



Radar Distance / Level Sensor
EM410-RDL (LoRaWAN® Version)
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. Default password is 123456.
- The device is not intended to be used as a reference sensor, and Milesight won't should responsibility for any damage which may result from inaccurate readings.
- 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.
- The device must never be subjected to shocks or impacts.

Revision History

Release Date	Version	Revision Content
Sept. 12, 2024	V1.0	Initial version
Nov. 29, 2024	V1.1	Modify Antenna installation steps and Mounting Bracket Appearance.

Release Date	Version	Revision Content
Jan. 16, 2025	V1.2	Add Tank Mode.

Chapter 2. Product Introduction

Overview

EM410-RDL is a non-contact Radar Distance/Level Sensor that adopts Millimeter Wave Radar technology. By measuring millimeter-wave signals at higher frequencies, it provides more stable performance over longer distances, and is less affected by environmental conditions. It can detect the distance between the sensor and liquid of various types, unaffected by temperature, dust, condensate etc. With IP68 waterproof and sealed enclosure, it can withstand the worst environment, while maintaining the measurement accuracy, and does not require routine maintenance.

The LoRaWAN[®] version can be integrated with Milesight LoRaWAN[®] gateway and Milesight Development Platform, enabling remote and visual management of all sensor data.

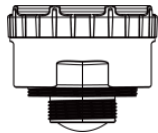
EM410-RDL can be used in sewers, rivers, impounding reservoir, storage tanks and high-salt mist environments (including seawater, high-concentration brine), and other locations that require to measure distance and level.

Features

- 8° Radar beam angle can be focused on the target fluid, enabling accurate measurement of liquid level
- Wide measuring range of 0.3m to 12m with small blind zone
- Not affected by dust, condensate, temperature, acoustic noise, etc
- Non-invasive liquid level monitoring, can detect hazardous or non-hazardous liquids
- External antenna or internal antenna versions are optional for various applications
- Built-in 3-axis accelerometer sensor to monitor device tilt status
- Support to check radar-echo curve and one-click diagnostic to calibrate the distance, ensuring the accurate measurement under different environments
- Support blind zone alarm when the ranging results are within the blind zone
- Adopt PVDF material, offering excellent corrosion resistance, wear resistance and compressive strength for harsh environments
- IP68 waterproof design, resistant in fresh water to a maximum depth of 1m for up to 48 hours
- Thread design for common tank installation without extra accessories needed
- Store up to 2000 historical records locally and support retransmission to prevent data loss
- Easy configuration via NFC and Bluetooth
- Support management and OTA upgrade via Milesight Development Platform
- Function well with standard LoRaWAN[®] gateways and network servers

Chapter 3. Hardware Introduction

Packing List



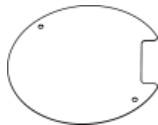
1 × EM410-RDL Sensor



1 × Mounting Bracket



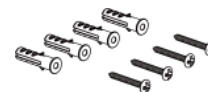
1 × Bubble Level



1 × Waterproof Tape



1 × G1^{1/2} Nut



4 × Wall Mount Screw Kits



1 × O-ring Seal



1 × ER34615 Li-SoCl₂ Battery



1 × SMB Magnetic Antenna with Screw Kits (External Antenna Version Only)



1 × Antenna Cable Gland (External Antenna Version Only)



1 × Quick Guide



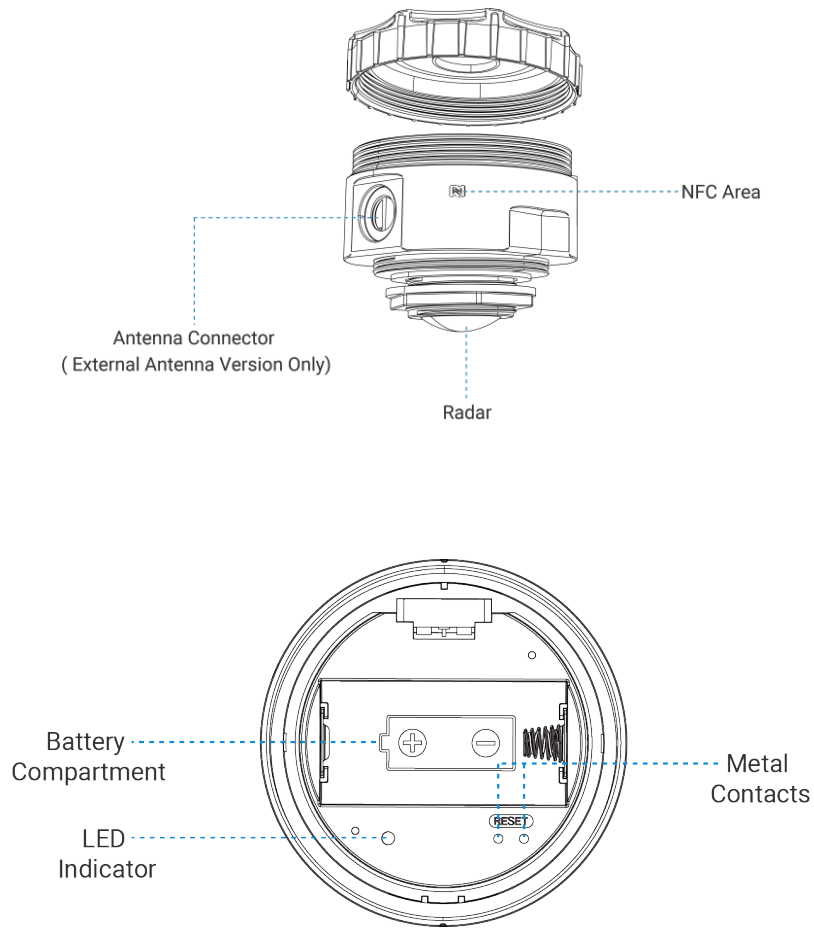
1 × Warranty Card



Note:

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

Hardware Overview

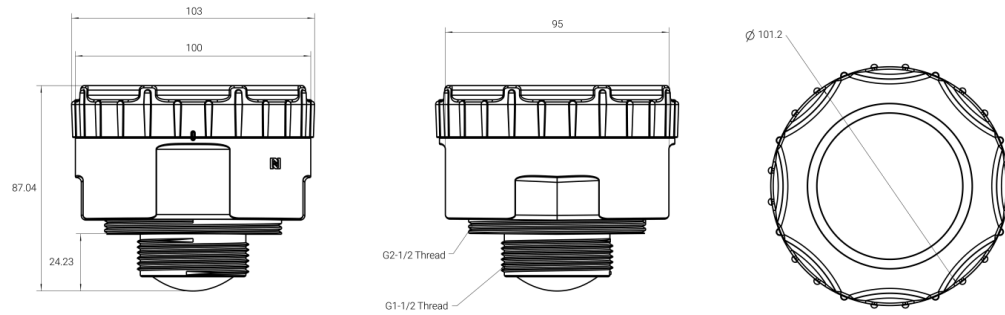


LED Indicator Descriptions

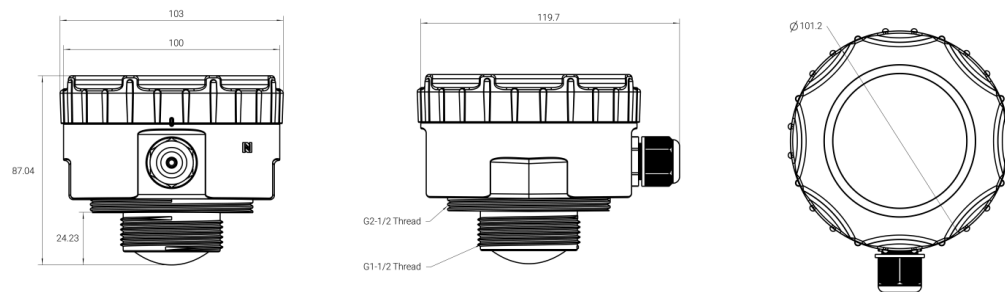
Function	Action	LED Indicator
Power On	Install the New Battery	Lights up for 3s
Power Off	Remove Battery	On → Off
Reboot	Create short circuit with the two metal contacts for over 3s	Blinks Slowly
Reset to Factory Default	Create short circuit with the two metal contacts for over 10s	Blinks quickly
Check On/Off Status	Create short circuit with the two metal contacts within 3s	Light On: device is on.
		Light Off: device is off.

Dimensions(mm)

Internal Antenna Version:



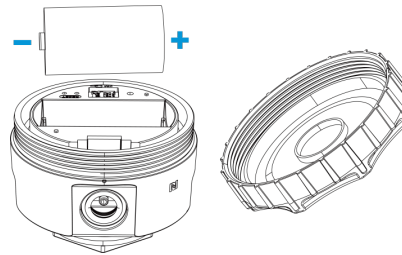
External Antenna Version:



Chapter 4. Accessories Installation

Battery Installation

Unscrew the top cover counterclockwise, install the batteries according the following picture, the device will turn on automatically and the LED indicator will turn on for 3s.

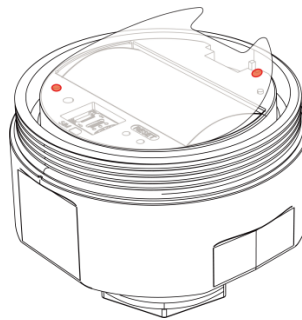


Note:

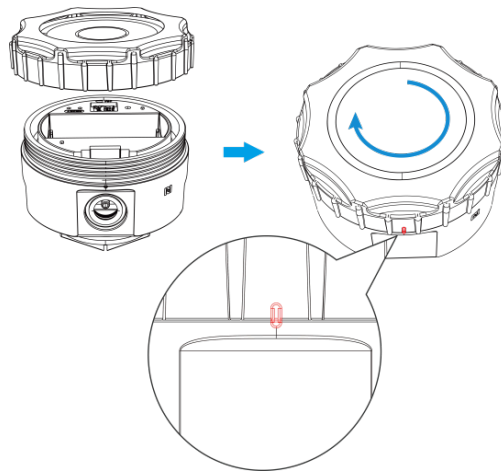
- The device can only be powered by ER34615 Li-SoCl₂ battery. The alkaline battery is not supported.
- The battery should be removed from the device if it is not used for an extended period.
- Ensure all replacing batteries are newest; otherwise, it may shorten battery life or cause inaccurate power calculations.

Waterproof Cover Fixed

Step 1: Attach the waterproof cover to the device with aligning the two red dots as shown in the diagram, and press waterproof cover firmly with your hand.

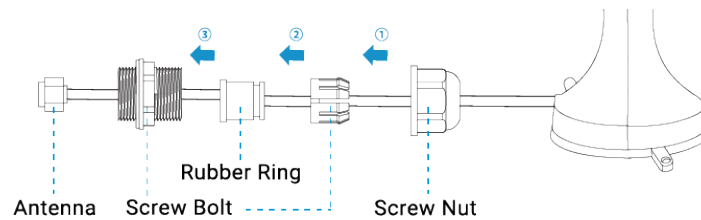


Step 2: Screw the top cover clockwise until the edge marks are aligned.

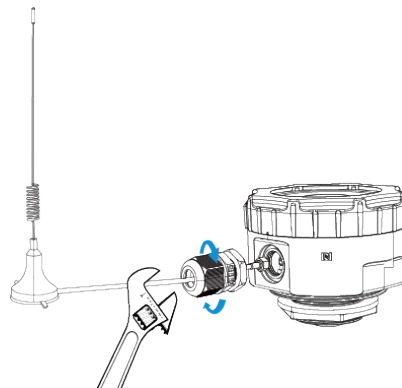


Antenna Installation (External Antenna Version Only)

Step 1: Install the waterproof connector as shown in the diagram.



Step 2: And then connect the antenna to antenna connector of the device and use an adjustable wrench to tighten the waterproof connector.



Chapter 5. Device Installation

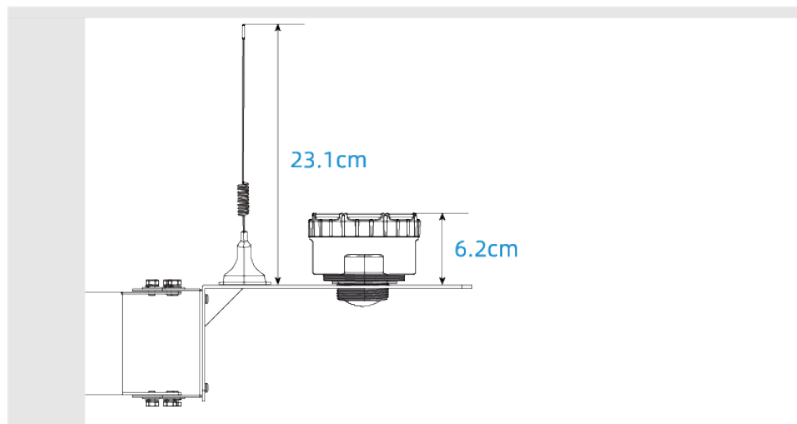
Installation Location

1. The installation location of the device should avoid strong vibrations, direct sunlight, and exposure to rain or snow.
2. Do not place the device near objects that emit intense heat, strong electromagnetic fields, or radioactive materials.

Bracket Installation

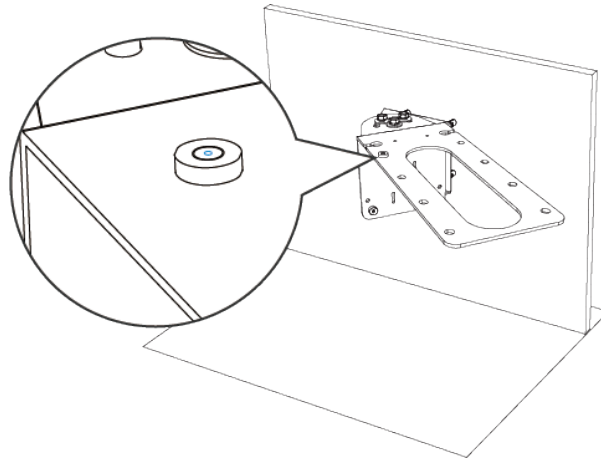
Step 1: Locate Position

- Avoid placing the device near any metal objects, water outlets, stairs and other obstacles;
- Please consider the height of the equipment and other factors (such as the height of antenna, the thickness of the manhole cover) to ensure that the equipment does not interfere with normal usage after installation.



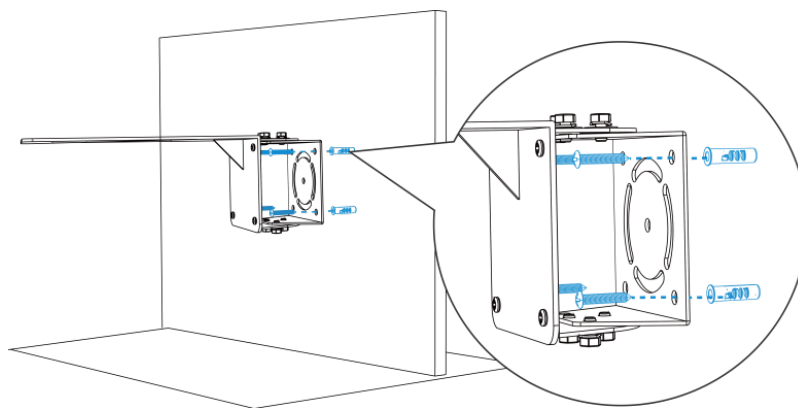
Step 2: Adjust Level

Attach the bubble level to the bracket surface to ensure the bracket is parallel.



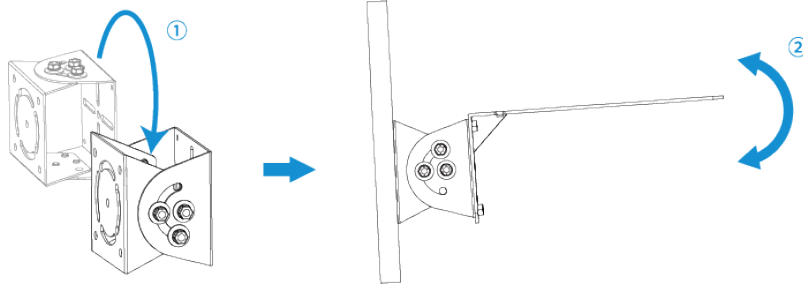
Step 3: Fix Mounting Bracket

Drill 4 holes according to the mounting bracket holes. Fix the wall plugs to the wall holes, then fix the mounting bracket to the wall plugs via mounting screws.



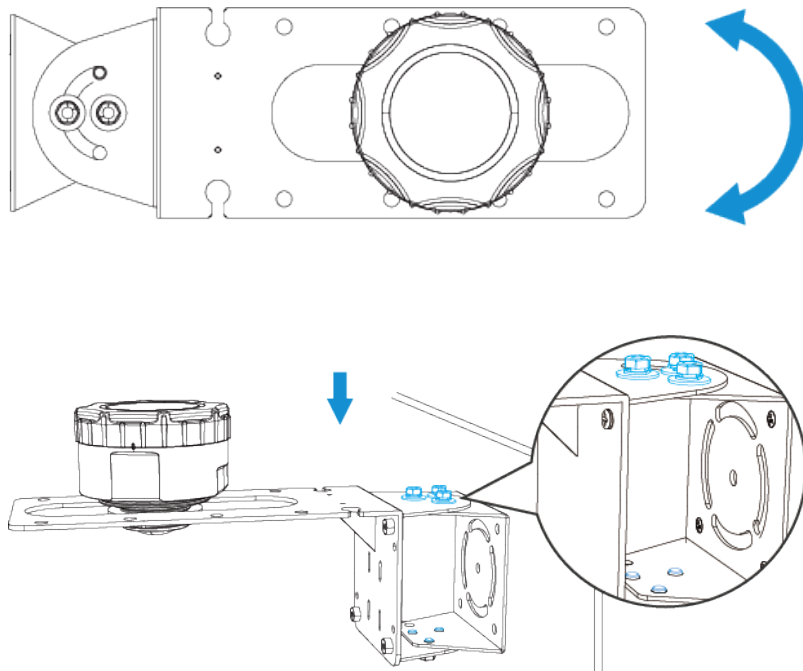
Note:

If the wall is inclined, you can first rotate the bracket assembly 90° clockwise or counterclockwise, and then adjust the horizontal plane up or down as needed based on the actual situation.



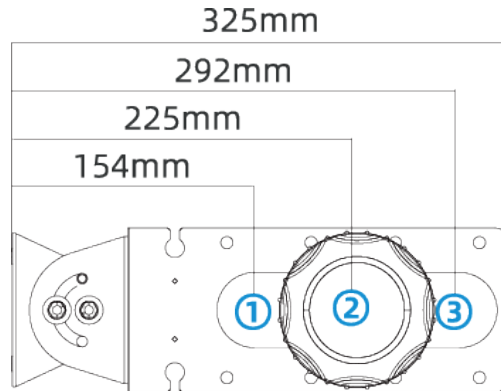
Step 4: Adjust Mounting Bracket Angle

Loosen the two nuts on both the upper and lower tracks of the bracket, adjust the bracket to the appropriate angle, then use a wrench to tighten all six nuts with flat washers.



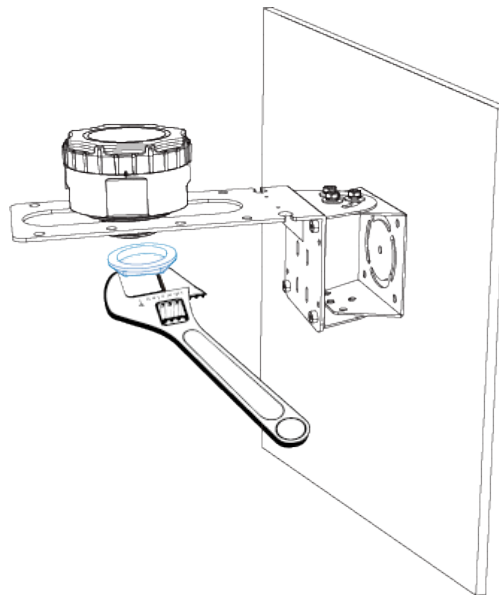
Step 5: Select the device installation location on the bracket according to the installation height.

Installation Height	Recommend Location
1 ~ 2m	1
2.1 ~ 3m	2
3.1 ~ 6m	3



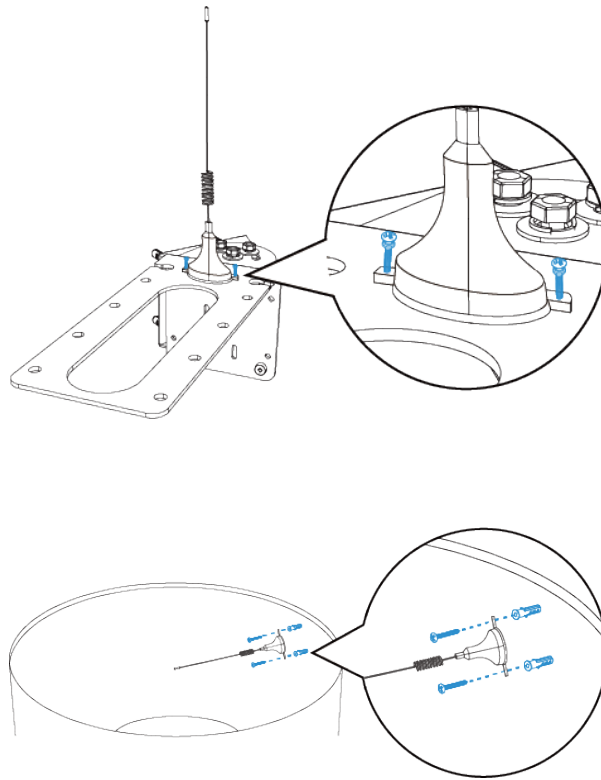
Step 6: Fix Device

Place the device onto the mounting bracket, adjust it to an appropriate position, and then tighten it with G1^{1/2} nut. The torque for tightening the G1^{1/2} nut with a wrench should not exceed 4 N·m.



Step 7: Fix Antenna (External Antenna Version Only)

The antenna can be secured to the mounting bracket with screws, or it can be fastened to the sewer wall with bolts and screws. Additionally, it can be attached to any metal surface using the magnetic base at the bottom of the antenna.



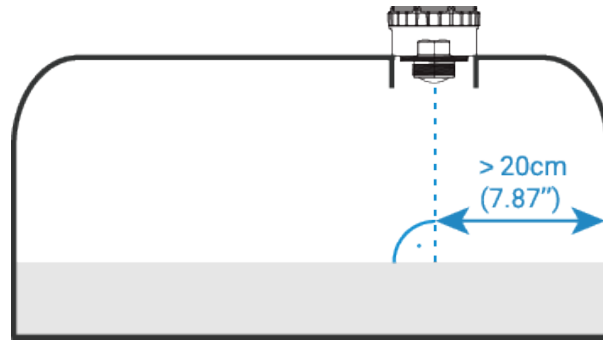
Step 8: After installation, check the tilt status in the Toolbox application and perform the following installation calibration.

1. [Relative Initial Surface](#)
2. [Blind Zone Calibration](#)

Thread Installation

Step 1: Locate the Device Installation Position

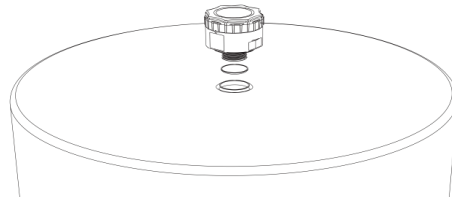
1. Place it away from the tank wall more than 20cm;
2. Perpendicular to the measured liquid and with no obstacles between the device and the measured liquid.



Step 2: Fix Device

The device has G1 $\frac{1}{2}$ " thread opening to allow it to be screwed into an existing applicable thread opening of a tank. An O-ring is supplied and should be used to ensure a watertight seal.

When tanks' mounting hole is unavailable or where it is undesirable to cut a mounting hole in the tank, an adapter can be installed on the top surface of the tank and the sensor can be mounted on this adapter. Adapters for different sized need to be purchased separately. The device should be threaded and screwed onto the adapter firmly to make a good seal. The O-ring shown below seals the non-invasive adapter to the bottom of the sensor's main enclosure.



Step 3: After installation, check the tilt status in the Toolbox application and perform the following installation calibration.

1. [Relative Initial Surface](#)
2. [Blind Zone Calibration](#)

Chapter 6. Operation Guide

Access the Sensor

After the device is powered on, it can be configured via Bluetooth or NFC. Bluetooth is recommended for the first time installation.

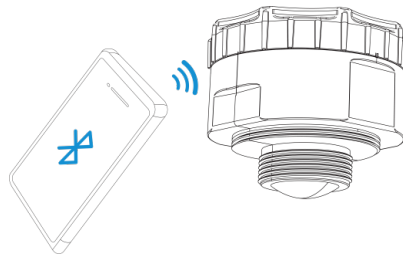
Access the Sensor via Bluetooth

1. Download and install "Milesight ToolBox" App from Google Play or Apple Store on an Bluetooth-supported smartphone.
2. Enable Bluetooth and location functions on the smartphone.
3. Launch Milesight ToolBox, and select the default mode as Bluetooth.
4. Click  to scan the devices around and select the target device to connect. The default Bluetooth name is model -XXXXXX (5th to 11st of device SN) and the default device password is 123456.
5. After connected, the basic information, data, and settings of the device will be shown on the Milesight ToolBox App if it's recognized successfully.
6. Adjust the settings on the App, then click **Write** to write the settings. After writing, reread the device to check if the configuration is written well.



Note:

- The Bluetooth connection will be terminated if there's no data interaction within 3 minutes. Please connect again.
- The device can connect to only one phone via Bluetooth. For example, if the device is connected to smart phone A via Bluetooth, the connection will be terminated after it is connected to smartphone B.
- The default device password is 123456. Please change a new password for security.



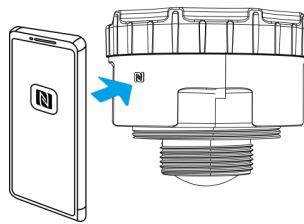
Access the Sensor via NFC

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.



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.

Parameter	Description
	 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 re-send data once.
Join Type	OTAA and ABP mode are available.  Note: It's necessary to select OTAA mode if connecting device to Mile-sight Development Platform.
Application Key	Appkey for OTAA mode, default value: "Device EUI" + "Device EUI" (since Q4 of 2025). Example: 24e124123456789024e1241234567890  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

Parameter	Description
	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 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.  Note: 1. Only OTAA mode supports rejoin mode. 2. The actual sending number is Set the number of packets sent +1.
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. 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.

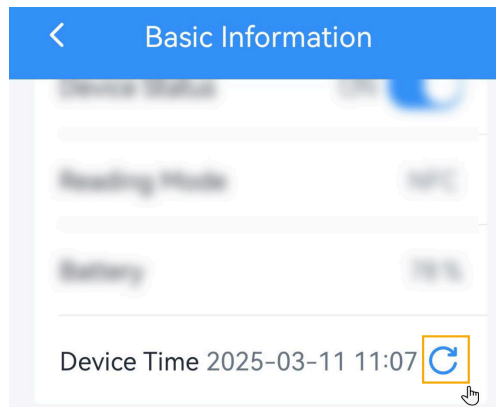
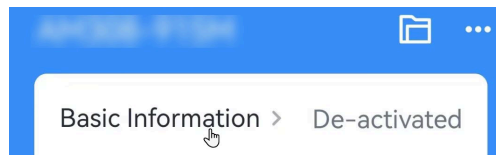
Parameter	Description
RX2 Frequency	RX2 frequency to receive downlinks. Unit: Hz

Time Synchronization

This section describes how to sync the time of the device.

Sync via ToolBox App

After reading the device via Milesight ToolBox App, sync the device time with time zone from the smart phone.



Sync via Network Server

This requires to ensure the LoRaWAN[®] network server supports device time synchronization feature. Example: Milesight gateway embedded NS.

1. Set the LoRaWAN[®] version of the device to V1.0.3.
2. Connect the device to the network server. After joining the network, the device will send a DeviceTimeReq MAC command to enquire the time from network server.

**Note:**

- This only supports to get the time but not time zone. The time zone can be configured by ToolBox App or downlink command.
- The device will send the DeviceTimeReq command every 5 days since the last sync.

General Setting

General settings include the basic parameters of the device.

Reporting Interval(min)

30

Scenario Mode ⓘ

Rainwater Well ▼

Measurement Range(m) ⓘ

10

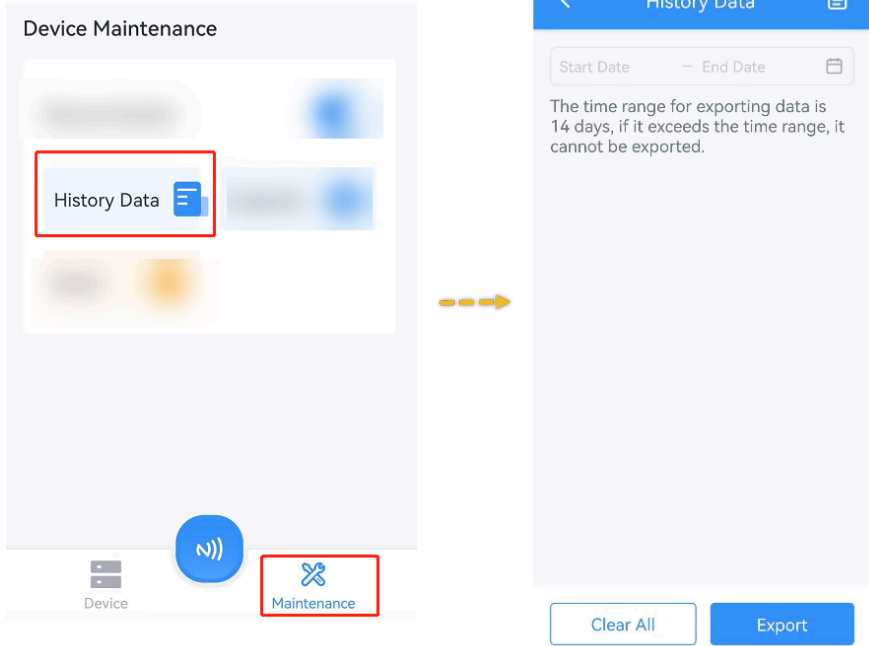
Tilt & Distance Switch ⓘ ☐

Data Storage ⓘ ☒

Data Retransmission ⓘ ☐

Change Password ☐

Parameter	Description
Reporting Interval	Reporting interval of transmitting data to server. Default: 1440 minutes, range: 1~1440 minutes.
Scenario Mode	General: Suitable for calm liquid surfaces Rainwater Well: Suitable for rainwater well

Parameter	Description
	Wastewater Well: Suitable for wastewater well Tank: Suitable for liquid storage tank scenarios  Note: When you use Tank mode, it will measure the height from the liquid surface to the bottom. When you use other modes, it will measure the height from the device to the liquid surface.
Measurement Range	The maximum distance between target surfaces and device.
Tank Depth	The maximum distance between the device and bottom of the tank.
Tilt & Distance Switch	When detecting that the offset angle is greater than 15 degrees, turn off the distance measuring function.
Data Storage	Disable or enable to store periodic report data locally. The stored data can be exported as CSV format file and saved to smartphone via ToolBox. 

Parameter	Description
	 Note: 1. It is necessary to sync the time to ensure the data is stored in correct time. 2. The device will still store the data even the network status is de-activated. 3. ToolBox App can only export the last 14 days' data at most.
Data Retransmission	Disable or enable data retransmission. When the device detects the network status is de-activated via Rejoin Mode, the device will record a data lost time point and re-transmit the lost data after device re-connects to the network.  Note: 1. This setting only takes effect when Data Storage is enabled. 2. If the device is rebooted or re-power when data retransmission is not completed, the device will re-send all retransmission data again after device is reconnected to the network. 3. If the network is disconnected again during data retransmission, it will only send the latest disconnected data. 4. The default report data retransmission interval is 600s, this can be changed via downlink command. 5. The reported format of retransmission data will include timestamps and is different from periodic report data. 6. This setting will increase the uplink frequencies and shorten the battery life.
Change Password	Change the password for ToolBox App to access this device.

Calibration Settings

This section describes the steps to calibrate the device to get accurate readings.

**Important:**

Please perform the calibration during on-site device installation; otherwise, the calibration may not take effect.

Numerical Calibration

Add the calibration value to the raw value, the device will display and report the final value.

Distance 

Current Value(m)	Final Value(m)
2.618	2.818

Calibration Value(m)

0.2

Relative Initial Surface

Click **Setting** to read the triaxial angle relative to the current surface, to adjust the current device position as "Normal".

Relative Initial Surface 

[Setting](#) [Clear](#)

The triaxial angle relative to the initial face is (0.06°, 0.28°, -89.76°)

Measure Outlier Calibration

Users can define either outlier range or outlier value. When the device distance value exceeds the outlier range (or range) compared to the previous value, the device will measure the distance once again. Outlier Value=Max.Range*Outlier Range.

Measure Outlier Calibration ⓘ
☒

Maximum Range: 6 m

Outlier Range(%) ⓘ

Outlier Value(m) ⓘ

Blind Zone Calibration

If calibrated, an alarm packet will be reported once if the liquid level distance falls within the blind zone. Please ensure there is not any objects within the blind zone when calibration.

Blind Zone Calibration ⓘ

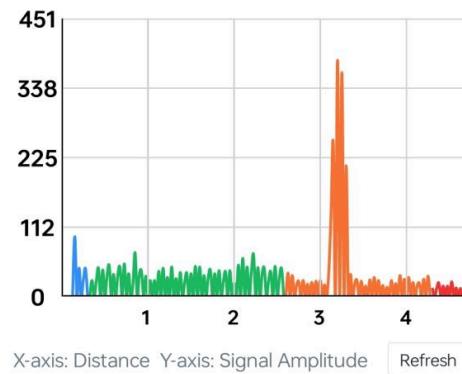
One-click Diagnosis

This only appears when connecting device via Bluetooth mode. When the collected distance is not consistent with the actual situation, you can use this function.

One-click Diagnosis

Step 1: Click to show the current Radar Echo Curve. If the collected distance has only one value, it means the nearest signal amplitude is equal to the strongest signal.

Radar Echo Curve Collection Time:09-02 16:56:14

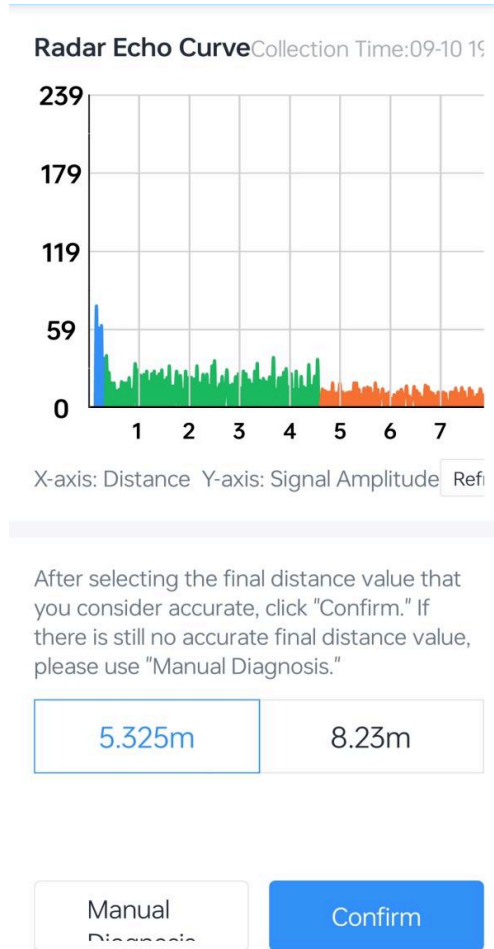


After selecting the final distance value that you consider accurate, click "Confirm." If there is still no accurate final distance value, please use "Manual Diagnosis."

3.24m

Manual Diagnosis Confirm

If two values appear, it means one represents the nearest signal amplitude and another represents the strongest signal.



Step 2: Choose a collected distance value that is closer to the actual distance, and click Confirm to finish configuration or click Refresh to get a new collected distance.

Step 3: If the distance value is still not accurate, click **Manual Diagnosis** to set the relevant parameters.

Final Distance 2.937m

Radar Echo Signal Quality ⓘ

10

Algorithm Threshold Sensitivity ⓘ

0.8

Peak Sorting ⓘ

Strongest Peak ▼

Parameters	Description
Radar Echo Signal Quality	If the liquid level has significant foam, numerous foreign objects, or the measurement signal is unstable and the peak is not clear, adjust this value upwards.  Note: The larger the value, the greater the power consumption.
Algorithm Threshold Sensitivity	The device requires only one target to measure. When a large number of targets are detected, the sensitivity can be appropriately decreased; when no targets are detected, the sensitivity can be appropriately increased.
Peak Sorting	According to the radar echo curve and the actual scene situation, the peak with the nearest signal amplitude or the strongest peak can be selected as the effective target.



Note:

If appear "Disabled", reset **Relative Initial Surface** or disable **Tilt & Distance Switch**.

Step 4: When adjusting parameters, click [Refresh Final Distance](#) to confirm the final distance value. Once you've obtain the desired final distance value, click the arrow on the upper left corner to return to the home page.

Threshold Settings

Threshold Alarm

When current value is over or below the threshold value, the device will report a threshold alarm packet once instantly. Only when the threshold alarm is dismissed and re-triggered, the device will send the threshold alarm again.

Parameter	Description
Collecting Interval	The interval to collect sensor data. This interval should be less than reporting interval.
Alarm Reporting Times	Alarm packet report times after threshold alarm triggers.
Alarm Dismiss Report	After enabled, when the collected value is not exceeding the threshold range, a packet including current sensor value will be reported to indicate alarm dismiss.

Distance/Liquid Level Shift Threshold

The device will report an alarm packet when the absolute value of the difference between the current value and the last collected value exceeds the threshold value.

Distance Shifts Threshold ⓘ

Distance Shifts Over(m)

Maintenance

Upgrade

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

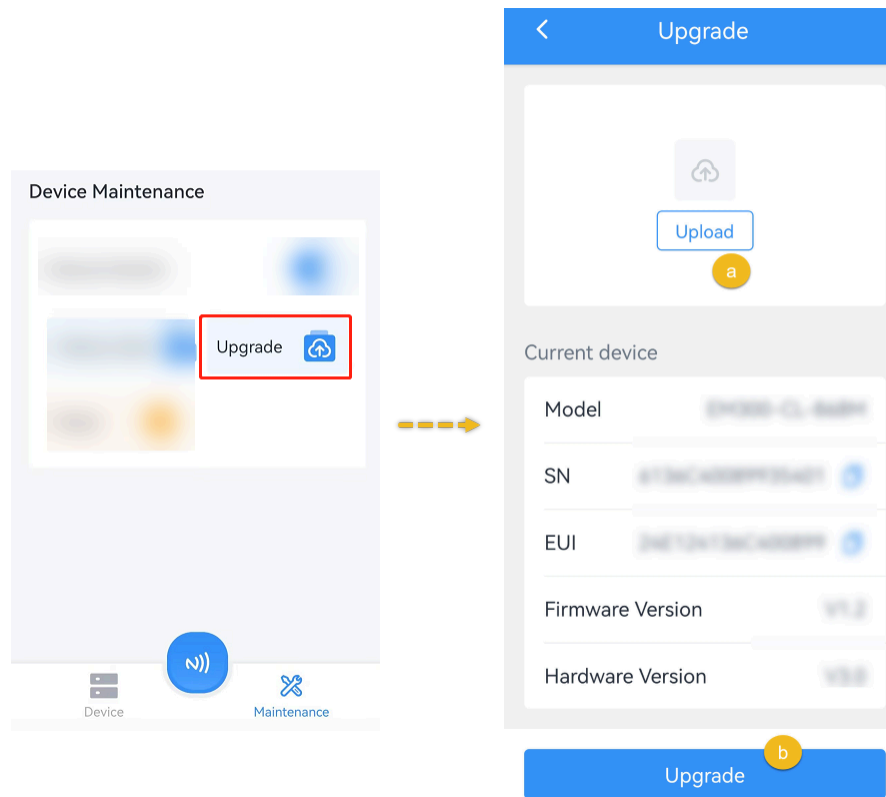
**CAUTION:**

This device only supports upgrading via Bluetooth mode.

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:**

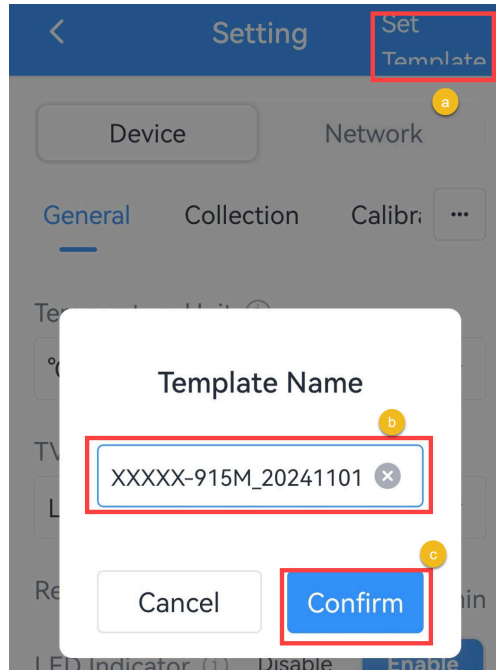
Operation on ToolBox is not supported during an upgrade.



Backup and Restore

This section describes how to backup the configuration of a device and import to other devices.

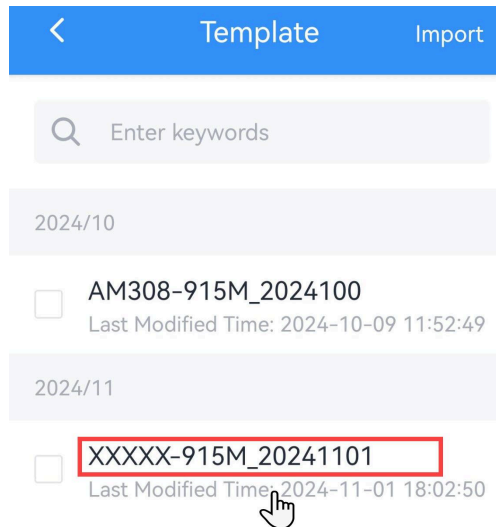
1. Read a device configuration via ToolBox App.
2. Edit the configuration as required, click **Set Template** to save current configuration as a template to the ToolBox App.



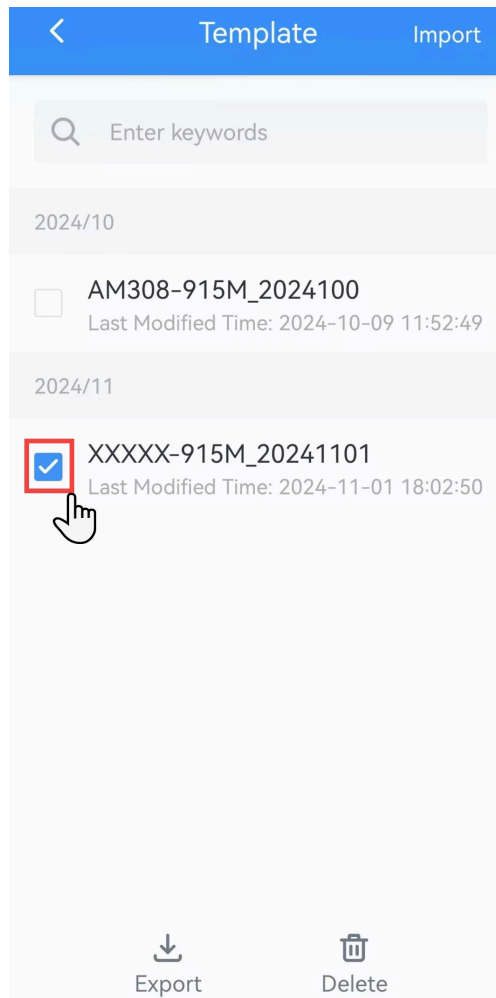
3. Go to **Device >Template** page of ToolBox App.



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



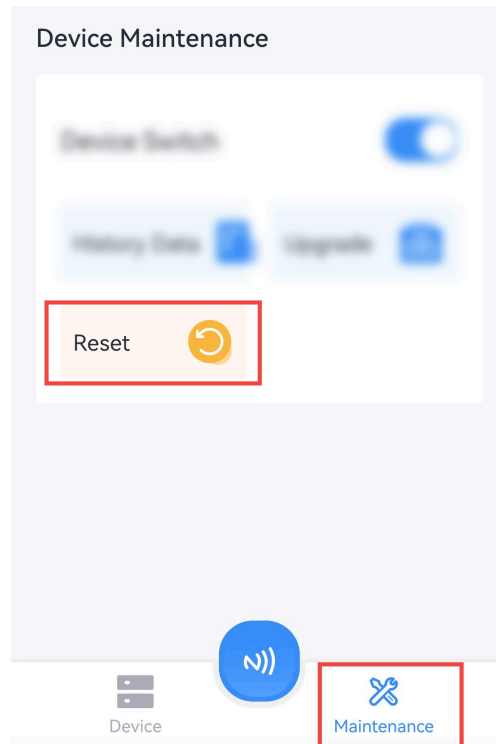
5 (Optional). Check the box of the target template, click **Export** to save this template as JSON format file to the smartphone, click **Delete** to delete this template from ToolBox App.



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. 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.

Basic Information

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

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
TSL Version	ff	ff	2	Example: 01 00=>V1.0
Reset Report	ff	fe	1	ff, report after reset to factory default

Example:

ff0bff ff0101 ff166862e21141780013 ff090100 ff0a0101 ff0f00 ffff0100		
Channel	Type	Value
ff	0b	ff

ff0bff ff0101 ff166862e21141780013 ff090100 ff0a0101 ff0f00 ffff0100		
Channel	Type	Value
ff	01	Protocol version: 01=V1
ff	16	SN: 6862e21141780013
ff	09	Hardware version: 0100=V1.0
ff	0a	Software version: 0101=V1.1
ff	0f	00: Class A
ff	ff	TSL version: 0100=V1.0

Periodic Report

Item	Channel	Type	Byte	Description
Battery Level	01	75	1	UINT8, Unit: %
Distance/Liquid Level	04	82	2	INT16, Unit: mm
Device Position	05	00	1	00: Normal 01: Tilt (horizontal offset angle $\geq 15^\circ$)
Radar Signal Strength	06	c7	2	INT16/100, Unit: dBm

Example:

017562 0482aa0c 06c70303 050000		
Channel	Type	Value
01	75	Battery: 62=>98%
04	82	Distance/Liquid Level: aa0c => 0caa =>3242 mm
06	c7	Radar Signal Strength:03 03=> 771/100=7.71dBm
05	00	Device Position: 00 = Normal

Alarm Report

Item	Channel	Type	Byte	Description
Distance/Liquid Level Alarm	84	82	3	Byte 1-2: Distance/Liquid Level, INT16, Unit: mm Byte 3: 01-Alarm; 00-Alarm dismiss
Distance/Liquid Level Shifts Threshold	94	82	5	Byte 1-2: Distance/Liquid Level, INT16, Unit: mm Byte 3-4: Distance/Liquid Level Shifts, INT16, Unit: mm Byte 5: 02
Blind Zone	b4	82	3	Byte 1-2: Distance, INT16, Unit: mm Byte 3: 00-Alarm dismiss 01-Alarm No target within 30cm, report distance as fffd Have target within 30cm, report the distance 02-Cannot collect the target, report distance as fffd 03-Sensor Abnormal, report distance as ffff

Example:

1. Threshold Alarm: report when distance/liquid level reaches the threshold.

8482 c827 01 9482 c827850c 02		
Channel	Type	Value
84	82	Distance/Liquid Level: c8 27 => 27 c8 =10184mm = 10.184m Alarm Status: 01= Alarm
94	82	Distance/Liquid Level Shifts Threshold: c8 27 => 27 c8 =10184mm = 10.184m 85 0c => 0c 85=3205mm = 3.205m

8482 c827 01 9482 c827850c 02		
Channel	Type	Value
		02=Alarm

2. Blind Zone Alarm : report when the target value reaches the blind zone.

b482 ac00 01		
Channel	Type	Value
b4	82	ac 00 => 00 ac = 172mm = 0.172m 01=calibrated distance

Historical Data

Channel	Type	Byte	Description
20	ce	11	Byte 1-4: Unix Timestamp Byte 5-6: Distance/Liquid Level, INT16, Unit: mm Byte 7-8: Temperature, INT16*0.1, Unit: °C Byte 9-10: Distance/Liquid Level Shifts, INT16, Unit: mm Byte 11: Alarm Status Bit0: Threshold Alarm Bit1: Threshold Alarm Dismiss Bit2: Blind Zone Alarm Bit3: Blind Zone Alarm Dismiss Bit4: Distance/Liquid Level Shifts Threshold Alarm Bit5: Device Position Bit6-7: 00

Example:

20ce 0d755b63 ac0c be00 0000 20			
Channel	Type	Time Stamp	Value
20	ce	0d 75 5b 63 => 63 5b 75 0d=1666938125s	Distance/Liquid Level: ac0c => 0cac =3244mm=3.244m Temperature: be00 => 00be = 190*0.1=19°C Distance shifts: 0000 Alarm Status: 20=0010 0000=>Tilt

Downlink Command

This device supports downlink commands to configure the device. Application port is 85 by default.

General Setting

Item	Channel	Type	Byte	Description
Reboot	ff	10	1	ff
UTC Time Zone	ff	bd	2	INT16/60
Clear History Data	ff	27	1	01
Query Device Status	ff	28	1	01
Data Storage	ff	68	1	00: Disable, 01: Enable
Data Retransmission	ff	69	1	00: Disable, 01: Enable
Data Retransmission Interval	ff	6a	3	Byte 1: 00 Byte 2-3: UINT16, Unit: s, Range: 30~1200, Default: 600
Reporting Interval	ff	8e	3	Byte 1: 00 Byte 2-3: Reporting Interval, UINT16, Unit: min, Range: 1~1440
Scenario Mode	f9	12	1	00 = General Mode; 01 = Rainwater Well Mode; 02 = Wastewater Well Mode

Item	Channel	Type	Byte	Description
				03 = Tank Mode
Measurement Range	ff	1b	5	Byte 1: 00 = General Mode; 01 = Rainwater Well Mode; 02 = Wastewater Well Mode; 03 = Tank Mode Byte 2-3: 0000 Byte 4-5: Max. Measuring Range, UINT16, Unit: mm
Tilt & Distance Switch	ff	3e	1	01 = Enable; 00 = Disable

Example:

1. Reboot the device.

ff10ff

2. Set time zone as UTC-4.

ffbd10ff		
Channel	Type	Value
ff	bd	10 ff => ff 10 = -240/60=-4

3. Set report interval as 20 minutes.

ff8e001400		
Channel	Type	Value
ff	8e	1400=>0014=20minutes

4. Set the data retransmission interval as 1200s.

ff6a00b004		
Channel	Type	Value
ff	6a	b004=>04b0=1200s

5. Set the device as Wastewater Well mode.

f912 02		
Channel	Type	Description
f9	12	02 = Wastewater Well Mode

Calibration Settings

Item	Channel	Type	Byte	Description
Device Calibration	ff	2a	1	01-Blind Zone Calibration
Distance Calibration	ff	ab	3	Byte 1: 01-Enable; 00-Disable Byte 2-3: Calibration Value, INT16, Unit: mm
Recollecting of Measure Out-lier Calibration	ff	1c	2	Byte 1: Recollecting Times, UINT 8, Range: 1~3 Byte 2: Recollecting Interval, UNIT 8, Unit: s, Range: 1~10
Radar Echo Signal Quality	f9	14	2	INT16, Range: -10~35
Algorithm Threshold Sensitivity	f9	15	2	INT16/10, Range: 0.1~1
Peak Sorting	f9	16	1	00-Nearest Peak; 01-Strongest Peak

Example:

Select the strongest peak as the effective target.

f91601		
Channel	Type	Description
f9	16	01 = Strongest Peak

Threshold Alarm Settings

Item	Channel	Type	Byte	Description
Collecting Interval	f9	39	2	Unit: min, Range: 1~1440
Threshold Alarm	ff	06	9	Byte 1: Bit2~Bit0: 000-disable 001-below 010-over 011-within 100-below or over 101-Distance shifts over Bit5~Bit3: 001-Distance threshold alarm 010-Distance shifts threshold alarm 011-Tank mode threshold alarm 100-Tank mode threshold alarm Bit6: 0 Bit7: 0-disable threshold dismiss report 1-enable threshold dismiss report Byte 2-3: Min. Value, INT16, Unit: mm Byte 4-5: Max. Value or distance shifts value, INT16, Unit: mm Byte 6-9: 00000000
Alarm Reporting Times	ff	f2	2	UINT16, Range: 1~1000, Default: 1

Example:

When the distance is below 1m or over 10m, the sensor will send threshold alarm.

ff06 8c e803 1027 00000000		
Channel	Type	Description
ff	06	8c=10 001 100: 100=below or over 001=Distance threshold alarm 10=enable threshold dismiss report Min: e8 03 => 03 e8 = 1000 mm = 1m Max: 10 27 => 27 10 = 10000 mm=10m

Historical Data Enquiry

The device supports data retrievability feature to send downlink command to enquire the historical data stored in the device. Before that, ensure the device time is correct and data storage feature was enabled to store data.

Command Format:

Item	Channel	Type	Byte	Description
Enquire Data in Time Point	fd	6b	4	Unix timestamp, Unit: s
Enquire Data in Time Range	fd	6c	8	Byte 1-4: Start timestamp, Unit: s Byte 5-8: End timestamp, Unit: s
Stop Query Data Report	fd	6d	1	ff
Data Retrieval Interval	ff	6a	3	Byte 1: 01 Byte 2-3: UINT16, Unit: s, Range: 30~1200, Default: 60

Reply Format:

Item	Channel	Type	Byte	Description
Enquiry Result	fc	6b/6c	1	00: Enquiry success. The device will report the historical data according to data retrievability interval.

Item	Channel	Type	Byte	Description
				01: Time point or time range invalid
				02: No data in this time or time range

**Note:**

1. Use [Unix Timestamp Converter](#) to calculate the time.
2. The device only uploads no more than 300 data records per range enquiry.
3. When enquiring the data in time point, it will upload the data which is closest to the search point within the reporting interval range. For example, if the device's reporting interval is 10 minutes and users send command to search for 17:00's data, if the device find there is data stored in 17:00, it will upload this data; if not, it will search for data between 16:50 to 17:10 and upload the data which is closest to 17:00.

Example:

Enquire the historical data in a time range.

fd6c 64735b63 7c885b63		
Channel	Type	Value
fd	6c	Start time: 64 73 5b 63 => 63 5b 73 64 = 1666937700s End time: 7c 88 5b 63 => 63 5b 88 7c = 1666943100s

Reply:

fc6c00		
Channel	Type	Value
fc	6c	00: Enquiry success

20ce 0d755b63 ac0c be00 0000 20			
Channel	Type	Time Stamp	Value
20	ce	0d 75 5b 63 => 63 5b 75 0d=1666938125s	Distance/Liquid Level: ac0c => 0cac =3244mm=3.244m Temperature: be00 => 00be = 190*0.1=19°C

20ce 0d755b63 ac0c be00 0000 20			
Channel	Type	Time Stamp	Value
			Distance shifts: 0000 Alarm Status: 20=0010 0000=>Tilt

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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