Ambient Weather WS-1002-ARRAY OBSERVER Solar Powered Wireless Weather Station User Manual

Table of Contents

1. Introduction

Thank you for your purchase of the Ambient Weather WS-1002-ARRAY OBSERVER Solar Powered Wireless Weather Station.

Please note that the sensor array requires a receiver, and is not a standalone product.

The following user guide provides step by step instructions for installation, operation and troubleshooting. To download the latest manual and additional troubleshooting tips, please visit:

https://ambientweather.net/help/

1.1 What's New with the WS-1002-WiFi Sensor Array

The WS-1001-WiFi uses rechargeable batteries for energy storage. The WS-1002-WiFi improves on this design by charging a super capacitor instead of rechargeable batteries. The non-rechargeable batteries provide back-up energy.

With the WS-1001-WiFi, the rechargeable batteries have a limited temperature range and prone to leaking. This problem is resolved with the WS-1002-WiFI by using high quality non-rechargeable batteries, like Lithium e2 Energizer batteries.

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.

⚠️ **Warning:** Installing your weather station in a high location may result in injury or death. 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.

3. Pre-Installation Checkout and Site Survey

3.1 Pre Installation Checkout

Before installing your weather station in the permanent location, we recommend operating the weather station for one week in a temporary location with easy access. This will allow you to check out all of the functions, insure proper operation, and familiarize you with the weather station and calibration procedures. This will also allow you to test the wireless range of the weather station.

3.2 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' 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' tall, and the mounting pole is 6' tall, install 4 x (20 – 6)' = 56' away.
4. Wireless Range. The radio communication between receiver and transmitter in an open field can reach a distance of up to 330 feet, providing there are no interfering obstacles such as buildings, trees, vehicles, high voltage lines.   Wireless signals will not penetrate metal buildings.   Under most conditions, the maximum wireless range is 100'.
5. Radio interference such as PCs, radios or TV sets can, in the worst case, entirely cut off radio communication. Please take this into consideration when choosing console or mounting locations. Make sure your display console is at least five feet away from any electronic device to avoid interference.
6. Visit Ambient Weather Mounting Solutions for assistance and ideas for mounting your weather station:

   http://www.ambientweather.com/amwemoso.html

4. Getting Started

4.1 Parts List

QTY	Item	Image
1	Sensor Array	
1	Wind Vane	
2	Pole (straight and crimped)	
2	Pole mounting U-bolt	
4	Pole mounting clamps	
4	Pole mounting U-bolt nuts	
1	Allen wrench	
1	User manual	
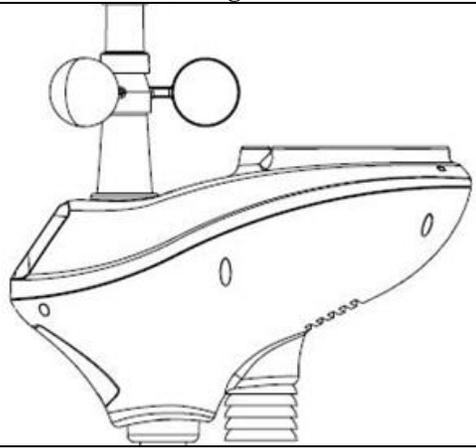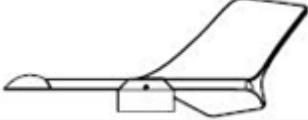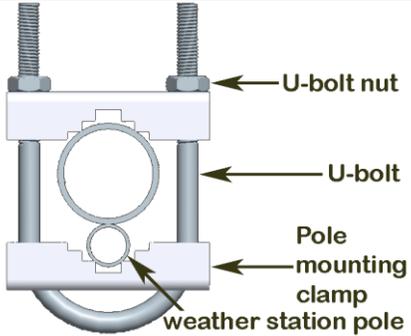
4.2 Recommend Tools

- Precision screwdriver (for small Phillips screw on battery cover door)
- Adjustable wrench (for mounting pole)
- Compass or GPS (for wind direction calibration)

4.3 Sensor Array Set Up
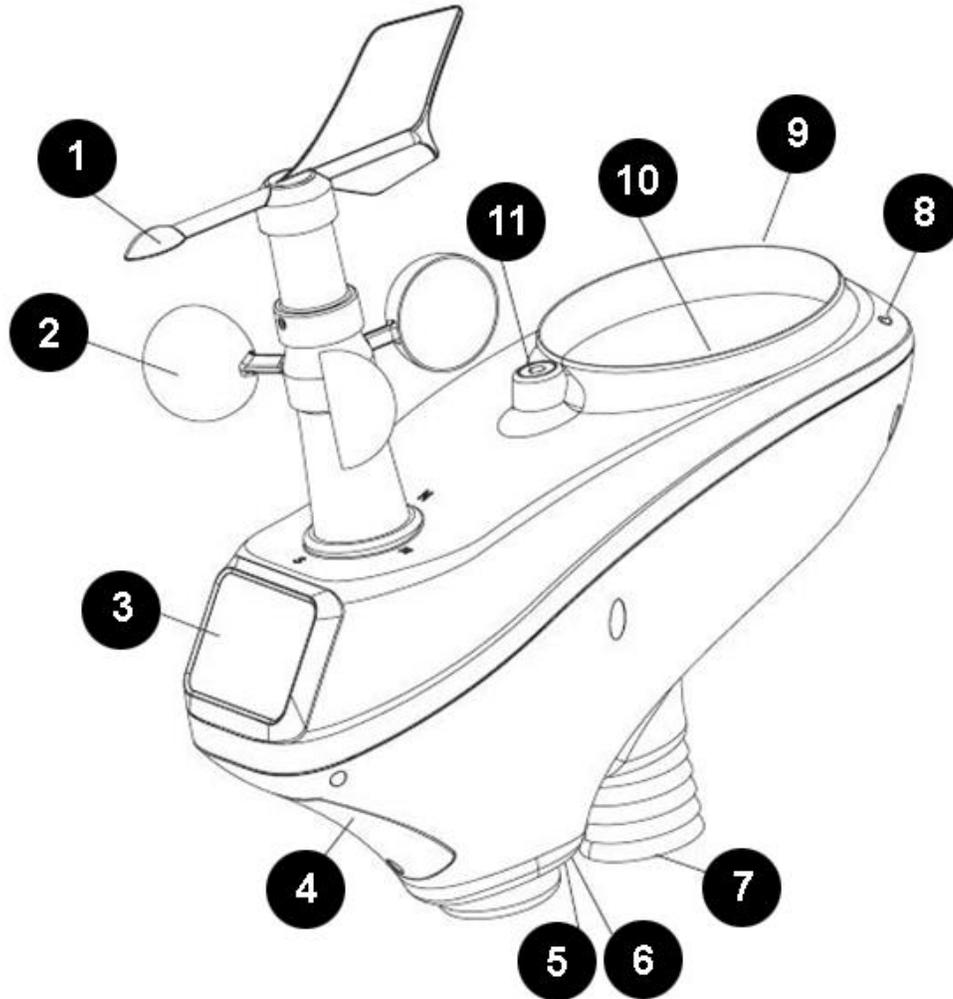
Figure 1

No	Description	No	Description
1	Wind Vane (measures wind direction)	7	Thermo-hygrometer Sensor (measures temperature and humidity)
2	Wind Speed Sensor (measures wind speed)	8	UV Sensor
3	Solar collector	9	Solar Radiation Sensor
4	Battery compartment	10	Rain Collector (self emptying)
5	LED transmission indicator (turns on for 4 seconds on power up, flashes once per 16 seconds)	11	Bubble Level
6	Reset button		

4.3.1 Install Wind Vane

Reference Figure 2. (a) Locate and align the flat key on the wind vane shaft to the flat key on the wind vane and push the vane on to the shaft. (b) tighten the set screw with the hex wrench (included).


(a)   **(b)**
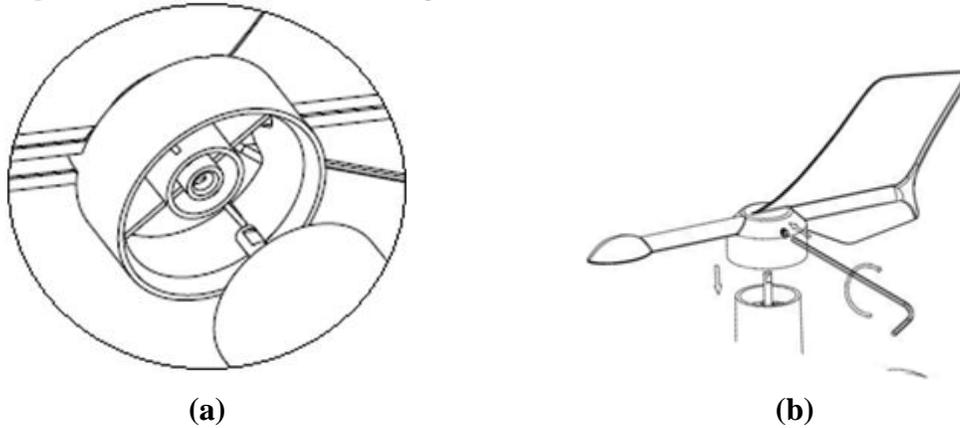
**Figure 2**

4.3.2 Install Mounting Pole

Reference Figure 3. Remove the mounting pole collar by rotating counter clockwise.
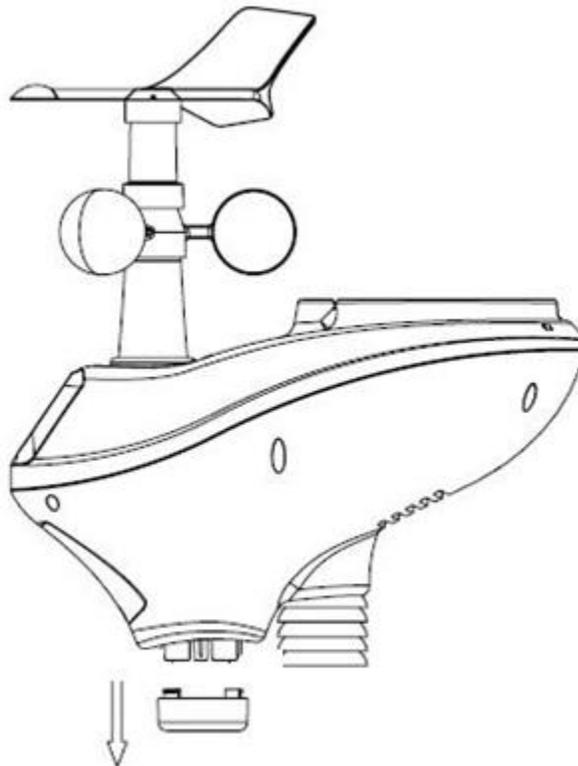
Figure 3

Reference Figure 4. Locate and align the groove on the sensor array and mounting pole.
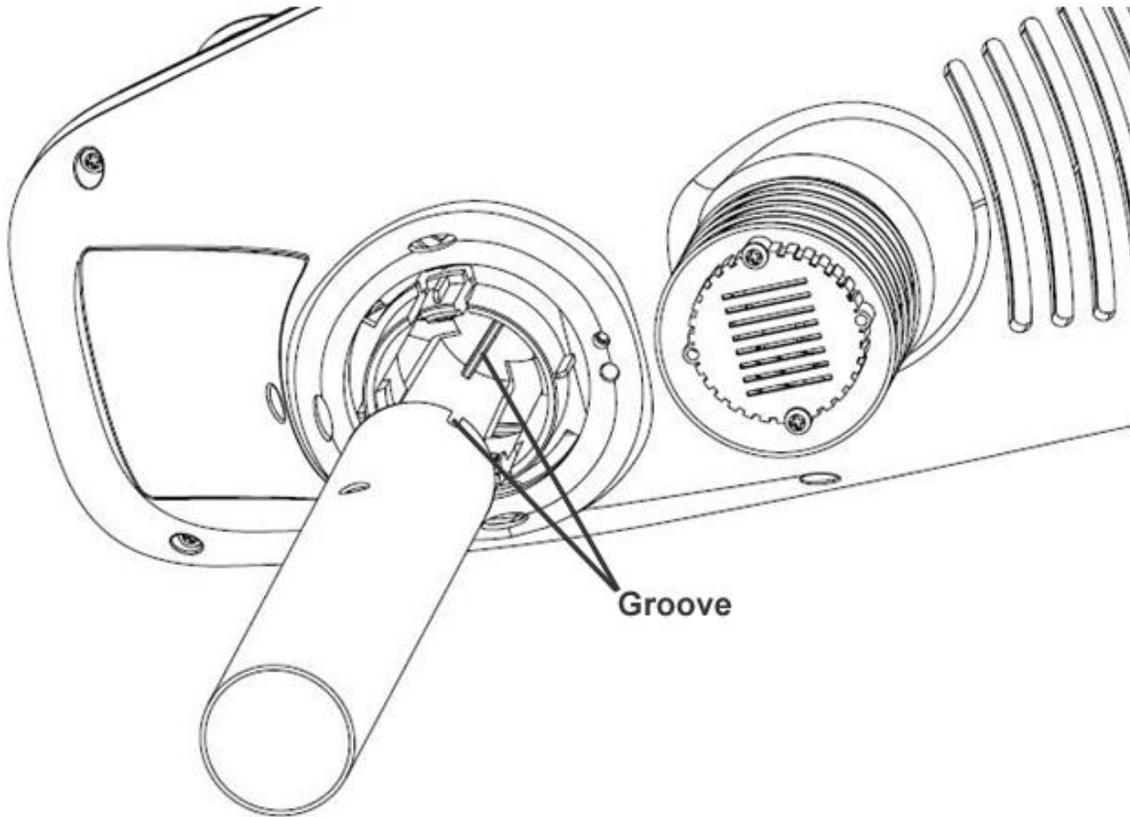
Figure 4

Reference Figure 5. Turn the mounting pole collar to lock the pole into place by rotating clockwise.
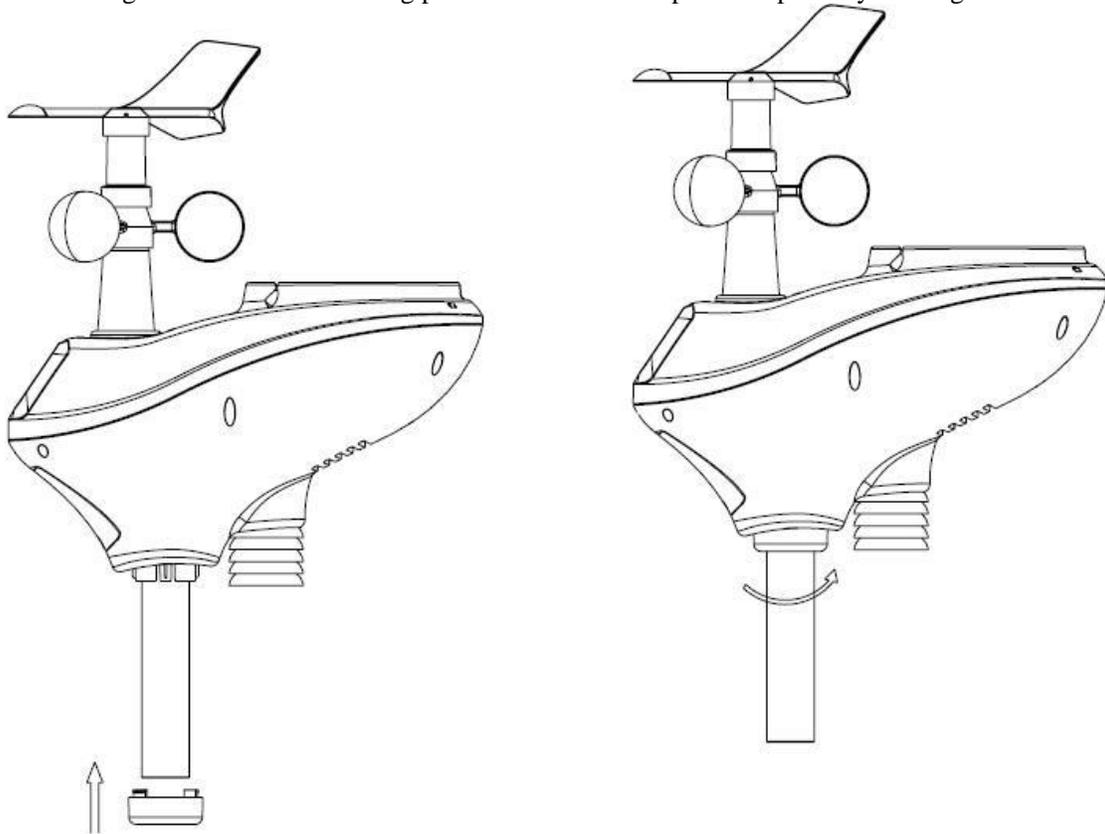

Figure 5

4.3.1 Install Batteries

Reference Figure 6. Locate the battery door on the bottom of the sensor array. Turn the set screw counter clockwise to open the battery compartment. Insert 3xAA batteries (not included). We recommend a high quality battery, such as Lithium e2 Energizer batteries.

The LED indicator on the bottom of the sensor array will turn on for four seconds and normally flash once per 16 seconds (the transmission update period).

Close the battery door and tighten the set screw.
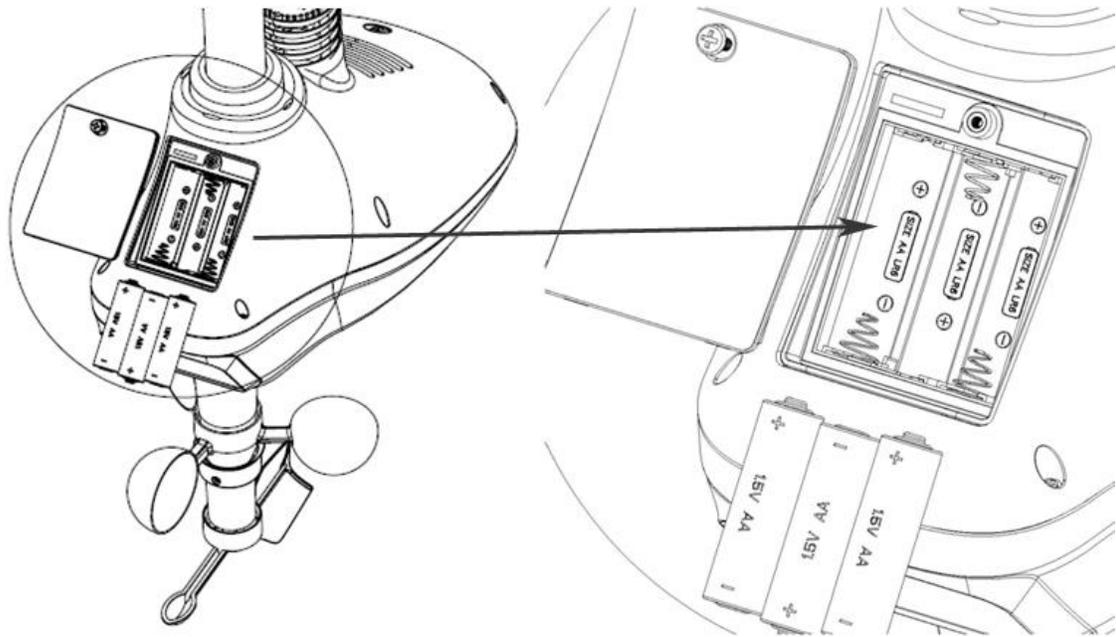
Figure 6

4.3.2 Mount Weather Station

There are two methods for attaching your weather station:

**A. Option 1: Mounting Clamps.** Fasten the mounting pole to your mounting pole or bracket (purchased separately) with the two U-bolts, mounting pole brackets and nuts, as shown in Figure 7. Tighten the mounting pole to your mounting pole with the U-Bolt assembly. Make sure your mounting pole is as far away from the temperature sensor as possible, as shown in Figure 7.
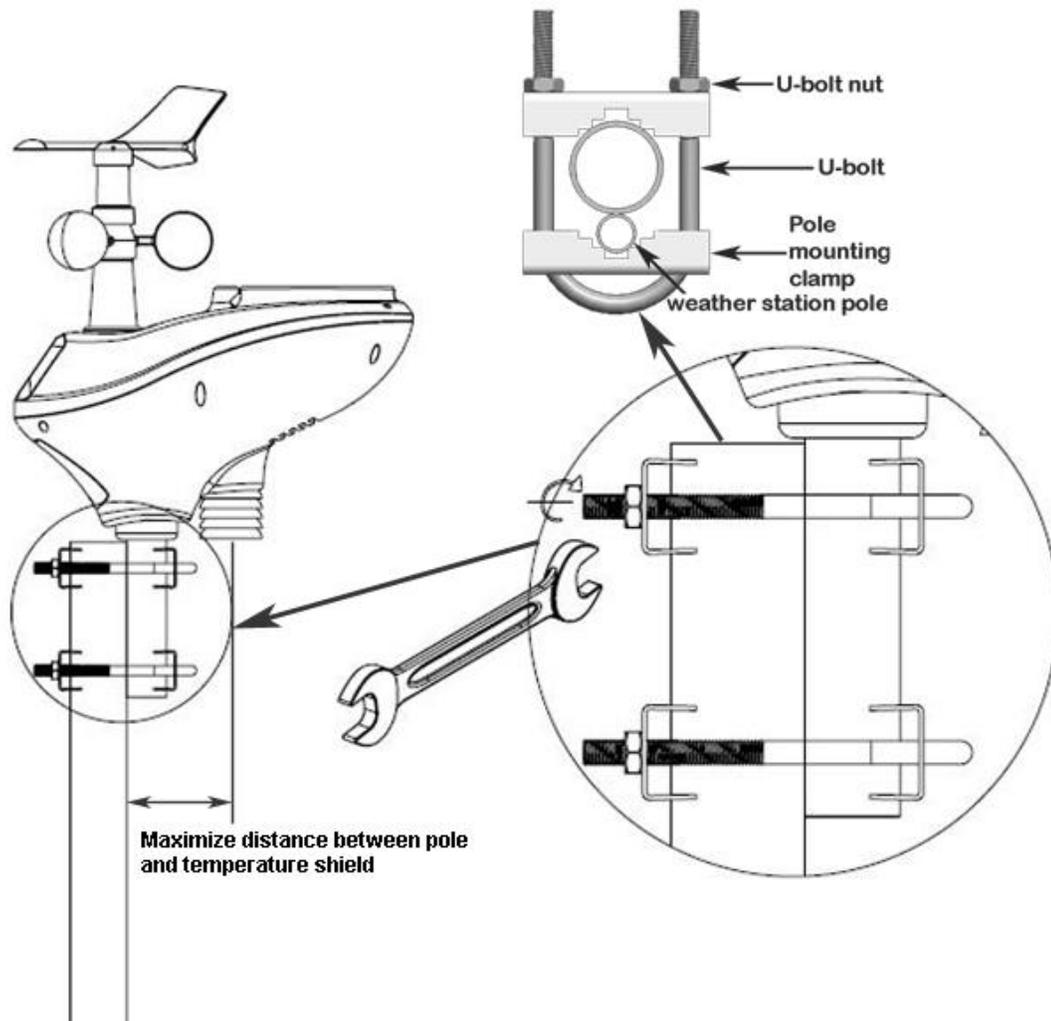
Figure 7

B. Option 2: Swedged Pole Mount. Insert the swedged end of the included mounting pole into the open end of any standard mounting pole solution (1 3/8" diameter) available from Ambient Weather, as shown in Figure 8. For more information on mounting solutions, visit:

http://www.ambientweather.com/amwemoso.html
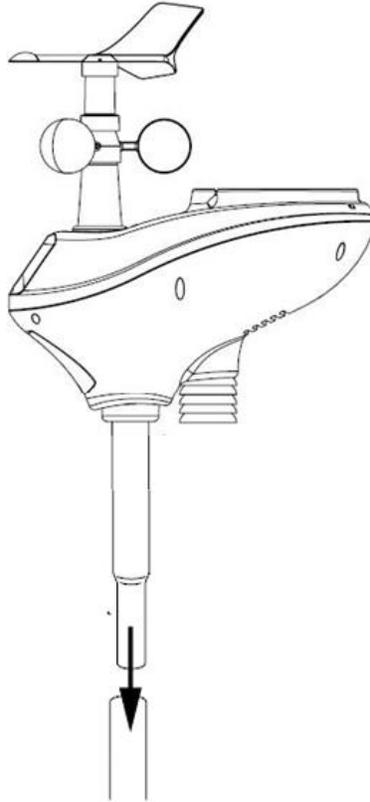
Figure 8

1. Reference Figure 9. Locate the four wind vane compass rose indicators of N, E, S, W (representing North, East, South and West). Align the compass rose direction upon final installation with a compass or GPS.
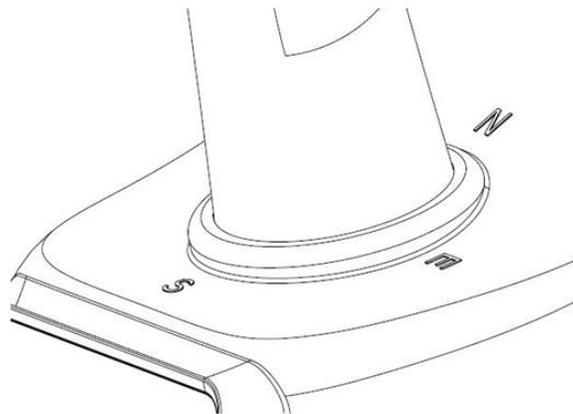
Figure 9

2. Reference Figure 10. Make sure the sensor array is completely level upon final installation. Failure to do so will result in inaccurate rain gauge readings.
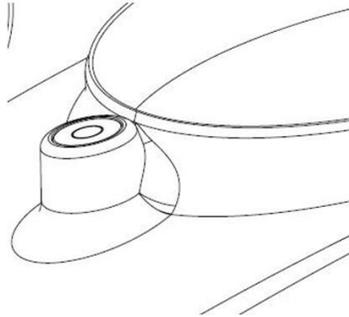
Figure 10

4.3.3 Reset Button and Transmitter LED

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

With an open ended paperclip, press and hold the **RESET BUTTON** for three seconds to completely discharge the voltage.

Take out the batteries and wait one minute, while covering the solar panel to drain the voltage.

Put batteries back in and resynchronize with console by powering down and up the console with the sensor array about 10 feet away.
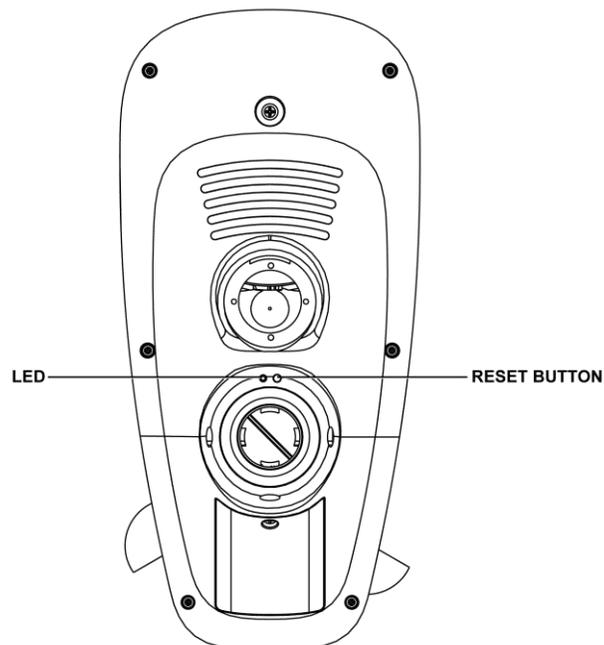
Figure 11

4.4 Receiving Units

You must own a receiver to use the sensor array (sold separately). They include one or more of the following. You can use as many receivers as you want with one sensor array.

Item Number	Picture	Description
WS-1200-CONSOLE		Display Console for WS-1200 Weather Station (no internet connectivity)
WS-1001-CONSOLE		Display Console for WS-1001-WiFi Weather Station (WiFi internet connectivity)
AIRBRIDGE-KIT		AirBridge and WeatherBridge for advanced weather station reporting (WiFi internet connectivity)
OBSERVERIP		ObserverIP module for reporting to Wunderground.com.

Figure 12

4.5 Best Practices for Wireless Communication

Note: To insure proper communication, mount the remote sensor(s) upright on a vertical surface, such as a wall. **Do not lay the sensor flat.**

Wireless communication is susceptible to interference, distance, walls and metal barriers. We recommend the following best practices for trouble free wireless communication.

1. **Electro-Magnetic Interference** (**EMI**). Keep the console several feet away from computer monitors and TVs.
2. **Radio Frequency Interference (RFI).** If you have other 433 MHz devices and communication is intermittent, try turning off these other devices for troubleshooting purposes. You may need to relocate the transmitters or receivers to avoid intermittent communication.
3. **Line of Sight Rating.** This device is rated at 300 feet line of sight (no interference, barriers or walls) but typically you will get 100 feet maximum under most real-world installations,

which include passing through barriers or walls.
4. **Metal Barriers.** Radio frequency will not pass through metal barriers such as aluminum siding. If you have metal siding, align the remote and console through a window to get a clear line of sight.

The following is a table of reception loss vs. the transmission medium. 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%

5. Glossary of Terms

Term	Definition
Absolute Barometric Pressure	Absolute pressure is the measured atmospheric pressure and is a function of altitude, and to a lesser extent, changes in weather conditions. Absolute pressure is not corrected to sea-level conditions. *Refer to Relative Barometric Pressure.*
Accuracy	Accuracy is defined as the ability of a measurement to match the actual value of the quantity being measured.
Barometer	A barometer is an instrument used to measure atmospheric pressure.
Calibration	Calibration is a comparison between measurements – one of known magnitude or correctness of one device (standard) and another measurement made in as similar a way as possible with a second device (instrument).
Dew Point	The dew point is the temperature at which a given parcel of humid air must be cooled, at constant barometric pressure, for water vapor to condense into water. The condensed water is called dew. The dew point is a saturation temperature. The dew point is associated with relative humidity. A high relative humidity indicates that the dew point is closer to the current air temperature. Relative humidity of 100% indicates the dew point is equal to the current temperature and the air is maximally saturated with water. When the dew point remains constant and temperature increases, relative humidity will decrease.
Heat Index	The Heat Index, sometimes referred to as the apparent temperature, is a measure of how hot it really feels when relative humidity is factored with the actual air temperature. To find the Heat Index temperature, look at the Heat Index chart below. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index (how hot it feels) is 121°F. IMPORTANT: Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F.

Term	Definition
	Also, strong winds, particularly with very hot, dry air, can be extremely hazardous. The Heat Index Chart shaded zone above 105°F shows a level that may cause increasingly severe heat disorders with continued exposure or physical activity. Heat Index is not calculated below 80°F.
HectoPascals (hPa)	Pressure units in SI (international system) units of measurement. Same as millibars (1 hPa = 1 mbar)
Hygrometer	A hygrometer is a device that measures relative humidity. Relative humidity is a term used to describe the amount or percentage of water vapor that exists in air.
Inches of Mercury (inHg)	Pressure in Imperial units of measure. 1 inch of mercury = 33.86 millibars
Rain Gauge	A rain gauge is a device that measures liquid precipitation (rain), as opposed to solid precipitation (snow gauge) over a set period of time. All digital rain gauges are self emptying or self dumping (also referred to as tipping rain gauge). The precision of the rain gauge is based on the volume of rain per emptying cycle.
Range	Range is defined as the amount or extent a value can be measured.
Relative Barometric Pressure	Measured barometric pressure relative to your location or ambient conditions.
Resolution	Resolution is defined as the number of significant digits (decimal places) to which a value is being reliably measured.
Solar Radiation	A solar radiation sensor measures solar energy from the sun. Solar radiation is radiant energy emitted by the sun from a nuclear fusion reaction that creates electromagnetic energy. The spectrum of solar radiation is close to that of a black body with a temperature of about 5800 K. About half of the radiation is in the visible short-wave part of the electromagnetic spectrum. The other half is mostly in the near-infrared part, with some in the ultraviolet part of the spectrum.

Term	Definition
Thermometer	A thermometer is a device that measures temperature. Most digital thermometers are resistive thermal devices (RTD). RTDs predict change in temperature as a function of electrical resistance.
UV	An ultraviolet sensor (UV sensor) is a device that measures UV light from the Sun. The UV index (UVI) is an international standard measurement of how strong the ultraviolet (UV) radiation from the sun is at a particular place on a particular day. It is a scale primarily used in daily forecasts aimed at the general public. Its purpose is to help people to effectively protect themselves from UV light, of which excessive exposure causes sunburns, eye damage such as cataracts, skin aging, and skin cancer.
Wind Vane	A wind vane is a device that measures the direction of the wind. The wind vane is usually combined with the anemometer. Wind direction is the direction from which the wind is blowing.

6. Specifications

6.1 Wireless Specifications

- Line of sight wireless transmission (in open air): 330 feet, 100 feet under most conditions
- Update Rate: Outdoor Sensor: 16 seconds, Indoor Sensor: 64 seconds
- Frequency: 915 MHz

6.2 Measurement Specifications

The following table provides the specifications for the measured parameters.

Measurement	Range	Accuracy	Resolution
Indoor Temperature	32 to 140 °F	± 2 °F	0.1 °F
Outdoor Temperature	-40 to 149 °F (lithium batteries) -4 to 140 °F (alkaline batteries)	± 2 °F	0.1 °F
Indoor Humidity	1 to 99%	± 5%	1 %
Outdoor Humidity	1 to 99%	± 5%	1 %
Barometric Pressure	8.85 to 32.50 inHg	± 0.08 inHg (within range of 27.13 to 32.50 inHg)	0.01 inHg
Light (solar radiation)	0 to 400,000 Lux	± 15%	1 Lux
Rain	0 to 394 in.	± 10%	0.01 in
UV Index	0-15	± 1	1
Wind Direction	0 - 360 °	1°	1°
Wind Speed	0 to 100 mph (operational)	± 2.2 mph or 10% (whichever is greater)	0.1 mph

6.3 Power Consumption

- Outdoor sensor array: 3xAA alkaline batteries (not included)

7. Maintenance

1. Clean the rain gauge once every 3 months as follows. Reference Figure 13.

   Step 1: Make a note of the current rain totals by referencing the receiver. You will need to re-enter these values after the calibration procedure it complete.

   Step 2: Pour water into the rain collector to moisturize the dirt inside rain bucket.

   Step 3: Use an approximately 3 inch (80 mm) long cotton swab, and push the cotton tip through the rain collector hole until is reaches the self emptying mechanism, and press until the mechanism no longer rotates.

   Step 4: Rotate the cotton swab back and forth, removing dirt from the tipping mechanism and rain collector hole.

   Step 5: Remove the cotton swab and flush with water to remove any remaining dirt.

   Step 6: Re-enter the rain totals recorded in Step 1.
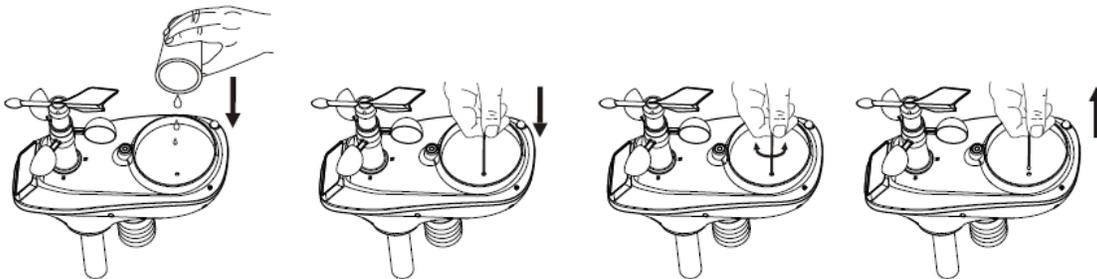
Figure 13

2. Clean the solar radiation and UV sensors every 3 months with water and towel.
3. Clean solar panel every 3 months with water and towel.
4. Replace batteries every 2 to 3 years.

7.1   Advanced Rain Gauge Cleaning

If the rain gauge stops updating, it is possible for spiders and other insects to nest inside the sensor array housing and interfere with the rain gauge mechanism.

1. Remove the six screws on the bottom of the sensor array, as shown in Figure 14.
2. **CAREFULLY** separate the top housing from the bottom housing. They cannot be completely separated due to wires. **DO NOT STRESS THE WIRES**. Open the sensor housing slightly, like a clam shell.
3. Clean any debris and spider webs, as shown in Figure 15.
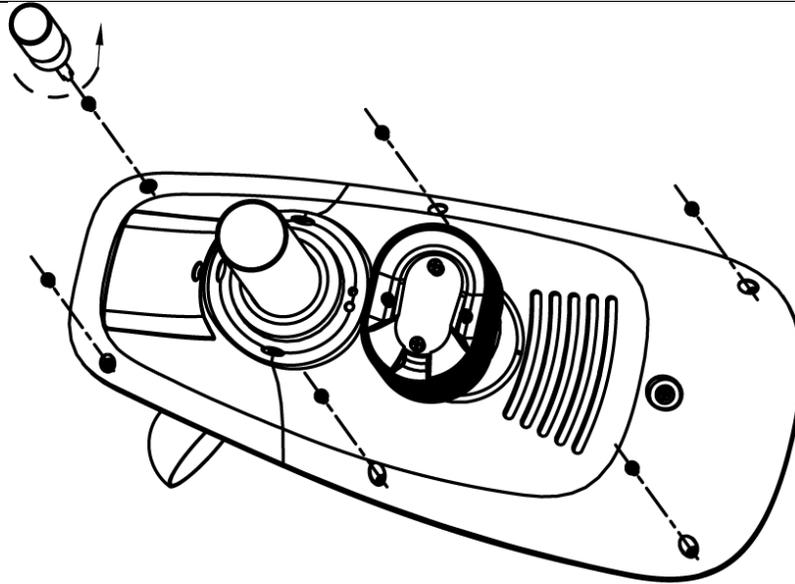
Figure 14
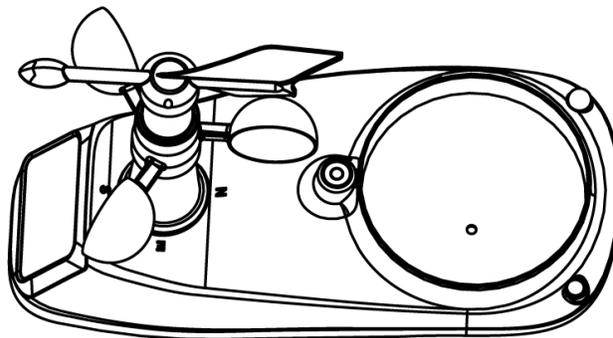
Do not stress wires

Clean Debris
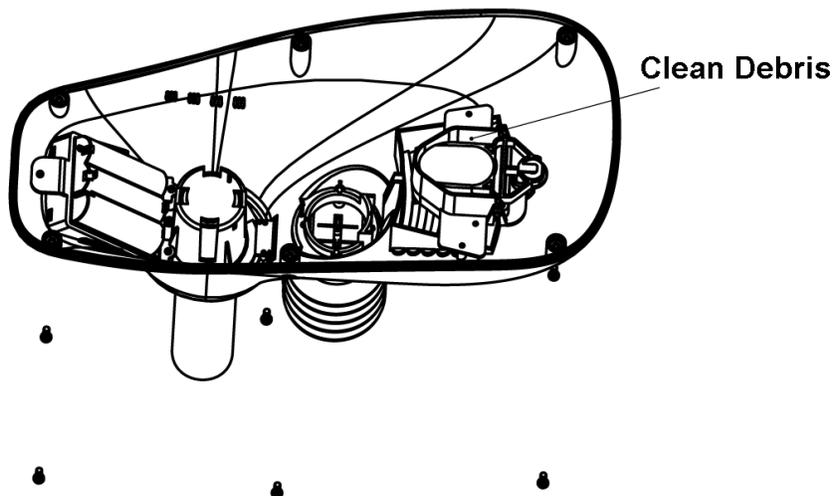
Figure 15

8. Troubleshooting Guide

If your question is not answered here, you can contact us as follows:

1. Email Support: support@ambientweather.com
2. Help: www.AmbientWeather.net/help
3. Technical Support: 480-346-3380 (M-F 8am to 3pm Arizona Time)

Problem	Solution
Outdoor sensor array does not communicate to the receiver.	The sensor array may have initiated properly and the data is registered by the console as invalid, and the console must be reset. The reset button is **next to the LED**, near the mounting point on the sensor array, as shown in Figure 11. With an open ended paperclip, press the reset button for 3 seconds to completely discharge the voltage. Take out the batteries and wait one minute, while covering the solar panel to drain the voltage. Put batteries back in and resync with console by powering down and up the console with the sensor array about 10 feet away. Bring the sensor array inside the house (you can disconnect it from the rest of the sensors). The LED next to the battery compartment will flash every 16 seconds. If the LED is not flashing every 16 seconds… Replace the batteries in the outside sensor array. If the batteries were recently replaced, check the polarity. If the sensor is flashing every 48 seconds, proceed to the next step. There may be a temporary loss of communication due to reception loss related to interference or other location factors, or the batteries may have been changed in the sensor array and the console has not been reset. The solution may be as simple as **powering down and up the console**. Replace the batteries in the outside sensor array. With the sensor array and console 10 feet away from each other, remove AC power from the display console and wait 10 seconds. Re-connect power.
Temperature sensor reads too high in the day time.	Make certain that the sensor array is not too close to heat generating sources or strictures, such as buildings, pavement, walls or air conditioning units. Use the calibration feature to offset installation issues related to radiant heat sources. Reference the receiver manual.
Rain gauge reports rain when it is not raining	An unstable mounting solution (sway in the mounting pole) may result in the tipping bucket incorrectly incrementing rainfall. Make sure you have a stable, level mounting solution.

9. Accessories

The following software and hardware accessories are available for this weather station at www.AmbientWeather.com .

Accessory	Description
Ambient Weather Mounting Solutions	Ambient Weather provides the most comprehensive mounting solutions for weather stations, including tripods, pole extensions, pole mounting kits, guy wires, ground stakes and more.

10. Liability Disclaimer

Please help in the preservation of the environment and return used batteries to an authorized depot. The electrical and electronic wastes contain hazardous substances. Disposal of electronic waste in wild country and/or in unauthorized grounds strongly damages the environment.

Reading the "User manual" is highly recommended. The manufacturer and supplier cannot accept any responsibility for any incorrect readings and any consequences that occur should an inaccurate reading take place.

This product is designed for use in the home only as indication of weather conditions. This product is not to be used for medical purposes or for public safety information.

The specifications of this product may change without prior notice.

This product is not a toy. Keep out of the reach of children.

No part of this manual may be reproduced without written authorization of the manufacturer.

Ambient, LLC WILL NOT ASSUME LIABILITY FOR INCIDENTAL, CONSEQUENTIAL, PUNITIVE, OR OTHER SIMILAR DAMAGES ASSOCIATED WITH THE OPERATION OR MALFUNCTION OF THIS PRODUCT.

11. FCC Statement

Statement according to FCC part 15.19:
This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Statement according to FCC part 15.21:
Modifications not expressly approved by this company could void the user's authority to operate the equipment.
Statement according to FCC part 15.105:
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 into 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.

12. Warranty Information

Ambient, LLC provides a 1-year limited warranty on this product against manufacturing 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 Ambient, LLC for problem determination and service procedures.

Warranty service can only be performed by a Ambient, LLC. The original dated bill of sale must be presented upon request as proof of purchase to Ambient, LLC.

Your Ambient, LLC warranty covers all defects in material and workmanship with the following specified exceptions: (1) damage caused by accident, unreasonable use or neglect (lack of reasonable and necessary maintenance); (3) damage resulting from failure to follow instructions contained in your owner's manual; (4) damage resulting from the performance of repairs or alterations by someone other than an authorized Ambient, LLC authorized service center; (5) units used for other than personal use (6) applications and uses that this product was not intended (7) the products inability to receive a signal due to any source of interference or metal obstructions and (8) extreme acts of nature, such as lightning strikes or floods.

This 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, claims based on misrepresentation by the seller or performance variations resulting from installation-related circumstances.