7.5' Large LCD Screen Display Wi-Fi Weather Station Operation Manual

Model: WS3900/WS3910

Table of Contents

1. Introduce

WS3900/WS3910 is a brand new 7.5-inch Wi-Fi LCD large screen weather station. Supports connecting to a 2.4 GHz Wi-Fi network for viewing data from anywhere on your phone, tablet, and computer browser, all for free. It can also pair with optional sensors(refer Section 4.1) with the same RF frequency to use together.

WS3900 console v.s.WS3910 console

Built-in sensors	WS3900 console	WS3910 console
CO2 sensor	×	√
Temp.& Humidity sensor	√	√
Pressure sensors	√	√

Meanwhile, it supports connecting IoT devices, such as WFC01 and AC1100, to achieve smart control through the Ecowitt app.
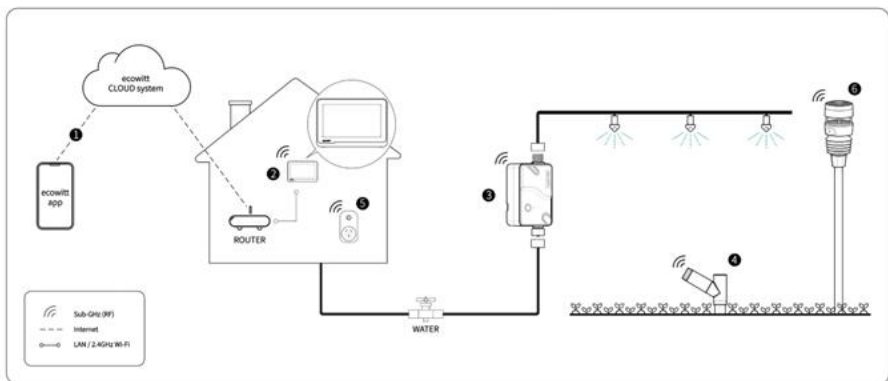
IoT Ecosystem

The following user guide provides step by step instructions for installation and operation. Use this manual to become familiar with your professional weather station and save it for future reference.

2. Warnings and Cautions

Warning:

- Any metal object may attract a lightning strike, including your weather station mounting pole. Never install the weather station in a storm.

- Installing your weather station in a high location may result in injury. Perform as much of the initial check out and operation on the ground and inside a building or home. Only install the weather station on a clear, dry, day.

- If you are mounting the weather station to a house or structure, consult a licensed electrician for proper grounding. A direct lightning strike to a metal pole can damage or destroy your home.
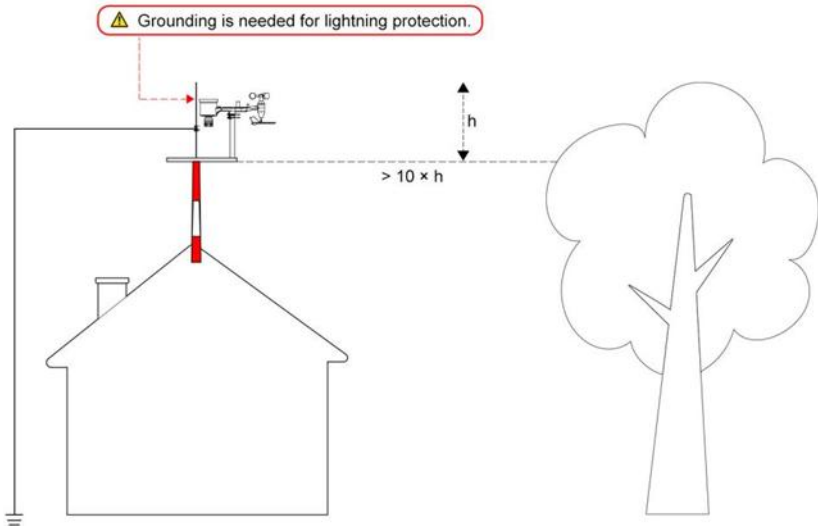
3. Unpacking

Open your weather station box and inspect that the contents are intact (nothing broken) and complete (nothing missing). Inside you should find the following:

QTY	Item Description
1	7.5" LCD Display console
1	Outdoor Sensor Body with built-in: Thermo-hygrometer / Rain Gauge / Wind Speed Sensor/ Wind Direction Sensor, Light and UV sensor, Solar panel
1	Wind speed cups (to be attached to outdoor sensor body)
1	Wind vane (to be attached to outdoor sensor body)
2	U-Bolts for mounting on a pole
4	Threaded nuts for U-Bolts (M6 size)
1	Metal mounting plate to be used with U-Bolts
1	Wrench for M6 bolts
1	3.5mm DC to USB Cable
1	User manual (this manual)

Table 1: Package content

Note: Batteries for the outdoor sensor package are not included. You will need 2 X AA size batteries, alkaline or Lithium batteries (Lithium recommended for colder climates).

4. Features

- Calendar, date, time, moon phase, sunrise, and sunset
- Built-in temperature humidity sensor, and barometric pressure, CO_2(only WS3910) sensors
- Displaying indoor temperature, humidity, pressure, and pressure changing trend
- Displaying wind speed, wind direction, rainfall, UV, solar radiation, feels like, dew point, CO_2(only WS3910)
- Support receiving and displaying up to 8 channels of temperature and humidity sensor data (sensor sold separately)
- Support receiving and display PM1.0, PM2.5, PM10 and AQI data (sensors sold separately)
- Weather forecast: Sunny, Partly Cloudy, Cloudy, Rainy, Stormy, Snowy and Storm Snowy.
- Alarm/Snooze function
- Unit setting
- DST (Daylight Saving Time)
- RST function (Clear daily max/min values)
- Backlight adjustment under DC power supply
- Max value of outdoor/indoor temperature & humidity, pressure, rainfall, wind speed, gust speed, UV, solar radiation, feels like, and dew point
- Min value of outdoor/indoor temperature & humidity, pressure, feels like, and dew point
- Can be used as a Wi-Fi gateway to support the reception of more sensors' data, which can be viewed through the web page
- Support Wi-Fi configuration on the web page (192.168.4.1), view more sensor data, set up server, set up calibration parameters, set up sensor ID
- Data storage on Ecowitt server: https://ecowitt.net
- Support uploading data to the weather station server after connecting to Wi-Fi network:
- ∎ ecowitt.net (Default upload to this server)
- ∎ wunderground.com

- ■ weathercloud.net
- ■ wow.metoffice.gov.uk
- ■ Custmized servers

5. Set up Guide

5.1 Pre-Installation Checkout

To complete assembly you will need a Philips screwdriver (size PH0) and a wrench (size M6; included in package).

Note: We suggest you assemble all components of the weather station, including console in one location so you can easily test functionality. After testing, place the outdoor sensor package in the desired location. Note, however, that movement during assembly, and movement after assembly can cause the rain sensor to "falsely" register rain. It is therefore best if you do not connect the console to any Internet services until you have reset these false readings using the console. The errant values may be hard to remove from Internet services if you do not reset first.

Attention:

- Follow suggested order for battery installation (outdoor sensor first, console second)
- Ensure batteries are installed with correct polarity (+/-)
- Do not mix old and new batteries
- Do not use rechargeable batteries
- If outdoor temperature may go below 0C for prolonged periods, Lithium based batteries are suggested over alkaline type batteries for the outdoor sensor array

5.2 Site Survey

Perform a site survey before installing the weather station. Consider the following:

1. You must clean the rain gauge every few months and change the batteries every 2-3 years. Provide easy access to the weather station.

2. Avoid radiant heat transfer from buildings and structures. In general, install the sensor array at least 5' or 1.52m from any building, structure, ground, or roof top.

3. Avoid wind and rain obstructions. The rule of thumb is to install the sensor array at least four times the distance of the height of the tallest obstruction. For example, if the building is 20' or 6.10m tall and the mounting pole is 6' or 1.83m tall, install the sensor array 4 x (20 – 6)' = 56' or 4 x (6.1-1.83)=17.08m away.

4. Mount the sensor array in direct sunlight for accurate temperature readings.

5. Installing the weather station over sprinkler systems or other unnatural vegetation may affect temperature and humidity readings. We suggest mounting the sensor array over natural vegetation.

6. Wireless Range. Radio communication between receiver and transmitter in an open field can reach a distance of up to 330 feet or 100 meter, providing there are no interfering obstacles such as buildings, trees, vehicles and high voltage lines. Wireless signals will not penetrate metal buildings. Under most conditions, the maximum wireless range is 100' or 30m.

7. Radio Interference. Computers, radios, televisions and other sources can interfere with radio communications between the sensor array and console. Please take this into consideration when choosing console or mounting locations. Make sure your display console is at least five feet or 1.52 meter away from any electronic device to avoid interference.

5.3 Sensor Package Assembly

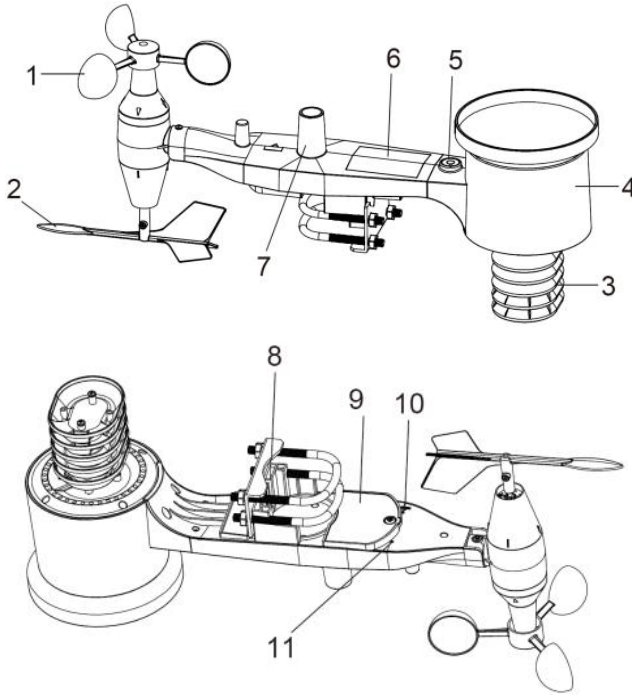See Figure 1 to locate and understand all the parts of the outdoor sensor package once fully assembled.

Figure 1: Sensor assembly components

1 Wind speed cups	7 Light sensor and UV sensor
2 Wind vane	8 U-Bolts
3 Thermo- and hygro-meter sensors	9 Battery compartment door
4 Rain collector	10 Reset button
5 Bubble level	11 LED (red) to indicate data transmission
6 Solar panel	

Table 2: Sensor assembly detailed items

5.3.1 Install U-bolts and metal plate

Installation of the U-bolts, which are in turn used to mount the sensor package on a pole, requires installation of an included metal plate to receive the U-bolt ends. The metal plate, visible in Figure 2 on the right side, has four holes through which the ends of the two U-Bolts will fit. The plate itself is inserted in a groove on the bottom of the unit (opposite side of solar panel). Note that one side of the plate has a straight edge (which goes into the groove), the other side is bent at a 90-degree angle and has a curved profile (which will end up "hugging" the mounting pole). Once the metal plate is inserted, remove nuts from the U-Bolts and insert both U-bolts through the respective holes of the metal plate as shown in Figure 2.
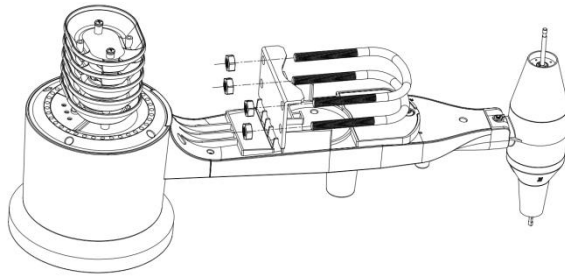

Figure 2: U-Bolt installation

Loosely screw on the nuts on the ends of the U-bolts. You will tighten these later during final mounting. Final assembly is shown in Figure 3.
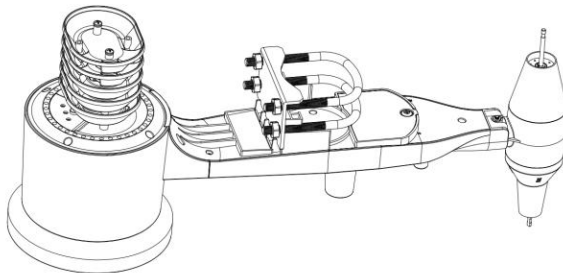

Figure 3: U-Bolts and nuts installed

The plate and U-Bolts are not yet needed at this stage but doing this now may help avoid damaging wind vane and wind speed cups later on.

Handling of the sensor package with wind vane and speed cups installed to install these bolts is more difficult and more likely to lead to damage.

5.3.2 Install wind vane

Push the wind vane onto the shaft on the bottom side of the sensor package, until it goes no further, as shown on the left side in Figure 4. Next, tighten the set screw, with a Philips screwdriver (size PH0), as shown on the right side, until the wind vane cannot be removed from the axle. Make sure the wind vane can rotate freely. The wind vane's movement has a small amount of friction, which is helpful in providing steady wind direction measurements.
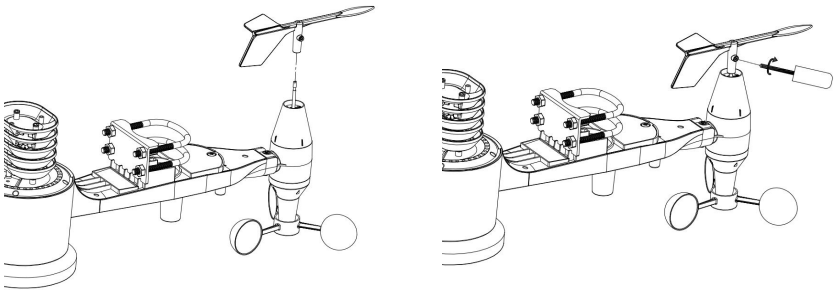
Figure 4: Wind vane installation diagram

5.3.3 Install wind speed cups

Push the wind speed cup assembly onto the shaft on the opposite side of the wind vane, as shown in Figure 5 on the left side. Tighten the set screw, with a Philips screwdriver (size PH0), as shown on the right side. Make sure the cup assembly can rotate freely. There should be no noticeable friction when it is turning.
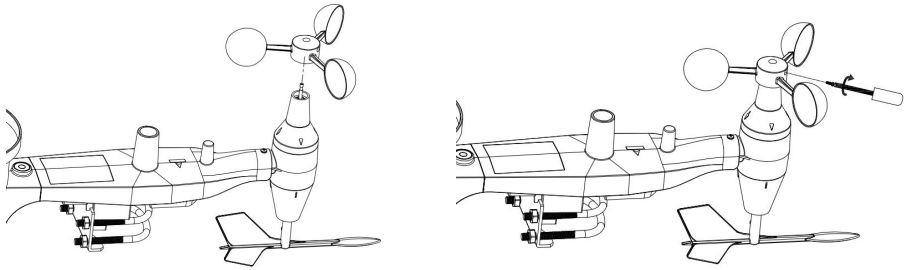
Figure 5: Wind speed cup installation diagram

5.3.4 Install Batteries in sensor package

Open the battery compartment with a screwdriver and insert 2 AA batteries in the battery compartment. The LED indicator on the back of the sensor package (item 9) will turn on for four seconds and then flash once every 16 seconds indicating sensor data transmission. If you did not pay attention, you may have missed the initial indication. You can always remove the batteries and start over, but if you see the flash once every 16 seconds, everything should be OK.
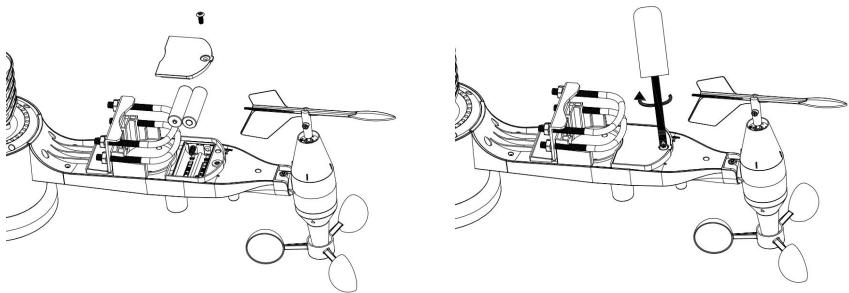

Figure 6: Battery installation diagram

Note: If LED does not light up or is on permanently, make sure the battery is inserted the correct way and inserted fully, starting over if necessary. Do

not install the batteries backwards as it may permanently damage the outdoor sensor.

Note: We recommend Lithium batteries for cold weather climates, but alkaline batteries are sufficient for most climates. Rechargeable batteries have lower voltages and should never be used.

5.3.5 Mount assembled outdoor sensor package

5.3.5.1 Before you mount

Before proceeding with the outdoor mounting detailed in this section, you may want to skip to setup instructions in section 6 and onwards first, while you keep the assembled outdoor sensor package nearby (although preferably not closer than 5 ft. or 1.53m from the console). This will make any troubleshooting and adjustments easier and avoids any distance or interference related issues from the setup.

After setup is complete and everything is working, return here for outdoor mounting. If issues show up after outdoor mounting they are almost certainly related to distance, obstacles etc.

5.3.5.2 Mounting

You can attach a pipe to a permanent structure and then attach the sensor package to it (see Figure 7).

The U-Bolts will accommodate a pipe diameter of 1-2 inches (pipe not included).
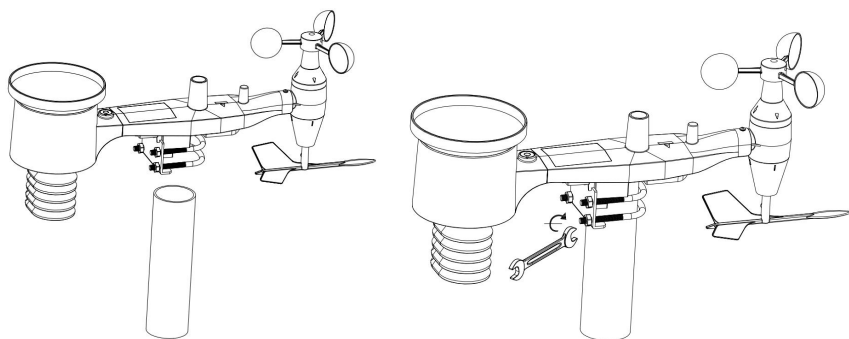
Figure 7: Sensor package mounting diagram

Make sure the mounting pipe is vertical, or very close to it. Use a level if needed.

Finally, place the sensor package on top of the prepared mounting pipe. Once placed, hand tightens all four nuts, taking care to do so evenly. Do not use a wrench yet!

Now you will need to align the whole package in the proper direction by rotating it on top of the mounting pipe as needed. Locate the arrow labeled "WEST" that you will find on top of the sensor package right next to the light sensor. You must rotate the whole sensor package until this arrow points due west. To achieve proper alignment, it is helpful to use a compass (many cell phones have a compass application). Once rotated in the correct orientation, lightly tighten the bolts a little more (use a wrench) to prevent further rotation.

Note: The orientation to WEST is necessary for two reasons. The most important one is to position the solar panel and light sensor in the most advantageous position for recording solar radiation and charging internal capacitors. Secondly it causes a zero reading for wind direction to correspond to due NORTH, as is customary. This orientation is correct for installations in the northern hemisphere. If you are installing in the southern

hemisphere, the correct orientation to achieve the same optimal positioning is to have the "WEST" arrow actually point due EAST! This has the side effect, however, of lining up the 0 reading of the wind direction with SOUTH. This needs to be corrected using a 180-degree offset in the calibration settings (see section 6.9.5).

Now look at the bubble level. The bubble should be fully inside the red circle. If it is not, wind direction, speed, and rain readings may not operate correctly or accurately. Adjust the mounting pipe as necessary. If the bubble is close, but not quite inside the circle, and you cannot adjust the mounting pipe, you may have to experiment with small wooden or heavy cardboard shims between the sensor package and the top of the mounting pole to achieve the desired result (this will require loosening the bolts and some experimentation).

Make sure you check, and correct if necessary, the westerly orientation as the final installation step, and now tighten the bolts with a wrench. Do not over tighten, but make sure strong wind and/or rain cannot move the sensor package.

Note: If you tested the full assembly indoors and then came back here for instructions and mounted to sensor package outdoor you may want to make some further adjustments on the console. The transportation from indoor to outdoor and handling of the sensor is likely to have "tripped" the rainfall sensing bucket one or more times and consequently the console may have registered rainfall that did not really exist. You can use console functions to clear this from history. Doing so is also important to avoid false registration of these readings with weather services.

5.3.6 Reset Button and Transmitter LED

In the event the sensor array is not transmitting, reset the sensor array.

Using a bent-open paperclip, press and hold the RESET BUTTON (see Figure 8) to affect a reset: the LED turns on while the RESET button is depressed, and you can now let go. The LED should then resume as normal, flashing approximately once every 16 seconds.
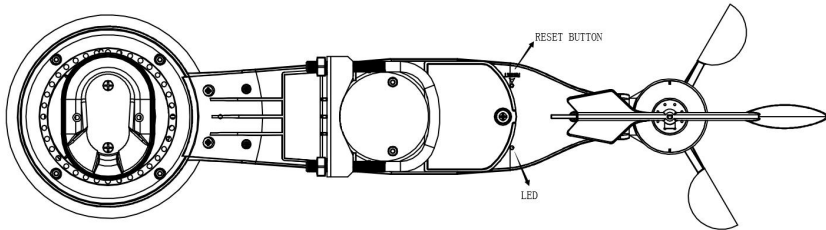
Figure 8: Reset button and Transmitter LED location

5.4 Best Practices for Wireless Communication

Wireless (RF) communication is susceptible to interference, distance, walls and metal barriers. We recommend the following best practices for trouble free wireless communication between both sensor packages and the console:

- **Electro-Magnetic Interference (EMI)**. Keep the console several feet away from computer monitors and TVs.

- **Radio Frequency Interference (RFI).** If you have other devices operating on the same frequency band as your indoor and/or outdoor sensors and experience intermittent communication between sensor package and console, try turning off these other devices for troubleshooting purposes. You may need to relocate the transmitters or receivers to avoid the interference and establish reliable communication. The frequencies used by the sensors are one of (depending on your location): 433, 868, or 915 MHz (915 MHz for United States).

- **Line of Sight Rating.** This device is rated at 300 feet or 100 meter line of sight (under ideal circumstances; no interference, barriers or walls), but in most real-world scenarios, including a wall or two, you will be able to go about 100 feet or 30 meter.
- **Metal Barriers.** Radio frequency will not pass through metal barriers such as aluminum siding or metal wall framing. If you have such metal barriers and experience communication problems, you must change the placement of sensor package and or console.

The following table shows different transmission media and expected signal strength reductions. Each "wall" or obstruction decreases the transmission range by the factor shown below.

Medium	RF Signal Strength Reduction
Glass (untreated)	5-15%
Plastics	10-15%
Wood	10-40%
Brick	10-40%
Concrete	40-80%
Metal	90-100%

Table 3: RF Signal Strength reduction

5.5 Wi-Fi Configuration
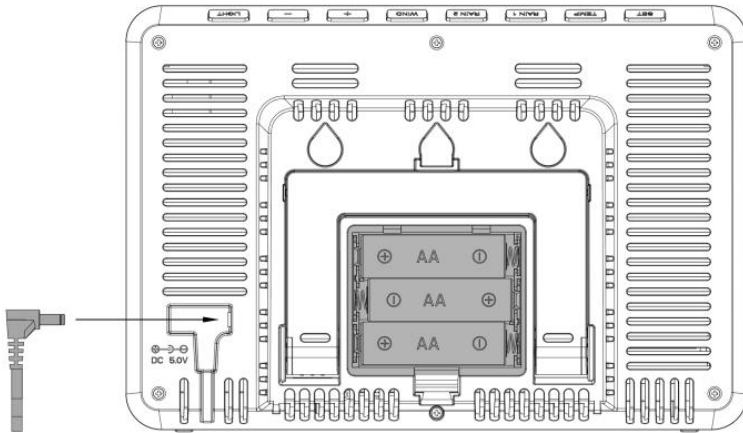
5.5.1 Power-up Console display

Figure 9: Install the Batteries or Insert the Power Adapter

(1) Insert the 5V AC adaptor into the back of the display console

Note: Place the outdoor sensor array about 5 to 10 feet from the display console and wait several minutes for the remote sensors to synchronize with the display console.

(2) Insert 3 x AA good quality Alkaline or Lithium batteries.

(3) Wait several minutes for the remote sensors to synchronize with the display console

(4) The software version number and frequency are displayed for 1 second, then full-screen displayed for 3 seconds, and finally enter normal mode.

(5)The console automatically opens the hotspot in 5 minutes to be paired by the phone or the laptop, and contact with the WIFI. If the hotspot does not get any action, and will be automatically closed after 5 minutes.

5.5.2 Download the Ecowitt App

6.2 Visit the App Store or Google Play Store or scan the QR code below to download the free Ecowitt App onto your mobile device.

6.3 Open the Ecowitt App, follow the on-screen setup instructions to create an account, add a new my device, and follow Section 6.3 or 6.4 below to connect your station to your Wi-Fi network.
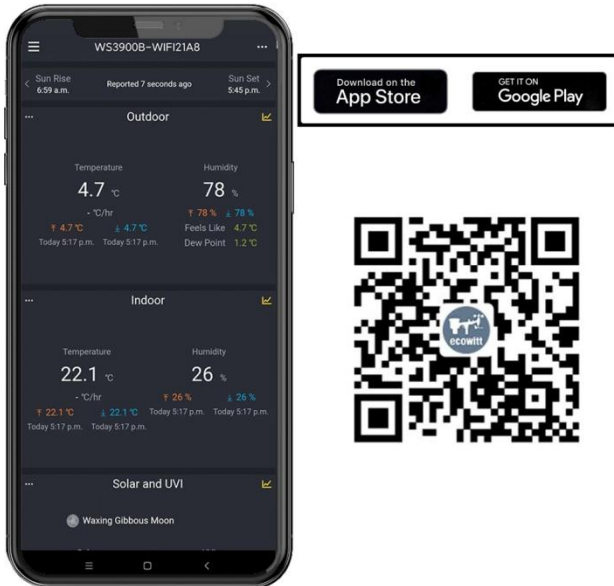

Figure 10: Download Ecowitt App

Note: For section 6.3 or 6.4 below, you'll need your Wi-Fi network name (SSID) and password. Make sure your mobile device is connected to the same Wi-Fi network.

Connect the Station to Wi-Fi via Ecowitt App

Open Ecowitt App, click "Add New Devices", click WS3900/WS3910 icon, and choose WiFi Provisioning：
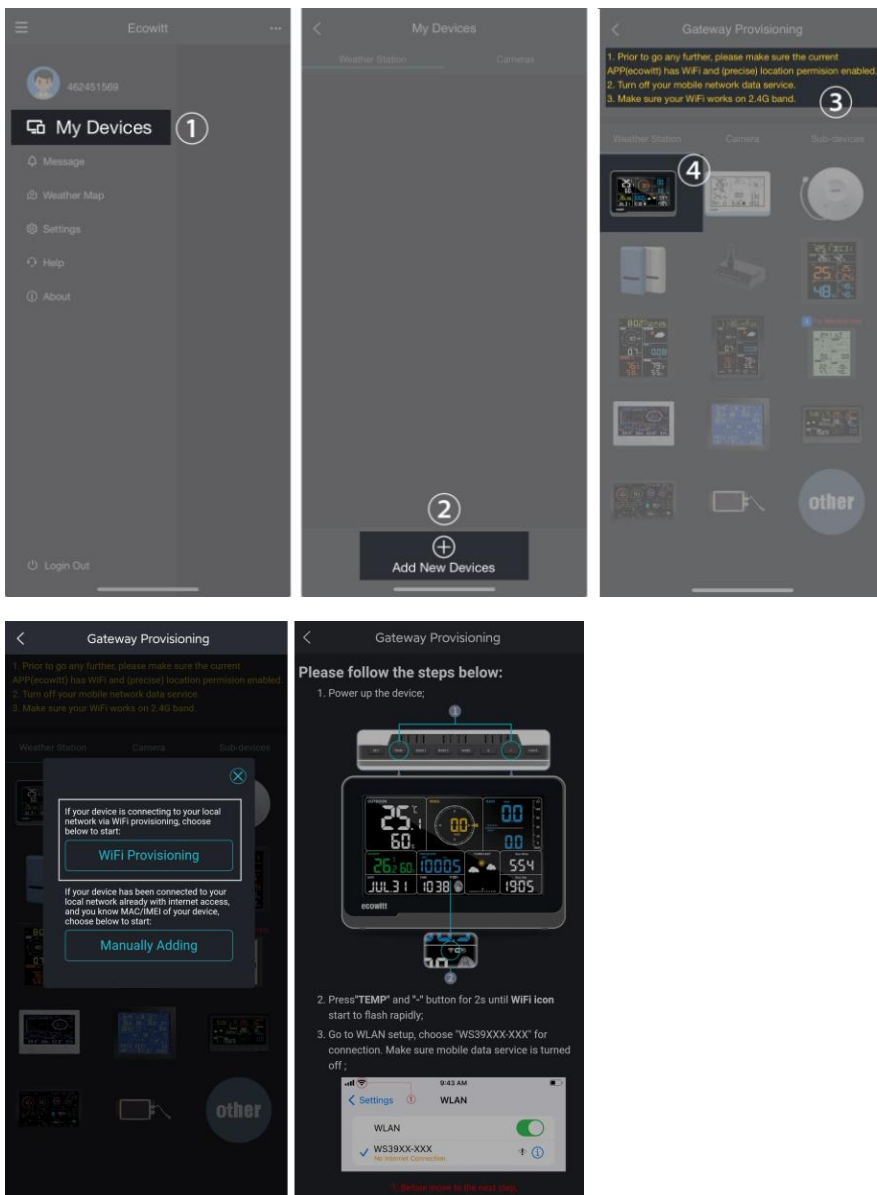
Figure 11

(1) Hold WS3900/WS3910's button TEMP + - for more than 2s in

normal mode will trigger to turn on AP (WS3900/WS3910's hotspot),
Wi-Fi icon will flash fast on the screen. Use your mobile phone to connect
to the hotspot "WS39xx-WIFIxxxx".

e.g.: WS3900x/WS3910x-WIFIxxxx, the first x represents the frequency,
A=868MHz, B=915MHz, C=433MHz, xxxx represents the last 4 digits of
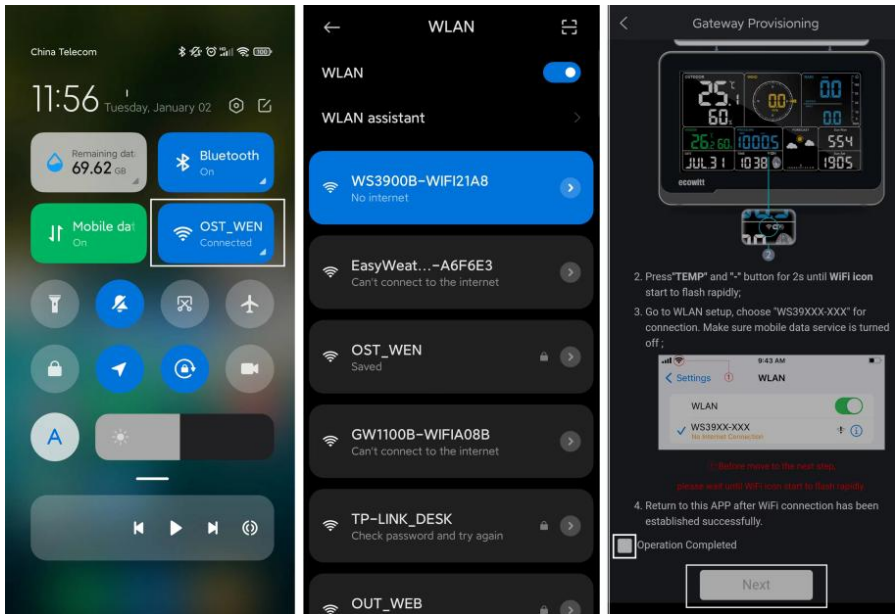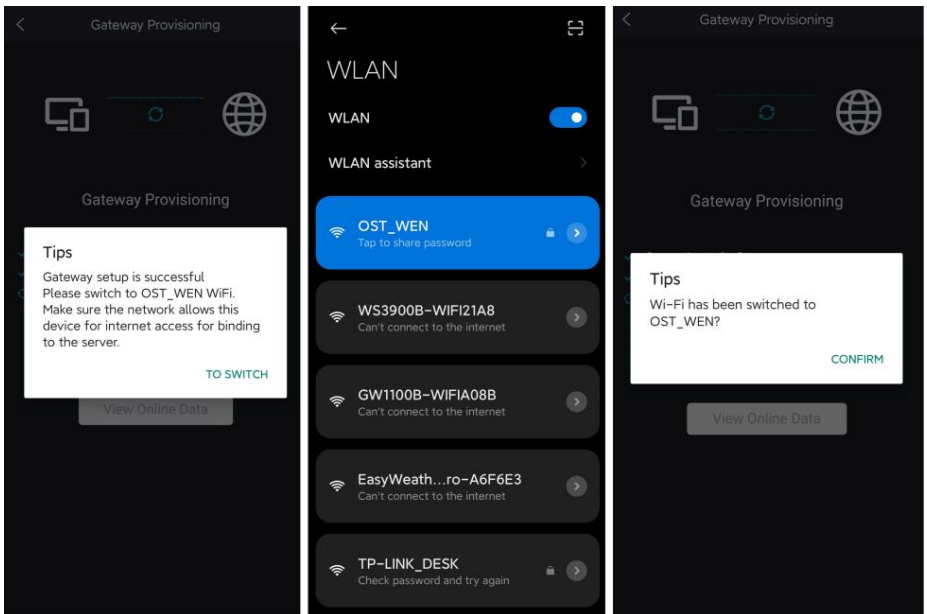the product MAC address.

Figure 12

(2)   Fill in the Wi-Fi SSID and Password.

Figure 13

(4) After the gateway setup is successful. Switch to your usual Wi-Fi. WS3900/WS3910 has been successfully added to the App, and you can view the weather data on the App.
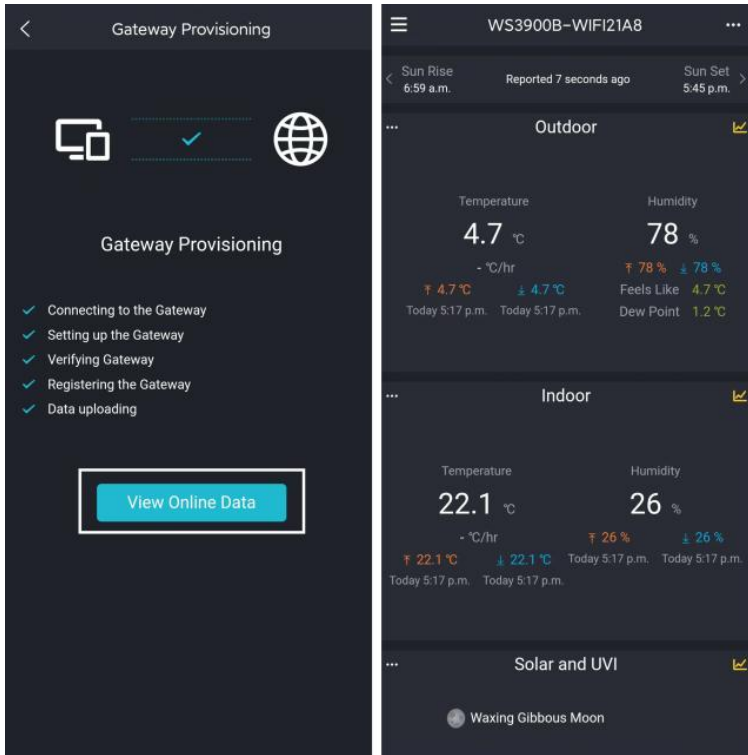
Figure 14

Note: If you are unable to connect the WS3900/WS3910 to Wi-Fi using the Ecowitt App, we recommend using the setup via Embedded Web Page 192.168.4.1.

5.5.3 Web Page 192.168.4.1

(1) Turn on WS3900/WS3910's AP.

The WS39xx's hotspot will be turned on automatically when the product is powered on, if the product is not paired with a network, the AP will be turned on all the time, and the Wi-Fi signal icon flashes fast to indicate.

(2) If WS39xx's hotspot can not be searched, hold TEMP + - for more

than 2s in normal mode will trigger to turn on AP, Wi-Fi icon will flash fast.

The above (1)(2) the WIFI hotspot should be in 5-minute pairing mode. If the pairing action does not be taken, so the WIFI hotspot will be closed automatically. If there is a phone or laptop to pair with the WIFI hotspot, the pairing time will be automatically extended to ensure the operation is successful.

Connecting this WS39xx's hotspot on a mobile phone or PC.

e.g.: WS3900x/WS3910x-WIFIxxxx, the first x represents the frequency, A=868MHz, B=915MHz, C=433MHz, xxxx represents the last 4 digits of the product MAC address.

(3) Open the browser and visit 192.168.4.1.

Enter the login page, the default password is empty, click Login directly.

(4) Select Local Network.

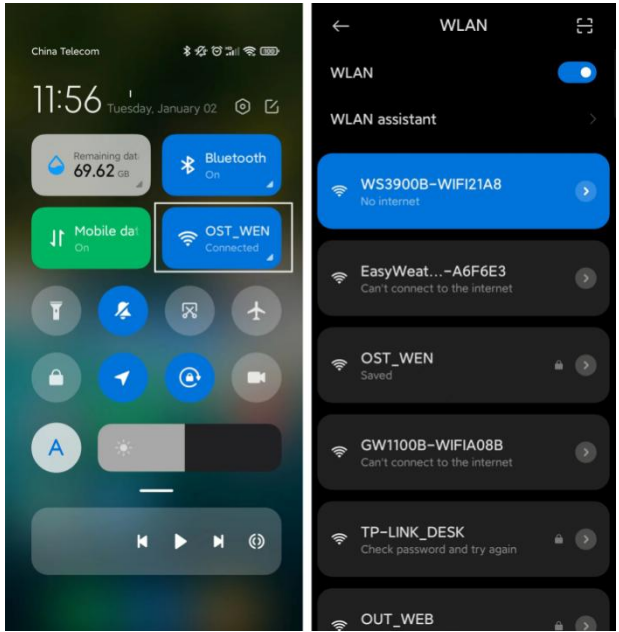(5) Select Scan Router, wait for the scanning to complete, and then select the router.
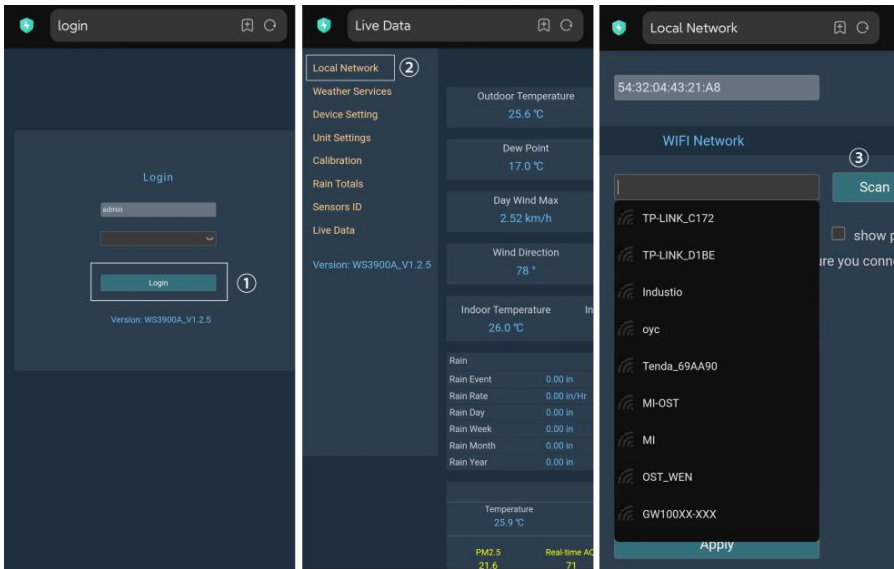
Figure 15: Select the router

(6) After entering the Wi-Fi password, click Apply

Figure 16

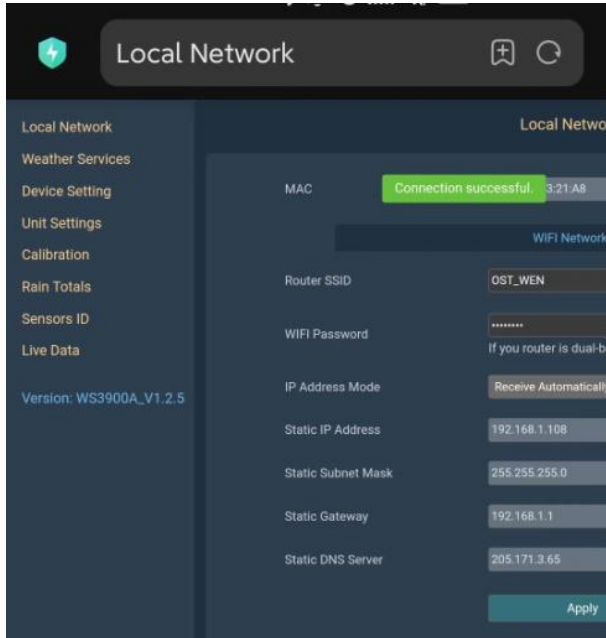(7) After connecting to the router, it prompts Connection successful.

Figure 17

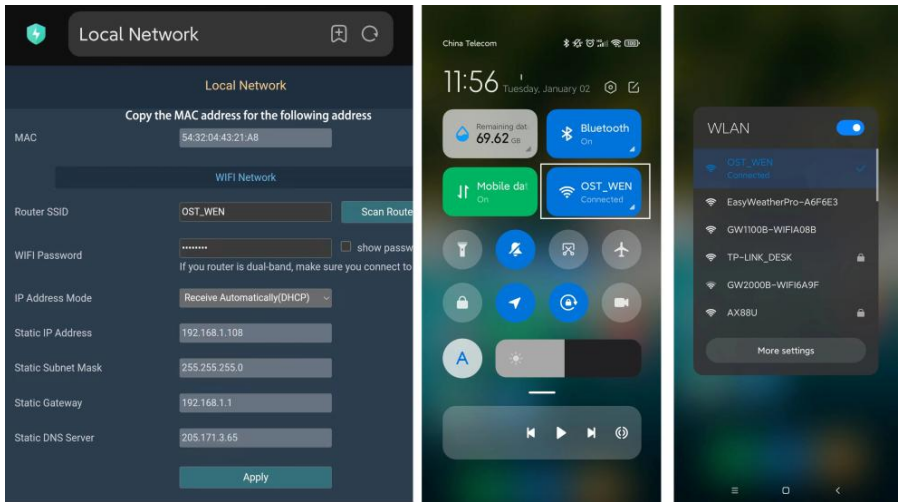(8) Wi-Fi configuration is complete. Copy the MAC Address for the following steps.

Figure 18: Copy the MAC address

(9) Open Ecowitt App, click "Add New Devices", click WS3900/WS3910 icon, and choose Manually Adding：
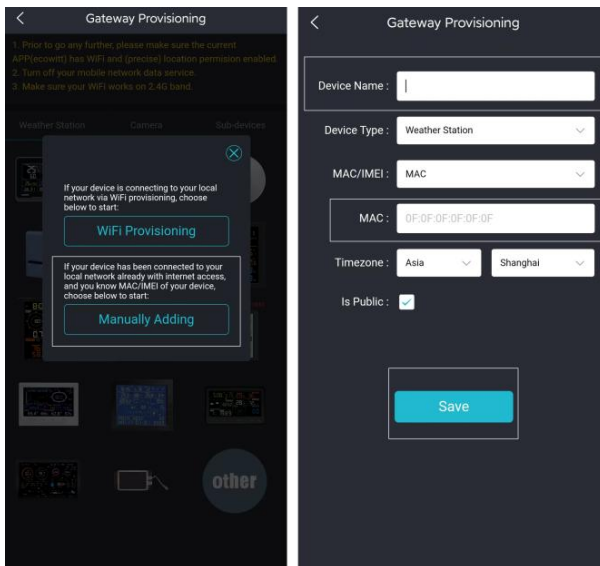

Figure 19

(10) Edit the Device Name and paste the MAC address copied in step (8) into the box, and click "Save", then you can view the data on the App.
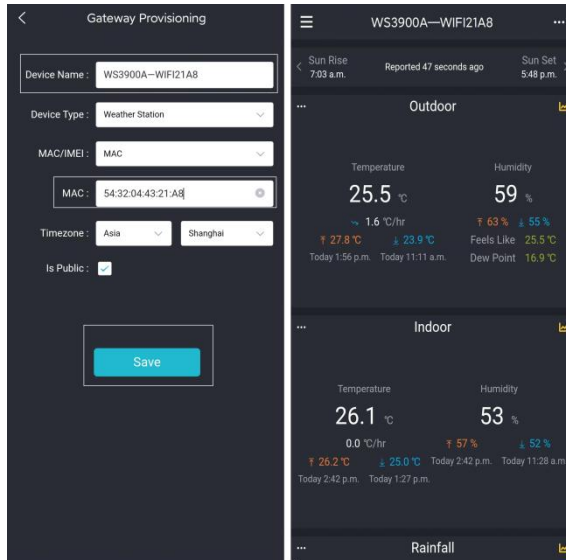

Figure 20

5.5.4 Edit Gateway

After completing the Wi-Fi configuration, press the upper left menu button , select "My Devices" and then press '...' button in the upper right corner of weather station list to enter Edit Gateway interface to set the following:

1. Firmware version upgrade

2. If there is new firmware release, there is a yellow upward arrow beside the firmware version to remind user to upgrade.

3. Device name

   You can rename your device name here.

4. Device Location

5. Timezone, DST (Daylight Saving Time)

6. Data Public

Press 'Save', then reboot the WS3900/WS3910 device, the device will automatically synchronize time and DST.
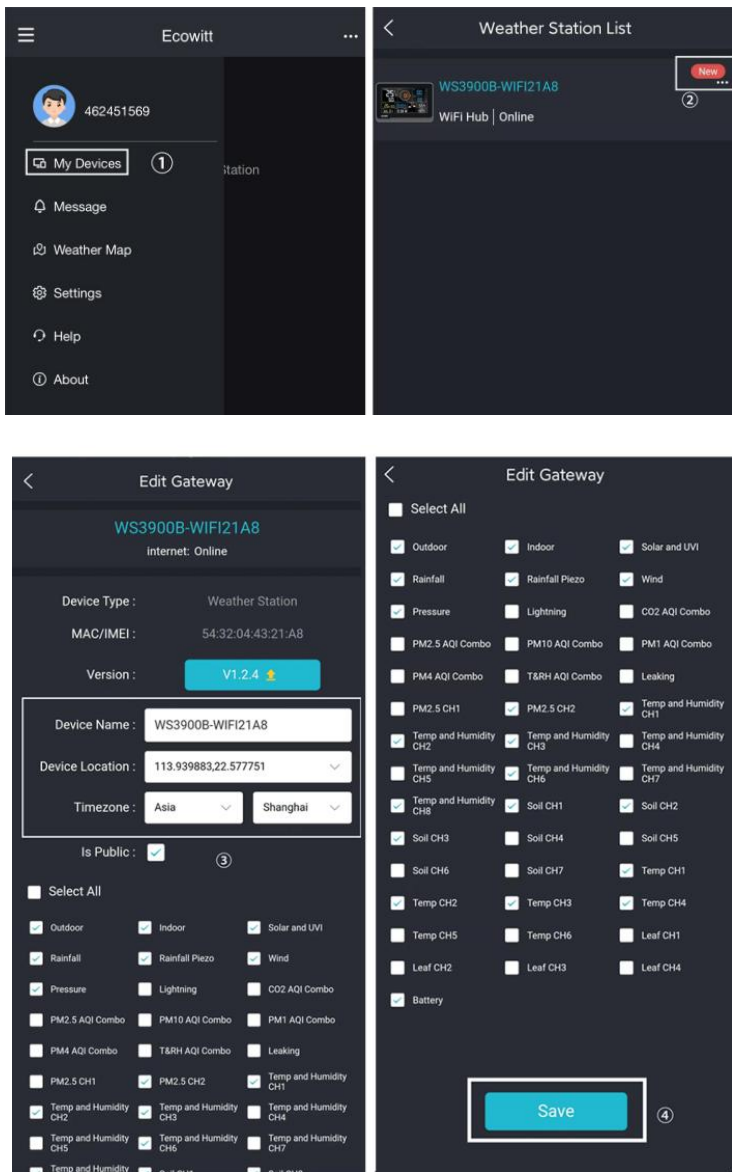

Figure 21: Related settings via Ecowitt App

Note: After completing the above Wi-Fi configuration and related settings, the WS3900/WS3910 screen will display a stable Wi-Fi signal tower, auto time zone, and DST (when necessary).

Figure 22: WS3900/WS3910 sync App related settings

5.5.5 Replacing Wi-Fi Router

If you want to change your router, follow these steps again after restoring the gateway to its factory settings (Hold SET + LIGHT for a factory reset).

5.6 Adding Sensors

To pair the optional sensors (refer to Section 8 for more optional sensors) with the WS3900/WS3910 display console, please do as follows:

1. Place the optional sensor next to the console.
2. Install batteries on the sensor and wait for 1-2 minutes.
3. Check whether the console will pick up the sensor data automatically and display it on the screen or App.
4. If data is not received from a registered sensor, the RF icon will decrease the signal by one frame; if data is received, the RF icon will increase the signal by one frame.
5. If data is not received, try the following: after making sure the phone and WS3900/WS3910 are connected to the same Wi-Fi network, open

the Ecowitt App, find Sensors ID, and enter the Sensor Management page.

6. In the Sensor Management page, find the sensor you want to pair - select the ID number box and register it.

7. Once successful, you may return to the main interface to check the data.

8. If you know exactly the sensor ID, and want the console to pair that sensor only, you may enter the sensor ID, and save the change to make it effective.
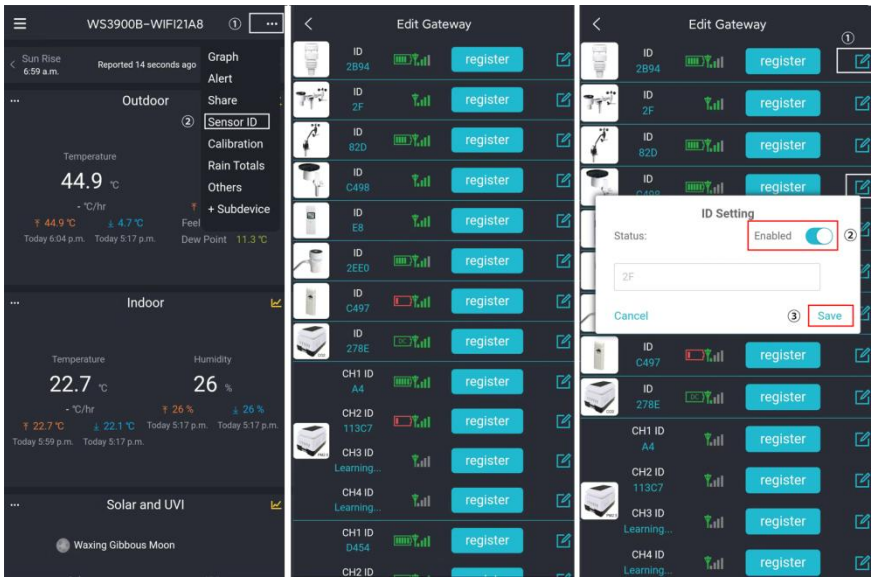

Figure 23: Sensor ID page

5.7 Upload Data to Server

After the Wi-Fi configuration is successful, data can be uploaded to the following weather station servers:

A. ecowitt.net (Default upload to this server)

B. wunderground.com

C. weathercloud.net

D. wow.metoffice.gov.uk

E. Customized servers

Upload server's management:

(1) Ensure that the mobile phone and WS3900/WS3910 receiver are using the same Wi-Fi.

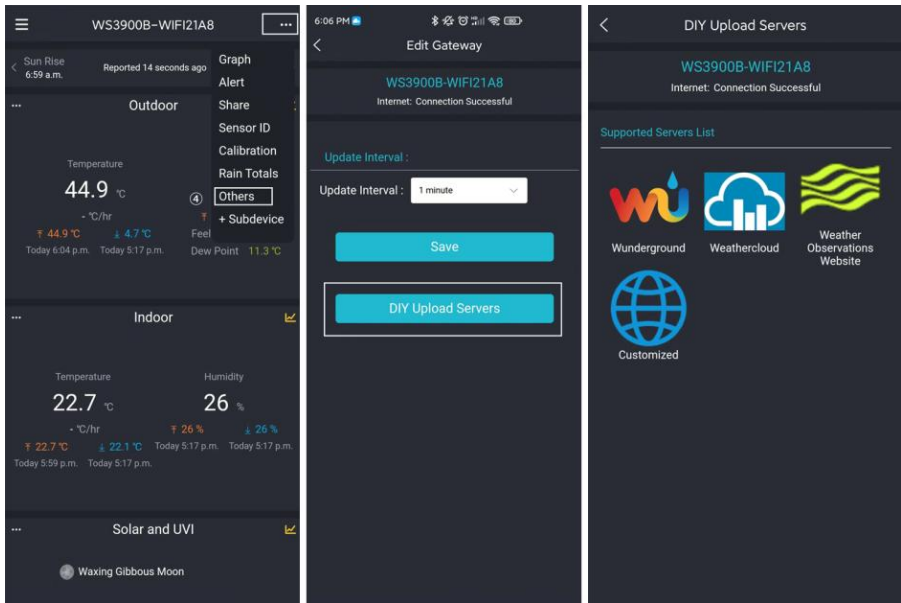(2) Ecowitt App - "..." at the top right corner - "Others" - "DIY Upload Servers"

Figure 24: Upload data to server

6.9 Other function on ecowitt app

Only when the mobile phone and WS3900/WS3910 receiver are using the same Wi-Fi network, the function of section 6.9.4 – 6.9.7 can set up on the app.

5.8 View data on the app

You can view the data uploaded to ecowitt.net on the data dashboard of the app.

When on the dashboard screen, you can press the "..." button (upper right) to view the graph of various weather data.
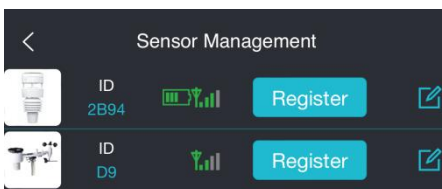

5.8.1 Alert

When on the dashboard screen, you can press the "..." button (upper right) to set the Alert email and triggering condition setting

5.8.2 Share

When on the dashboard screen, you can press the "..." button (upper right) to enter the Share page, adding your station on the share list if you want to share your station data with other user.

5.8.3 Sensor ID

On dashboard screen, press "..." button and select "Sensors ID" to set the following:

1. View sensor ID, signal strength and battery power condition. 1-4 bars means 1-4 successful successive signal receptions without missed ones.

2. Register the sensor when offline.

3. Enable or disable the sensor.

4. Input the Sensor ID when offline.

5.8.4 Calibration

When on the dashboard screen, you can press the "..." button (upper right) to enter the calibration screen. Rain calibration is in the Rain Total screen not in this screen.

Calibration is only useful if you have a known calibrated source you can compare it against, and is optional. Do not compare your readings obtained from sources such as the internet, radio, television or newspapers. The purpose of your weather station is to measure conditions of your surroundings, which vary significantly from location to location.
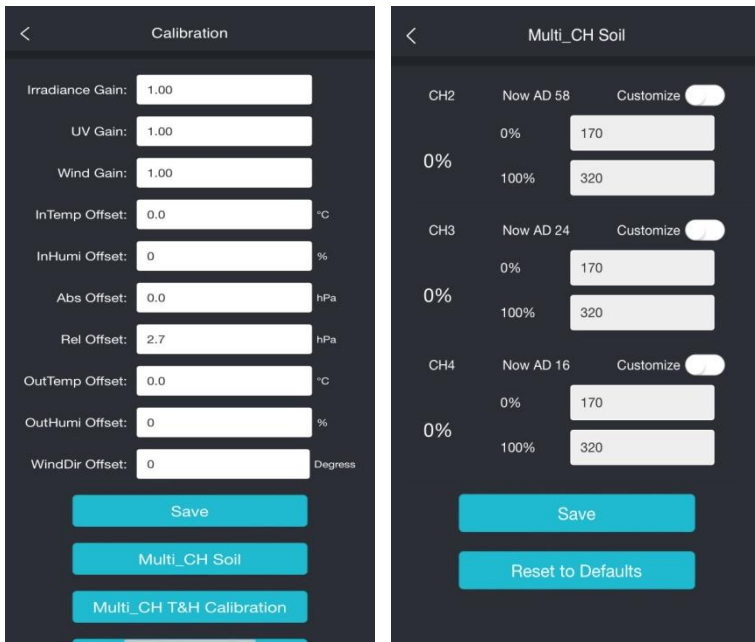
5.8.5 Rain Total

On dashboard screen, press "..." button and select "Rain Total" to set the following:

1. Rainfall data priority

The WS3900/WS3910 console display can pair with traditional self-empty rain gauge and Piezoelectric rain gauge, if you have two kind of rain gauge, you can select the rainfall rule you want to display via the "Rainfall data priority" on the App or web page.

2. Rain Day / Week / Month / Year / Rain Gain calibration

To reset the rain data to the correct data. Make sure you have a reliable calibration source and periodically clean the rain gauge funnel.

3. Reset Daily Rain/Weekly Rain/Rain Sensor

To reset the Daily Rain start time from 0:00 - 23:00, default is start from midnight (0:00).

To reset the Weekly Rain start from Sunday or from Monday. Default is start from Sunday morning at midnight (Sunday thru Saturday).

To reset the beginning of the rainfall yearly season month. The default is January. Rainfall season influence the annual rainfall maximum, minimum and total value. When one month was selected, the annual rainfall and annual max/min rainfall were zero clearing at 0:00 of the first day of the selected month.

5.8.6 Others

Set the update interval from 1minutes to 10miutes

Set the other upload servers(wunderground.com, weathercloud.net, . wow.metoffice.gov.uk, Customized servers)

5.8.7 Add Subdevice

After the Wi-Fi configuration of WS3900/WS3910 is finished (refer to 6.3 or 6.4), IoT products (such as Smart water timer WFC01 and Smart plug AC1100) can be connected to the App

5.8.8 Viewing data on ecowitt.net

You can observe your sensor's data by using the ecowitt.net web site. You will use a URL like this one, where your station ID replaces the text "STATIONID".

https://www.ecowitt.net/home/index?id=STATIONID

Note: If you want to share your station data with other users, you may use the Share option under the Menu to create a share link.

It will show a page such as this, where you can look at today's data and historical data as well.
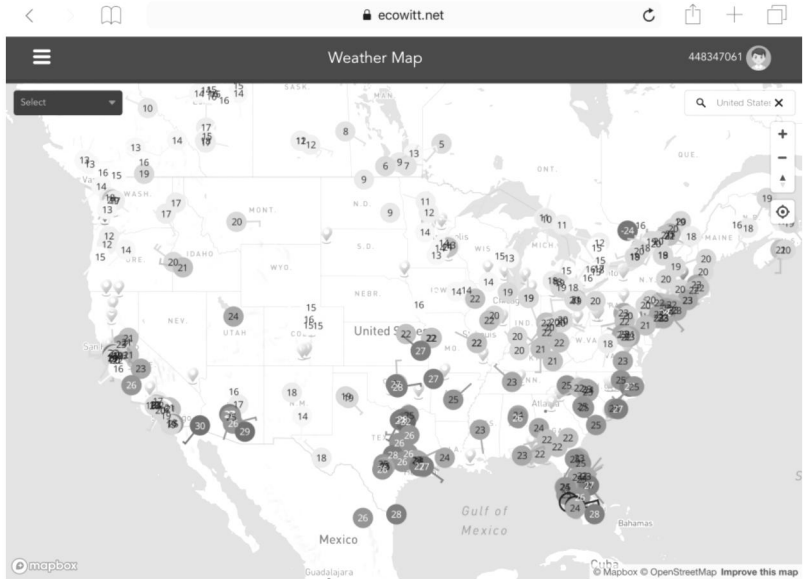
Dashboard

Graph display

List display

Weather Map

Email Alerts
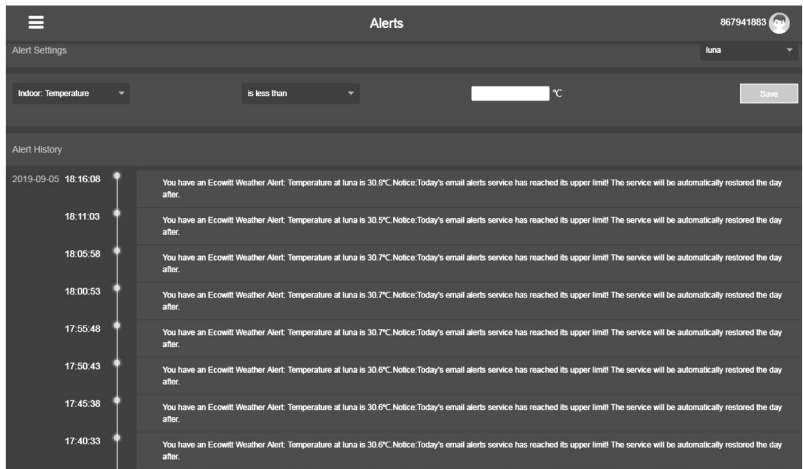
6. Display Console

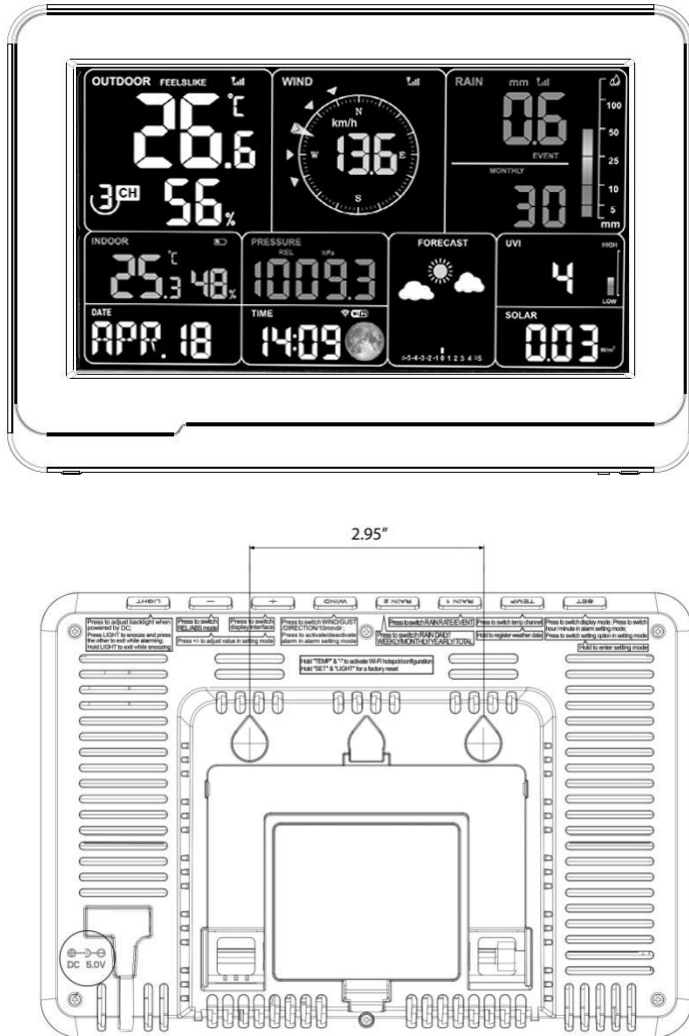The front and back of the display console is shown in Figure 25 and Figure26

Figure 25: front and back of the display console

6.1 Stepless adjustment support stand

According to your preferred viewing angle, adjust the bracket to the right position
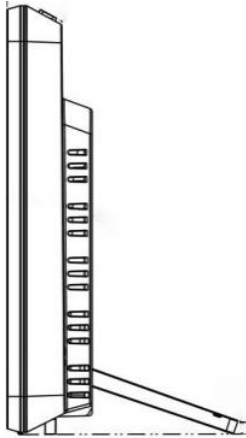
Figure 26: Stepless adjustment support stand

6.2 Console Initializaion

6.2.1 When Battery Powered:

When the battery power is supplied, pressing any button will turn on the backlight for 15s only. When only battery powered, the backlight is only "Medium " and "Off".

Note: Run on 3 x AA battery power alone for only about 24 hours.

6.2.2 When DC Powered:

When the device accesses to power supply, it will first show the software version number and frequency 2 seconds after power up.

Then the console display will show all of the LCD segment for 3seconds as Figure 27, the indoor condition will immediately update, and the outdoor

sensor will register within a few minutes

Figure 27

6.3 Icon Explanation

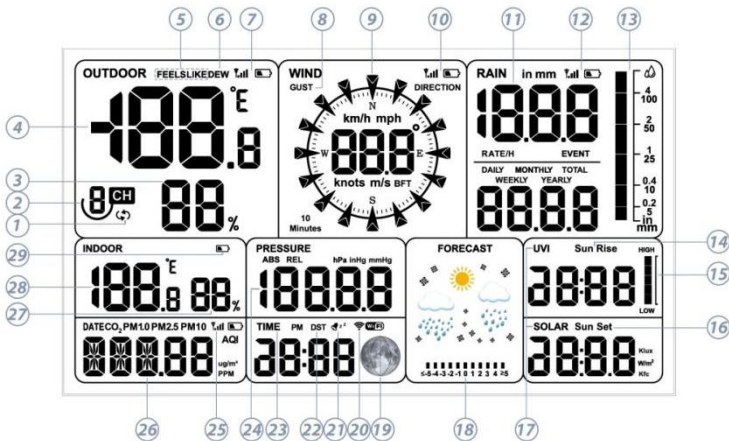See Figure 27 to help you identify icons of the console's display screen.

Figure 28: Full segment of LCD display

No	Description	No	Description
1	Auto-Scroll model	2	Circulating multi-channel temperature and humidity
3	Outdoor humidity	4	Outdoor temperature
5	Feels like temperature	6	Dew point
7	RF signal bar and low battery Power indicator for WS69 or WN30/31/36 sensors	8	Gust
9	Direction/ 10min direction icon	10	RF signal bar and low battery power indicator for WS90/WS80/WS68
11	Rain Rate/Event/Daily/ Weekly/Monthly/Yearly/Total	12	RF signal bar and low battery power indicator for WH40
13	Rainfall bar graph	14	Sunrise
15	UV index histogram	16	Sunset
17	UVI & Solar radiation	18	Weather forecast, Pressure trend function
19	Moon phase	20	Wi-Fi signal bar
21	Alarm & Snooze	22	DST (Daylight Saving Time)
23	Time	24	ABS/REL pressure
25	RF signal bar and low batter power indicator for WH45/WH46 air quality sensor	26	Date/CO2/PM1.0/PM2.5/ PM10/AQI
27	Indoor humidity	28	Indoor temperature
29	Console low battery power/no battery indicator		

Table 1: Icon explanation

6.3.1 Date & Time

The date and time will be automatically updated when connected to Wi-Fi. (refer to 6.3 or 6.4 for Wi-Fi configuration)
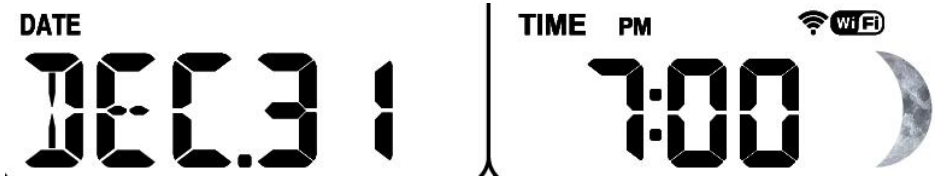

Figure 28: Date & Time

6.3.2 CO2/PM1.0/PM2.5/PM10/AQI

WS3900/WS3910 supports connecting WH45/WH46 air quality sensor and displaying CO2/PM1.0/PM2.5/PM10/AQI data. Air quality data share the same display area with Date, which can be switched by pressing the ⊞ button.

Note:

1. The WH46 sensor would show the data of the Temperature-Humidity and PM4.0 on the Ecowitt App or the website, but the WS3900/WS3910 console would not show the related data.

2. The WH45 sensor would show the data of Temperature-Humidity on the Ecowitt App or the website, but the WS3900/WS3910 console would not show the related data.

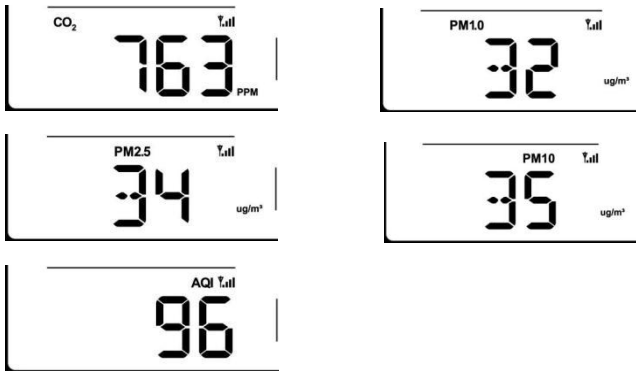The WS3900 shows the data of the CO2 PM1.0 PM2.5 PM10 AQI:

Figure 29: CO2/PM1.0/PM2.5/PM10/AQI

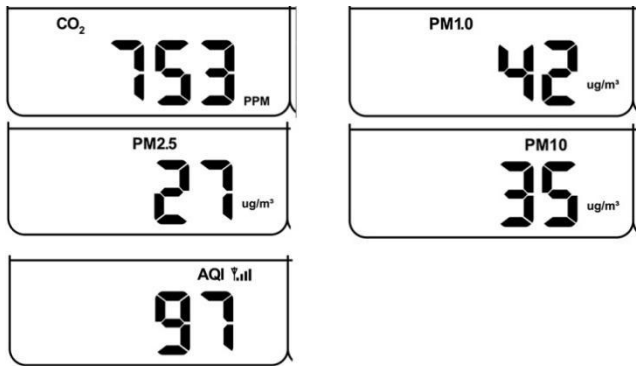The WS3910 shows the data of the CO2 PM1.0 PM2.5 PM10 AQI:

Figure 30: CO2/PM1.0/PM2.5/PM10/AQI

How to distinguish the built-in CO2 sensor and the WH46/WH45 CO2 sensor:

The built-in CO2 sensor does not show the RF signal bar. The WH46/WH45 CO2 sensor shows the RF signal bar.
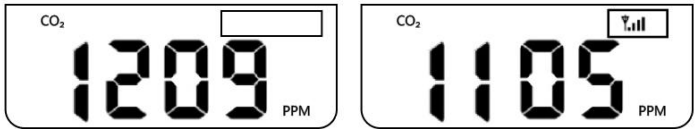
Figure 31

6.3.3 Weather Forecast

Weather forecast is based on learning the local air pressure over a period (at least one month) and then making a prediction of the weather for the day ahead based on the change in air pressure.

There are seven weather conditions: Sunny, Partly Cloudy, Cloudy, Rainy, Stormy, Snowy and Storm Snowy.

Rain/snow will blink when in a Stormy/Storm Snowy condition. When the outdoor temperature is below 0°C (32°F) and the weather forecast is Rainy or Stormy, the display will show the Snowy condition.
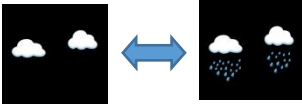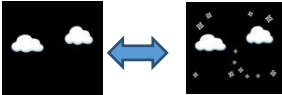
Sunny	Partly Cloudy	Cloudy
Pressure increases for a sustained period of time	Pressure increases slightly or initial power up	Pressure decreases slightly
Rainy	Stormy	Snowy
Pressure decreases for a sustained period of time	Pressure rapidly decreases	Pressure decreases for a sustained period of time, and temperature ≤0℃
Storm Snowy		
Pressure rapidly decreases, and temperature ≤0℃		

Table 2: Weather forecast

6.3.4 Pressure Trend Function

Indicates the difference between the current barometric pressure and the average barometric pressure over the past 30 days.

Figure 32: Pressure

6.3.5 Wi-Fi Icon

Wi-Fi Icon Status	Description
Flash	Situation 1: AP switched on after power up or TEMP + - button activation. Situation 2: WS3900/WS3910 is not connected to the router.
Slow flash	WS3900/WS3910 is connected to the router. But the data hasn't been successfully uploaded.
Constant light	The data has been uploaded to the server. The Wi-Fi icon indicates the signal strength.

Table 3：Wi-Fi icon

6.3.6 Indoor Temperature, Humidity, and Pressure

WS3900/WS3910 has a built-in temperature & humidity sensor, and barometric pressure sensor, but the WN32P sensor also could receive the data, and be used to replace the indoor temperature, humidity, and air pressure.
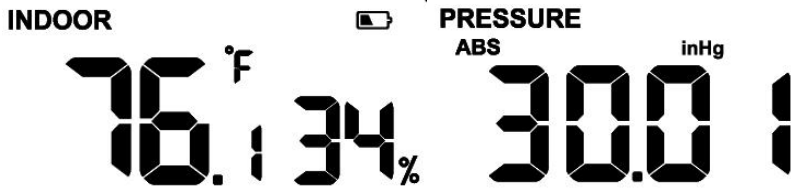
Figure 33: Indoor temperature, humidity and pressure

6.3.7 Outdoor Temperature and Humidity

Temperature and humidity display priority:

WN32 > WS90 > WS80 > WS69
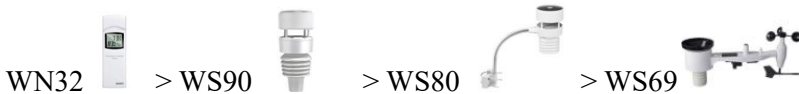
6.3.8 Wind

1. Wind display priority:

WS90 > WS80 > WS68 > WS69

2. Wind values and wind units:

When the wind speed unit is selected via buttons (refer to Section 7.4.2 to adjust the unit) or web page 192.168.4.1 (Unit Settings), the WS3900/WS3910 will display the corresponding unit and value on the screen. Units set by the Ecowitt App or Ecowitt.net website will not be synchronized to the WS3900/WS3910.

6.3.9 Rainfall

1. Rainfall display priority:

Traditional rainfall: WH40   >   WS69

Piezoelectric rainfall: WS90

2. Display rules

The WS3900/WS3910 can display either rainfall or piezoelectric rainfall, simply by selecting the rainfall rule you want to display via the "Rainfall data priority" on the App (refer section 6.9.6) or web page.

3. Units

When the rainfall unit is selected via buttons (refer to Section 7.4.2 to adjust the unit) or web page 192.168.4.1 (Unit Settings), the WS3900/WS3910 will automatically calculate and display the corresponding unit and value on the screen. Units set by the Ecowitt App or Ecowitt.net website will not be synchronized to the WS3900/WS3910.

4. Rain Definitions

- **Rain rate or hourly rain** is defined as the last 10 minutes of rainfall, multiplied by six (10 minutes x 6 = 1 hour). This is also referred to as instantaneous rain per hour.
- **Rain event** is defined as continuous rain, and resets to zero if rainfall accumulation is less than 1 mm (0.039 in) in a 24-hour period.
- **Daily Rain** is defined as the rainfall since midnight (00:00).
- **Weekly Rain** is defined as the calendar week total and resets on Sunday morning at midnight (Sunday thru Saturday).
- **Monthly Rain** is defined as the calendar month total and resets on the first day of the Month.
- **Yearly Rain** is defined as the total rainfall from January 1 to December 31.

6.3.10 UVI

The UV index varies between 0 ~ 15. The bar graph is divided into 6 levels of display.

Level 5: 12 < value < =15, EXTREME
Level 4: 9 < value < =12, VERY HIGH
Level 3: 6 < value < =9, HIGH
Level 2: 3 < value <= 6, MODERATE
Level 1: 0 < value < =3, LOW
Level 0: 0 = value, (no display)
e.g.:

Figure 34: UVI

6.3.11 Moon Phase

Configure the default northern and southern hemispheres based on RF frequency:

915/868MHz: Northern Hemisphere

433MHz: Southern Hemisphere

The following moon phases are displayed based on the calendar date.

Northern Hemisphere:

New Moon	Waxing Crescent	First Quarter	Waxing Gibbous	Full Moon	Waning Gibbous	Third Quarter	Waning Crescent	New Moon

Southern Hemisphere:

New Moon	Waxing Crescent	First Quarter	Waxing Gibbous	Full Moon	Waning Gibbous	Third Quarter	Waning Crescent	New Moon

Note: When the new moon comes, our display will show a circle arc

Figure 35: The New Moon

6.3.12 Feels Like

Feels Like measurement range: -40°C ~ 60°C (-40°F ~ 140°F).

When the outdoor temperature is less than 10°C (50°F), the value of Feels Like is wind chill.

When the outdoor temperature is greater than or equal to 10°C (50°F) and less than or equal to 26.7°C (80°F), the value of Feels Like is the outdoor temperature.

When the outdoor temperature is greater than 26.7°C (80°F), the value of Feels Like is the heat index.

Users can choose whether to display Feels Like Temperature or Apparent Temperature on the App: Open Ecowitt App – Menu – Setting – Temp Index.

6.3.13 LCD Display Brightness

When DC power is supplied, press LIGHT briefly to adjust the backlight: Max -> High -> Medium -> Low -> Off.

When only battery powered, the backlight is only "Medium " and "Off".

6.4 Buttons

There are 8 buttons in total: SET, TEMP, RAIN1, RAIN2, WIND, +, -, LIGHT.
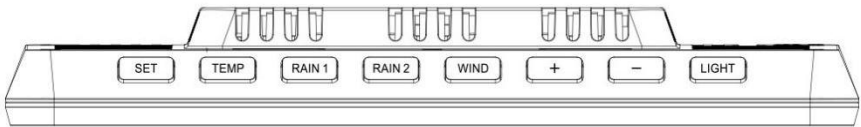
Figure 36: 8 Buttons

There are eight buttons on the top of the display console. The following tables briefly explain the function of these buttons.

Buttons	Functions
SET	Setting button Press to switch MAX/MIN/Alarm setting/MAC mode. Press to switch setting option in setting mode. Hold to enter setting mode. Hold SET + LIGHT for a factory reset.
TEMP	Temperature display button Press to switch temp channel. Hold to register weather data from sensor. Hold TEMP + - to activate Wi-Fi hotspot/configuration.

RAIN1	Rain display button Press to switch RAIN RATE/EVENT.
RAIN2	Rain2 display button Switch RAIN DAILY/WEEKLY/MONTHLY/YEARLY/TOTAL.
WIND	Wind display button Press to switch WIND/GUST/DIRECTION/10min direction. Press to activate/deactivate alarm in alarm setting mode.
+	Press to switch display in the Date area. Press + to adjust the date/CO2/PM1.0/PM2.5/PM10/AQI
−	Press 1S − to switch PERSSURE REL/ABS, and adjust the value in setting mode. Press 3S − to switch Light UV/sunrise/sunset display. The bar chart on the right side synchronizes the graphical display of its values, and adjust the value in setting mode. Hold TEMP + − to activate Wi-Fi hotspot/configuration.
LIGHT	Brightness adjustment button Press to adjust backlight when powered by DC. Hold SET + LIGHT for a factory reset.

Table 5: Button functions

6.5 Product Modes

There are 5 modes in total: Normal mode, Setting mode, Max/Min value mode, Alarm setting mode, MAC address display.

6.5.1 Normal Mode

1. The product will enter the main page of Normal mode by default when it is normally powered on. In other modes, no button operation for 30 seconds

or press LIGHT can also return to the main page of normal mode.

2. In Normal mode, press SET to change the mode.

Sequence: Normal mode -> Maximum value -> Minimum value -> Alarm setting -> MAC address display.

3. Press TEMP in Normal mode to switch the display: OUTDOOR -> FEELSLIKE -> DEW -> CH1 -> CH2 -> CH3 -> CH4 -> CH5 -> CH6 -> CH7 -> CH8 -> Auto-Scroll mode.

4. When the OUTDOOR, FEELSLIKE and DEW show the states, hold the TEMP for 5 seconds to re-register the outdoor temperature and humidity sensors.

5. If the TEMP is held for more than 5s in single CH mode, the corresponding CH sensor transmitter will be re-registered.

6. If the TEMP is held for more than 5s in ⟳ Auto-Scroll mode, it will re-register the Outdoor and CH1~CH8 sensors. Same as 4. above, need to DISABLE other registered priority transmitters first.

① Press RAIN1 to switch RAIN RATE/EVENT. The bar chart on the right side synchronizes the graphical display of its values.

② Press RAIN2 to switch RAIN DAILY/ WEEKLY/ MONTHLY/ YEARLY/ TOTAL.

7. Press WIND can switch WIND/GUST/DIRECTION/10min direction display. Numbers indicate the angle of the wind direction.

8. Press + to switch Date/CO2/PM1.0/PM2.5/PM10/AQI display.

9. Hold ⬛ to switch to UVI/Solar radiation/Sunrise/Sunset display. The exponential intensity graph on the right side synchronizes the display of UVI values.

Press ⬛ to switch PERSSURE REL/ABS.

10. When DC power is supplied, press LIGHT on the main page to adjust the backlight in 5 levels: MAX -> High -> Medium -> Low -> Off.

11. Hold TEMP + ⬛ for more than 2s to open AP, Wi-Fi signal icon fast flash, you can connect to this hotspot on a mobile phone or PC.

12. Hold SET + LIGHT for 5 seconds the device will restore factory settings and reboot, all setup parameters will be cleared.

Notes:

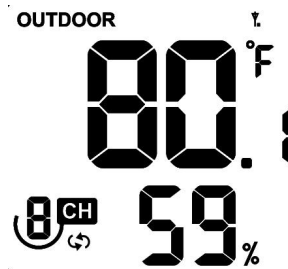*** In ↺ Auto-Scroll mode, only registered sensors are displayed.**

Figure 37

* Max and Min values will be cleared together if the multi-channel temperature and humidity sensor is re-registered.

6.5.2 Setting Mode

In Normal mode, hold SET for more than 2s to enter Setting mode. Then

press SET to switch the setting item, press the + or - button to adjust the

setting value:

① Beep sound (ON/OFF)
② Hour format (12 hours/24 hours)
③ Hour setting
④ Minute setting
⑤ Year setting
⑥ Month setting
⑦ Day setting
⑧ Pressure unit selection (hPa, mmHg, inHg)
⑨ Relative pressure setting (700hPa-1100hPa)
⑩ Temperature unit selection (°C/°F)
⑪ Wind speed unit selection (m/s, km/h, mph, knots, BFT)
⑫ Rainfall unit selection (in/mm)
⑬ Solar Light unit selection (W/m2, Kfc, Klux)
⑭ Selection of the northern and southern hemispheres (NTH, North)
⑮ RST daily High and Low reset switch
⑯ CO2 Calibrations

6.5.3 Max/Min Value Mode

In Normal mode, press SET to enter Max/min value mode.

Sequence: Normal mode -> Maximum value -> Minimum value.

Max value: outdoor/indoor temperature & humidity, feels like, dew point,

pressure, rainfall, wind speed, gust speed, UVI and solar radiation.

Min value: outdoor/indoor temperature & humidity, feels like, dew point, and pressure.

Figure 38：Max/Min values

6.5.5 Alarm Setting Mode

6.5.5.1 Alarm Function

In Normal mode, press SET to enter Alarm setting mode.

Sequence: Normal mode -> Maximum value -> Minimum value -> Alarm setting.

In the alarm setting mode, press SET to switch the alarm clock setting item:

① Alarm hour setting
② Alarm minute setting

Press + or - to adjust the value. Press WIND to switch on/off the alarm clock.

After the alarm is triggered, the alarm will continue to sound for 2 minutes when no button is pressed, and the alarm will become more and more rapid within these 2 minutes.
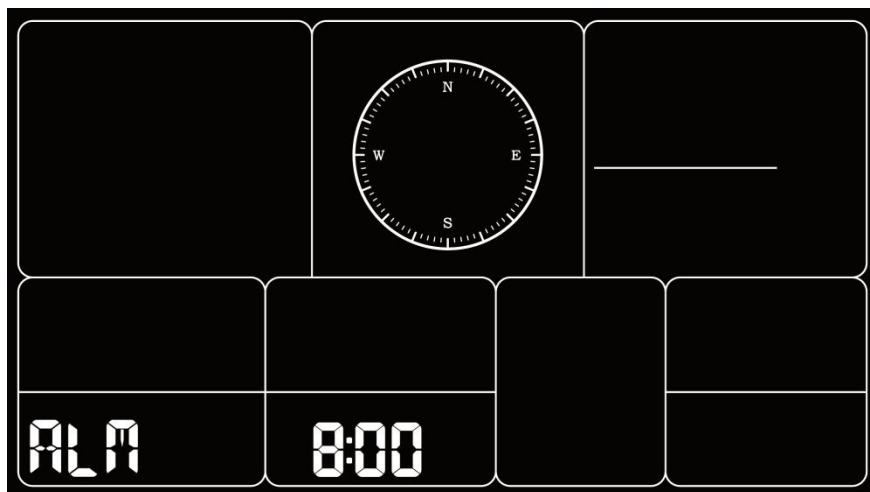
Figure 39: Alarm setting

6.5.5.2 Snooze Function

When the alarm clock is set and the alarm is triggered, press LIGHT to enter snooze mode, the snooze icon z^z will be displayed near the alarm clock icon 🔔, and the alarm will sound again after 10 minutes.

Hold any button for 2 seconds after entering snooze mode will exit snooze mode.

Figure 40: Snooze function

7.5.5 MAC Address Display

In Normal mode, press SET to change the mode.

Sequence: Normal mode -> Maximum value -> Minimum value -> Alarm setting -> MAC address display.

Figure 41: MAC address

6.5.5.3 Bulit-in CO2 sensor Calibration(Only WS3910)

The CO2 calibration has two ways.

1. Select the setup to enter from the setup mode.

2. Press and Hold the SET button and then power on, directly into the calibration interface.

In the calibration interface, press + or - button to set the desired calibration value. Press WIND button to start/stop the calibration process.

3. Calibration process steps:

Press + or - to set the desired calibration value.

Press WIND to start calibration, the screen displays ON and blinks.

The left side show the current collected CO2 value (528) and the top side displays the calibration value to be set (580)
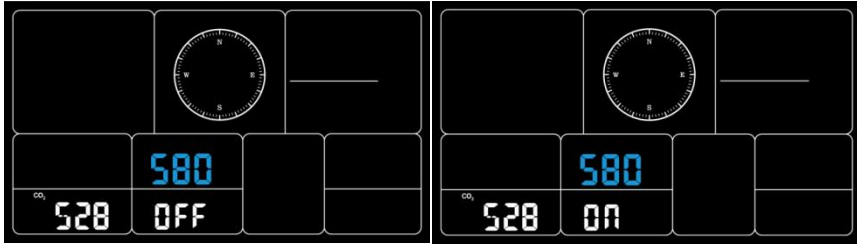

Figure 42： Only WS3910 CO2 Calilbration

Keep the device for 3 to 5 minutes in a stable environment, when the left of the screen will be shown OK at the bottom, the calibration is complete.

Figure 43

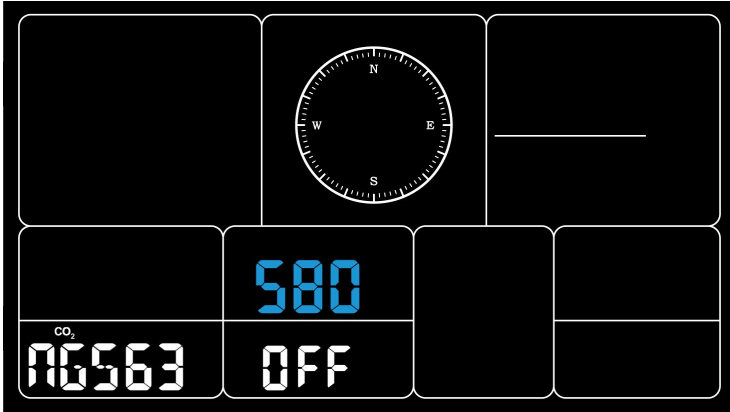If NG is shown, the calibration has failed, and needs to be re-calibrated.

Figure 44

Note: The calibration costs five minutes to complete base on the stability of the environment. If the environment is unstable or great change, it will take more time.

6.6 Historical Data Export and Clear

6.6.1 Export History Data:

WS3900/WS3910 doesn't support a memory card to store data, when the Wi-Fi configuration (refer to 2.2 for Wi-Fi Configuration) is completed, you can log in to Ecowitt.net to export the data in CSV file format.

Figure 45: Export Historical Data from Ecowitt.net

Note:

Data with a query period of days/24 hours is retained for 3 months.

Data with a weekly query period is retained for 1 year.

Data with a monthly query period is retained for 2 years.

Data with a yearly query period is retained for 4 years.

6.6.2 Clear History Data:

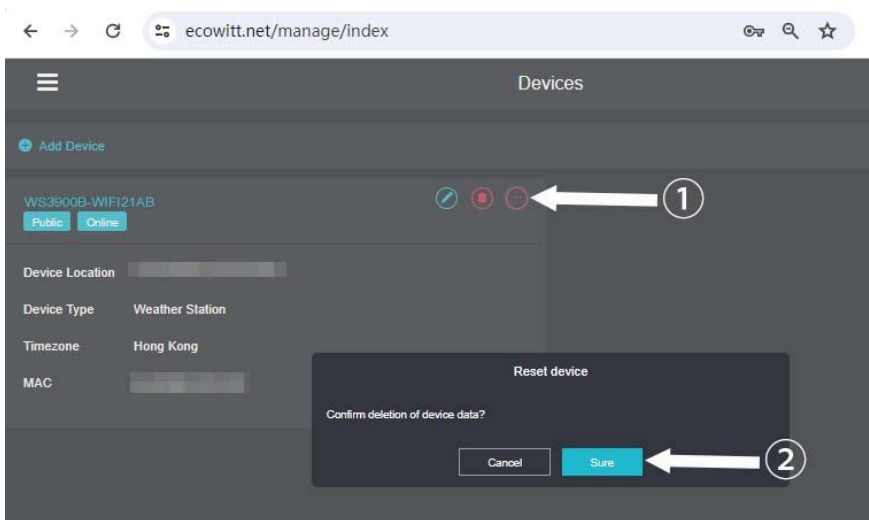Under "menu" - "devices" - "..." button to reset history data.

Figure 46: Clear History Data

6.7 Firmware Upgrade

Method 1: Via Ecowitt App

Open Ecowitt App – My Devices – "…" (Open the edit gateway page) – tap the firmware version number to upgrade if there is a new version available. When the upgrade is complete, the WS3900/WS3910 will reboot into the latest version.

Figure 47: Firmware Upgrade on the App

Method 2: Via web page 192.168.4.1

If you choose "Automatically upgrade firmware" on the web page 192.168.4.1, WS3900/WS3910 will enter OTA every time when there is a new firmware, and the screen will display the "OTA" character. When the automatic firmware update is successful, it will display "OTA OK" and reboot automatically. (Automatic update interval is 24 hours).
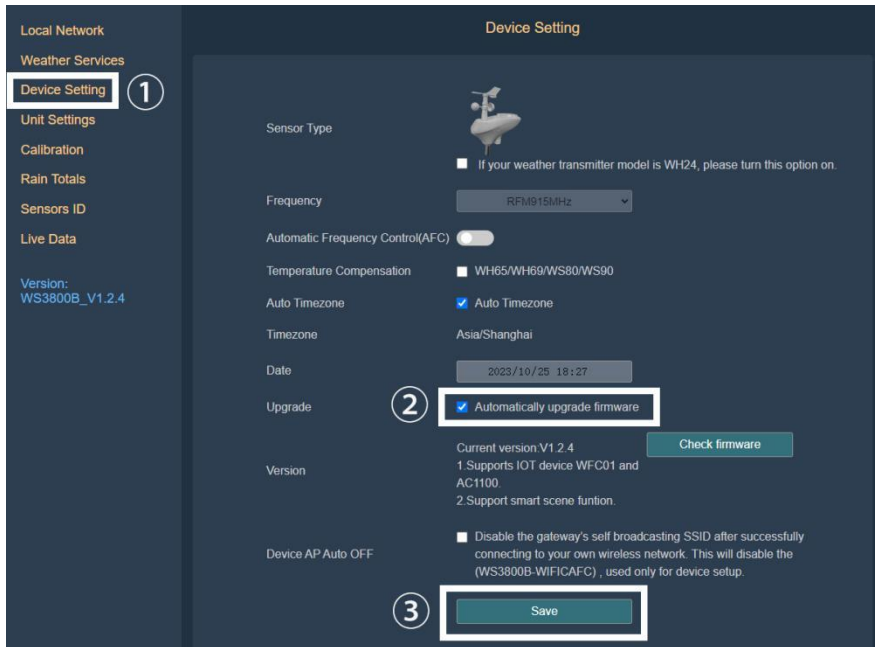
Figure 48: Automatically upgrade firmware setting on the web page

7. Optional Sensors

The RF reception function will always be turned on to receive data from multiple sensors at any time.

7.1 Sensors：

When powered by DC or battery, the device supports these sensors as below, power consumption can be high if only battery power is available.

The following sensors can be purchased separately. For more information, please visit our website: http://www.ecowitt.com. Make sure to select the model of the units with the same RF frequency as your gateway or display (the frequency is different for various countries because of regulations).

Note: Max QTY of the following table means the maximum number of different sensors that can be connected to the WS3900 or WS3910.

7.1.1 Sensor Data Can be Displayed on the WS3900/WS3910:

Sensor Model	Max QTY	Picture	Functions
WS90	1		Outdoor temperature & humidity, light, UV, wind speed/direction, rainfall
WS80	1		Outdoor temperature & humidity, light, UV, wind speed/direction
WS69	1		Outdoor temperature & humidity, light, UV, wind speed/direction, rainfall
WS68	1		Light, UV, wind speed/ direction,
WH40	1		Rainfall
WN32P	1		Indoor temperature, humidity and pressure
WN32	1		Outdoor temperature and humidity
WH45/WH46	1		WH45: CO2, PM2.5, PM10, temperature and humidity WH46: CO2, PM1.0, PM2.5, PM4.0, PM10, temperature and humidity
WN31/WN30/ WN36	8		WN31: Temperature and humidity WN30: Temperature WN36: Pool temperature

Table 6: Optional sensors

Note:

1. Some data of WS90/80/69/68/WH40/WN32 exist display priority, please refer to Section 3.3.7~3.3.9.
2. Some data of WH45/WH46 would not show on the WS3900/3910 (uploading the data). Please refer to Section 3.3.2.

7.1.2 Sensor Data Can Only be Uploaded to the Cloud：

Sensor Model	Max QTY	Picture	Functions
WH57	1		Lightning detection
WH41/WH43	4		PM2.5
WH55	4		Water leak detection
WH51L	8		Soil moisture
WH51			
WN34L/S/D	8		Soil/liquid temperature
WN35	8		Leaf wetness

Table 7: Optional sensors

7.2 IoT Device：

Sensor Model	Max QTY	Picture	Functions
WFC01	16		Smart water timer
AC1100			Smart plug

Table 8: IoT device

After the Wi-Fi configuration of WS3900/WS3910 is finished (refer to 2.2), IoT products can be connected to the App. Take WFC01 for an example:
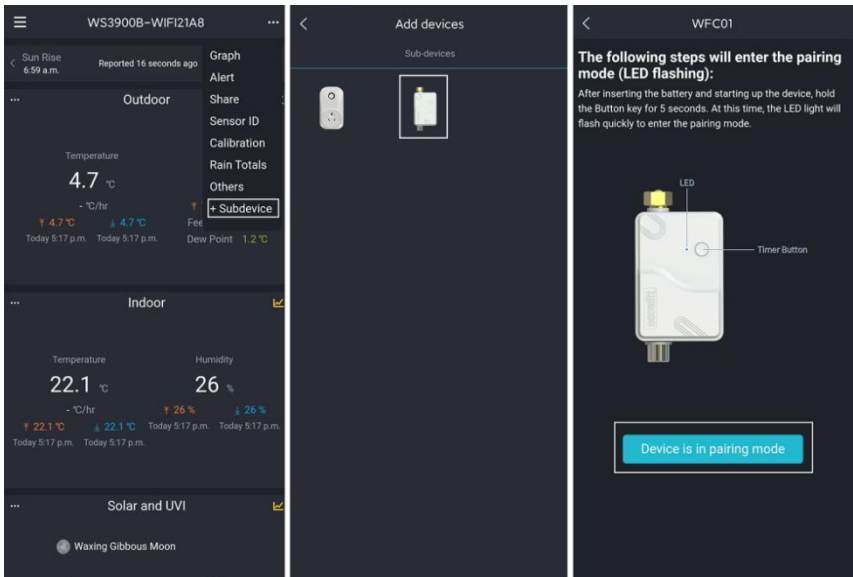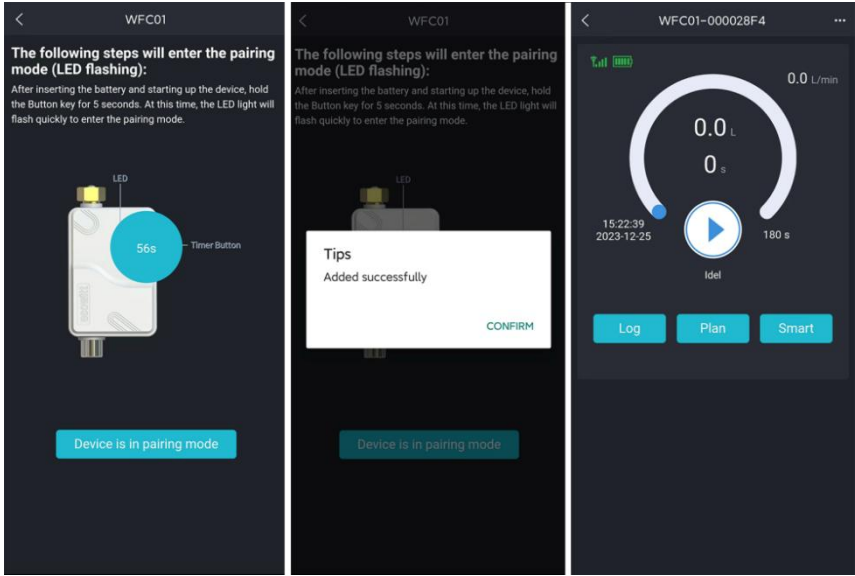
Figure 49

7.3 Calibrate the WH46/WH45 CO2 Sensor

If you have relatively accurate CO2 data. You can use the data to do the calibration.

1. Make sure your mobile device is connected to the same Wi-Fi network.

2. Click "…" on the top right corner and choose "Calibration".

3. Calculate the offset of data for the WH45/WH46 CO2 sensor.

4. Fill in the offset from step3, click Save.

5.The Ecowitt sensors also can be calibrated when compared with other accurate data of the same type. sensors.
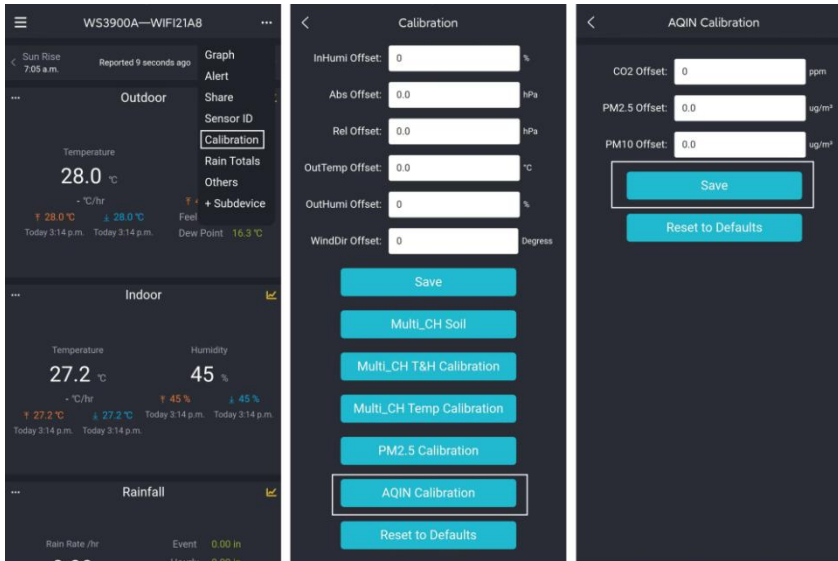
Figure 50

7.4 Others

7.4.1 Lightning Distance Unit

WS3900/WS3910 can connect WH57 lightning sensor, and the lightning data can only be viewed through Ecowitt App, website, and web page, if you need to modify the lightning distance unit, you can modify it by modifying the wind speed unit on App, website or web page.

We here recommend modifying units on the App, the lightning units will be used in daily viewing and exporting data on the website.

Wind Speed Unit	Lightning Distance Unit
m/s, km/h, BFT	km
Knots	nmi
mph, fpm (fpm can only be set in App/website)	mi

Table 9: Corresponding table of wind speed and lightning distance units
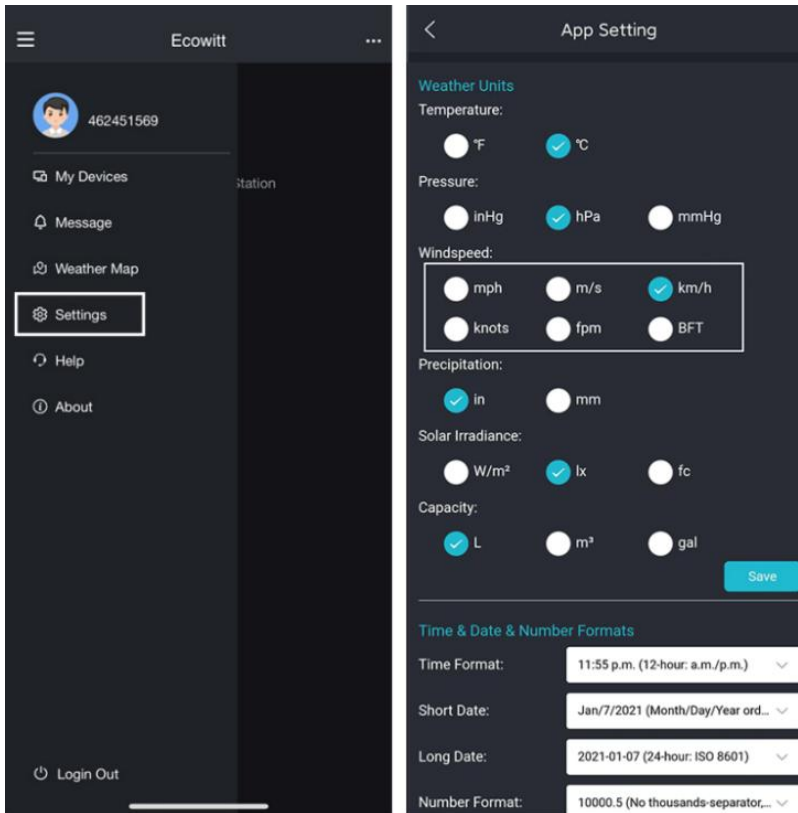
Figure 51: Setting lightning units by setting wind speed units on App

Note: The wind speed units set on the App will not be synchronized to the console display.

8. Specifications

Console	Specification
Model	WS3900
Name	Weather Station (receiver)
Dimensions	209×28.5×142.5(mm)
Screen Size	169×94.5(mm)
Weight	366(g)
Material of Plastic Casing	ABS
Material of Screen	VA-LCD
Temperature Range	-10°C to 50°C(14°F to 122°F)
Temperature Accuracy	±1°C(±2°F)
Temperature Resolution	0.1°C(0.2°F)
Humidity Range	1% to 99%
Humidity Accuracy	±5%
Humidity Resolution	1%
Barometric Pressure range	300 to 1100 hPa (8.85 to 32.5 inHg)
Barometric Pressure accuracy	±1.5hpa(absolute pressure); ±2hpa(relative pressure)
Barometric Pressure resolution	0.1 hPa (0.01 inHg)
Reading Update Interval	About 1 minute
RF Connection Frequency	920/915/868/433MHz (depending on local regulations)
RF Wireless Range	Over 100 meters (in open areas)
WLAN	802.11 b/g/n 2.4 GHz (802.11n, Max 150 Mbps)
WLAN Range	Over 30 meters (in open areas)
Power Supply	DC 5V 1A or 3 AA Alkaline or Lithium Battery (not included)
Battery Life	Run for about 24 hours on battery power alone. (Battery only used as a short-term backup power)

Console	Specification
Model	WS3910
Name	Weather Station (receiver)
Dimensions	209×28.5×142.5(mm)
Screen Size	169×94.5(mm)
Weight	366(g)
Material of Plastic Casing	ABS
Material of Screen	VA-LCD
Temperature Range	-10°C to 50°C(14°F to 122°F)
Temperature Accuracy	±1°C(±2°F)
Temperature Resolution	0.1°C(0.2°F)
Humidity Range	1% to 99%
Humidity Accuracy	±5%
Humidity Resolution	1%
Barometric Pressure range	300 to 1100 hPa (8.85 to 32.5 inHg)
Barometric Pressure accuracy	±1.5hpa(absolute pressure); ±2hpa(relative pressure)
Barometric Pressure resolution	0.1 hPa (0.01 inHg)
Photoacoustic NDIR CO_2 range	0 to 40000 ppm
Photoacoustic NDIR CO_2 accuracy	±(50ppm + 5% of reading) when 400 to 2000 ppm
Photoacoustic NDIR CO_2 resolution	1ppm
Photoacoustic NDIR CO_2 Accuracy drift per year	± (5ppm + 5% of reading)
Reading Update Interval	About 1 minute
RF Connection Frequency	920/915/868/433MHz (depending on local regulations)
RF Wireless Range	Over 100 meters (in open areas)
WLAN	802.11 b/g/n 2.4 GHz (802.11n, Max 150 Mbps)
Power Supply	DC 5V 1A or 3 AA Alkaline or Lithium Battery (not included)
Battery Life	1 Day

Table 10: Specifications

Note: When working with other transmitters, the screen displays the following range of data:

Indoor temperature	-10 to 50℃
Outdoor temperature	-40 to 60°C
Humidity	1% to 99%
Wind speed	0-180km/h
Wind direction	0 to 359 degrees
Rainfall	0 to 9999mm

Table 11

Note: Out of range values will be displayed using "---":

Outdoor 7-in-1 sensor	Specification
Transmission distance in open field	100 m (330 ft.)
RF Frequency	433/868/915 MHz depending on location
Temperature range	-40°C – 60°C (-40°F - 140°F)
Temperature accuracy	± 1°C, or ± 2°F
Temperature resolution	0.1°C, or 0.1°F
Humidity range	1% ~ 99%
Humidity accuracy	± 5%
Humidity resolution	1%
Rain volume display range	0 – 9999 mm
Rain volume accuracy	± 10%
Rain volume resolution	0.3 mm (for volume < 1,000 mm) 1 mm (for volume ≥ 1,000 mm), or 0.01 in (for volume < 100 in) 1 mm (for volume ≥ 100 in)
Wind speed range	0 – 50 m/s (0 ~ 100 mph)

Wind speed accuracy	± 1 m/s (speed < 5 m/s) ± 10% (speed ≥ 5 m/s), or ± 0.1 mph (speed < 11 mph) ± 10% (speed ≥ 11 mph)
UV-Index range	0 - 15
Light range	0 – 200 kLux
Light accuracy	± 15%
Sensor reporting interval	16 seconds
Power supply	Solar panel (built-in) 2 x AA 1.5V LR6 Alkaline (not included), or 2 x AA 1.5V Lithium battery (not included)

Table 4: Outdoor sensor specification

The primary power source for the outdoor sensor is the solar panel. When available solar power (light over recent period) is insufficient, the batteries will be used. In outdoor climates that frequently have sustained temperatures below 0°C (or 32°F) the use of Lithium batteries is strongly suggested as these are performing better than Alkaline batteries under such circumstances.

9. Care and Maintenance

When batteries of different brands or types are used together, or new and old batteries are used together, some batteries may be over-discharged due to a difference in voltage or capacity. This can result in venting, leakage, and rupture and may cause personal injury.

• Do not mix Alkaline, Lithium, standard, or rechargeable batteries.

• Always purchase the correct size and grade of battery most suitable for the intended use.

• Always replace the whole set of batteries at one time, taking care not to mix old and new ones, or batteries of different types.

• Clean the battery contacts and also those of the device prior to battery installation.

• Ensure the batteries are installed correctly with regard to polarity (+ and -).

• Remove batteries from products during periods of non-use. Battery leakage can cause corrosion and damage to this product.

• Remove used batteries promptly.

• For recycling and disposal of batteries, and to protect the environment, please check the internet or your local phone directory for local recycling centers and/or follow local government regulations