RADIONODE®

Wireless Temperature & Humidity Sensor
900MHz LoRaWAN®

RN320-BTH User Guide

2023 | Rev. 1.01

Keep this document nearby so that it may be referred to when needed.

CONTENTS

About this Manual

This document contains instructions for usage and installation of the RADIONODE® RN320. Product specifications and certain features herein may be subject to change without prior notice. Figures used in this manual are for explanatory purposes only, and may differ from your system depending on installation conditions. Software screenshots may change after software updates.

Safety Precautions

DEKIST 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 close to objects with naked flames. Do not place the device where the temperature is below/above the operating range.

The device is not intended to be used as a reference sensor, and DEKIST will not should 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.

Make sure all batteries are newest when install, or battery life will be reduced.

The device must never be subjected to shocks or impacts.

Certifications

FCC Class A Digital Device

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the manufacturer responsible for compliance could void the user's authority to operate the equipment.

CE

Applied harmonized european standards and technical specifications:
EN IEC 61000-6-3:2021
EN IEC 61000-6-1:2019
ETSI EN 301 489-1 V2.2.3
ETSI EN 301 489-3 V2.1.1
EN 61000-4-2:2009
EN 61000-4-3:2006 +A1:2008 +A2:2010
EN 62311:2008
ESTI EN 300 220-2 V3.2.1 (2018-06)
ETSI EN 300 220-1 V3.1.1 (2017-02)
EN 62321-1 : 2013
EN 62321-2 : 2014
EN 62321-3-1 : 2014
EN 62321-4 : 2014
EN 62321-5 : 2014
EN 62321-6 : 2015
EN 62321-7-1 : 2015
EN 62321-7-2 : 2017
EN 62321-8 : 2017
EN IEC 62368-1:2020+A11:2020

KC

이 기기는 사용 중 전파 혼신 가능성이 있으며, 타 기기로부터 유해한 혼신을 받을 수 있습니다.

Intellectual Property Rights

Contact

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Support portal: help.radionode365.com

Tel: +82-(0)70-7529-4359

Fax: +82-(0)31-8039-4400

Address: Tower-1801, 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea

Introduc-tion

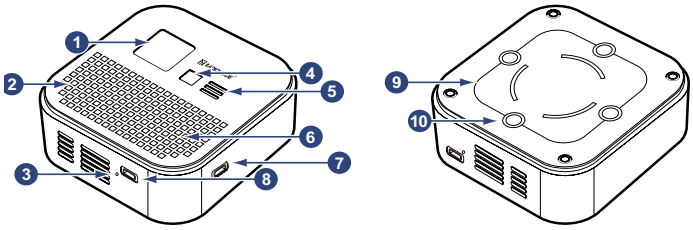
The RN320 is a compact temperature & humidity sensor that supports LoRaWAN communication and is easy to use. It is equipped with high-precision sensors for accurate detection of temperature and humidity data in various environments.

Not only does it use low-power LoRaWAN technology, but it also includes a large-capacity battery that can be used for up to 10 years without replacement. Additionally, the RN320 is compatible with Dekist's LoRaWAN gateway and IoT cloud solution. It can be used indoors and outdoors, and is suitable for cold chain transportation, agricultural greenhouses, offices, hospitals, and factories.

Key Features

- Uses high-precision sensors that can detect even minor changes in temperature and humidity.
- Features a replaceable 16000mAh battery with ultra-low power consumption/standby design ensuring durable battery life.
- Supports installation in various environments with magnetic attachment and screw mounting options.
- Robust installation ensured by a rear cover, anti-theft, and anti-slip pad design.
- Capable of long-distance data transmission up to 10km in obstacle-free flat areas.
- PC software support for easy configuration changes.
- Complies with standard LoRaWAN gateways and network servers.
- Fast and easy management through Dekist's IoT cloud solution.

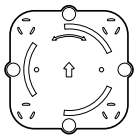
Exterior



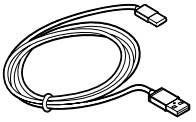
1. E-Paper display
2. TEMP/RH Sensor
3. Reset Button
4. Setting Button
5. LED
6. Buzzer
7. SD-Card
8. USB-C Port
9. Magnet
10. Anti-slip Pad

Product Components

RN320



Magnetic Mount

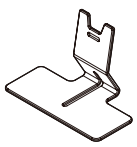


USB C-TYPE Cable

C-TYPE 3.6V batteries,
2EA (built-in)

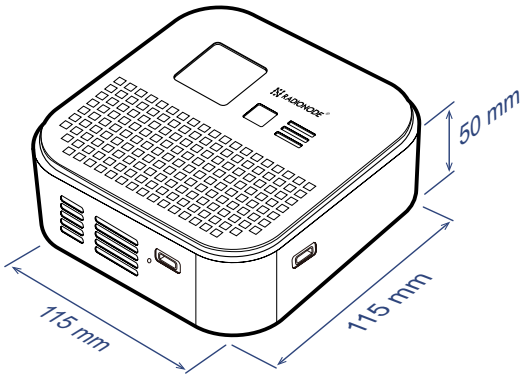
When purchasing the product, two C-type 3.6V batteries are installed in the device. Since it uses lithium batteries, please contact the seller if you need to replace the batteries.

Optional Accessory



Desktop Bracket

Specification



Model	RN320-BTH
Wireless Telecommunications	LoraWAN ® V1.0.3 ,OTAA/ABP ClassA CN470/IN865/RU864/EU868/US915/AU915/ KR920/AS923 TX : 20dBm Sensitivity : -137 dBm @ 300 bps
Internal Temp/RH sensor	CH1: Temp (-40 ~ 80℃) CH2: RH (5 ~ 95%RH)
Accuracy (Repeatability)	Temp.Accuracy : ± 0.2 ℃(0.07℃) R.H. Accuracy : ± 1.8 %RH(0.15%RH)
Resolution	Temp. Resolution : 0.1 ℃ R.H. Resolution : 0.1 %RH
Operating Condition	-20 ~ 80 ℃ / 5 ~ 95% (Non condensing)
Material	PC, PS
Buzzer	97dBA @10cm
Display	Electronic ink display, 200x200 Pixel 1.54 Inch Operating condition : 2~50℃ (Display off is recommeded below 0℃)
LED Status	GREEN : Normal RED : Alert *Configurable Parameter
External Memory	Option (16GB microSD, permanent logging)
Battery	3.6V Li-SOCL2 X 2EA (16000mAh) Eco mode : 10 Years @ 10Mins (-55~85℃) Normal mode : 5 Years @ 10Mins (-55~85℃)
USB Port	Configuration Port
Button	Menu BUTTON Reset button(Baelow)
Installation Types	Magnet & Screw for wall mount (Option) Desktop bracket for Table mount (Optional accessory)
Weight	352 g (with Battery)

Battery Life		
Service life	CONFIRM MODE	DISPLAY
5 Years	ON	ON
7 Years	OFF	ON
10 Years	OFF	OFF
Based on a measurement interval of 10 minutes		

Please refer to the following URL for the payload decoder:
https://github.com/radionode/RN300-Series-Lorawan

Configuration

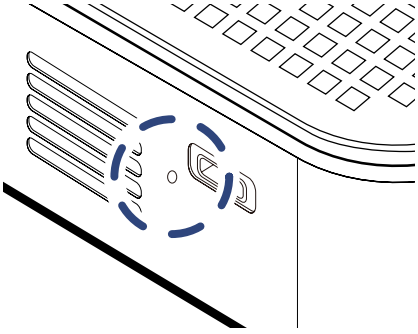
Turning on the RN320 & Setting Up

The RN320 device can be configured using a USB cable. Follow these steps to complete the setup :

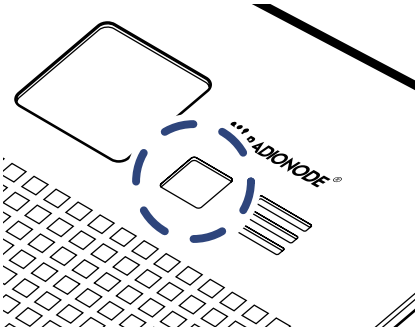
1. Download and install the "Radionode Configuration change Terminal Program" from the Radionode website (www.radionode365.com).

2. Run the "Radionode Configuration change Terminal Program."

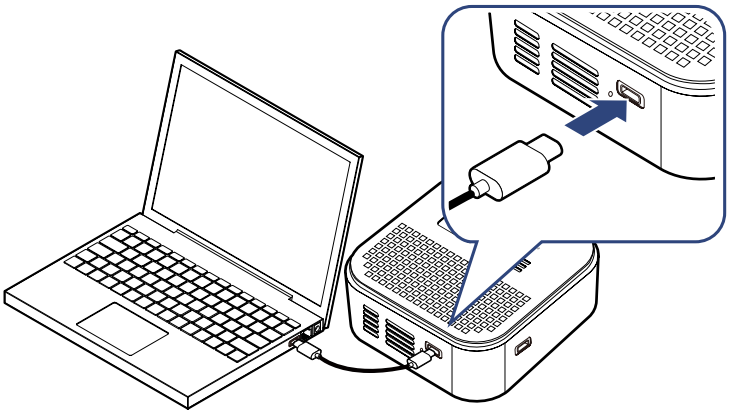
3. Press the reboot button located at the bottom of the RN320 device to boot the device.

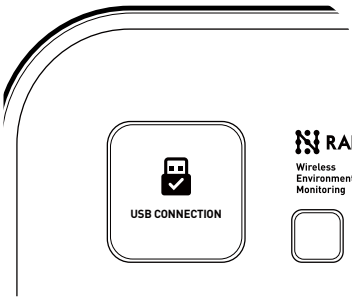


4. Once booted, press the button on the front of the device "once briefly" to enter the menu. When the menu window appears, press "once briefly" again and then "hold long" to enter USB CONNECT MODE



5. Use the C to A type cable included with the product purchase to connect the C type terminal at the bottom of the RN320 to the A type terminal of the PC.





[Display upon entering USB CONNECT MOD]

6. Once the device is successfully recognized, the screen of the "Radionode Configuration Change Program" will change to green, and you should enter the command "ATSCON" in uppercase.
The device's basic information and settings will be displayed.
Navigate to the desired items and make changes as needed.

```
<RN320 AT Command Mode Start>
Type 'ATSCON' for CONFIG Menu!
```

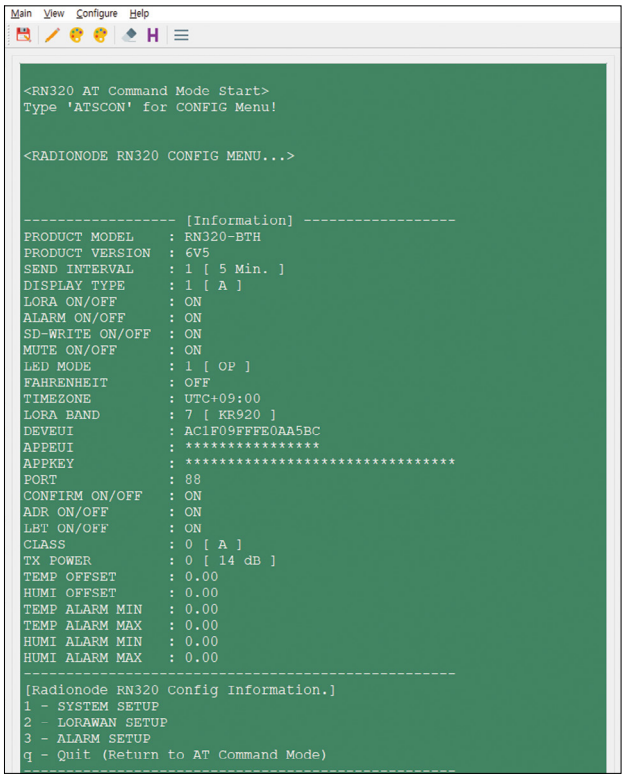
Detailedm Configuration Instructions

LoRaWAN Setting

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

RN320-BTH Default Settings

After running the Radionode Configuration Change Terminal Program and typing “ATSCON,” you can check the default settings of the RN320 device.



Please enter the number to select a menu.

```
[Radionode RN320 Config Information.]
1 - SYSTEM SETUP
2 - LORAWAN SETUP
3 - ALARM SETUP
q - Quit (Return to AT Command Mode)
```

System Setup

To change the system settings of the device, select menu `1 - SYSTEM SETUP.` Options along with the current settings will be displayed. To return to the main menu, enter “x”

`1 - SEND INTERVAL [ 5Min ]`

Set the data transmission interval in minutes. You can set it from 1 to 60 minutes.

`2 - DISPLAY TYPE [ A ]`

Choose the display setting from “A, B, C”.

A MODE : Both CH1 and CH2 measurement values are displayed at the top and bottom of the display, respectively, in the same size.

B MODE : CH1 measurement value is displayed larger at the top, and CH2 measurement value is displayed smaller at the bottom.

C MODE : CH1 measurement value is displayed larger at the top, and CH2 measurement value is displayed smaller at the bottom.

`3 - LORA ON/OFF [ ON ]`

Choose whether to use LoRaWAN communication.

`4 - ALARM ON/OFF [ ON ]`

Choose whether to use the alarm.

`5 - SD-WRITE ON/OFF [ ON ]`

Choose whether to save data to the SD card memory.

`6 - MUTE ON/OFF [ OFF ]`

Choose whether to use the built-in buzzer.

`7 - LED MODE [ OP MODE ]`

Choose the LED mode that lights up on the front of the product.

AQ+OP MODE : The green LED continues to light up when the temperature and humidity values are within the normal range, and the red LED lights up when they are out of the normal range.

OP MODE : The green LED blinks when data is transmitted or the front button is pressed.

`8 - FAHRENHEIT [ OFF ]`

Choose whether to switch to Fahrenheit temperature (℉).

`9 - TIMEZONE HOUR [ 9 ]`

Select the local timezone.

a - TIMEZONE MINUTE [0]

Settings for adjusting the minutes in a specific timezone.

b - TIMESTAMP [0]

You can set the UNIX TIMESTAMP time.

c - FACTORY RESET

Resets the device to its factory default settings.

d - USB MODE EXIT

Disconnects the connected PC.

e - SYSTEM RESET

Reboots the device.

x - back to Main Menu

Returns to the previous menu.

LoRaWAN Setup

To change the LoRaWAN communication settings of the device, select menu 2 - LoRaWAN SETUP.

```
[ 2 - LORAWAN SETUP MENU. ]
1 - LORA BAND [ KR920 ]
```

Select the frequency band specific to a country.
[EU433], [CN470], [RU864], [IN865], [EU868], [US915], [AU915], [KR920], [AS923_1], [AS923_2], [AS923_3], [AS923_4]

```
2 - APPEUI
```

Enter the unique application identifier.

```
3 - APPKEY
```

Enter the network communication authentication key.

```
4 - PORT [ 88 ]
```

Enter the network data transmission and reception port.

```
5 - CONFIRM ON/OFF [ ON ]
```

If set to ON, the device will resend the data if it does not receive an ACK packet from the network server.

```
6 - ADR ON/OFF [ ON ]
```

If set to ON, it allows the network server to adjust the data rate of the device.

```
7 - LBT ON/OFF [ ON ]
```

If set to ON, it is a feature of the radio protocol that checks if the frequency band is currently in use before using it. When ON, it is used to improve communication reliability.
* Available only in Korea and Japan.

```
8 - CLASS [ A ]
```

Defines the class of LoRaWAN device in terms of how it performs transmission and reception operations.
· Class A : The lowest power mode that changes to receive mode after transmitting data
· Class B : Similar to Class A but stays in standby mode more frequently
· Class C : Bidirectional communication is always open

```
9 - TX POWER [ 14dB ]
```

Represents the power output used by the LoRa communication device when transmitting data. Supports a range from 0dB to 14dB.

`a - MANUAL JOIN`

Manually attempt to connect with a LoRa Gateway.

`b - MANUAL TIME SYNC`

Manually attempt to synchronize time with a LoRa Gateway.

`x - back to Main Menu`

Return to the previous menu.

LoRa Payload

The RN320 - BTH LoRa Payload is designed for efficient transmission of sensor data, historical records, or status updates over LoRa networks. It supports two distinct formats, each tailored to specific use cases:

- **DATA-IN Format**: Optimized for real-time transmission of current sensor values or live updates.
- **RESTORE-IN Format**: Designed for retrieving historical data points or restoring critical information.

1. DATA-IN Message Binary Format (Total Size: 24 Bytes)

Head	Model	TSMode	Timestamp
1 Byte	1 Byte	1 Byte	4 Byte

Sample Format	Temperature	Humidity	RSVD
1 Byte	4 Byte	4 Byte	8 Byte

Details:

- **Head (1 Byte)**:A fixed byte to indicate the start of a transmission. Possible values:
  - 0x0C: Data-In Payload (Realtime)
- **Model (1 Byte)**:Represents the index of the RadiNode transmitter model.
  - 30: RN320-BTH
- **Timestamp Mode (TSMode, 1 Byte)**:Determines the format of the timestamp.
  - 1: RadiNode Timestamp (time from 2010-01-01 00:00:00 UTC , as epoch - 1262304000)
- **Timestamp (4 Bytes)**:Represents the measurement time of the sample as a 32-bit integer.
- **Sample Format (1 Byte)**:Specifies the data format. For RN320-BTH:
  - 2: Float (4 Bytes, IEEE754 Single Precision)
- **Temperature (4 Bytes)**:Contains the Temperature data as a 32-bit IEEE754 float.
  - Example: 21.96
- **Humidity (4 Bytes)**:Contains the Humidity data as a 32-bit IEEE754 float.
  - Example: 29.85
- **RSVD reserved for future use.**

2. RESTORE-IN Message Binary Format (Total Size: 24 Bytes)

Head	Model	TSMode	Timestamp
1 Byte	1 Byte	1 Byte	4 Byte

Sample Format	Temperature	Humidity	RSVD
1 Byte	4 Byte	4 Byte	8 Byte

Details:

- **Head (1 Byte)**:A fixed byte to indicate the start of a transmission. Possible values:
  - 0x0D: Data-In Payload (Piggyback)
- **Model (1 Byte)**:Represents the index of the RadiNode transmitter model.
  - 30: RN320-BTH
- **Timestamp Mode (TSMode, 1 Byte)**:Determines the format of the timestamp.
  - 1: RadiNode Timestamp (time from 2010-01-01 00:00:00 UTC , as epoch - 1262304000)
- **Timestamp (4 Bytes)**:Represents the measurement time of the sample as a 32-bit integer.
- **Sample Format (1 Byte)**:Specifies the data format. For RN320-BTH:
  - 2: Float (4 Bytes, IEEE754)
- **Temperature (4 Bytes)**:Contains the Temperature data as a 32-bit IEEE754 float.
  - Example: 21.96
- **Humidity (4 Bytes)**:Contains the Humidity data as a 32-bit IEEE754 float.
  - Example: 29.85
- **RSVD reserved for future use.**

For decoder examples please find files on `https://github.com/radionode/RN300-Series-Lorawan/RN320-BTH`

Alarm Setup

To set the alarm conditions, select menu 3 - ALARM SETUP.

```
[ 3 - ALARM SETUP MENU.]
1 - TEMP OFFSET
```

You can set the temperature calibration value. The measured temperature will be displayed with the calibration value added.

```
2 - HUMI OFFSET
```

You can set the humidity calibration value. The measured humidity will be displayed with the calibration value added.

```
3 - TEMP ALARM MIN
```

Enter the minimum value of the normal range for the temperature sensor.

```
4 - TEMP ALARM MAX
```

Enter the maximum value of the normal range for the temperature sensor.

```
5 - HUMI ALARM MIN
```

Enter the minimum value of the normal range for the humidity sensor.

```
6 - HUMI ALARM MAX
```

Enter the maximum value of the normal range for the humidity sensor.

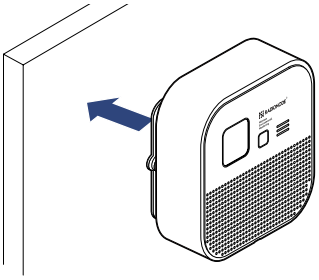
```
x - back to Main Menu
```

Return to the previous menu.

Installation

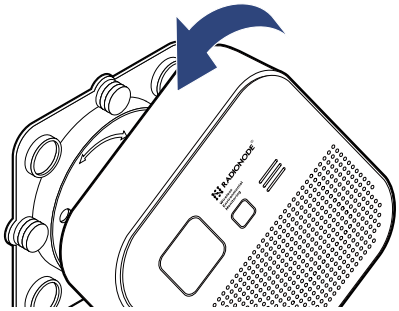
Magnetic Version

1. Attach the device to metal surfaces such as refrigerators, freezers, or cargo containers. The device is equipped with anti-slip pads on the back to ensure a firm and sturdy installation.

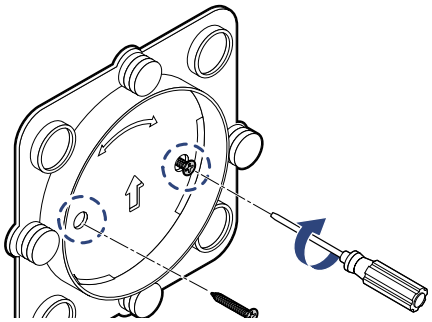


Screw Version

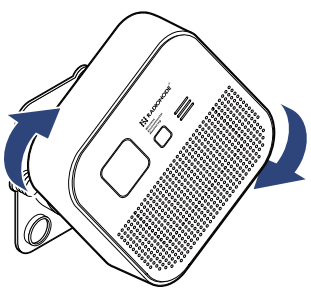
1. Turn the product counterclockwise to detach the mount on the back.

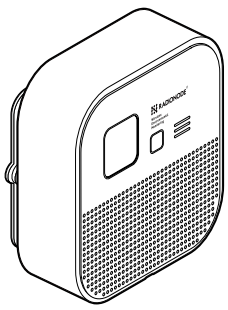


2. Then, position the detached mount on the wall and secure it with two screws.



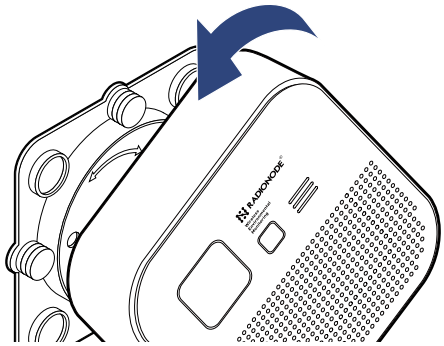
3. After securing the mount, attach the main body of the product to it by turning it clockwise.



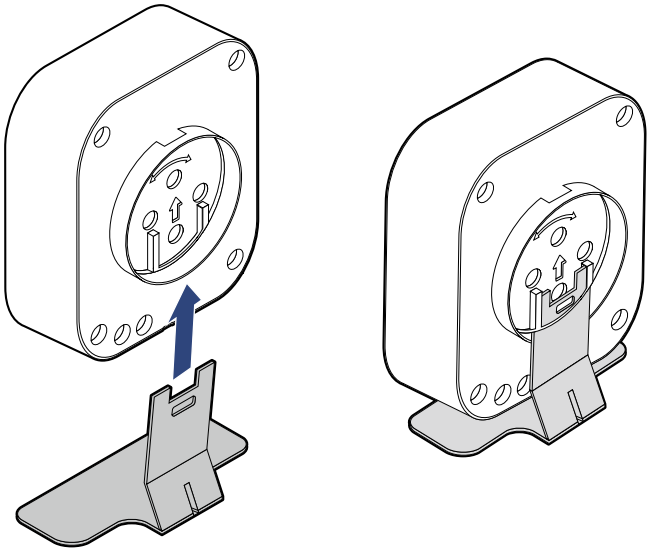


Strand-type Mount Version

1. Turn the product counterclockwise to detach the mount on the back



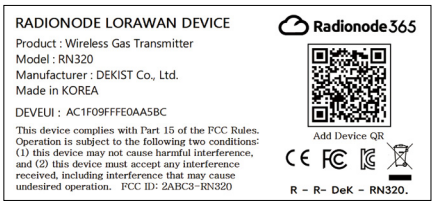
2. Then, align and attach the stand-type mount to the guide at the lower back of the product.



Registering on Radionode 365 Cloud

To register the RN320 product on Radionode365, there must be a LoRa gateway registered with Radionode365. Once you have a LoRa gateway, set up the RN320 product to connect wirelessly, and then scan the QR CODE on the side of the product to proceed with registration on the displayed screen.

1. Check the QR code and device information on the side of the RN320.



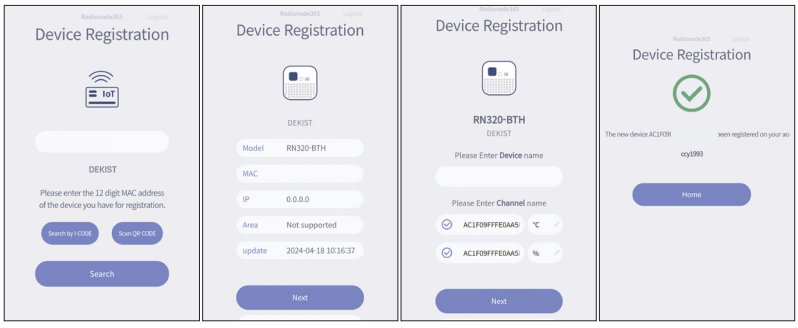
2. Scan the QR code on the side of the device to navigate to the device registration web page. Log in with your Radionode365 account information to register the device.

3. After the device's DeviceEUI information is automatically retrieved, confirm that it matches the information written on the side of the device, then press the Search button.

4. Check the device information such as model name, MAC, and IP, then press the Next button.

5. Enter the name of the device to be managed on Radionode365. Select the channel to register, enter the channel name and measurement units, then press the Next button.

6. Device registration and channel registration are completed. Additional settings can be made at s2.radionode365.com. You can find related help at the support portal (help.radionode365.com).



Radionode365 registered

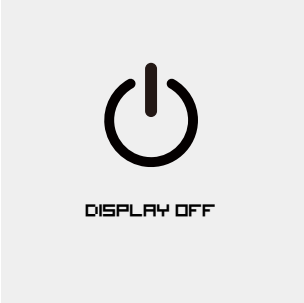
You must have a gateway with a Radionode365 registration sticker attached and connected to the internet in the vicinity to be able to register the device.

Display

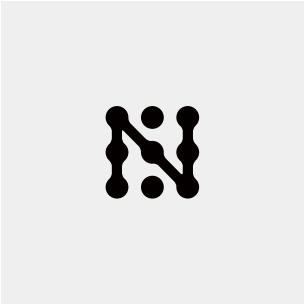
The display located on the front of the device shows important information including the model number, measurement values, and the status of the device. Utilizing electronic paper, this display has low power consumption and characteristics such as flickering during screen transitions.

Refer to page 13, the system settings page (2. DISPLAY TYPE), for instructions on how to change the display settings.

	Measurement Interval (1~60 Min)
	Built-in Buzzer ON/OFF Indicator
	Micro SD Card Insertion Detection
	LoRaWAN Signal Strength
	Battery Level
	Temperature Value (CH1) ℃
	Humidity Value (CH2) %
	Last Measurement Time



The product is in standby mode. You can change it to operating mode by pressing the reset switch at the bottom.



When the device is turned on, the Radionode logo is displayed along with a buzzer sound.

The display shows the model name of the device and indicates that it is attempting to communicate with the LoRa Gateway.

The device successfully connected to the LoRa Gateway.

The device is attempting to synchronize time information through the LoRa Gateway.

The device has successfully synchronized time information through the LoRa Gateway.

DISPLAY TYPE : A

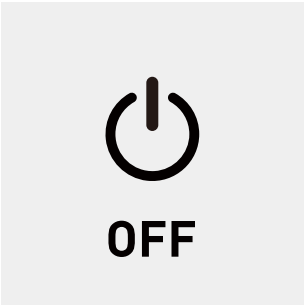
In the default setting state, the measurement value of CH1 is displayed at the top part of the display, and the measurement value of CH2 is displayed at the bottom part, both in the same size.

DISPLAY TYPE : B

The measurement value of CH1 is displayed largely at the top part of the display, and the measurement value of CH2 is displayed smaller at the bottom part..

DISPLAY TYPE : C

The measurement value of CH2 is displayed largely at the top part of the display, and the measurement value of CH1 is displayed smaller at the bottom part.

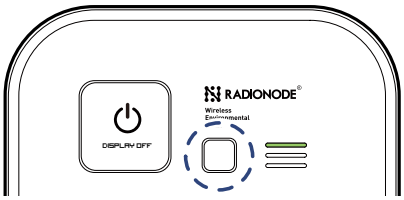


DISPLAY TYPE : OFF

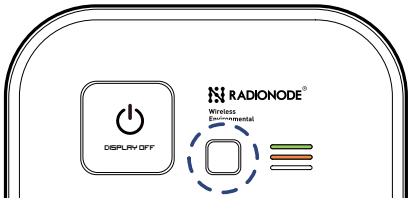
The display of the device is disabled to minimize power consumption.

How to switch from OFF to ON display status

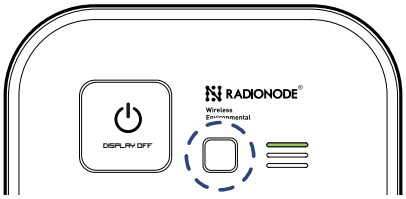
1. Short press the front button once. Press the power button on the display briefly once to put it into standby mode.At this time, the green LED light will blink.



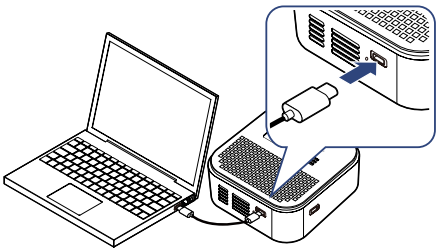
2. Long press the front button once. Press the power button on the display long once to forcefully enter the menu.During this process, the green and orange LED lights will alternate blinking.

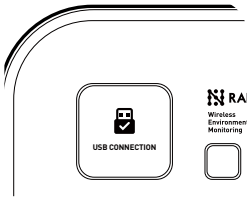


3. Long press the front button again. Finally, press the power button on the display long once again to enter USB CONNECT MODE. At this time, the green LED light will blink, and the display will turn on.



4. Use the C to A type cable included with the product. Connect the C type terminal to the bottom of the RN320 and the A type terminal to the PC.

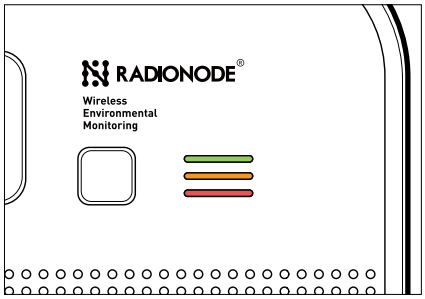




[Display upon entering USB CONNECT MOD]

LED Status Indicators

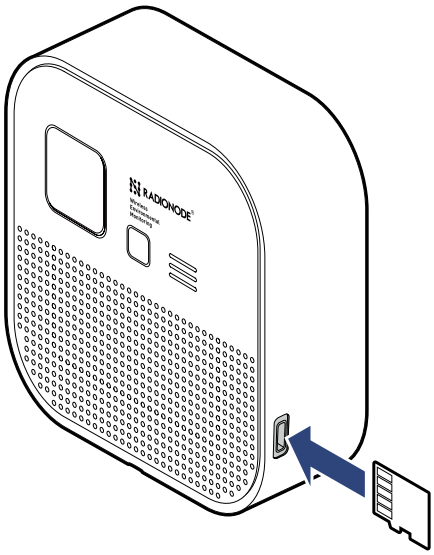
Refer to page 13, the system setup page (7. LED MODE), for instructions on how to change the display settings.



- LED OP MODE: In the most basic state, the data is transmitted, or the front button is pressed, a green LED will blink.
- LED AQ+OP MODE: When the temperature and humidity values are within the normal range, the green LED light is on, and when they are outside the normal range, the red LED light is on.
- LED OFF MODE: If the LED status indicator is completely disabled, the LED will not blink under any circumstances.

Memory Card for Data Recording

The device has the SD-WRITE function enabled by default.



When an SD card is installed in the data logger, the measured data is recorded in CSV format as follows:

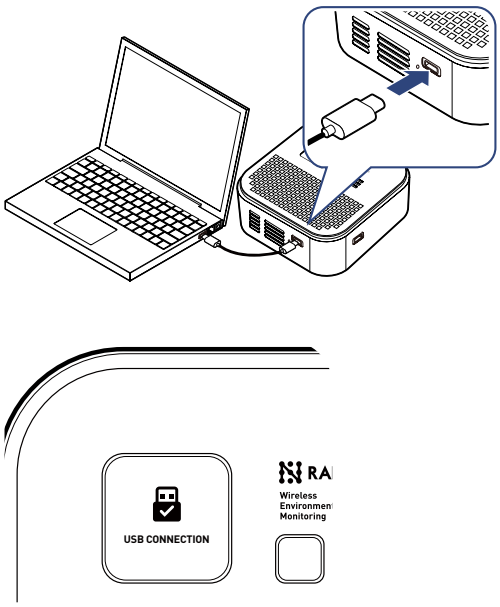
Measurement date and time, timestamp, DEVEUI address, channel 1 value, channel 2 value.

	A	B	C	D	E
1	CALENDAR(UTC+09:00)	TIMESTAMP	DEVEUI	CH1	CH2
2	2024-04-08T17:31:54	1712565114	AC1F09FFFE0AA5BC	26.58	28.19
3	2024-04-08T18:03:54	1712567034	AC1F09FFFE0AA5BC	26.86	27.46
4	2024-04-08T18:08:54	1712567334	AC1F09FFFE0AA5BC	26.82	27.54
5	2024-04-08T18:13:54	1712567634	AC1F09FFFE0AA5BC	26.88	30.66
6	2024-04-08T18:18:54	1712567934	AC1F09FFFE0AA5BC	26.99	27.21
7	2024-04-08T18:23:54	1712568234	AC1F09FFFE0AA5BC	27.02	27.53
8	2024-04-08T18:28:54	1712568534	AC1F09FFFE0AA5BC	27.04	27.25
9	2024-04-08T18:33:54	1712568834	AC1F09FFFE0AA5BC	27.2	28.12

Maintenance

Update

1. Use the C to A type cable included with the product purchase to connect the C type terminal at the bottom of the RN320 to the A type terminal of the PC.



[Display upon entering USB CONNECT MOD]

2. While pressing the button on the front of the product, press the reset button located at the bottom of the product twice in succession to enter firmware update mode.
3. The RN320 drive will be detected in the devices and drives on your PC.
4. Drag and drop the latest firmware file provided by our company from your computer into the RN320 drive.
5. The firmware update will proceed, and the device will automatically reboot.

> ⚠ The firmware update is completed without changing the existing settings.

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