ecowitt®

7-in-1 Weather Sensor
Model: WS90

https://s.ecowitt.com/MP7YJJ

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1.Introduction

Figure 1 Ecowitt Ecosystem

2.Pair with the gateways/consoles

Pair with the gateways: GW1100/GW2000/GW1200

GW1100	**GW2000**	**GW1200**

Table 1

Pair with the consoles:
HP2560/WS3800/WS3900/WS3910/HP2550/
WN1820/ WN1821/WN1920/WN1980

HP2560	WS3800	WS3900 /3910	HP2550	WN1820/ 1821	WN1920/1980
Show on the display	Show on the display	Show on the display	Show on the display	Show outdoor temperature-humidity, Other data upload to Cloud	（Illumination ,UV data just upload Cloud, no show）

Table 2

Note: Just a weather outdoor sensor unit, it needs to be paired with other gateways or consoles to use.

The WN1920/WN1980 can't show the data of the illumination and UV on the display, just upload their data to the Ecowitt cloud.
The WN1820/WN1821 just shows the outdoor temperature-humidity data of the WS90 on the display and uploads other sensors' data to the Ecowitt cloud.

3.Part List

1 x WS90 Weather Sensor

1 x User Manual

Note:

1.Optional other accessories (sold separately): 12V/1A power extension cord; Bird spikes.

2.2*AA Batteries for the sensor package are not included.

3.There's a built-in heat plate in the 7-in-1 sensor package body, if the lowest temperature at your place is below 0°C, or 32°F, and the weather is mostly snowy or rainy, then you may need to activate the heater by supplying an external 12V/1A power to the sensor heating element for melting accumulated snow or ice, which can influence wind measurement accuracy significantly. Please contact us at support@ecowitt.com for the extension cord information if needed.

4.Features

- Piezoelectric rain gauge;
- Ultrasonic anemometer (start wind speed 0.5m/s);
- Outdoor Temperature and Humidity;
- Solar light intensity and UV index;
- Waterproof IPX5;
- Heater and additional power supply;

5.Overview

Figure 2: Sensor package assembly components

6.Setup Guide

6.1 Preparations
1. Open the package.
2. Preparing the receivers (gateways and consoles) to pair with the WS90.

6.2 Install batteries in the sensor package
Insert 2*AA batteries into the battery compartment after opening the battery compartment with a screwdriver, when the LED on the back of the sensor package lights up for 3 seconds and blinks every 8.8 seconds, make sure that the sensor is transmitting data.
If the light does not come on for 3S, you can press the "Reset" button to start over. Make sure it blinks every 8.8 seconds.
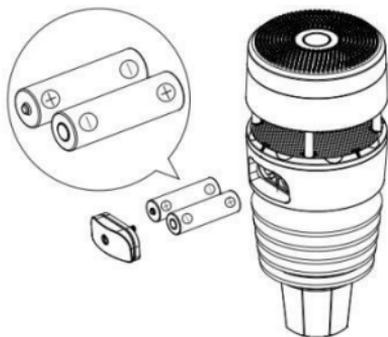

Figure 3: Battery installation diagram

Note:

Please make sure the battery is inserted correctly for its polarity as the system needs its initial power from this backup battery to start up the system before the solar panel charges up the accumulator and supply system power afterward.

when in high altitude areas, during wintertime, the sunshine time is short, and the system needs to be powered from this backup battery, we recommend Lithium batteries to be used for cold weather climates.

Please avoid alkaline batteries, especially when the internal heater is to be activated during cold and wet weather conditions as when the heater is activated, the trapped heat inside will warm up internally, and alkaline batteries are extremely susceptible to leakage when the temperature is over certain limits.
Alkaline batteries can be used also, avoid rechargeabl e battery type of NiMh or NiCd.

7. Ultrasonic anemometer with piezoelectric assembly

7.1 Before you mount

Before mounting the outdoor sensor in a permanent location, you should test the sensor wireless connection in a temporary location, and make sure that the sensor has a good station to show the data on the gateway or console. At the same time, you can adroitly use the various functions and familiarize yourself with the performance of the device.

7.2 Mounting

1. You can attach a pole (not included) to a permanent structure and then attach the sensor package to it (see Figure 4).
The install hole will accommodate a pole diameter of 1.0 inch (pole not included). If you don't use external heater, you can put the heater cable inside the pole fixing thread, which can make the setup looking neat and tidy.
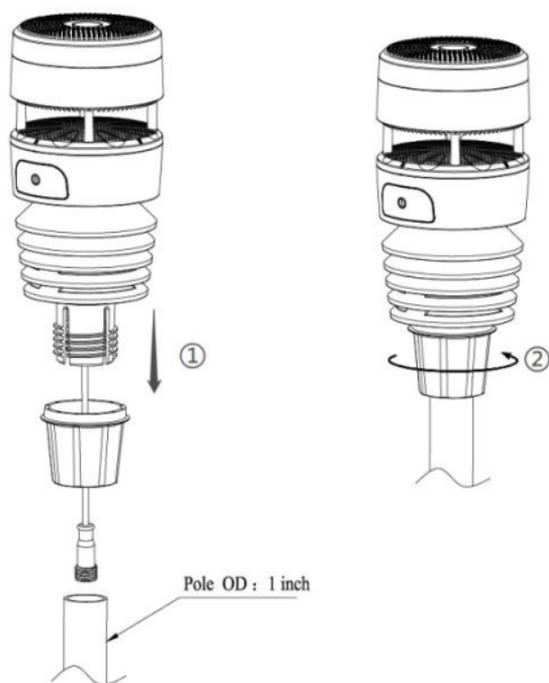
Figure 4: Sensor package mounting diagram

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

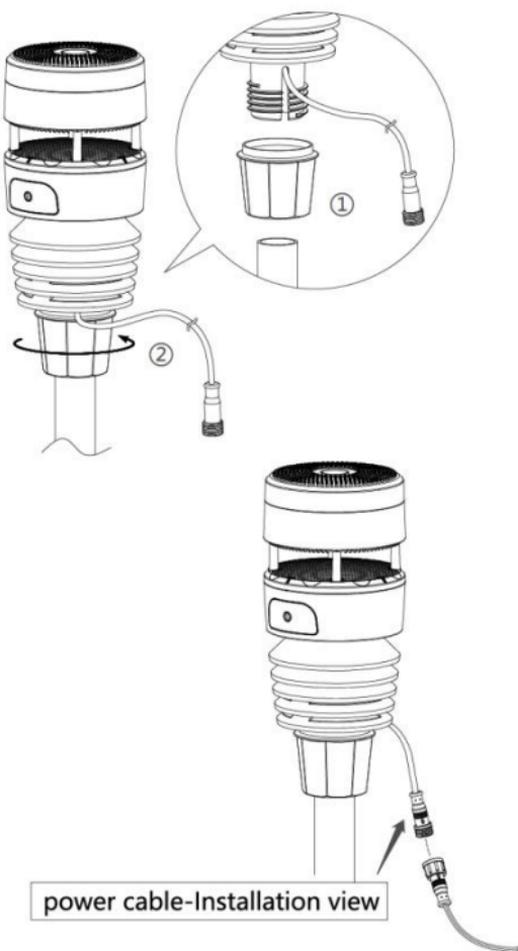2.The WS90 has the extension cable to connect the waterproof adapt 12V(sold separately).

power cable-Installation view

Figure 5: Sensor package mounting diagram

3.The extension cord can also power the entire sensor, not just melts the ice!

Now you will need to align the whole package in the proper direction by rotating it on top of the mounting pipe as needed.

4. When you get the weather sensor WS90, try to turn left or turn right to confirm how to screw the bottom threaded cover.

If you can not confirm the direction.

Locate the arrow labeled "NORTH" that you will find on top of the connector tube of the sensor package. You must rotate the whole sensor package until this arrow points due "NORTH" (synchronize the direction on the phone after open compass APP), and screw the bottom threaded cover to the direction of the "NORTH", As the Figure 6 shows:

Figure 6

To achieve proper alignment, it is helpful to use a compass (many cell phones have a compass application).

Note:

In Southern hemisphere, it is not necessary to change the orientation to"SOUTH"as its solar panel is a rounded type and it is orientation free for its charging capability.

Ensure that the mounting tube for the sensor package is installed upright to maintain proper vertical alignment. You can adjust the mounting pipe to achieve this. Next, also make sure the mounting of the anemometer body on the pipe is level. If it is not, wind direction and speed readings may not operate correctly or accurately. Adjust the mounting assembly as necessary.

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

8.Specification

Model	WS90
Name	Ultrasonic Anemometer with Piezoelectric Rain Gauge, Light & UV, Thermo-hygrometer Sensors
Dimensions	93*93*208mm
Weight	498(g)
Material of Plastic Casing	ASA+PC、PC
Temperature Metering Range	-40°C to 60°C(-40°F to 140°F)
Temperature Metering Accuracy	±1°C (± 1.8°F)
Temperature Metering Resolution	0.1°C (0.2°F)
Humidity Metering Range	1%RH to 99%RH
Humidity Metering Accuracy	±5%RH
Humidity Metering Resolution	1%RH
Rainfall Metering range	0mm to 9999mm
Rainfall Metering accuracy	<5mm/h, ±20%; 5mm/h to 50mm/h, ±10%; >50mm/h, ±20%
Rainfall Metering resolution	0.1mm
Wind speed Metering range	0m/s to 40m/s
Wind speed Metering accuracy	<10m/s, ±1m/s; ≥10m/s, ±10%
Wind speed measurement interval	2s
GUST wind speed	The past 28s
Wind speed Metering resolution	0.1m/s (starting speed > 0.5m/s)

Wind direction Metering range	0° to 359°
Wind direction Metering accuracy	±15°
Wind direction Metering resolution	1°
Light Metering range	0Klux to 200Klux
Light Metering accuracy	±25%
Light Metering resolution	0.1Klux
UV Metering range	1 to 15
UV Metering accuracy	±2
UV Metering resolution	1
Data reporting Interval	8.8 seconds
RF Connection Frequency	920/915/868/433MHz (depending on local regulations)
RF Wireless Range (in open areas)	Over 150 meters (500 ft.)
Operating Temperature Range	-40°C to 60°C(-40°F to 140°F)
Protection Rating	IPX5
Built-in Solar panel	7.5V±5%/30mA±10%
Power Supply	2*AA batteries(not included) or DC12V/1A Power adapter (not included)
Battery Life	1 Year

Table 3

Note:

• The wind speed is detected by every 2s.

- The wind speed reading will be a real-time value (The latest sampling data will be reporting to the receiver).

- The wind gust reading will be the max wind speed in the past 28s.

- When the wind speed is lower than 5m/s,the dispersion of wind direction will increase.

- The primary power source for the sensor is the solar panel. When available solar power (light over recent period) is insufficient, the batteries will be used.

9.Attention

9.1 About daily rain deviation

Figure 7: Daily rain deviation for WH40 and WS90

The daily rain deviation of WS90 is very small in the long run, but under certain conditions the deviation

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can be larger: as the rain drop size and wind speed can have different impacts on the sensor output which lead to this variance.

The WS90 product suffer from this imperfectness. If you are very demanding on rain data accuracy, we suggest you buy WH40 and use it together with WS90. If there is no precise requirement on data of each rain, then WS90 is just fine: After all the device works well after a longer run time.

9.2 How to calibrate WS90

Ensure your mobile phone and gateway in the same router, the WS90 has been paired with the gateway.

1. Set the Calibrate in the Ecowitt app
   If you have data from a relatively accurate weather station. You can use the data to do the calibration.
2. Make sure your mobile device is connected to the same Wi-Fi network.
3. Click "…" on top right corner and choose "Calibration".
4. For a certain parameter(Use Indoor temperature as an illustration in the Figure 8). Calculate the offset of data from accurate weather station and ecowitt sensor.
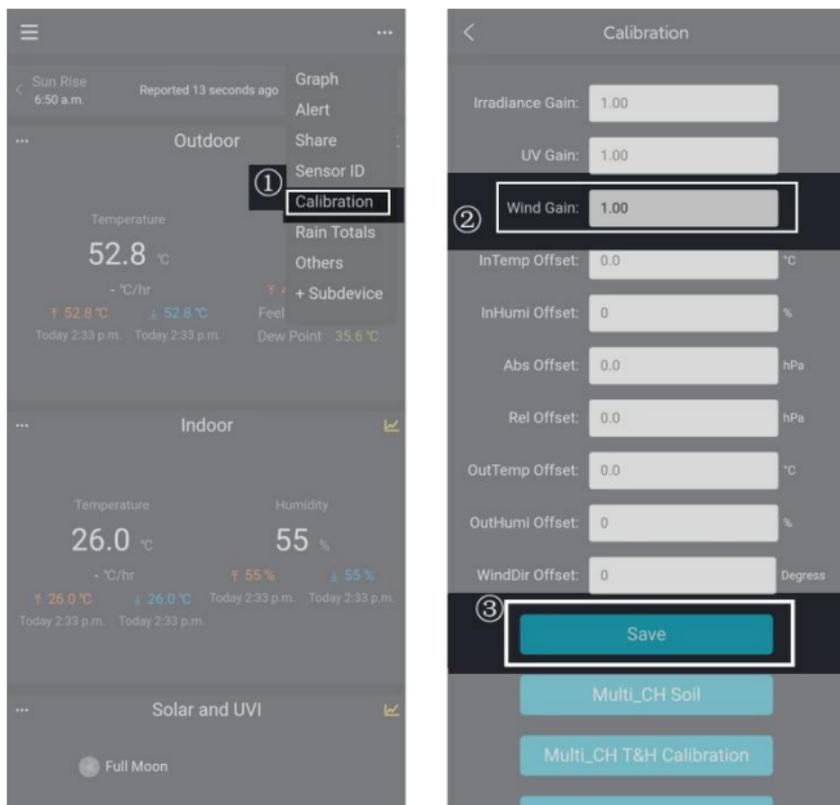5. Fill in the offset got from step3, click Save.

Figure 8

The WS90 is equipped with a haptic rain sensor, and the system offered a way that users can calibrate the rain sensor accuracy by themselves.

To carry out a proper calibration, please check the following:

2. A reference will be needed to record the rainfall value, and also it is quite important to have the ability to record the rain rate. For this, our WH40 rain sensor can be used for this purpose.

3. There are five rain gain parameters you can set: Piezo Rain1: Rain5. So we leave Rain1 as it is unless you can confirm it made constantly same result, and then you can adjust this.

4. Have rain data recorded, like this: we set rain4 gain to $6/7.5 = 0.8$. For easier handling, you can set rain2:rain3:rain5 all the 0.8 for the time being. Only when different rain rates are recorded, you have the WS90 rain divided by 0.8 to get 1.0 rain, and then have the (reference/WS90/0.8) calculated again, and fill up the corresponding rain gain setting precisely.
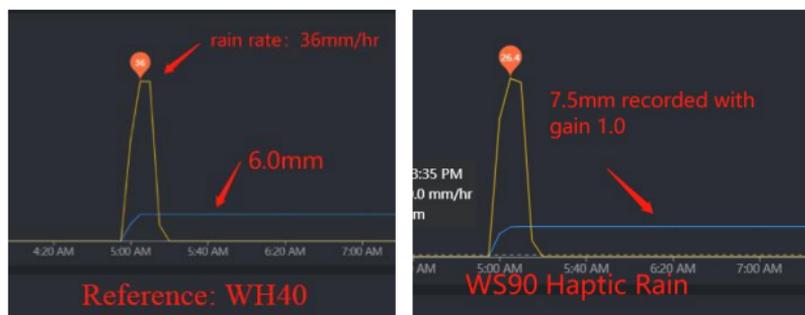

Figure 9: Rainfall values recorded for WH40 and WS90

Piezo Rain1 Gain	1.00
	When rain rate less than 4 mm/h, Range: 0.10 - 5.00
Piezo Rain2 Gain	1.00
	When rain rate less than 10 mm/h, Range: 0.10 - 5.00
Piezo Rain3 Gain	1.00
	When rain rate less than 30 mm/h, Range: 0.10 - 5.00
Piezo Rain4 Gain	1.00
	When rain rate less than 60 mm/h, Range: 0.10 - 5.00
Piezo Rain5 Gain	1.00
	When rain rate more than 60 mm/h, Range: 0.10 - 5.00

Figure 10: Set five rain gain parameters

9.3 Wind speed 0 calibration for WS90.

1. In a windless room, research a soft cloth to cover the top cover and the wind speed area of the WS90, after holding the CAL button for 3 seconds, the light will be bright for 5 seconds and then start to flash, after waiting the light has closed, and the wind speed will be reset to zero.
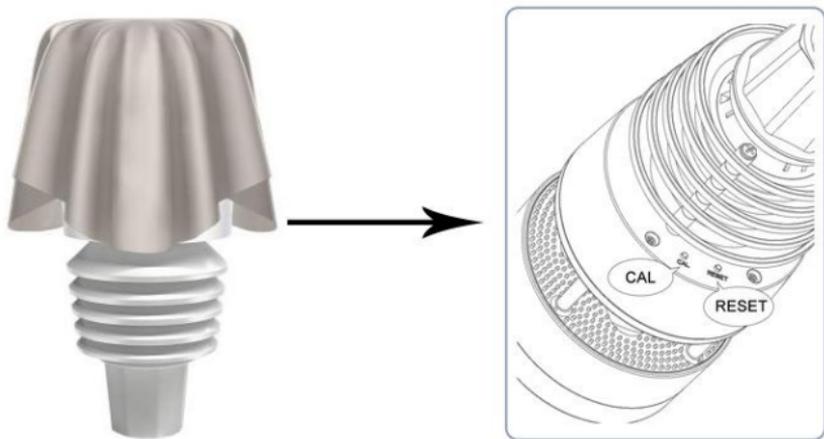As the picture shows:

Figure 11

2. In the usual state, press the CAL button three times
to turn the LED off to stop the light flash. After the
LED has been closed, if want to restart the light
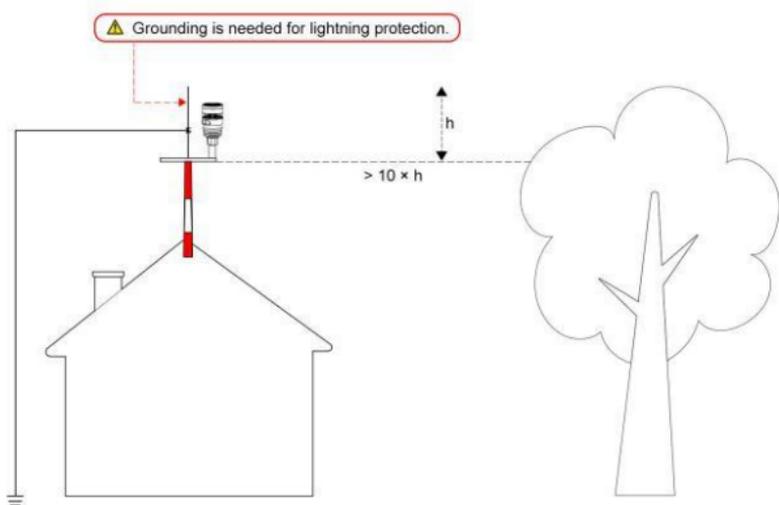function: Press the CAL button 3times to restart it.

10.Warranty

Figure 12

Note: Sensor damage, due to lack of grounding
protection against lightning ESD discharge, is
not covered by warranty.

We disclaim any responsibility for any technical error
or printing error or the consequences thereof.

All trademarks and patents are recognized.

We provide a 1-year limited warranty on this product against manufacturing defects or defects in materials and workmanship.

This limited warranty begins on the original date of purchase, is valid only on products purchased, and only to the original purchaser of this product. To receive warranty service, the purchaser must contact us for problem determination and service procedures.

This limited warranty covers only actual defects within the product itself and does not cover the cost of installation or removal from a fixed installation, normal set-up or adjustments, or claims based on misrepresentation by the seller, or performance variations resulting from installation-related circumstances.

11. FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device should not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception,which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with RF Exposure guidelines, This equipment should be installed and operated with a minimum distance between 20cm of the radiator and your body. Use only the supplied antenna.

IC Caution:
English:
This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two

Conditions:
1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

French:
L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de

licence. L'exploitation est autorisée aux deux conditions suivantes :
1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Manufacture: Shenzhen Fine Offset Electronics Co., Ltd.
Address: 4/F, Block C, JiuJiu Industrial City, Shajing Town, Baoan District, Shenzhen City, China

12. 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.

The provided solar panel charges a supper capacitor on this WS90. In normal conditions (solar light intensity over 20klux and lasted longer than 4 hours), the supper capacitor peak voltage displayed on the battery tile from your dashboard should be above 3.5v and lower than 5.5v. If it is not overpassing 2.5v, please check the top part of your WS90, and make sure it is free from dust coverage. Use a brush to clean

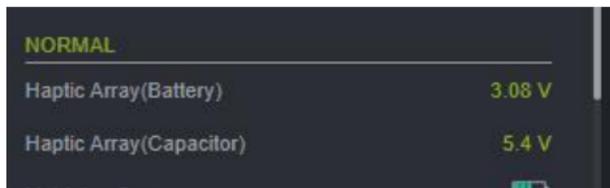up the surface for higher solar charging efficiency.

Figure 13

13. Contact Us

13.1 After-sales Service

Order Issues:
If you encounter any missing or incorrect shipments of Ecowitt products purchased, please reach out to the respective platform's customer service from the store where you bought the product for assistance.

Usage Inquiries:
Our product is continuously changing and improving, particularly online services and associated applications. To download the latest manual, and additional help, and for any issues related to product usage feel free to contact our customer support team at support@ecowitt.com. We are committed to providing assistance and resolving any concerns you may have.

13.2 Stay in Touch

Ask questions, watch setup videos, and provide feedback on our social media outlets. Follow Ecowitt on Discord, YouTube, Facebook and Twitter.