iSSBot IoT smart sensor

Temperature/humidity CO2 sensor   ISS-THC-JA

✔ **2way communication**

Bidirectional communication between this product and the application server allows for remote monitoring and control.
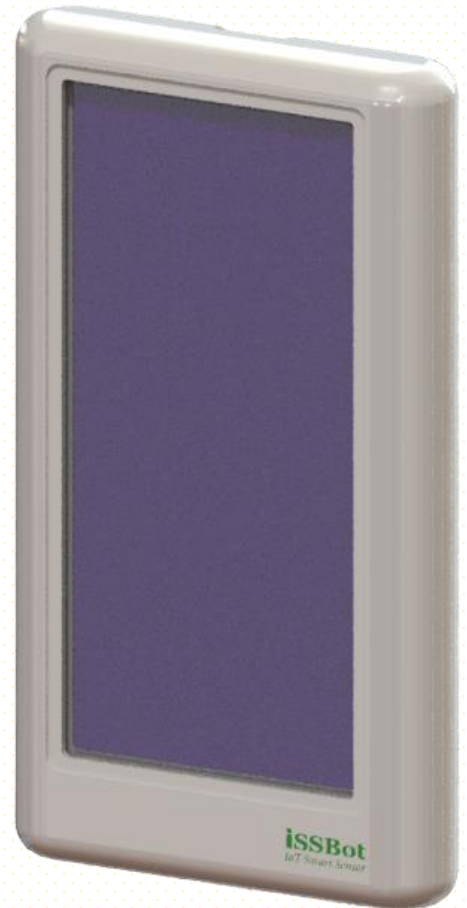
✔ **LoRaWAN® compatible**

Wide area real-time data collection with LoRaWAN®

✔ **maintenance-free**

Powered by electricity generated from indoor lighting, no need to replace batteries

✔ **Supports labor saving**

Supporting the reduction of manual work and effort. Automated tasks minimize the involvement of workers.

入一通信工業株式会社

Introduction

Thank you for purchasing our IoT smart sensor.
Please be sure to read the "Safety Precautions" before use.

Safety   Please be sure to observe

This manual and product contain important information regarding correct way to use the product in order to prevent harm to the user and damage to property.

■The following graphic symbols explain the contents to be observed. (The following is an example of the graphic symbol)

❗	This is something that must be done. (**do**)	🚫🚫	This is something you should not do. (**don't**)

⚠ **CAUTION**   Contents that may result in death or serious injury.

❗ Be sure to protect it	● Handling the main unit Do not put metal or flammable objects inside the main unit or expose to water. Doing so may cause fire, electric shock, malfunction, etc. ● Impact on medical devices The main body has a strong magnet. It may affect medical devices such as cardiac pacemakers. Please consider the installation process, location and handling. ● Installation and storage Do not install it in a place where infants and children can reach it.
🚫 Ban	● Avoid chemicals etc. Do not apply volatile chemicals such as benzene or thinner, or pesticides to the main unit. ● Putting it into equipment that may cause malfunctions. Do not put in microwave oven or high pressure container.
🚫 Do not disassemble	● Do not modify the main unit or replace parts. Failure to do so may cause malfunction or fire.

⚠ **Note**   Contents that may cause injury or property damage.

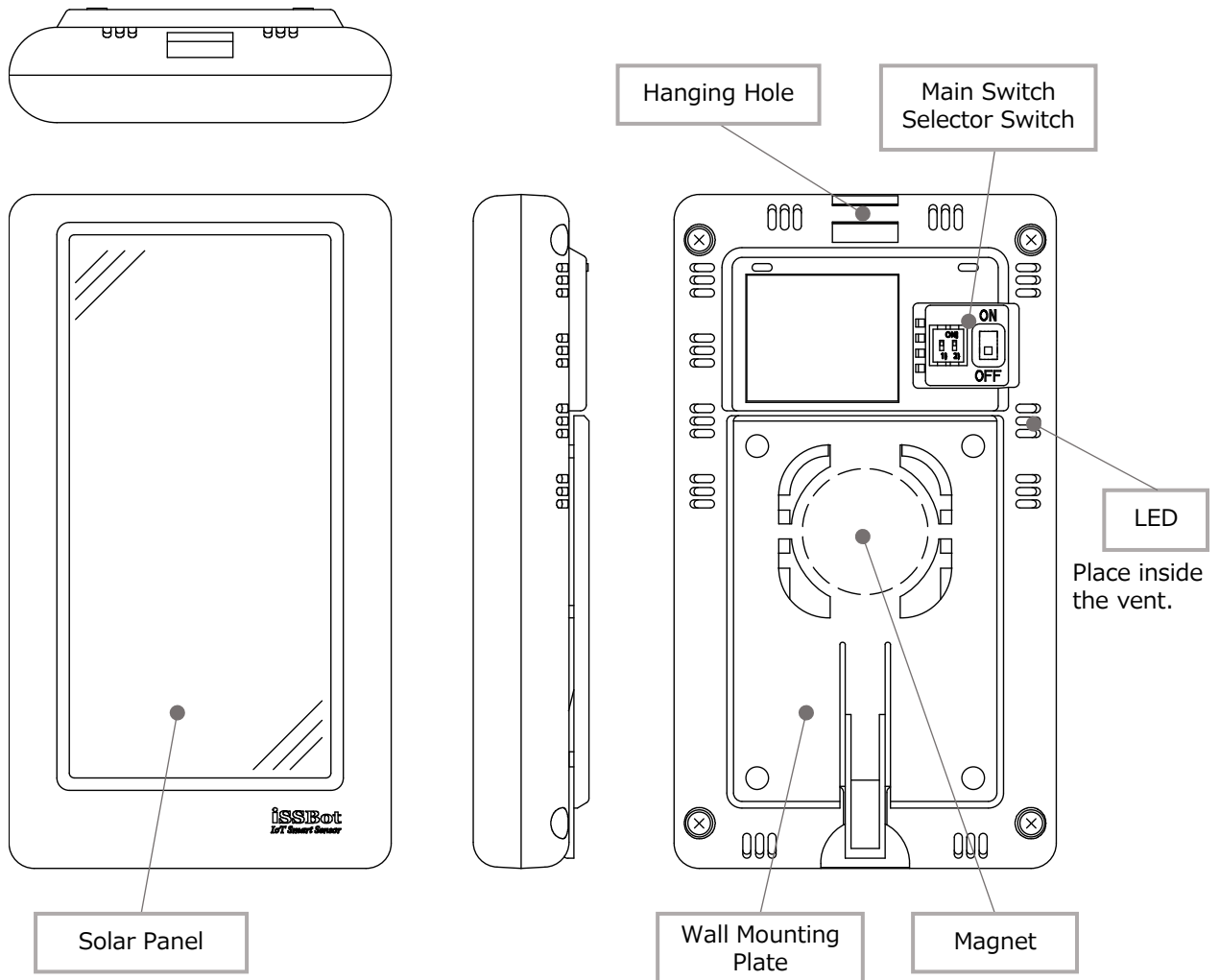| ❗ Be sure to protect it	● Usage environment precautions Do not install the main unit in locations where exposed to direct sunlight, high temperatures, high mechanical vibrations, or strong magnetic fields. Doing so may cause malfunction or fire. ● Do not place objects with high temperature directly under the main unit. It may cause a fire.
🚫 Ban	● Installation surface when using magnets The metal surface which the magnet is attached may be unstable depending on the material. Please make sure it is flat and will not fall easily before use.
🚫 No water allowed	● Do not use in humid or dusty places or outdoors. It may cause fire or malfunction. This device does not have dustproof or waterproof functions.

Precautions

Important
- If the internal rechargeable battery is completely drain, it will take up to 5.5 hours to charge with 500lx lighting.
- This product is for indoor use. Please avoid using it outdoors. We also recommend avoiding locations exposed to direct sunlight and using the product under lighting of 5000 lx or less.
- When not in use, turn off the main switch and store away from direct sunlight.

Note
- ・This product is for used in Japan only.
- ・This product cannot be used alone, a LoRaWAN® gateway is required.
- ・Communication may not be possible even within the communication area.Please check the location where this product can communicate before using it.
- ・This product is not designed to withstand various environments such as waterproof, dust resistance, and shock resistance.
- ・If installed next to other electronic devices, they may have a negative effect on each other.
- ・Please contact us regarding disposal/recovery of this product.

Part names

Hanging Hole

Main Switch
Selector Switch

ON

OFF

LED

Place inside the vent.

Solar Panel

iSSBot
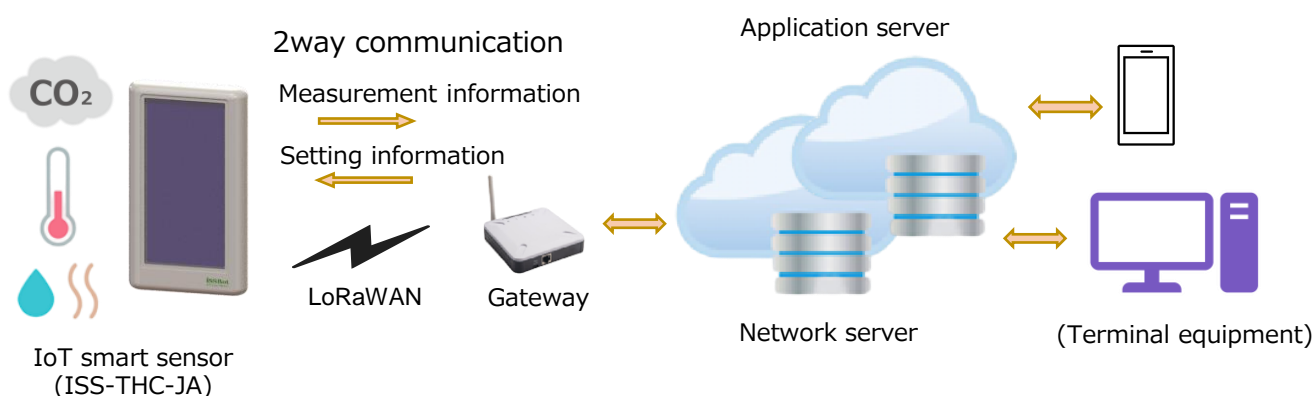IoT Smart Sensor

Wall Mounting
Plate

Magnet

Overview

This product allows you to monitor CO_2, temperature, and humidity measurement information from a terminal device via a platform such as a LoRaWAN® gateway or network server.
Additionally, since it supports bidirectional communication, various settings (such as measurement intervals) can be made to this product from the terminal device via the platform.

Communication environment/configuration

2way communication
Measurement information
Setting information
Application server
LoRaWAN   Gateway
Network server
(Terminal equipment)
IoT smart sensor
(ISS-THC-JA)

Features

① 2-way communication
・You can use it just by installing the sensor, and sensor settings (measurement interval, etc.) can be configured remotely from the application server according to usage conditions.

② Maintenance free
・Equipped with a solar panel that can generate electricity using indoor light, eliminating the need for battery replacement.
・Since there are no power supply restrictions, sensors can be installed freely.

③ Comply with the latest NDIR method CO2 sensor
・Comply with the NDIR method with calibration function recommended by the Ministry of Health, Labor and Welfare and the Ministry of Economy, Trade and Industry.(NDIR : Non-Dispersive Infrared)

④ Control of power consumption
・Adjust radio wave output depending on the distance between the sensor and gateway to optimize power consumption.

⑤ Installation of highly efficient solar panels
・High power density and approximately twice the independent power generation capacity compared to products made by other companies.
  *According to our research

*We are not responsible for any fall or malfunction of this product due to installation.
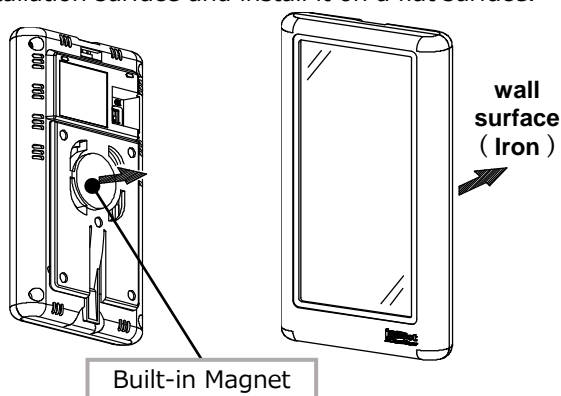
[Wall installation by fixing the wall plate with screws]

① Press the stopper on the wall-mounted plate to release the lock, and then slide the wall-mounted plate to remove it.
② Drill holes for fixing screws (M4) on the wall and secure the wall plate with the screws.
  (Please prepare the screws yourself.)
③ Insert the wall mounting plate into the recess on the back of the main unit and slide it until the stopper locks.

①
Main Body
Wall Mounting Plate
Stopper

②
Construction Hole(M4)
(Screw)
Wall Mounting Plate

③
Stopper
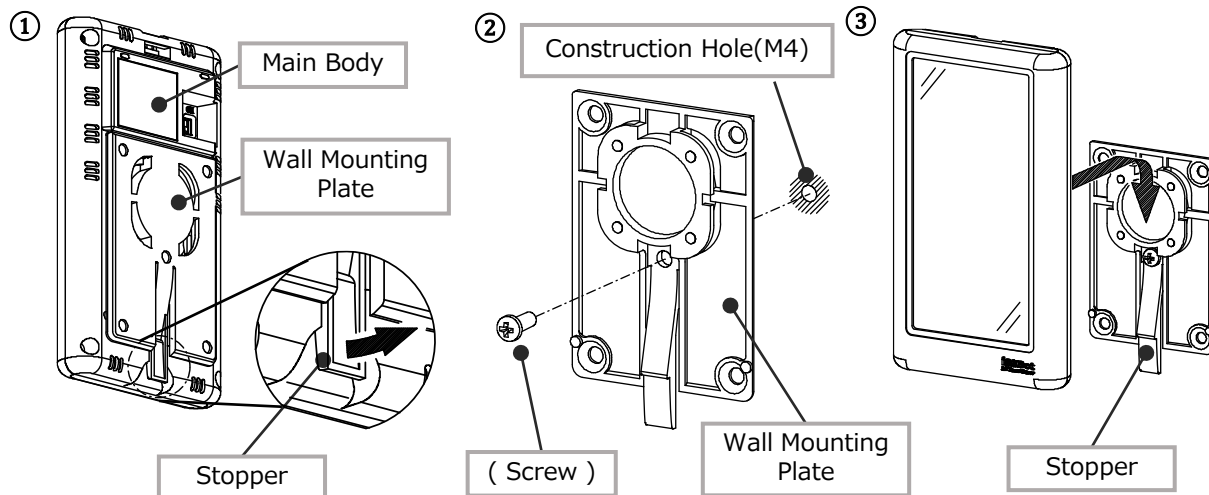
[Installation using magnet]

There is a built-in magnet inside the wall-mounted plate, so wipe off any dust or dirt from the metal installation surface and install it on a flat surface.

wall surface（Iron）

Built-in Magnet

[Attaching and removing the main body]

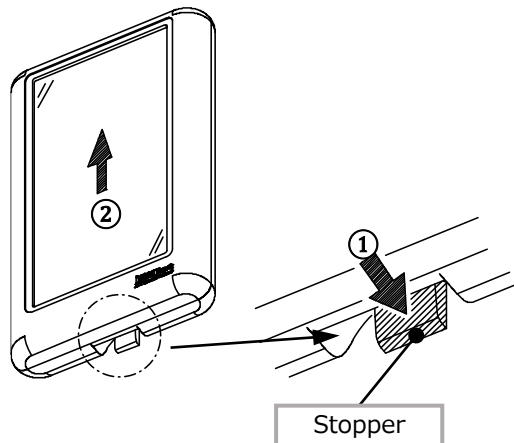### Attaching the main body

Insert the main unit into the wall plate and slide it until the stopper locks.
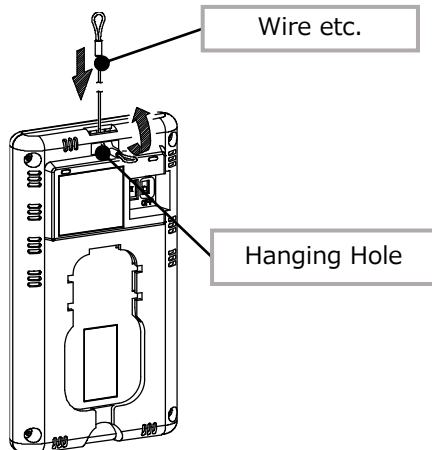
Main Body
Wall Mounting Plate
Stopper
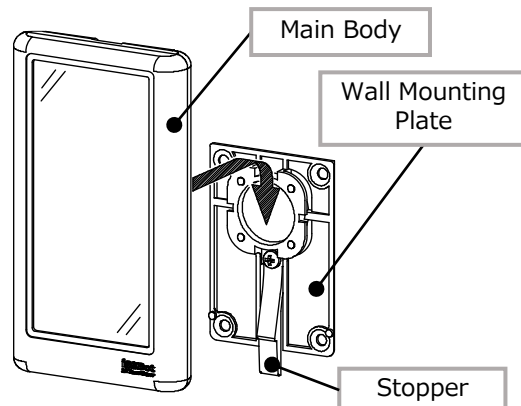
Removing the main body

Push the stopper to release the lock and slide the main unit.

②
①
Stopper

## [Installation by hanging]

You can hang it on the wall by insert a wire through the hanging hole.

Wire etc.
Hanging Hole

Switch settings

You can change the transmission interval by setting the transmission interval setting switch. The default setting is AUTO (15 minutes) .

| TIME	15min	30min	60min	AUTO
SET POSITION	▯▯	▯▯	▯▯	▯▯

note

Use a rounded object such as a ballpoint pen to operate the switch.

Regardless of the switch settings, when the battery voltage drops according to the battery alert setting (factory default 2.5V), the transmission interval will be double automatically.
Meanwhile, if the battery voltage drops below 2.4V, it will quadruple the set interval and transmit.

Boot

① When the power switch is turned ON, the LED will blink.
   When the LED turns OFF, the device will boot.
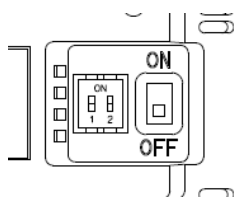
② When communication starts, a "join request" is sent to the LoRaWAN® network server. If correctly approved by the network server, the values of CO_2 concentration, temperature, and humidity will be sent. After that, it will send the measurements twice at 30-second intervals. Then, the values of CO_2 concentration, temperature, and humidity will be transmitted at each transmission interval.

・This product must be registered on the LoRaWAN® network server in advance. The information required for registration is provided in the instruction manual included with the product.

・If the LED does not turn off during startup, the join request has not been approved by the network server. The registration information of the product and the settings of the network server should be rechecked and retry. If the radio environment cause the interference, performing the join request near the gateway may result in proper approval.

・If you need to turn the power switch back ON, please turn it off for at least a minute before switching it ON again. If you switch it back ON immediately after turning it off, the initial data transmission may not be carried out properly.

Illuminance required for operation

A guideline for the required illuminance depending on the transmission interval. Illuminance is required to enable continuous operation without decreasing secondary battery voltage under each transmission interval condition.

Communication interval	500lx	400lx	300lx	200lx	130lx
15 Minutes	3.5h/Day	4.0h/Day	6.0h/Day	8.0h/Day	24h/Day

* This is a guideline under normal temperature environment.

Charging performance

The lower limit of operable secondary battery voltage is 2.0V.
If the secondary battery becomes depleted and becomes inoperable, it can be charged under the following conditions.
・When irradiating 500lx: With the switch in the "OFF" state, the starting voltage (2.4V) is reached in about 5.5 hours.

Dark operation time

The estimated operating time in a completely dark place with no light is approximately. Continuous operation for 7 days is possible when the secondary voltage is 2.7V.
* The operating time will vary depending on the measurement interval conditions and signal strength.

Data Retransmission Function

If the uplink failed, this product will temporarily stores the data and retransmits it once the uplink occurs.
This product can store up to 250 data entries, and during each uplink, it can retransmit up to 2 most recent data entries.

Automatic calibration function of CO2 sensor

The CO_2 sensor of this product performs automatic calibration by assuming the lowest CO_2 concentration within a given measurement period as the atmospheric CO_2 concentration.
Automatically calibrates the lowest value measured for 180 hours to 400ppm.
When using in an environment where the minimum CO_2 concentration is significantly different from the atmospheric CO_2 concentration (approximately 400 ppm), you can turn off the automatic calibration function.

*The application server must support downlinks as it is configured using the downlink command.

Transmission data format

1 , Uplink payload data structure

Byte	1	2 to 4	5 to 8	9	10,11	12,13	14,15	16
Data	Alert information (refer to the following)	Setting information (refer to the following)	Time stamp (HEX)	Battery voltage (HEX)	Temperature (HEX)	Humidity (HEX)	CO2 (HEX)	Firmware version (HEX)

① Alert information

Bit	7	6	5	4	3	2	1	0
Flag								

CO2   00:Normal 10:Upper limit alert 01:Lower limit alert 11:Error

Temperature   00:Normal 10:Upper limit alert 01:Lower limit alert 11:Error

Humidity   00:Normal 10:Upper limit alert 01:Lower limit alert 11:Error

Battery voltage
   00:Normal 10:Upper limit alert 01:Voltage drop 11:Lower limit alert

② Setting information

Byte2

Bit	7	6	5	4	3	2	1	0
Flag								

Transmission interval setting   0:Not executed 1:Command executed

CO2 automatic calibration function   0:Disabled 1:Enabled

CO2 calibration 0 : Not executed   1:Command executed

Time setting 0 : Not executed   1:Command executed

Alert setting 0 : Not executed   1:Command executed

Factory setting 0 : Not executed   1:Command executed

System restart 0 : Not executed   1:Command executed

Transmission interval setting switch   0:Manual 1:Auto

Byte3

Bit	7	6	5	4	3	2	1	0
Flag								

Byte4

Bit	7	6	5	4	3	2	1	0
Flag								

Transmission interval   0 to 1440 minutes (0 to 5A0h)

Charging status   11:Fully charged   10:Charging(strong)
   01: Charging(weak)   00: Discharge

Command execution error   1:Error

Time setting request   0:Set 1:Not set

③ Time stamp

Convert the delay time value from the measurement point to transmission into hexadecimal and place it in the payload (5th, 6th, 7th, 8th).

example 1) Current data delay time
Data transmission time: 05:22:01
Measurement time: 05:21:40
05:22:01 – 05:21:40 = 21 seconds → 0x00000015

example 2) Data delay time when retransmitting (after 15 minutes)
Data transmission time: 05:37:01
Measurement time: 05:21:40
05:37:01 – 05:21:40 = 921 seconds → 0x00000399

④ Battery voltage

Multiply the battery voltage by 10, convert it to hexadecimal, and place it in the payload (9th).
example) 2.7V → 27 (10x) → 0x1B (hexadecimal conversion)

⑤ Temperature

Multiply the temperature by 10, convert it to hexadecimal, and place it in the payload (10th, 11th).
Temperatures below freezing are two's complement numbers.
*Temperatures below freezing are outside the product specification temperature range.
example) 29.8 ℃ → 298 (10x) → 0x012A (hexadecimal conversion)
            -5.6 ℃ → -56 (10x) → 0xFFC8 (hexadecimal conversion)

⑥ Humidity

Multiply the humidity by 10, convert it to hexadecimal, and place it in the payload (12th, 13th).
example) 52.5%RH → 525 (10x) → 0x020D (hexadecimal conversion)

⑦ CO_2 concentration

Convert the CO2 concentration value to hexadecimal and place it in the payload (14th, 15th).
example) 450ppm → 0x01C2 (hexadecimal conversion)

⑧ Firmware version

Multiply the firmware version by 10, convert it to hexadecimal, and place it in the payload (16th).
example) Ver1.0 → 10 (10x) → 0x0A (hexadecimal conversion)

2 , downlink command

Note: The application server must support downlink.

① Transmission interval setting

Byte	1	2	3,4	5	6,7
Data	0x49	Switching time 1 0 to 23:00 (HEX)	Transmission interval 1 15 to 1440 minutes (HEX)	Switching time 2 0 to 23:00 (HEX)	Transmission interval 2 15 to 1440 minutes (HEX)

Every 60 minutes from 11:00 PM to 5:00 AM, every 15 minutes from 5:00 AM to 11:00 PM
example) Every 60 minutes from 11:00 PM to 5:00 AM , every 15 minutes
        11PM → 23 → 0x17 Place it into the payload (2nd).
        5AM → 5 → 0x05 Place it into the payload (5th).
        60 minutes → 60 → 0x003C Place it into the payload (3rd,4th).
        5 minutes → 5 → 0x0005 Place it into the payload (6th,7th).
Note: Please use this in conjunction with the time setting command.

② CO_2 calibration

Byte	1	2,3
Data	0x43	Calibration value 400 to 2000ppm (HEX)

Performs forced correction of CO2 sensor value.
example) 450ppm → 450 → 0x01C2

③ Time setting

Byte	1	2	3	Four
Data	0x52	Time (HEX)	Minutes (HEX)	Seconds (HEX)

Set the time on the instrument.
example) 20:30:00 → 203000 → 0x14 0x1E 0x00

④ CO 2 alert setting

Byte	1	2	3,4	5,6
Data	0x41	0x00: Valid 0x01: Invalid	Upper limit (HEX)	Lower limit (HEX)

Set the alert threshold for
example) 450ppm → 450 → 0x01C2

⑤ Temperature alert settings

Byte	1	2	3,4	5,6
Data	0x41	0x02: Valid 0x03: Invalid	Upper limit (HEX)	Lower limit (HEX)

Set the temperature alert threshold.
example) 26.8 ℃ → 268 (10x) → 0x010C

⑥ Humidity alert setting

Byte	1	2	3,4	5,6
Data	0x41	0x04: Valid 0x05: Invalid	Upper limit (HEX)	Lower limit (HEX)

Set the humidity alert threshold.
example) 50.5%RH → 505 (10x) → 0x01F9

⑦ Battery alert settings

Byte	1	2	3	4	5
Data	0x41	0x06: Valid 0x07: Invalid	Upper limit (HEX)	Voltage drop (HEX)	Lower limit (HEX)

When a drop in battery voltage is detected, the transmission interval will be doubled
Transmission will stop when the battery voltage detects a lower limit alert.

Set the battery alert threshold.
example) 2.5V → 25 (10x) → 0x19

⑧ CO2 sensor automatic calibration setting

Byte	1	2
Data	0x4d	0x00: Invalid 0x01: Valid

Set the automatic calibration function of the CO2 sensor.

⑨ System restart settings

Byte	1
Data	0x42

Restart the product.

⑩ Factory settings

Byte	1
Data	0x46

Restore
Factory settings.

Transmission interval setting	15 minutes
CO2 alert settings	Invalid
Temperature alert settings	Invalid
Humidity alert settings	Invalid
Battery alert settings	Valid (Upper limit value 2.7V / Voltage drop 2.5V / Lower limit value 2.0V)
CO2 sensor automatic calibration setting	Valid

Maintenance

Periodically remove dust etc. from this product using the method below.

・Use a vacuum cleaner's crevice nozzle to suck up any dust that appears at the vents from the outside of this product.

note
・Do not use broom-type or brush-type nozzles.
The brush may get stuck inside this product and cause a malfunction.
・Do not blow away dust with a blower, etc.
Dust may get inside this product and cause it to malfunction.

・Wipe off any dirt that appear at the case surface with a dry, soft cloth.

note
・Never wash with water.
・Do not use detergents or chemicals.
・Do not wipe with disinfectant wipes containing alcohol.
It may cause a malfunction.

Storage

When not used the device, turn off the power, use the product's packaging box or plastic bag, and store it in a place out of direct sunlight.

Note: Do not use non-static plastic bags.
Also, do not use adhesives or adhesive tape for sealing, etc.
It may affect the humidity sensor.

Specification

Product name		ISS-THC-JA
Mechanical specifications	Structure	Front: Equipped with low-light driven solar panel Exterior case: Resin (PC-ABS)
	Size	W76mm x D134mm x H23mm
	Mass	130g
Communication specifications	Communication method	LoRaWAN® Mutual communication method
	Compatible class	CLASS A
	Data rate	ADR
	Activation method	OTAA method
	Transmission power	20mW or less
	Antenna	λ/4 Wavelength monopole antenna
Measurement	Range	Temperature: -10℃ ~ 40℃
		Humidity: 10 % RH to 90 % RH (no condensation)
		CO2: 400-5000ppm
	Accuracy *1	Temperature: ±0.2℃
		Humidity: ±1.8 %
		CO 2 : 30ppm+ 3% of reading (25℃)
	Interval	15 minutes /30 minutes /60 minutes / Auto (Auto: 15 minutes at factory shipment) *2
Motion	Continuous Condition	By irradiating daylight white LED500Lx light for 3.5 hours a day , it will last for 21.5 hours. Continuous operation possible (when measurement interval is 15 minutes)
Environmental Condition	Use	Temperature: 0℃ ~ 40℃ Humidity: 10 % RH ~ 90 % RH (no condensation)
	Keep	Temperature: 0℃ ~ 50℃ Humidity: 5 % RH ~ 90 % RH (no condensation)
	Dustproof and waterproof performance	Protection class IP30 (for indoor use) *3
EMC Standard		VCCI class B

*1 Measurement errors will increase in environments with contaminants such as solvent vapor or adhesives that release gas.

*2 If the application server supports downlink, settings can be made in 1-minute increments between 15 minutes and 1440 minutes.
When the battery voltage drops, the transmission interval will be doubled (factory set at 2.5V) and quadrupled at 2.4V depending on the voltage drop value in the battery alert settings.

*3 It is not dust-proof and drip-proof.

Inquiries regarding this product

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(Excluding Saturdays, Sundays, holidays, and company holidays)

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