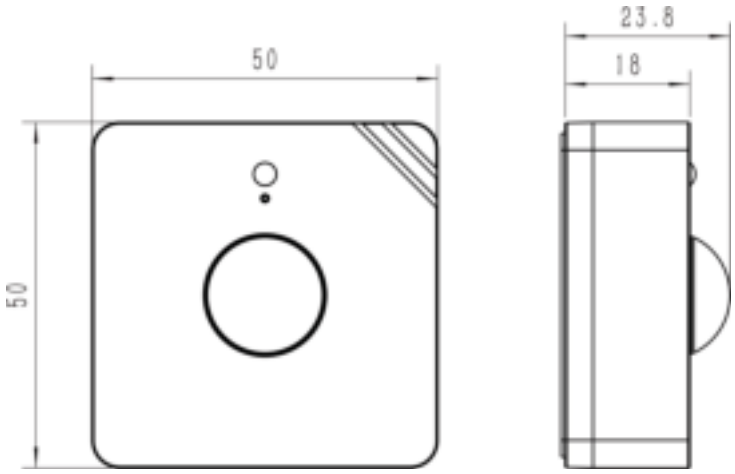
Quick Guide

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

2.2 Hardware Overview



2.3 Dimensions (mm)



2.4 LED Patterns

Function	Action	LED Indicator
PIR Detection	PIR is triggered (network unregistered)	Red, blink once
	PIR is triggered (network registered)	Green, blink once
Network Status	Send join network requests	Red, blinks once
	Joined the network successfully	Green, blinks twice
Reboot	Press and hold the reset button for more than 3s	Slowly blinks
Reset to Factory Default	Press and hold the reset button for more than 10s	Quickly blinks

3. Operation Guide

3.1 NFC Configuration

WS202 can be configured via an NFC-enabled smartphone.

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

2. Download and install "Milesight ToolBox" App from Google Play or App 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 the device will be shown on ToolBox if it's recognized successfully. You can read and configure the device by tapping the Read/Write device on the App. In order to protect the security of the device, password validation is required when configuring via a new smartphone. The default password is **123456**.

Note:

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

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

3) WS202 can also be configured by ToolBox software via a dedicated NFC reader provided by Milesight IoT, you can also configure it via TTL interface inside the device.

3.2 LoRaWAN Settings

LoRaWAN settings are used for configuring the transmission parameters in LoRaWAN® network.

Basic 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. The default port is 85.
Join Type	OTAA and ABP modes are available.
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.
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: device will send specific mounts of LoRaMAC packets to check connection status every 30 mins; If no reply after specific packets are being sent, the device will re-join. Reporting interval > 30 mins: device will send specific mounts of LoRaMAC packets to check connection status at every reporting interval; If no reply after

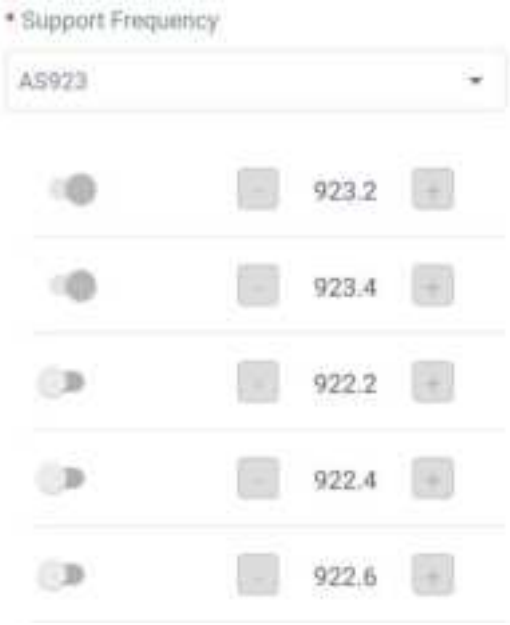
	specific packets are being sent, the device will re-join.
ADR Mode	Allow network server to adjust data rate of the device.
Tx Power	Transmit power of device.

Note:

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

LoRaWAN Frequency Settings:

Go to **Setting->LoRaWAN Settings** of ToolBox App to select the supported frequency and select channels to send uplinks. Make sure the channels match the LoRaWAN® gateway.



If device frequency is one of CN470/AU915/US915, you can enter the index of the channel that you want to enable in the input box, making them separated by commas.

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: Indicates that all channels are disabled

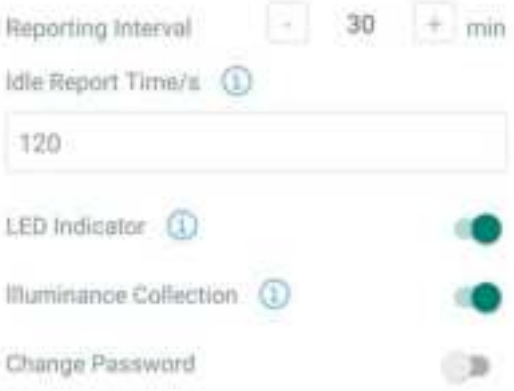
Note:

For -868M model, default frequency is EU868;

For -915M model, default frequency is AU915.

3.3 General Settings

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



Parameters	Description
Reporting Interval	The interval of reporting PIR, light status and battery level to network server. Default: 30 mins, Range: 1 - 1080 mins Note: WS202 will also report “triggered” status of PIR sensor immediately when it detects motions.
Idle Time	When the PIR sensor does not detect motion for a period of Idle Time,

Reporting/s	device will report “not triggered” status. Default: 120 s
LED Indicator	Enable or disable the light indicating in chapter 2.4. Note: The indicator of reset button is not allowed to disable.
Illuminance Collection	Enable or disable illuminance collection. When this is disabled, reporting interval will be changed to 1080 mins automatically.
Change Password	Change the password for ToolBox App to write this device.

3.4 Threshold Settings

When illuminance collection is enabled, users can define the Bright or Dark state via detection data of light sensor in threshold settings. Besides, when the PIR sensor is triggered and light status meets the threshold, WS202 will send alarms immediately. Otherwise, it will not send data right away.

3.5 LoRa D2D Settings

LoRa D2D protocol is developed by Milesight and used for setting up transmission among Milesight devices without gateway. When the LoRa D2D setting is enabled, WS202 can work as a LoRa D2D controller to send control commands to trigger LoRa D2D agent devices.

1. Enable LoRa D2D feature.
2. Define a unique LoRa D2D key which is the same as LoRa D2D agent devices, then s elect the frequency and spreading factor. (Default LoRa D2D Key: 5572404C696E6B4C6F5 2613230313823)

3. Enable one of WS202 status and configure a 2-byte hexadecimal command (This command is pre-defined in LoRa D2D agent device). When WS202 detects this status, it will send the control command to corresponding LoRa D2D agent devices.

Note: When this feature is enabled, the device will not send data to LoRaWAN® network server if WS202 PIR or light status changes.

3.6 Maintenance

3.6.1 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 upgrade.

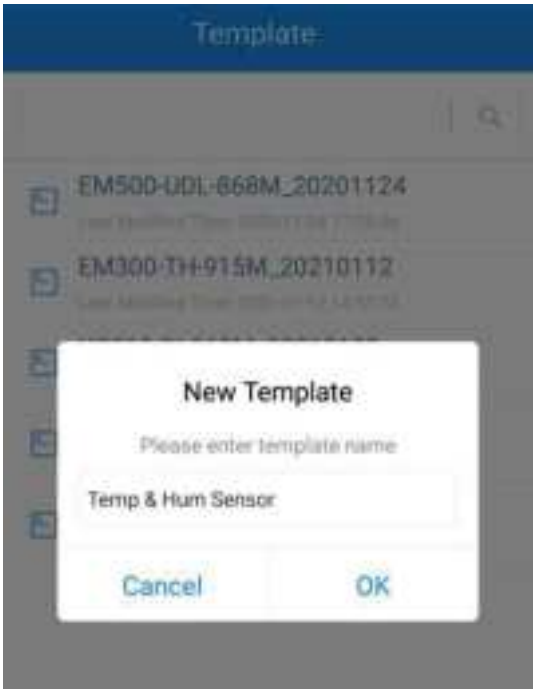
2) Only Android version ToolBox supports the upgrade feature.

3.6.2 Backup

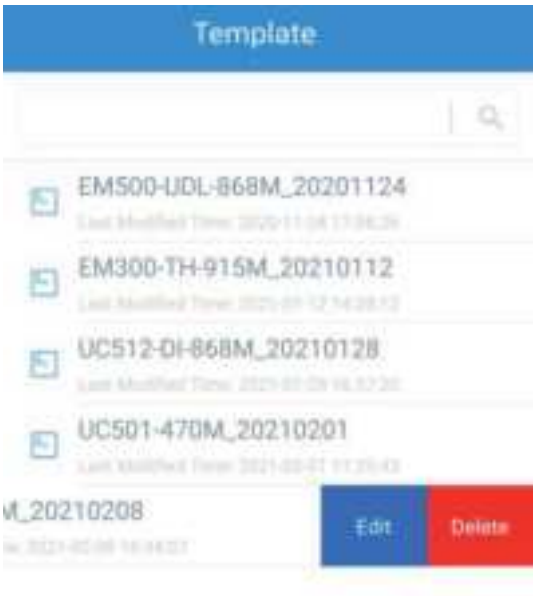
WS202 supports configuration backup for easy and quick device configuration in bulk. Backup is allowed only for devices with the same model and LoRa frequency band.

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 to the left to edit or delete the template. Click the template to edit the configurations.



3.6.3 Reset to Factory Default

Please select one of the following methods to reset device:

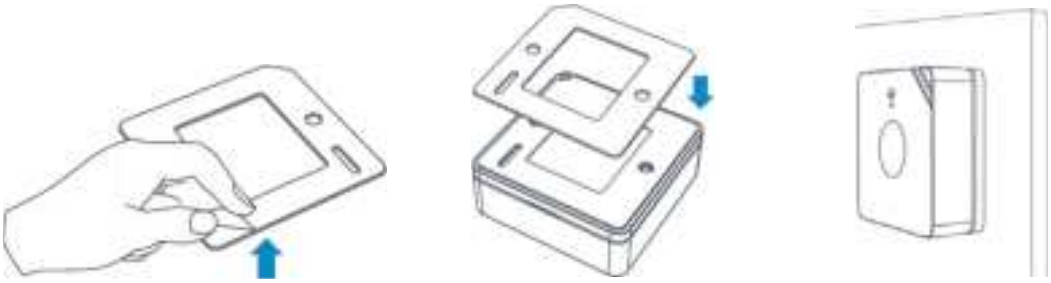
Via Hardware: Hold on the reset button for more than 10s. After reset complete, the indicator

will blink in green twice, then device will reboot.
Via ToolBox App: Go to **Device -> Maintenance** to tap "Reset", then attach smartphone with NFC area to device to complete reset.

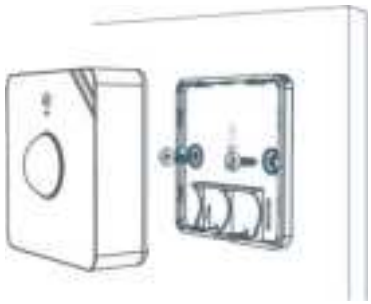
4. Installation

3M Tapes Fix:

Paste 3M tape to the back of the device, then tear the other side and place it on a flat surface.



Screw Fix:
Remove the back cover of the device, screw the wall plugs into the wall and fix the cover with scr ews on it, then install back the device.



Note:
1. Adjust the installation direction according to detection area requirement.
2. WS202 can be mounted on a wall or ceiling. It's recommended to install at 1.5~2.5m from the floor.
3. Ensure the detection area does not have moving objects like waving trees and fans.
4. Ensure the detection area is not blocked by curtains or barriers.

5. Device Payload

All data are based on the following format (HEX):

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, you can find them at https://github.com/Milesight-IoT/SensorDecoders.

5.1 Basic Information

WS202 reports basic information of the device whenever it joins 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 ff0a0101 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)	0101 (V1.1)	ff	0f (Device Type)	00 (Class A)

5.2 Sensor Data

WS202 reports sensor data and battery level according to reporting interval (30 mins by default) or when PIR or light status changes.

Channel	Type	Description
01	75 (Battery Level)	UINT8, Unit: %
03	00 (PIR Status)	01: PIR is triggered 00: PIR is not triggered
04	00 (Light Status)	01: Bright 00: Dark

Example:

01 75 64 03 00 01 04 00 01					
Channel	**Type**	**Value**	**Channel**	**Type**	**Value**
01	75 (Battery)	64 => 100%	03	00 (PIR Status)	01=> PIR is triggered
Channel	**Type**	**Value**			
04	00 (Light Status)	01=> Bright			

5.3 Downlink Commands

WS202 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-