

LINOVISION

IOT-S500AM Series

User Guide



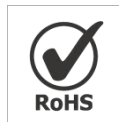
Safety Precautions

Linovision will not shoulder responsibility for any loss or damage resulting from not following the instructions of this operating guide.

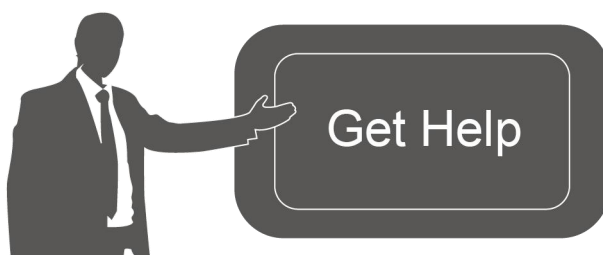
- ❖ The device must not be disassembled or remodeled in any way.
- ❖ Do not place the device outdoors where the temperature is below/above operating range. Do not place the device close to objects with naked flames, heat source (oven or sunlight), cold source, liquid and extreme temperature changes.
- ❖ The device is not intended to be used as a reference sensor, and Milesight will not shoulder responsibility for any damage which may result from inaccurate readings.
- ❖ The battery should be removed from the device if it is not to be used for an extended period. Otherwise, the battery might leak and damage the device. Never leave a discharged battery in the battery compartment.
- ❖ The device must never be subjected to shocks or impacts.
- ❖ Do not clean the device with detergents or solvents such as benzene or alcohol. To clean the device, wipe with a soft moistened cloth. Use another soft, dry cloth to wipe dry.

Declaration of Conformity

IOT-S500AM series is in conformity with the essential requirements and other relevant provisions of the CE, FCC, and RoHS.



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1. Product Introduction

1.1 Overview

IOT-S500AM series is a compact indoor ambience monitoring sensor including motion, humidity, temperature, light, TVOC, CO₂, barometric pressure for wireless LoRa network. IOT-S500AM series is a battery powered device and is designed to be wall-mounted. It is equipped with NFC (Near Field Communication) and can easily be configured via a smartphone or a PC software.

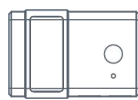
Sensor data are transmitted in real-time using standard LoRaWAN[®] protocol. LoRaWAN[®] enables encrypted radio transmissions over long distance while consuming very little power. The user can obtain sensor data and view the trend of data change through Cloud or through the user's own Network Server.

1.2 Features

- Robust LoRa connectivity for indoor or HVAC environments
- Integrated multiple sensors like temperature, humidity, light, air quality, etc.
- Easy configuration via NFC
- Visual display via E-Ink screen
- Standard LoRaWAN[®] support
- Low power consumption (about 1 year battery life)
- Standard AA alkaline battery

2. Hardware Introduction

2.1 Packing List



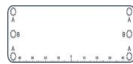
1 x

IOT-S500AM



2 x

AA Batteries
(LR6)



1 x

Mounting
Sticker



2 x

Mounting
Screws



1 x

Warranty
Card



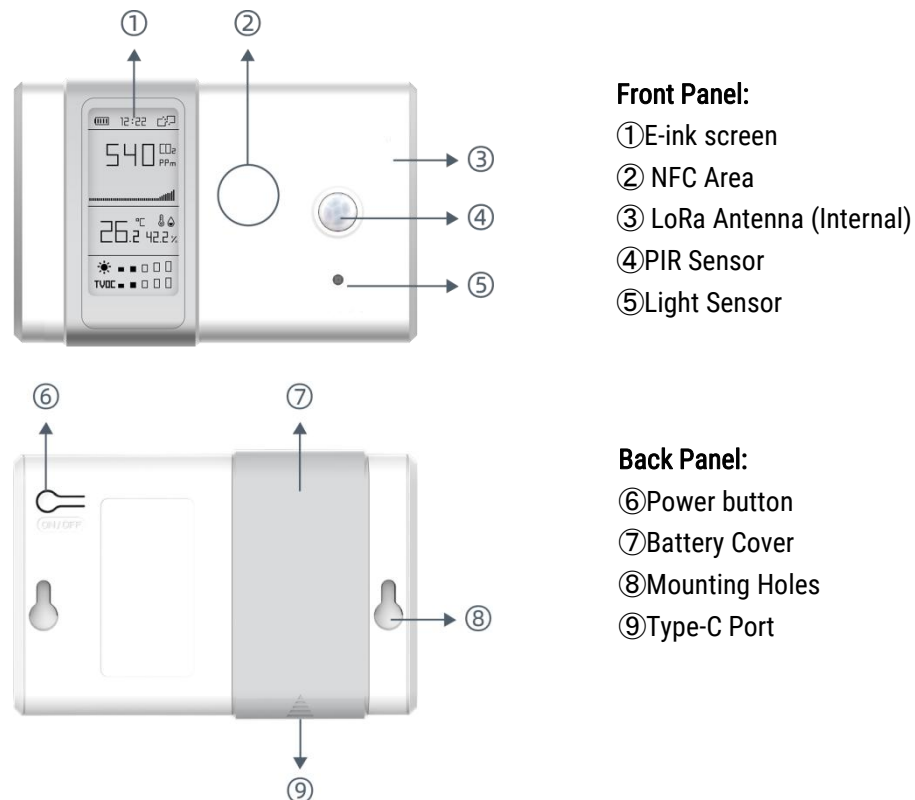
1 x

Quick
Guide



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

2.2 Product Overview



2.3 E-link Screen

2.3.1 Screen Description

To learn what an icon means, find it below.

Icon	Description	Screen Update
	Battery level	Once per day
22:22	Sync time with software or mobile APP	1 min
	The device joins the network.	According to join status
	The device fails to join the network.	
	Temperature	1 min
	Humidity	1 min
	Luminance Level 0: 0-5 lux Level 1: 6-50 lux Level 2: 51-100 lux Level 3: 101-400 lux Level 4: 401-700 lux Level 5: ≥701 lux	1 min

Total volatile organic compounds		
	Level 0: 0-100 ppb	
	Level 1: 101-200 ppb	
	Level 2: 201-250 ppb	
	Level 3: 251-300 ppb	
	Level 4: 301-350 ppb	
	Level 5: 351-400 ppb	1 min
Show alarm when TVOC exceeds the threshold value.(400 ppb by default)		
	Show CO ₂ history tendency from 0 to 1400ppm.	
	Show alarm when CO ₂ exceeds the threshold value.(1200 ppm by default)	2 min

Note:

- IOT-S500AM series will do a full-screen refresh every 30 minutes in order to remove ghosting.
- IOT-S500AM series shows current value on the screen and uplink the average value of the reporting interval to the gateway.

2.3.2 Screen Mode Switch

Here are 3 methods to switch between the three modes:

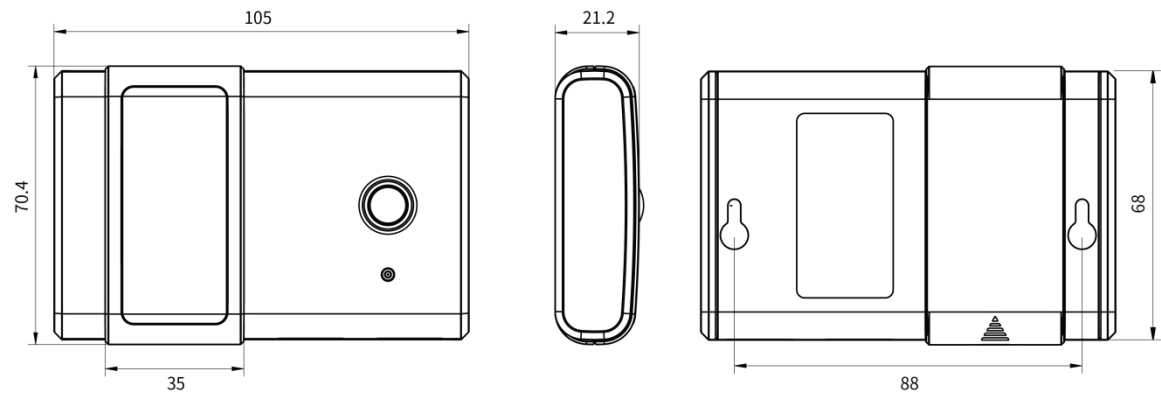
- Power button: Quick press on the power button to switch the mode.
- Mobile APP: Go to APP menu "Device > Settings > Basic Settings" to select screen display mode.
- Software: Go to Toolbox menu "Device Settings > Basic > Basic Settings" to select screen display mode.

2.3 Power Button

IOT-S500AM series can be turned on/off or reset by power button on the rear panel.

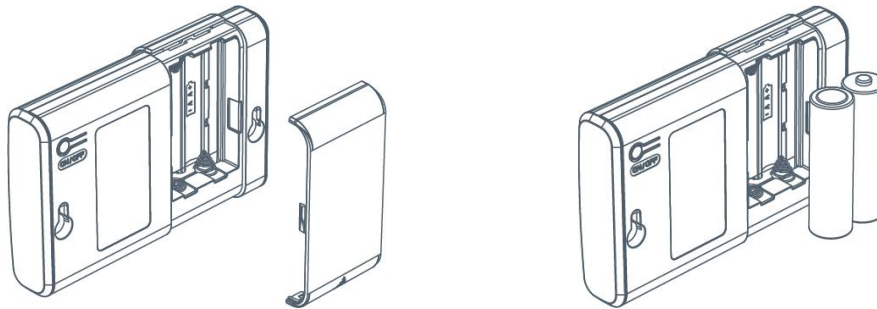
Function	Action
Turn On	Press and hold the power button for more than 3 seconds until the screen changes state.
Turn Off	Press and hold the power button for more than 3 seconds until the screen changes state.
Reset	Press and hold the power button for more than 10 seconds. Note: IOT-S500AM series will be automatically power on after reset.
Change Screen Mode	Quick press on the power button.

2.4 Dimensions(mm)



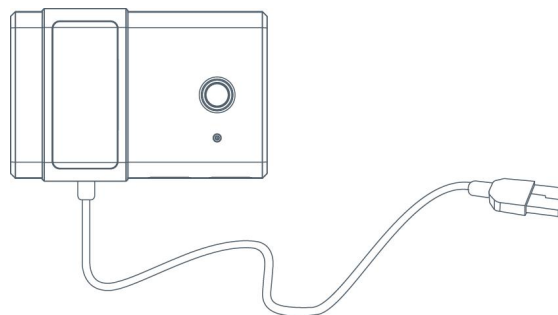
3. Power Supply

Remove the battery cover and install two new AA/LR6 batteries. Batteries can be replaced on the fly.



Note:

- IOT-S500AM series can also be powered by type-C USB port (5V, 100mA). When batteries and external power are both connected, external power will power the device first.
- USB port can't be used to charge battery.



4. Basic Configuration

IOT-S500AM series sensor can be monitored and configured through one of the following methods:

- Mobile APP (NFC);
- Windows software (NFC or Type-C port).

In order to protect the security of sensor, password validation is required when first configuration. Default password is **123456**.

4.1 Configuration via Smartphone APP

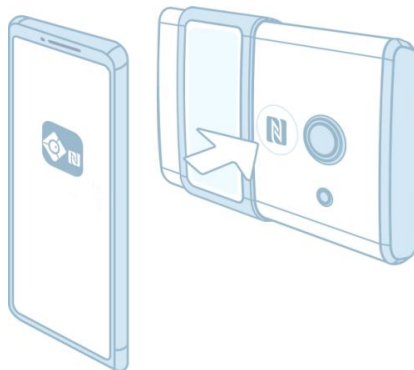
Preparation:

- Smartphone (NFC supported)
- Toolbox APP: APP can be download on Google Play or Apple Store.

4.1.1 Read/Write Configuration via NFC

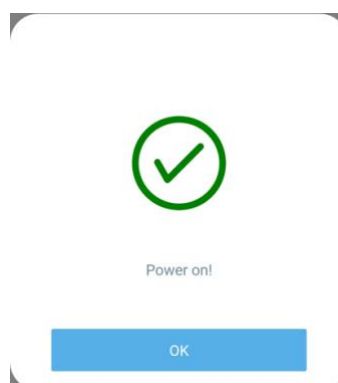
1. Enable NFC on the smartphone and open “Toolbox” APP.
2. Attach the smartphone with NFC area to the device to read basic information.

Note: Ensure your smartphone NFC area and it is recommended to take off phone case before using NFC.



3. Click “Write” to change the configuration of sensor and attach the smartphone with NFC area to the device until the APP shows a successful prompt.

Note: If you use a new smartphone to configure the sensor at the first time, it's necessary to enter the password. (Default password: 123456)



4. Click “Read” to fetch the current data of sensor.

Status	Setting	Upgrade
SN	6127A1022508	
Model		
Device EUI	24e124127a102250	
Firmware Version	V1.1	
Hardware Version	V1.0	
Device Status	ON	
Device Time	2020-03-18 13:46:37	SYNC
Join Status	De-activated	
RSSI/SNR	-60/6	
Temperature	25.6 °C	
Humidity	60.5 %	
Activity Level (PIR)	796	

[Read](#)

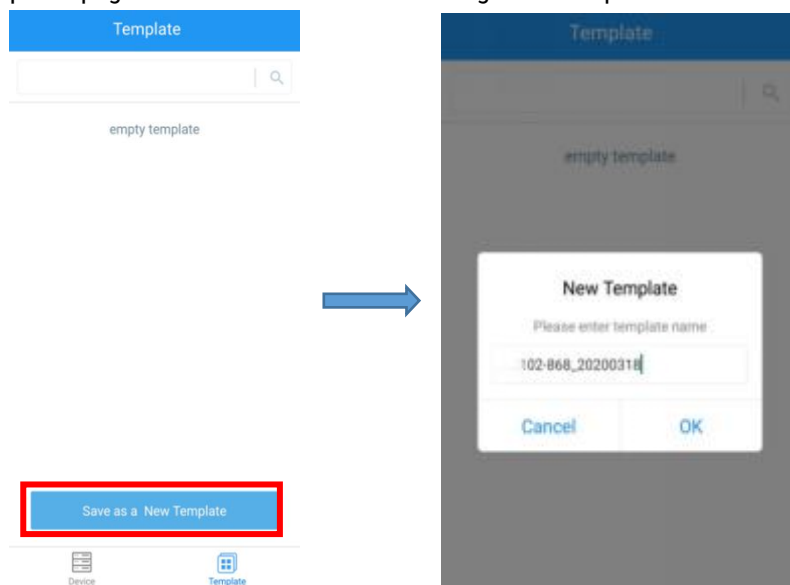
[Device](#) [Template](#)

4.1.2 Template Settings

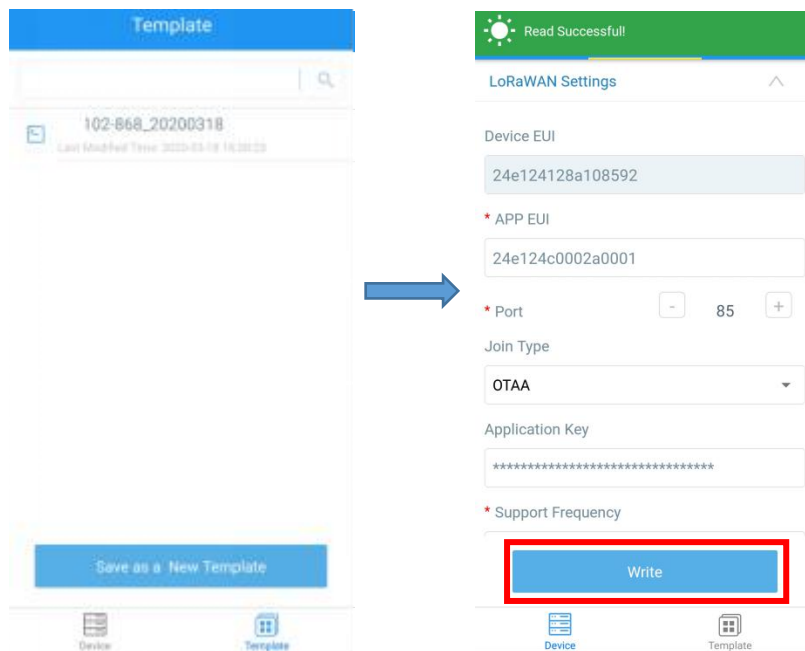
Template settings are used for easy and quick device configuration in bulk.

Note: Template function works only for sensors with the same model and LoRa frequency band.

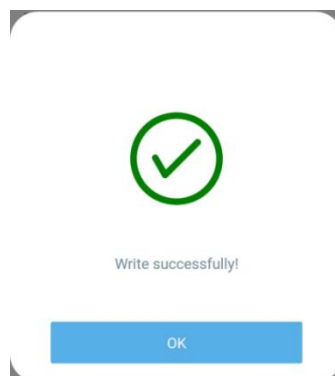
1. Go to "Template" page of APP and save current settings as a template.



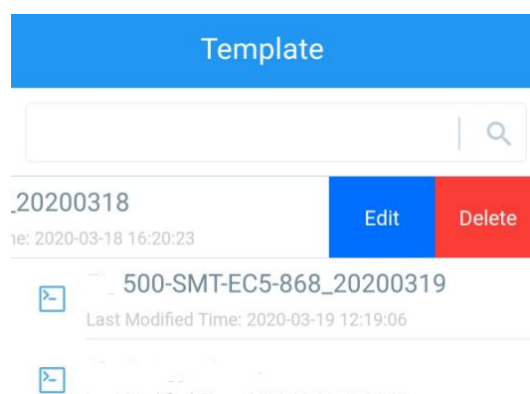
2. Attach the smartphone with NFC area to another device.
3. Select the template file from Toolbox and click "Write".



4. Keep the two devices close until the APP shows a successful prompt.



5. Slide the template item left to edit or delete the template.



4.3 Configuration Examples

4.3.1 LoRa Channel Settings

The configuration of LoRaWAN® channel of IOT-S500AM must match the gateway's. Refer to Appendix to check default channel settings of IOT-S500AM.

Mobile APP Configuration:

Open Toolbox APP and go to "Device ->Setting -> LoRaWAN Settings" to change the frequency and channels.

Software Configuration:

Log in Toolbox and go to "LoRaWAN Settings -> Channel" to change frequency and channels.

Note: If 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

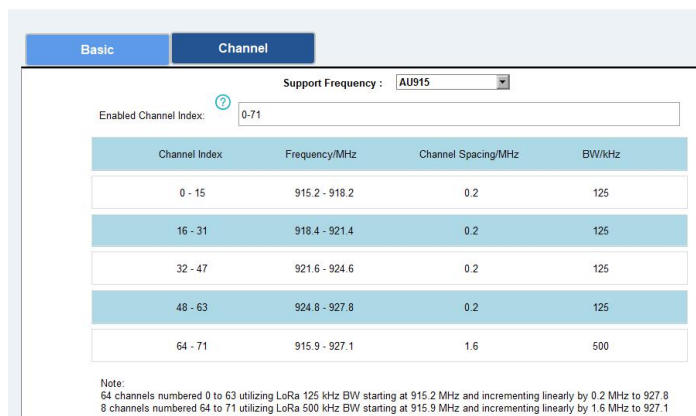


Support Frequency: US915

Enable Channel Index: 0-71

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	903.9 - 914.2

LoRaWAN >



Support Frequency: AU915

Enabled Channel Index: 0-71

Channel Index	Frequency/MHz	Channel Spacing/MHz	BW/kHz
0 - 15	915.2 - 918.2	0.2	125
16 - 31	918.4 - 921.4	0.2	125
32 - 47	921.6 - 924.6	0.2	125
48 - 63	924.8 - 927.8	0.2	125
64 - 71	915.9 - 927.1	1.6	500

Note:
64 channels numbered 0 to 63 utilizing LoRa 125 kHz BW starting at 915.2 MHz and incrementing linearly by 0.2 MHz to 927.8
8 channels numbered 64 to 71 utilizing LoRa 500 kHz BW starting at 915.9 MHz and incrementing linearly by 1.6 MHz to 927.1

4.3.2 Time Synchronization

Mobile APP Configuration:

Open Toolbox APP and go to "Device ->Status"to click "sync" to sync the time on the screen.

Status	Setting	Reset
Device Status	ON	
Join Status	Activated	
RSSI/SNR	-44/9	
Device Time	1970-01-24 09:10	Sync
Temperature	27.0 °C	
Humidity	58.5 %	
Activity Level (PIR)	1	
Illumination	89 lux	
Battery	61 %	
Channel Mask	0003	

Read

Device Template

Software Configuration:

Log in Toolbox and go to “Status” page to sync the time on the screen.

Status > Read Power Off

Device Status:	On
Join Status:	De-Activate
RSSI/SNR:	0/0
Temperature:	Disabled
Humidity:	61.5%
Activity Level (PIR):	40
Illumination:	85 lux
CO2:	585 ppm
TVOC:	210 ppb
Barometric Pressure:	1006.1 hPa
Battery:	92%
Channel Mask:	000000000000000000000000#
Uplink Frame-counter:	0
Downlink Frame-counter:	0
Device Time:	2020-08-21 13:18:12 Sync

4.3.3 Alarm Settings

IOT-S500AM series will upload the current data instantly after the threshold is triggered.

Mobile APP Configuration:

Open Toolbox APP and go to “Device -> Setting -> Threshold Settings”to enable the threshold settings and input the threshold.

Software Configuration:

Log in Toolbox and go to “Device Settings -> Basic -> Threshold Settings” to enable the calibration and input the calibration value.

Threshold Settings

When the value meets the threshold, the device will report the value immediately.

Temperature

☐

CO2

☒

Over / ppm

TVOC

☒

Over / ppb

Threshold Settings ?

Temperature

☐

CO2

☒

Over

ppm

TVOC

☒

Over

ppb

5. Installation

5.1 Installation Note

In order to ensure the best detection and LoRaWAN® communication effect, it is recommended to install IOT-S500AM series as follows:

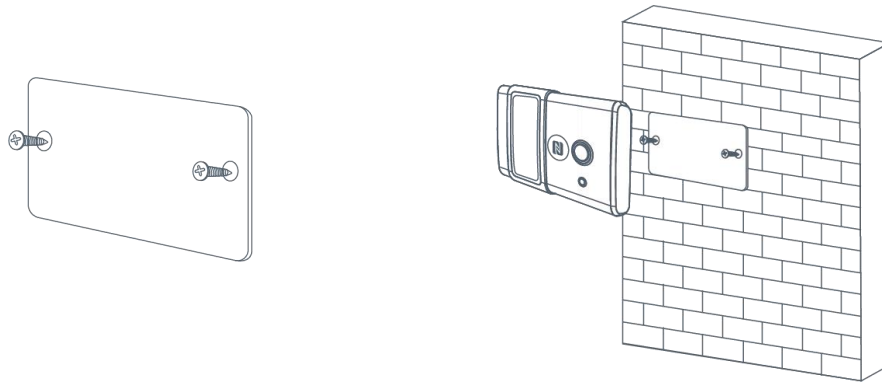
- There should not be any isolates or barriers in PIR and light detection range.
- Do not mount the device where the temperature is below/above operating range and temperature varies greatly.
- Stay far away from any heat source or cold source like oven, refrigerator.
- Do not mount the device close to where airflow varies greatly like windows, vent, fan and air conditioner.
- Do not mount the device upside down.
- Do not place the device right to the window or door. If you have to, you'd better pull the curtain.
- It is recommended to install at least 1.5m high from floor.

5.2 Wall Mounting

1. Attach the mounting sticker to the wall.
2. Mark the wall where the two mounting holes are according to the sticker's mark (around 88mm).

Note: The connecting line of two holes must be a horizontal line.

3. Drive two screws into wall at the marks using screw driver.
4. Mount the device on the wall.



6. Cloud Management

IOT-S500AM series sensors can be managed by Cloud platform. Cloud is a comprehensive platform that provides multiple services including device remote management and data visualization with the easiest operation procedures.

6.1 Add a Gateway

1. Click "Enable" and choose mode in gateway web GUI.

Note: Ensure gateway has accessed the Internet.

The screenshot displays the 'General' tab of the gateway's web interface. On the left is a sidebar with navigation options: Status, Packet Forwarder, Network Server, Network, System, Maintenance, and APP. The main content area is titled 'General Setting' and includes fields for Gateway EUI (24E124FF), Gateway ID (24E124FF), and Frequency-Sync (Disabled). Below these is a 'Multi-Destination' section containing a table with columns for ID, Enable, Type, Server Address, and Operation.

ID	Enable	Type	Server Address	Operation
0	Enabled		localhost	

General Setting

Enable ☒

Cloud ☒

NetID: 010203

Join Delay: 5 sec

RX1 Delay: 1 sec

Lease Time: 8760-0-0 hh-mm-ss

Log Level: info

2. Go to "My Devices" page and click "+New Devices" to add gateway to Cloud via SN. Gateway will be added under "Gateways" menu.

Add Device

* SN:

* Name:

Cancel Confirm

1. Check if gateway is online.

Gateways

Status	Name	Associated Devices (Joined /Not Joined /Failed)	Last Updated
	85-915 621694470052	2 / 2 / 0 More	-
	8555 6217A3163763	Device is not bound, please power on the device, after that, it will be associated with your account automatically	2020-08-18 16:42

6.2 Add IOT-S500AM Series to Cloud

1. Go to "Device->My Devices" and click "Add Device". Fill in the SN of IOT-S500AM sensor and select associated gateway.

Add Device

SN

6127

Name

Associated Gateway

231 (621700424000)

Device EUI

24e124127/

Application Key

5572404c696e6b4c6f52613230313e

Cancel

Add

2.After sensor is connected to Cloud, you could check the device information and data and create dashboard for it.

Dashboard
My Devices
Map
Triggers
Reports
Event Center 30
Sharing Center
Me

Devices
Gateways
History
+

Search

Normal 1
Alarm 1
Offline 1
Inactive 3
+ New Devices

☐		6128A2175966	26.9°C Temperature	50.5% Humidity	22 Activity Level (PIR)	57lux Illumination	a minute ago	
			797ppm CO2	209ppb TVOC	1012.3hPa Barometric Pressure			
☐		6128A2391618	27°C Temperature	50.5% Humidity	1 Activity Level (PIR)	2lux Illumination	a few seconds ago	
			632ppm CO2	103ppb TVOC	1013hPa Barometric Pressure			
☐		6127A1782908	Device is inactive!					

<
1
>

7. Sensor Payload

All data are based on 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	...

7.1 Basic Information

AM500 series sensors report basic information of sensor everytime joining the network.

Channel	Type	Data Example	Description
ff	01	01	V1

	16 (Device SN)	61 27 a2 17 41 32	Device SN is 6127a2174132
	09 (Hardware Version)	01 40	V1.4
	0a(Software Version)	01 14	V1.14
	0f(Device Type)	00	Class A
	18 (Sensor Status)	00 7f	00=>all sensors 7f=>0111 1111 means all sensors are open

7.2 Sensor Data

AM100 series sensors report sensor data according to reporting interval (10min by default). Battery level is reported every 24 hours.

Channel	Type	Data Example	Description
01	75(Battery Level)	64	64=>100 Battery level =100%
03	67 (Temperature)	10 01	10 01 => 01 10 = 272 Temp=272*0.1=27.2°C
04	68(Humidity)	71	71=>113 Hum=113*0.5=56.5%
05	6a(Activity Level)	49 00	49 00 => 00 49 =73 Activity Level = 73
06	65(Illumination)	1c 00 79 00 14 00	Illumination: 1c 00 => 00 1c =28 lux Visible + Infrared: 79 00=> 00 79= 121 Infrared: 14 00=> 00 14= 20
07	7d (CO ₂)	67 04	67 04 => 04 67 =1127 CO ₂ = 1127 ppm
08	7d(TVOC)	07 00	07 00 => 00 07=7 TVOC = 7 ppb
09	73 (Barometric Pressure)	68 27	68 27=>27 68=10088 Pressure=10088*0.1=1008.8hPa

7.3 Downlink Commands

AM100 series sensors support downlink commands to configure the device. Application port is 85 by default.

Channel	Type	Data Example	Description
ff	03(Set Reporting Interval)	b0 04	b0 04 => 04 b0 = 1200s
	18 (Enable/disable sensor)	01 01 (Enable Temperature)	Byte 1: Select Sensor 01: Temperature 02: Humidity 03: PIR 04: Light 05: CO ₂ 06: TVOC 07: Barometric Pressure Byte 2: 00=disable, 01=enable

Appendix

Default LoRaWAN Parameters

DevEUI	24E124 + 2 nd to 11 th digits of SN e.g. SN = 61 26 A1 01 84 96 Then Device EUI = 24E124126A101849
AppEUI	24E124C0002A0001
Appport	0x55
NetID	0x010203
DevAddr	The 5 th to 12 th digits of SN e.g. SN = 61 26 A1 01 84 96 00 41 Then DevAddr = A1018496
AppKey	5572404C696E6B4C6F52613230313823
NwkSKey	5572404C696E6B4C6F52613230313823
AppSKey	5572404C696E6B4C6F52613230313823