ambient weather®

WI-FI ULTRASONIC SOLAR-POWERED WIRELESS WEATHER STATION

Model WS-4000

USER MANUAL

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INTRODUCTION

Thank you for your purchase of the Ambient Weather WS-4000 Wi-Fi Ultrasonic Solar-Powered Wireless Weather Station. 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.com/faqs/question/tags/tag/WS-4000/. To sign up for firmware or app update alerts, please visit https://ambientweather.com/firmware-update-alerts

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: *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.*

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.*

QUICK START GUIDE

The manual is organized by components rather than a sequential flow, facilitating easy reference to specific sections.

The following Quick Start Guide provides only the necessary steps to install, operate the weather station, and upload to the internet, along with references to the pertinent sections.

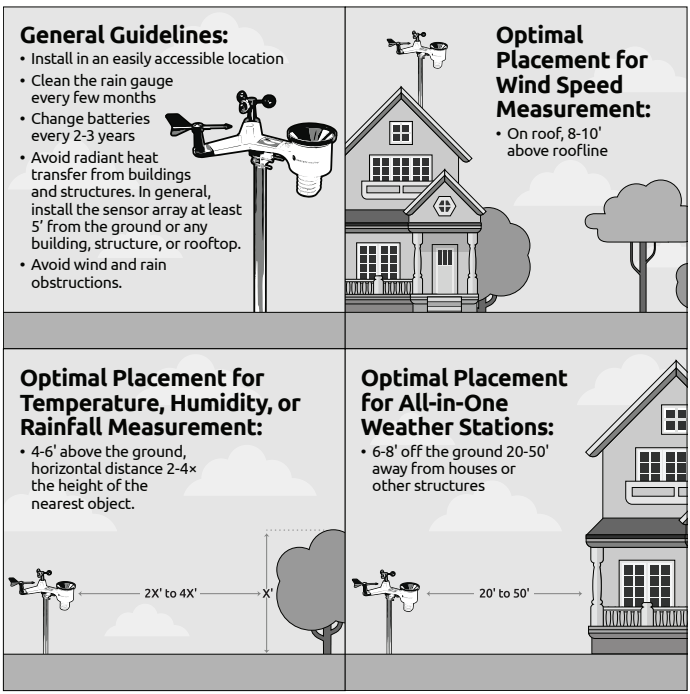
STEP	DESCRIPTION	PAGE(S)
1	Assemble and power up the ultrasonic sensor array	6
2	Power up the indoor thermo-hygrometer-barometer and any other sensors	7, refer to other sensor documentation
3	Power up the display console and synchronize with sensors	11-15
4	Mount the sensor array	7

5	Set date and time on console	21
6	Calibrate the relative pressure to sea-level conditions (local airport) on console	40-42
7	Reset the rain to zero on console	34
8	Configure Wi-Fi	33
9	Register and upload to Weather Servers	25-31

PRE-INSTALLATION AND SITE SURVEY

Pre-Installation

Before installing your weather station in its permanent location, we recommend placing it in a temporary, easily accessible spot for one week. This will allow you to test all functions, confirm proper operation, familiarize yourself with the device and calibration procedures, and assess the wireless range.



Site Survey

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

1. **Accessibility**: The rain gauge should be cleaned every few months, and batteries changed every 2-3 years.
2. **Radiant Heat**: 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 × (20–6)' = 56' away.
4. **Wireless Range**: The radio communication between receiver and transmitter in an open field can reach up to 330', 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. **Electromagnetic Signals**: Devices such as PCs, radios, or TV sets can interfere, or in the worst case, entirely cut off radio communication with your array. Please take this into consideration when choosing locations for your Console and the weather array. Make sure your Console is at least 5' away from any other electronic device(s) to minimize the chance of interference.

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

Visit Ambient Weather Mounting Solutions for assistance and ideas for mounting your weather station:
http://www.ambientweather.com/amwemoso.html

GETTING STARTED

The Ambient Weather WS-4000 Ultrasonic Wi-Fi Personal Weather Station consists of one indoor display console (RF receiver + Wi-Fi transmitter), one ultrasonic sensor array, one indoor thermo-hygrometer barometer, and one (online) user manual:

Parts List

Ultrasonic Sensor Array Assembly (Item WS-4000-ARRAY)

QTY	ITEM
1	Ultrasonic sensor array with built-in: thermo-hygrometer/ wind speed/wind direction sensor, light and UV sensor, haptic rain sensor, solar panel, and mounting nut

Display Console (Item WS-4000-Console-AC)

QTY	ITEM
1	Display Console
1	AC adapter

Thermo-Hygrometer-Barometer (Item WH32B)

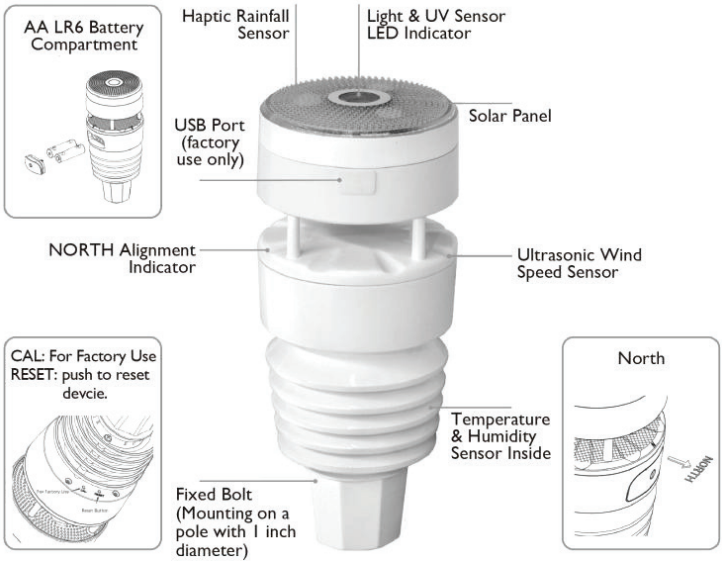
QTY	ITEM
1	Thermo-hygrometer-barometer transmitter
1	Mounting screw
1	Zip tie for non-surface mounting

NOTE: *Batteries are not included. Alkaline (in temperatures as low as 4 °F) or Lithium batteries (in temperatures as low as -40 °F) are recommended.*

NOTE: *AC adapter is included. The adapter is a switching-type adapter and can generate a small amount of electrical interference with the RF reception in the console, when placed too close to the console. Please keep the console display at least 2 ft. or 0.5 m away from the power adapter to ensure best RF reception from the outdoor sensor package.*

Recommend Tools

- Compass or GPS (for wind direction calibration)



Sensor Array Set Up

Install the Batteries in the Sensor Array

Open the battery compartment with a screwdriver, insert 2×AA batteries in the battery compartment, and press the "Reset" button. The LED indicator on the back of the sensor package will turn on for 3 seconds and then flash once every 8.8 seconds indicating sensor data transmission. Please pay close attention or you may miss the initial indication. You can always press the "Reset" button to start over. Monitor long enough to be sure that you see the flash once every 8.8 seconds

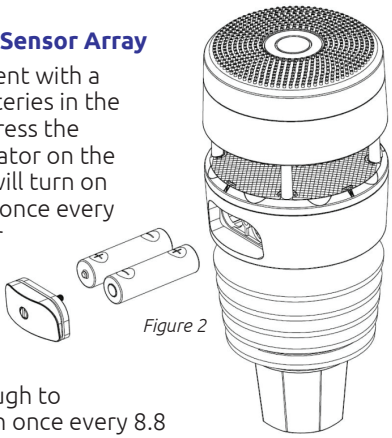
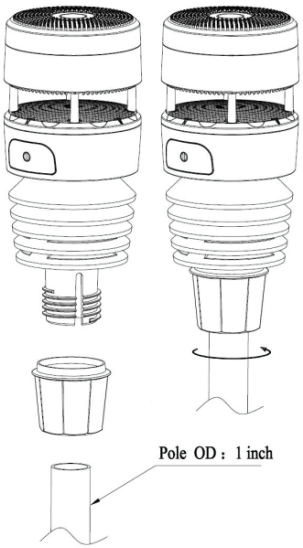


Figure 2

If the sensor package has been outside for some time, and solar panel has charged up the internal accumulator fully or partially, the system might not start up properly when you install the 2 AA backup batteries. You can always make a system reset by pressing the "Reset" button.

Sensor Array Mounting

The unit can be mounted on a 1" diameter, vertical pole (not included). Remove the collar from the bottom of the unit and slide it onto the mounting pole. Align the battery compartment so it faces north. Carefully place the unit onto the top of the pole, and replace the collar onto the unit, tightening the mount and securing the array. Be careful not to over tighten the collar, as it may strip. Hand snug is enough.



Indoor Thermo-Hygrometer-Barometer Transmitter Set Up

Install Batteries

- Remove the battery door on the back of the sensor (Figure 3).
- Insert 2×AA batteries.
- After inserting the batteries, the remote sensor will display temperature, humidity and barometric pressure on the display (Figure 4).

This sensor is also capable of displaying in Celsius or Fahrenheit by using the switch under the battery door (Figure 5).

Figure 3

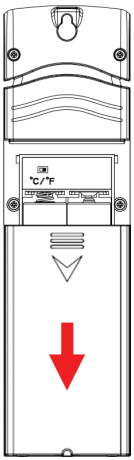


Figure 4

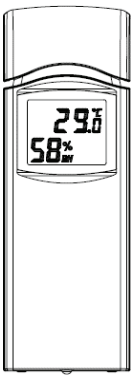
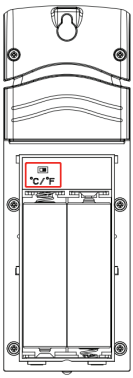


Figure 5



Sensor IDs

The console supports multiple sensors and sensor arrays. You can disable or enable specific sensors. Please reference pages 37-38 for more information regarding Sensor IDs

OPTIONAL ACCESSORIES

DESCRIPTION	PART NUMBER	IMAGE	PRODUCT PAGE
Indoor Air Quality Monitor*	AQIN*		
Outdoor PM25 Particulate Monitor	PM25		
Indoor PM25 Particulate Monitor*	PM25IN*		
Wireless Temperature and Humidity Sensor†	WH31E†		
Indoor Wireless Temperature, Humidity and Pressure Sensor	WH32B		
Leak Detector	WH31LA		

* PM25IN and AQIN share the same channel. Only one may be used at any time.

† The WH31E, WH31P and WH31PF share the same 8-channels.

DESCRIPTION	PART NUMBER	IMAGE	PRODUCT PAGE
Waterproof Probe Temperature Sensor†	WH31P†		
Soil Moisture Sensor	WH31SM		
Floating Pool Thermometer†	WH31PF†		
Leaf Wetness Sensor	WH51LW		
Wireless Refrigerator/ Freezer Temperature and Humidity Sensor	WH51RF		

† The WH31E, WH31P and WH31PF share the same 8-channels.

BEST PRACTICES FOR WIRELESS COMMUNICATION

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

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

Radio Frequency Interference (RFI): If you have other 915 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.

Line of Sight Rating: This device is rated at 300' line of sight (no interference, barriers or walls) but typically you will get 100' maximum under most real-world installations, which include passing through barriers or walls.

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%

DISPLAY CONSOLE

Figure 6

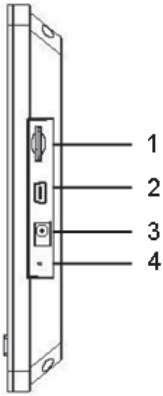


Figure 7

NUMBER	DESCRIPTION
1	Memory card slot for upgrades and backup data
2	USB port for loading the operating system (not required by user)
3	Power jack
4	Reset

Connect the display console power jack to AC power with the power adapter (included) as shown in Figure 7.

Place the sensor array and indoor thermo-hygrometer transmitter about 5' to 10' from the display console and wait several minutes for the remote sensors to synchronize with the display console.

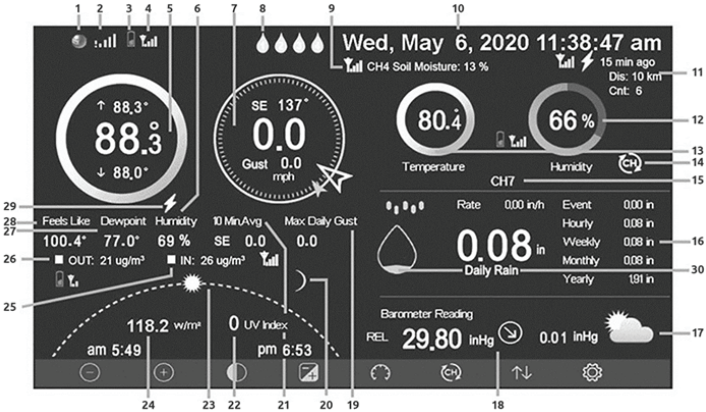
Display Console Operation

NOTE ABOUT THIS SECTION: *The display console includes buttons at the bottom with icons signifying the menu functions. This manual includes "Quick Menu Boxes" as shown below, showing how to access a particular panel* ***starting from the home screen:***

For example, to access the Calibration panel from the home screen, press the Set Key ***three times*** *to view the Calibration panel.*

Initial Display Console Operation

Connect the display console power jack to AC power with the power adapter. The console starts to receive from the indoor and outdoor transmitters.



Home Screen Display

The display console home screen layout is shown above.

#	DESCRIPTION
1	AWN connection icon
2	Wi-Fi signal strength icon. An exclamation point (!) indicates the display is connected to Wi-Fi but not the Internet.
3	Outdoor Sensor Array Low Battery Indicator
4	Outdoor Sensor Array Signal Quality
5	Current, high and low outdoor temperature
6	Humidity
7	Wind speed, wind gust, current wind direction (blue arrow), 10-minute average wind direction (larger gray arrow).
8	Leak detector status (channels 1-4)
9	Soil moisture, leaf wetness (channels 1-16)
10	Current date and time
11	Lighting detector last strike, last strike time and strikes per hour
12	Indoor, Channel 1-8 humidity
13	Indoor, Channel 1-8 temperature
14	Channel scroll mode indicator

#	DESCRIPTION
15	Channel indicator
16	Rain rate, daily, hourly, weekly, monthly and yearly rain
17	Forecast icon based on rate of change of pressure
18	Barometric pressure (REL or ABS), rate of change and rate of change arrow
19	Max daily wind gust
20	Moon Phase
21	10-minute average wind speed and direction
22	UV Index
23	Sunrise, sunset, sun arc
24	Solar Radiation
25	Indoor PM2.5 sensor
26	Outdoor PM2.5 sensor
27	Dew Point
28	Feels Like Temperature
29	Lightning icon appears when then Dew Point exceeds 70ºF, which signifies conditions may be possible for lightning storms to form in the area.
30	Hourly Rain Icon

NOTE: *A red exclamation mark symbol near a measurement readout indicates an alarm is set for that parameter.*

For sun and moon phases to function, Latitude and Longitude must be set. Please see pages 23-24 for how to do so.

Display Buttons

ICON	DESCRIPTION
	Brightness control: Press this key to enhance the brightness
	Brightness control: Press this key to decrease the brightness
	Backlight on/off: Press this key to turn on/off the display
	Background: Press this key to choose between dark background display and light background display
	Pressure display: Press this key to choose the display between Absolute pressure and Relative pressure.
	Channel: Press this key to change the display between indoor temperature & humidity, multiple channel temperature & humidity and scroll mode, where the channels scroll every 5 seconds.
	History: Press this key to enter History Mode
	Set: Press this key to enter Set Mode

Multi-Channel and Scroll Mode for Optional Sensors

You can add up to 8 additional thermos-hygrometer sensors (optional, item number WH31).

Press the Channel Button (CH) to switch between indoor and Channels 1-8. After the last channel is selected, press the Channel Button (CH) one more time to scroll all the sensors every 5 seconds.

NOTE: *Multi-channel sensor data will be delivered directly to the Ambient Weather Network server, and no history data will be saved in the display console.*

Temperature and Humidity Color Gradients

Outdoor/Indoor Temperature Color Ring

TEMP. RANGE	COLOR RING
< -10°F	
-10 to 0°F	
0 to 10°F	
10-20°F	
20-30°F	
30-40°F	
40-50°F	

TEMP. RANGE	COLOR RING
50-60°F	
60-70°F	
70-80°F	
80-90°F	
90-100°F	
100-110°F	
> 110°F	

Outdoor/Indoor Humidity Color Ring

HUMIDITY RANGE (%)	COLOR RING
0%, No signal or dashes	
1 to 10	
10 to 20	
20 to 30	
30 to 40	
40 to 50	

HUMIDITY RANGE (%)	COLOR RING
50 to 60	
60 to 70	
70 to 80	
80 to 90	
90 to 99	
100%	

Hourly Rain Icon

The Hourly Rainfall Icon shows the accumulated rainfall for the last hour (60 mins). For the purpose of this icon, the console stores the rainfall every 5 minutes and displays the sum of the last 12 measurements (trailing 60-minute summary).

HOURLY RAIN (IN)	ICON
0.0	
0 to 0.2	
0.2 to 0.4	
0.4 to 0.6	

HOURLY RAIN (IN)	COLOR RING
0.6 to 0.8	
0.8 to 1	
1 to 1.2	
1.2 to 1.4	

OTHER CONSOLE FEATURES

Weather Forecasting

The five weather icons are Sunny, Partly Cloudy, Cloudy, Rainy and Stormy. The forecast icon is based on the rate of change of barometric pressure. Please allow at least one month for the weather station to learn the barometric pressure over time.

SUNNY	PARTLY CLOUDY	CLOUDY	RAINY	STORMY
Pressure increases for a sustained period of time	Pressure increases slightly, or initial power up	Pressure decreases slightly	Pressure decreases for a sustained period of time	Pressure rapidly decreases

Weather Forecasting Description and Limitations

In general, if the rate of change of pressure increases, the weather is generally improving (sunny to partly cloudy). If the rate of change of pressure decreases, the weather is generally degrading (cloudy, rainy or stormy). If the rate of change is relatively steady, it will read partly cloudy.

The reason the current conditions do not match the forecast icon is because the forecast is a prediction 24-48 hours in advance. In most locations, this prediction is only 70% accurate and it is a good idea to consult the National Weather Service for more accurate weather forecasts. In some locations, this prediction may be less or more accurate. However, it is still an interesting educational tool for learning why the weather changes.

The National Weather Service (and other weather services such as Weather Channel) have many tools at their disposal to predict weather conditions, including weather radar, weather models, and detailed mapping of ground conditions.

Wireless Signal Quality Icon

The wireless signal strength displays reception quality. If no signal is lost, the signal strength indicator will display 5 bars. If the signal is lost once, four bars will be displayed, as shown below. A bar is removed for each consecutive loss of signal.

FIVE BARS	FOUR BARS
No signal loss	Lost signal once

Lightning Icon

The lightning icon appears when then Dew Point exceeds 70ºF, which signifies temperature and humidity conditions may be possible for lightning storms to form in the area.

PM2.5 Sensor (optional)

An optional PM2.5 sensor is available for the WS-4000. The display shows the current PM2.5 measurement, and the 24-hour running average, which is a better indication of the accumulative effect of particulates on overall health.

The display features a color-coded icon with the following breakpoints:

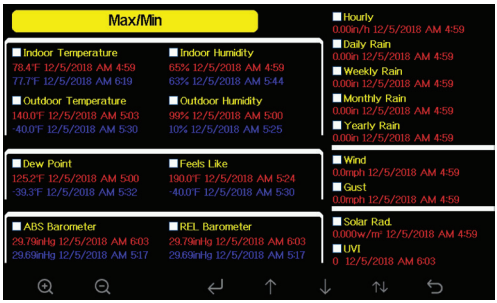
AQI CATEGORY	COLOR	BREAKPOINTS (µg/m³)
Good	Green	0.0 – 12.0
Moderate	Yellow	12.1 – 35.4
Unhealthy for Sensitive Groups	Orange	35.5 – 55.4
Unhealthy	Red	55.5 – 150.4
Very Unhealthy	Purple	150.5 – 250.4
Hazardous	Maroon	250.5 – 500

History Mode

Min/Max

↑↓ × 1

View high and low records, and clear specific records in the history mode.



Press the Up ↑ or Down ↓ buttons to scroll to the parameter you wish to clear. Press the Plus Button ⊕ to check the parameter you wish to clear. Once checked, press the Enter Button ↵. To confirm the selection, press ↑ and ⊕. The high and low will be reset for the checked parameters.

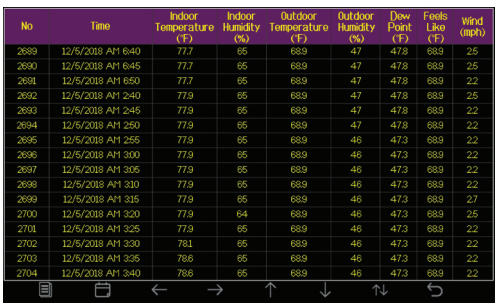
Press the Return Button ⮌ to return to the main screen.

Refer to page 43 to clear all of the highs and lows at Midnight, or to manually clear all of the highs and lows at once.

Archive Memory Mode

↑↓ × 2

View archive memory for all parameters, based on the date and time.



No	Time	Indoor Temperature (°F)	Indoor Humidity (%)	Outdoor Temperature (°F)	Outdoor Humidity (%)	Dew Point (°F)	Feels Like (°F)	Wind (mph)
2689	12/5/2018 AM 6:40	77.7	65	68.9	47	47.8	68.9	25
2690	12/5/2018 AM 6:45	77.7	65	68.9	47	47.8	68.9	25
2691	12/5/2018 AM 6:50	77.7	65	68.9	47	47.8	68.9	22
2692	12/5/2018 AM 6:40	77.9	65	68.9	47	47.8	68.9	25
2693	12/5/2018 AM 2:45	77.9	65	68.9	47	47.8	68.9	22
2694	12/5/2018 AM 2:50	77.9	65	68.9	47	47.8	68.9	22
2695	12/5/2018 AM 2:55	77.9	65	68.9	46	47.3	68.9	22
2696	12/5/2018 AM 3:00	77.9	65	68.9	46	47.3	68.9	22
2697	12/5/2018 AM 3:05	77.9	65	68.9	46	47.3	68.9	22
2698	12/5/2018 AM 3:10	77.9	65	68.9	46	47.3	68.9	22
2699	12/5/2018 AM 3:15	77.9	65	68.9	46	47.3	68.9	27
2700	12/5/2018 AM 3:20	77.9	64	68.9	46	47.3	68.9	25
2701	12/5/2018 AM 3:25	77.9	65	68.9	46	47.3	68.9	22
2702	12/5/2018 AM 3:30	78.1	65	68.9	46	47.3	68.9	22
2703	12/5/2018 AM 3:35	78.6	65	68.9	46	47.3	68.9	22
2704	12/5/2018 AM 3:40	78.6	65	68.9	46	47.3	68.9	22

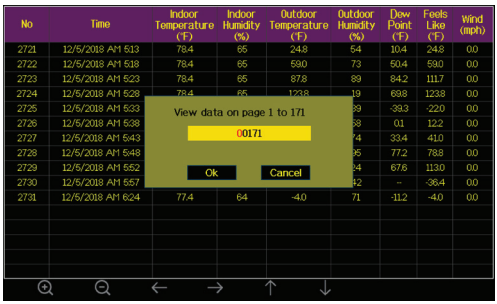
Clear All History	Recall Page	Scroll Left	Scroll Right	Scroll Up	Scroll Down	Switch To Graph Screen	Return Home

You can view and clear archived memory via Archive Memory Mode.

To clear all of the records, press the Clear All History Button and you will be prompted to clear the data. Press the Down button once to confirm. The Yes Button will be highlighted in green. Press the Plus Button to clear all archived records.

To scroll to a specific page, press the Recall Page Button.

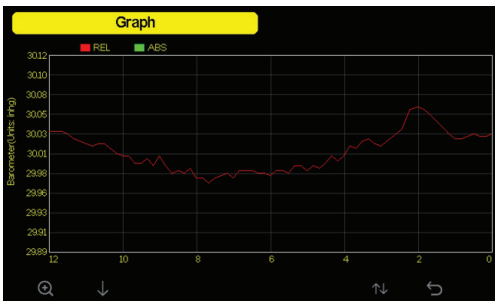
Press the Left or Right buttons to select a digit in the page number, press Plus or Minus buttons to change the number up or down. Press Up or Down to change the activated option field, toggle OK or Cancel then press Plus Button to confirm.



Graph

× 3

Graph memory for all parameters, based on the date and time.

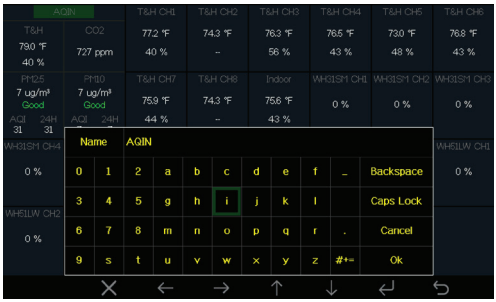


Change x-axis time between 12, 24, 48 and 72 hours.	Change graph parameters	Switch to Min/ Max display	return home

Sensors Name and Data

× 4

View live current data and change sensor ID names.



Select Field		Scroll Field Up	Scroll Field Down	Return To Setup

Set Mode

× 1

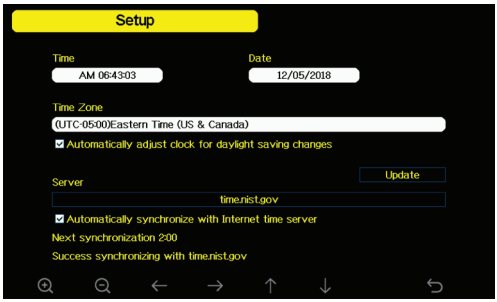
Enter Set Mode.

Select units of measure or scroll value up	Select units of measure or scroll value down	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Select next Set Page	Return To Home

Set Mode allows you to customize your display, manage archive data, and connect your display console to the Internet.

Set Date and Time

Set the date and time. Set automatic time synchronization.



Scroll Value Up	Scroll Value Down	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Return to Setup

Set Time: (hour:minute:second) Press ↓ to set the time. The hour field will turn red. Press → or ← to select hour, minute or second. Press ⊕ or ⊖ to increase or decrease the value.

Set Date: (month:day:year) Press ↓ to set the date. The month field will turn red. Press → or ← to select month, day or year. Press ⊕ or ⊖ to increase or decrease the value.

Set Time Zone: Press ↓ to set the time zone. Press ⊕ to increase the time zone and ⊖ to decrease the time zone. With time zone highlighted, press ↓ to set Daylight Savings Time (DST). Press ⊕ to toggle ON or OFF. To automatically update the time when DST changes, please make sure "DST" is checked on.

Set Time Server: The default time server is *time.nist.gov*. Press ↓ to set the time server. Press ⊕ again to turn ON. Press ⊕ to toggle ON or OFF. Press ↑ to immediately to highlight Update and ⊕ to immediately update.

NOTE: *The time server will only work once the Wi-Fi connection has been set up.*

Set Time Format

× 2

Press to change the time format between hour:minute:second (h:mm:ss), AM hour:minute:second (AM h:mm:ss) and hour:minute:second AM (h:mm:ss AM).

Set Date Format

× 3

Press to change the date format between MM-DD-YYY, DD-MM-YYYY and YYYY-MM-DD.

Temperature Units of Measure

× 4

Press to change the temperature units of measure between °F and °C.

Barometer Units of Measure

× 5

Press to change the temperature units of measure between inHg, mmHg and hpa.

Wind Speed Units of Measure

× 6

Press to change the wind speed units of measure between mph, bft (Beaufort scale), ft/s, m/s, km/h and knot.

Rainfall Units of Measure

× 7

Press to change the rainfall units of measure between in and mm.

Solar Radiation Units of Measure

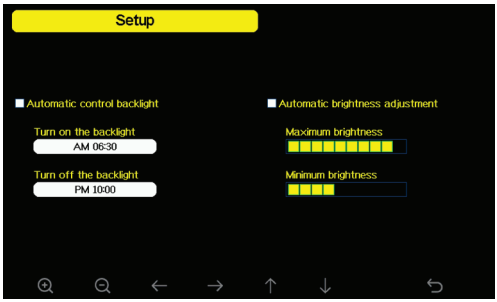
× 8

Press to change the solar radiation units of measure between W/m2, lux and fc.

Backlight Display

× 9

Press to automatically turn on and off the backlight or adjust the brightness based on the time of day.

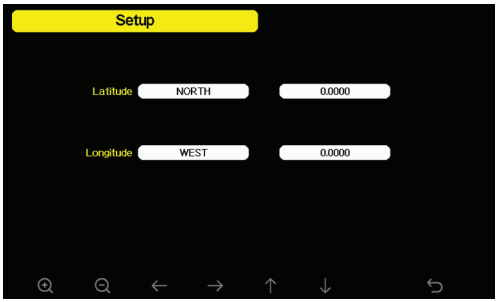


Adjust Up or Check	Adjust Down or Uncheck	Scroll Left	Scroll Right	Scroll Up	Scroll Down	Return Home

Longitude and Latitude

× 10

Press to set longitude and latitude for your location. This calculation is used for the sunrise and sunset calculation.



Adjust Up or Check	Adjust Down or Uncheck	Scroll Left	Scroll Right	Scroll Up	Scroll Down	Return Home

Latitude: Press to set the Northern or Southern Hemisphere. In the USA, the hemisphere setting is NORTH. To change to SOUTH, press the key.

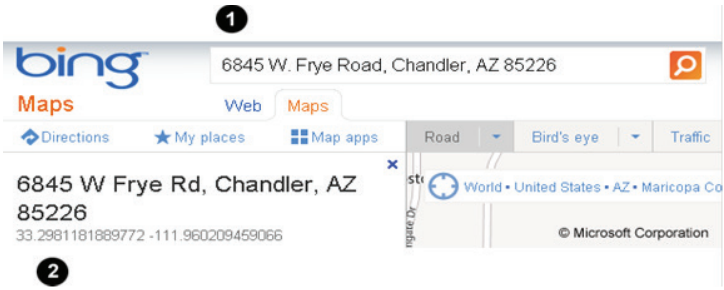
Press to change your latitude. The longitude ×10 will turn red. Press or to increase or decrease the value. Press or to change the remaining latitude variables.

Longitude: Press to set the Western or Eastern Hemisphere. In

the USA, the hemisphere setting is WEST. To change to EAST, press the ⊕ key.

Press ↓ to change your longitude. The longitude ×100 will turn red. Press ⊕ or ⊖ to increase or decrease the value. Press ← or → to change the remaining longitude variables.

To determine your longitude and latitude, we recommend the following website: *www.bing.com/maps*



Enter your address and select the search Button

The latitude (first number) and longitude (second number) are returned.

In this example:
Latitude = 33.2981181889772
Longitude = -111.960209459066

Based on your location:

- In the Northern Hemisphere your latitude will be positive.
- In the Southern Hemisphere your latitude will be negative.
- In the Eastern Hemisphere your longitude will be positive.
- In the Western Hemisphere your longitude will be negative.

In this example, the longitude and latitude will be entered into the display as follows (after rounding values to four significant digits):

Latitude = NORTH 33.2981
Longitude = WEST 111.9602

Record your longitude and latitude here for future reference:

Longitude: _____

Latitude: _____

Reset Weekly Rain at

× 11 Press to change the day the display resets weekly rain total to Sunday or Monday.

Rainfall Season

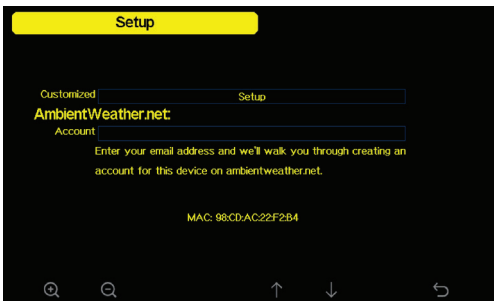
× 12 Press to change the beginning of the rainfall yearly season month. The default is January.

Archive Interval

× 13 Press to change the archive interval for historical data and graphing. Press to change the ×100 minute field. Press to highlight the ×10 minute field. Press to change the ×10 minute field. Press to highlight the minute field. Press to change the minute field.

Weather Server

× 14 Press to send real-time data to AWN.

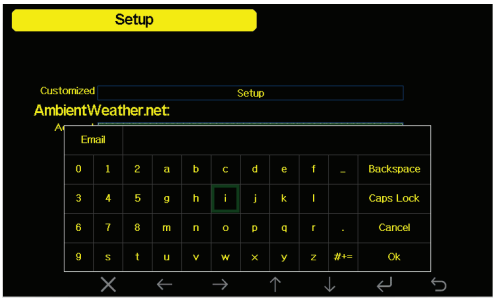


Scroll Value Up	Scroll Value Down	Scroll Field Up	Scroll Field Down	Return to Setup

Enter your email address and we will walk you through creating an account for this device on Ambient Weather Network (AWN) via email.

Registration for AWN is accomplished through the console. Please note that it may take 24-48 hours for data to initially appear.

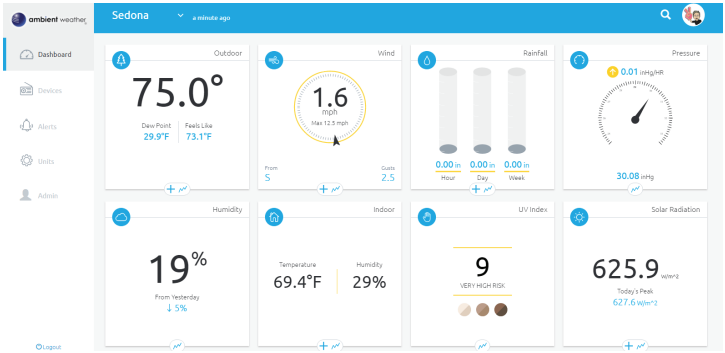
On the weather server screen, you can enter the email address that you wish to use to create your AWN account.



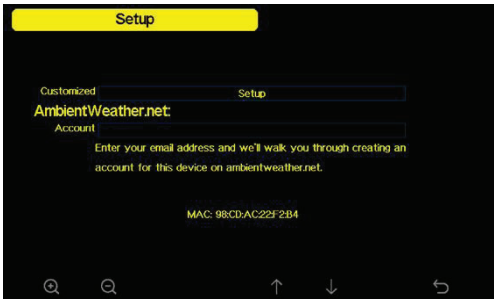
NOTE: *This is an example; Your MAC address will be different.*

Once registered, select the dashboard to view your data.

NOTE: *Data is no longer transmitted directly from your console to Weather Underground. This connection is now accomplished via AWN. Weather Underground data is now delivered from AWN. Please see below for an instructional image on sharing data from AWN on Weather Underground.*



For custom server uploads, press ↓ to highlight the Setup. Press ⊕ to access.



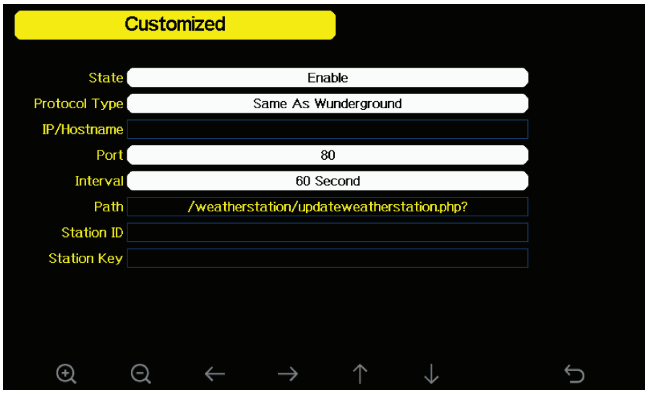
← →	↑	↓	↩
Select Keyboard	Scroll Field Up	Scroll Field Down	Return To Setup

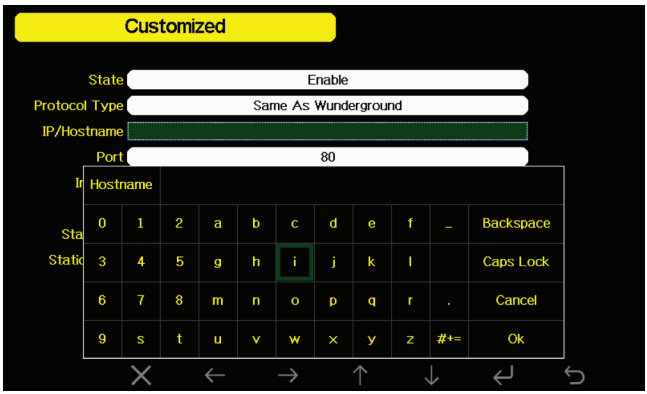
Set Setup: Press ↓ to highlight the customized panel. Enter Setup to customize your own server. You can choose the Wunderground.com or AmbientWeather.net protocol, which is defined on the Weather Underground website (search Weather Underground upload protocol) and the AWN help guide:

https://ambientweather.com/faqs/question/view/id/1857/

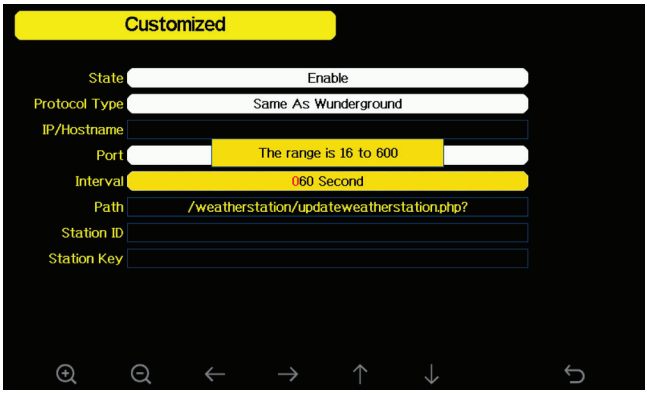
Press ⊕ to display the keyboard. Press ↑ ↓ ← → to scroll to the character and press ↵ to select the character. Select **OK** when complete. Press ↵ to return to the Server Setup page.

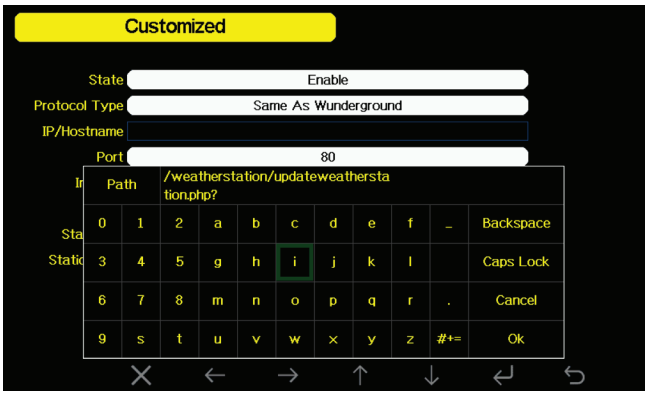
The following pages of screenshots outline the personal web server set up using the Weather Underground protocol.

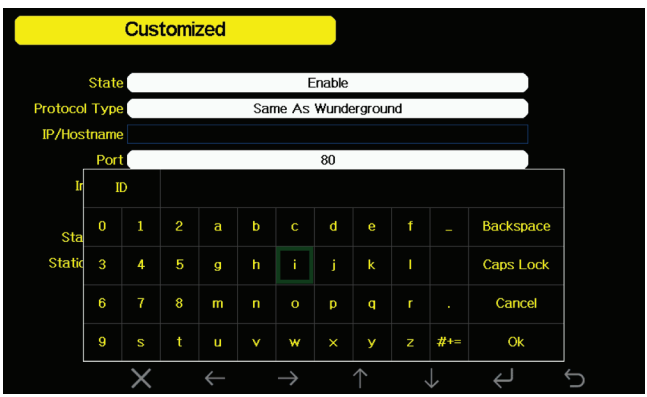

Customized
State
Enable
Protocol Type
Same As Wunderground
IP/Hostname
Port
80
Interval
60 Second
Path
/weatherstation/updateweatherstation.php?
Station ID
Station Key

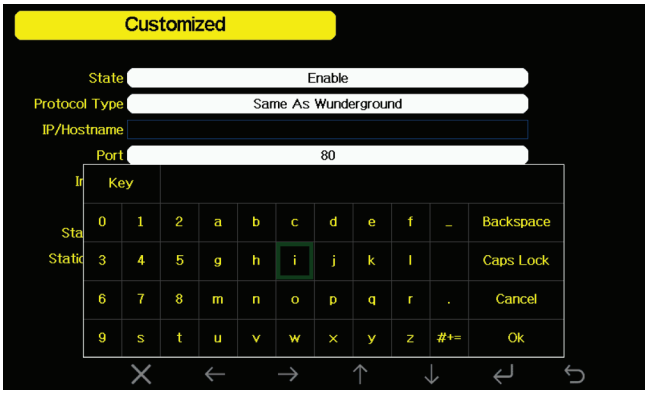

Customized
State
Enable
Protocol Type
Same As Wunderground
IP/Hostname
Port
80
Hostname
0 1 2 a b c d e f _ Backspace
3 4 5 g h i j k l Caps Lock
6 7 8 m n o p q r . Cancel
9 s t u v w x y z #+= Ok

Customized
State
Enable
Protocol Type
Same As Wunderground
IP/Hostname
The range is 0 to 65535
Port
00080
Interval
60 Second
Path
/weatherstation/updateweatherstation.php?
Station ID
Station Key

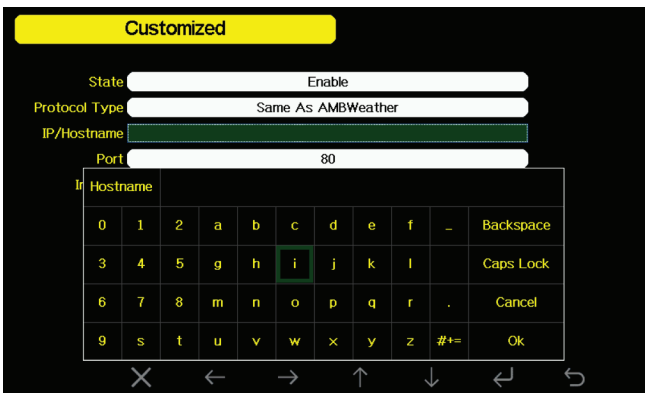

Customized
State
Enable
Protocol Type
Same As Wunderground
IP/Hostname
Port
The range is 16 to 600
Interval
060 Second
Path
/weatherstation/updateweatherstation.php?
Station ID
Station Key

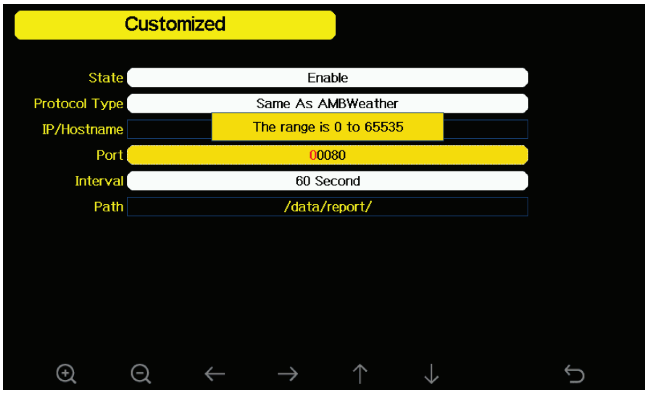

Customized
State
Enable
Protocol Type
Same As Wunderground
IP/Hostname
Port
80
Path
/weatherstation/updateweatherstation.php?
0 1 2 a b c d e f _ Backspace
3 4 5 g h i j k l Caps Lock
6 7 8 m n o p q r . Cancel
9 s t u v w x y z #+= Ok

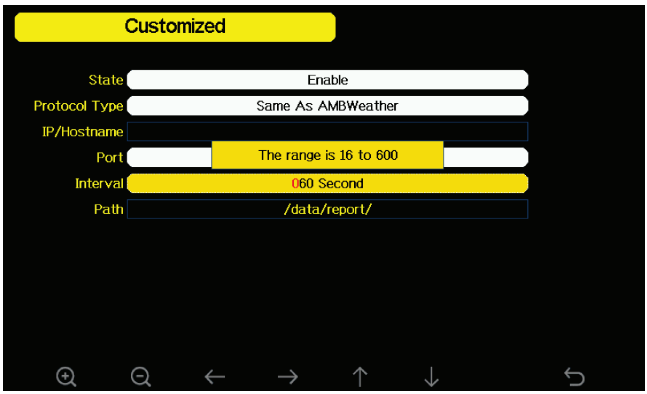

Customized
State
Enable
Protocol Type
Same As Wunderground
IP/Hostname
Port
80
ID
0 1 2 a b c d e f _ Backspace
3 4 5 g h i j k l Caps Lock
6 7 8 m n o p q r . Cancel
9 s t u v w x y z #+= Ok

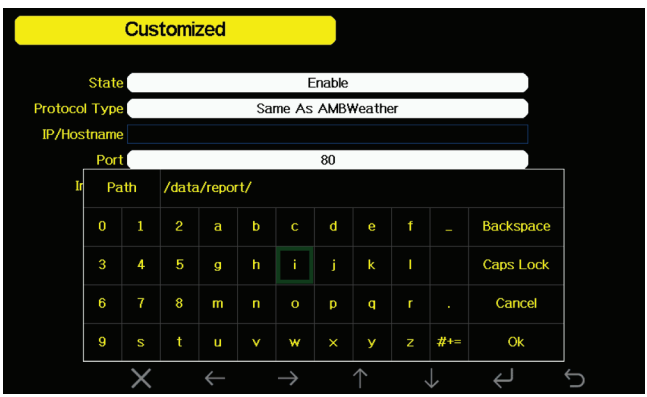

Customized
State
Enable
Protocol Type
Same As Wundergroud
IP/Hostname
Port
80
Key
0 1 2 a b c d e f _ Backspace
3 4 5 g h i j k l Caps Lock
6 7 8 m n o p q r . Cancel
9 s t u v w x y z #+= Ok

Customized
State
Enable
Protocol Type
Same As AMBWeather
IP/Hostname
Port
80
Interval
60 Second
Path
/data/report/


Customized
State
Enable
Protocol Type
Same As AMBWeather
IP/Hostname
Port
80
Hostname
0 1 2 a b c d e f _ Backspace
3 4 5 g h i j k l Caps Lock
6 7 8 m n o p q r . Cancel
9 s t u v w x y z #+= Ok


Customized
State
Enable
Protocol Type
Same As AMBWeather
IP/Hostname
The range is 0 to 65535
Port
00080
Interval
60 Second
Path
/data/report/


Customized
State
Enable
Protocol Type
Same As AMBWeather
IP/Hostname
Port
The range is 16 to 600
Interval
060 Second
Path
/data/report/


Customized
State
Enable
Protocol Type
Same As AMBWeather
IP/Hostname
Port
80
Path
/data/report/
0 1 2 a b c d e f _ Backspace
3 4 5 g h i j k l Caps Lock
6 7 8 m n o p q r . Cancel
9 s t u v w x y z #+= Ok

IFTTT

The Ambient Weather Network service connects to IFTTT, the platform that allows devices and services to work together seamlessly.

Here are a few things you can do with IFTTT:

- Turn off your Rachio sprinklers when it rains, there is too much wind, or below freezing.
- Close your Hunter blinds when the sun is too intense.
- Close your garage door when it is too windy.
- Blink your hue lights when it starts raining.
- Connect to other web services, such as Gmail, Facebook, Instagram, or Pinterest.

For more information on IFTTT, most recent instructions and how it can work for you, scan the QR code above or visit:

https://ambientweather.com/faqs/question/view/id/1796/

Compatible with Alexa

The Ambient Weather skill provides Ambient Weather personal weather station owners with the ability to get real-time, and past weather information generated by the devices they have set up at AmbientWeather.net.

Enable the skill and get started: say “Alexa, ask Ambient Weather for a weather report.” This will provide you with your outdoor weather report, but you can ask for your indoor weather report as well by saying, “Alexa, ask Ambient Weather about the indoor conditions.” You can also ask for a report about a specific day, month or year! Just say “Alexa, ask Ambient Weather about the weather yesterday.” or “Alexa, ask Ambient Weather about the weather in May.”

For more information and to enable this skill, visit:

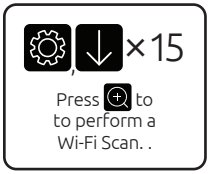
https://www.amazon.com/dp/B074PGCM1D/

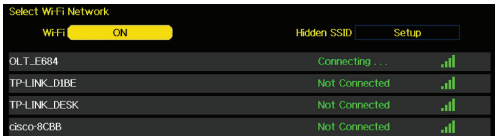
Works with Google

Google periodically changes support for integration with their platforms. Please visit the instructions page linked below for the most up to date information.

https://ambientweather.com/faqs/question/view/id/1797/

Wi-Fi Scan





Press to perform a Wi-Fi Scan. Your wireless router will appear.

Press to select your wireless network. Press to enter the password. Press to scroll to the character and press to select the character. Press **OK** when complete. Press to return to the Wi-Fi Network setup page. Leave the password blank if the Wi-Fi network is not encrypted.

NOTE: *The Wi-Fi signal strength icon is displayed on the home page.*

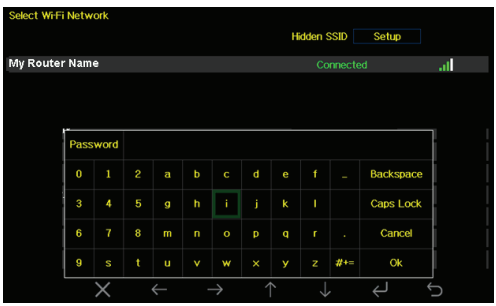
If you do not see your wireless network, press the Return button and perform another Wi-Fi scan. If the problem persists, power down and up your display console and perform another Wi-Fi scan.

If you are uploading to AWN successfully, the icon will show on the left top of the display console.

You may also opt to turn Wi-Fi off entirely. To do this, press the button to toggle Wi-Fi on and off. If you had previously connected, turning it back on will connect it to that network.

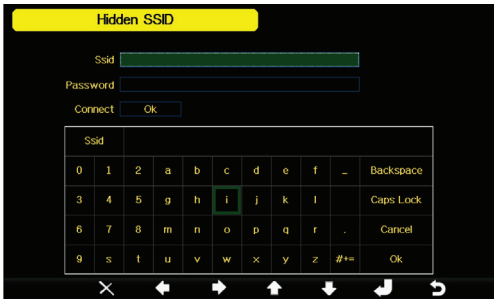
Hidden SSID

From the Wi-Fi Scan panel, press to select **Hidden SSID**. Press to enter



Select Value	Select Value	Scroll Field Up	Scroll Field Down	Select	Return to Setup

If the Wi-Fi network you are connecting to is hidden, please follow below steps to connect:



1. From the Wi-Fi Scan page, press ↑ ↓ to select **Hidden SSID** setup and press ↵ key to enter.

2. Press ↓ to highlight the SSID. Press ↵ to display the keyboard and enter your SSID (not that this is case sensitive). Press ↑ ↓ ← → to scroll to the character and press ↵ to enter the character. Press ↩ to return to the setup page.
3. Press ↓ to highlight the Password. Press ↵ to display the keyboard and start to enter your password. Press ↑ ↓ ← → to scroll to the character and press ↵ to enter the character. Press ↩ to return to the setup page.
4. Press ↓ to highlight the **OK** button and press ↵ to connect.

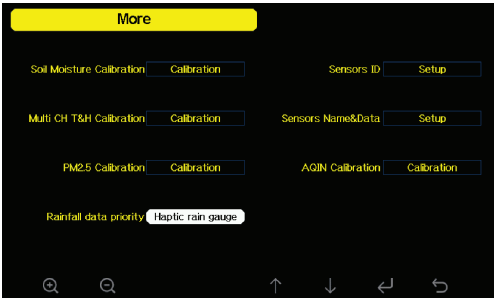
After connecting successfully, the status will display **Connected**.

Reset Daily Rain at

⚙, ↓ × 16 — With the **Reset Daily Rain at** section highlighted, press Plus ⊕ or Minus ⊖ to set the what time the daily rain resets. Available times 00:00-23:00 in 1 hour increments.

More

Press to view additional settings.
NOTE: *You must be running Firmware Version 1.5.3 or greater.*



Select Field	Scroll Field Up	Scroll Field Down	Return To Setup

More > Soil Moisture Calibration

The soil moisture sensor provides for optional two-point linear calibration. This is important due to different soil types and density.

The calibration equation is defined as:

*% Soil Moisture (calibrated)=(Now AD–0%AD)*100/(100%AD–0%AD)*

Where **AD** stands for "analog to digital" and is the unscaled digital value, **Now AD** is the currently measured **AD** and the other parameters are described below.

More > Soil Moisture Calibration > 0% Soil Moisture Set Point

To determine the 0% soil moisture, collect a soil sample in a cup from where the sensor will be installed, and allow the soil to completely dry out. Next, place the soil sensor in the medium and allow the sensor to stabilize for one hour.

Next, set the **0%AD** calibration set point to the **Now AD** value.

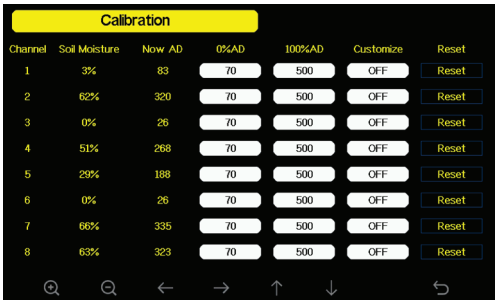
More > Soil Moisture Calibration > 100% Soil Moisture Set Point

To determine the 100% soil moisture, collect a soil sample in a cup from where the sensor will be installed, and add water and mix until the soil is saturated, and there is no standing water. Next, place the soil sensor in the medium and allow the sensor to stabilize for one hour.

Next, set the **100%AD** calibration set point to the **Now AD** value.

More > Soil Moisture Calibration > Customize and Reset

Once the **0%AD** and **100%AD** are entered, set **Customize** to **ON**. To return to the non-calibrated settings, set **Customize** to **OFF**. Select **Reset** to restore to factory default.

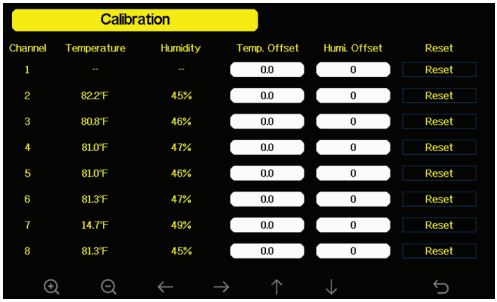


Increase Value	Decrease Value	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Return Home

To adjust the parameter, press to scroll to the parameter you wish to change. Press to highlight the sign (positive vs. negative, if applicable) and significant digit. Press or to change the calibrated value.

More > Multi-Channel Temperature and Humidity Calibration

For general information on temperature and humidity calibration, reference **Calibration Mode** on page 40.



Increase Value	Decrease Value	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Return Home

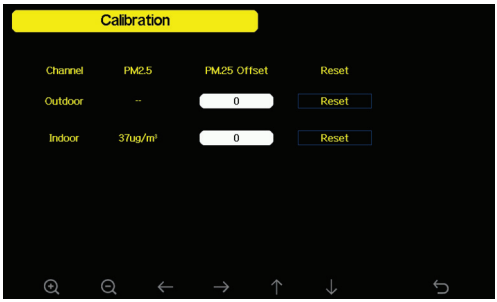
The calibrated temperature and humidity equations are as follows:

Calibrated Temperature = Measured Temperature + Temp. Offset

Calibrated Humidity = Measured Humidity + Humidity Offset

To adjust, press to scroll to the parameter you wish to change. Press to highlight the sign (positive vs. negative, if applicable) and significant digit. Press or to change the calibrated value.

More > PM2.5 Air Quality Sensor Calibration



Increase Value	Decrease Value	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Return Home

The calibrated PM2.5 equation is as follows:

Calibrated PM2.5 = Measured PM2.5 + PM2.5 Offset

To adjust, press ↓ to scroll to the parameter you wish to change. Press → to highlight the sign (positive vs. negative, if applicable) and significant digit. Press ⊕ or ⊖ to change the calibrated value.

More > Sensors ID

The console supports multiple sensors and sensor arrays. You can disable or enable specific sensors.

Select Field	Scroll Field Up	Scroll Field Down	Return To Setup

To view a complete list of sensor IDs, visit:

https://ambientweather.com/faqs/question/view/id/1502/

For the WS-4000 weather station, the following sensor IDs are assigned:

WS4000: Ultrasonic sensor array

WH32B: Indoor thermo-hygrometer-barometer

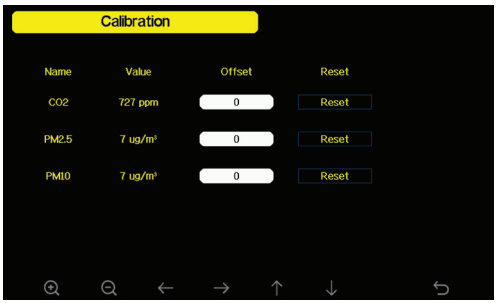
To register, disable or select a specific sensor, press the button to edit and save settings.

More > Sensors Name & Data

This screen will allow you to name you sensors and view current live data.

Select Field	Scroll Field Up	Scroll Field Down	Return To Setup

More > AQIN Calibration



Increase Value	Decrease Value	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Return Home

The calibrated AQIN equations are as follows:

Calibrated CO_2 = Measured CO_2 + CO_2 Offset

Calibrated PM2.5 = Measured PM2.5 + PM2.5 Offset

Calibrated PM10 = Measured PM10 + PM10 Offset

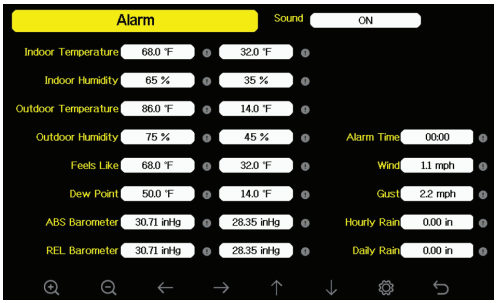
To adjust, press ↓ to scroll to the parameter you wish to change. Press → to highlight the sign (positive vs. negative, if applicable) and significant digit. Press ⊕ or ⊖ to change the calibrated value.

Alarm Mode

× 2

Press ⊕ to enter the Alarm home screen.

NOTE: *The location of the Set icon changes after the first press.*



Increase Alarm Limit Values	Decrease Alarm Limit Values	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Enter Sub-Setup Mode	Return to Home

The upper alarm is displayed on the right and the lower alarm is displayed on the left. If the measured value is greater than the maximum alarm setting, the alarm will sound. If the measured value is less than the minimum alarm setting, the alarm will sound.

To turn Alarm sound ON or OFF, go to the Alarm home screen, and select the box next to "Sound."

HINT: *Once you get to the Alarm home screen, press down button once. You may use EITHER the (+) or the (-) buttons to toggle between sound ON or OFF*

To adjust the alarm, press to scroll to the alarm setting you wish to change. Press to highlight the sign (positive vs. negative, if applicable) and significant digit. Press or to change the value.

To set the alarm, press to highlight the alarm symbol and press to toggle the alarm ON or OFF.

When a weather alarm condition has been triggered, the alarm will sound for 120 seconds and the corresponding icon will flash red for the high alert limit, and blue for the low alert limit, until the weather condition is no longer present. Press any key to mute the alarm.

You can also set a **time of day** alarm using the same method.

More > Rain Calibration

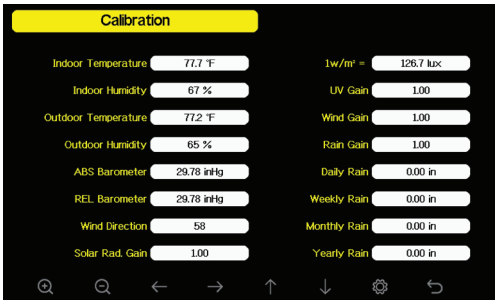
To calibrate rainfall, a reference device will be needed. This can be another trusted sensor, gauge or a very nearby public weather station capable of measuring total rainfall and rate of rainfall. Before accessing the calibration page, ensure the console is set to detecting rainfall from the Haptic gauge on the WS-4000 array (instead of a funnel type, such as the WS-5000).

To do this, press the Set button from the home screen one time, then on the next page, navigate to the "More" option and hit the button. You will then see the "Rainfall Data Priority" indicator. Use or to highlight it, then use or to cycle through the options. You will see "**Tradi. Rain gauge**", which is the traditional funnel type, "**No Rain Gauge**" and either "**Piezo**" or "**Haptic Rain Gauge**." If needed, cycle to the **Piezo/Haptic Rain Gauge** option, then press to return to the home page.

Calibration Mode

× 3

NOTE: *The location of the Set icon changes after the first press.*



Increase Calibrated Value	Decrease Calibrated Value	Select Value	Select Value	Scroll Field Up	Scroll Field Down	Enter Sub-Setup Mode	Return to Home

To adjust, press ↓ to scroll to the parameter you wish to change. Press → to highlight the sign (positive vs. negative, if applicable) and significant digit. Press ⊕ or ⊖ to change the calibrated value.

PARAMETER	TYPE OF CALIBRATION	DEFAULT	TYPICAL CALIBRATION SOURCE
Temperature	Offset	Current Value	Red Spirit or Mercury Thermometer[1]
Humidity	Offset	Current Value	Sling Psychrometer[2]
ABS Barometer	Offset	Current Value	Calibrated laboratory grade barometer
REL Barometer	Offset	Current Value	Local airport[3]
Wind Direction	Offset	Current Value	GPS, Compass[4]
Solar Radiation	Gain	1.00	Calibrated laboratory grade solar radiation sensor
1 w/m2	Gain	126.7 lux	Solar radiation conversion from lux to w/m2 for wavelength correction[5]
Wind	Gain	1.00	Calibrated laboratory grade wind meter[6]
Rain	Gain	1.00	Sight glass rain gauge with an aperture of at least 4"
Daily Rain	Offset	Current Value	Apply an offset if the weather station was not operating for the entire day.
Weekly Rain	Offset	Current Value	Apply an offset if the weather station was not operating for the entire week.
Monthly Rain	Offset	Current Value	Apply an offset if the weather station was not operating for the entire month.
Yearly Rain	Offset	Current Value	Apply an offset if the weather station was not operating for the entire year.

(1) Temperature errors can occur when a sensor is placed too close to a heat source (such as a building structure, the ground or trees).

To calibrate temperature, we recommend a mercury or red spirit (fluid) thermometer. Bi-metal (dial) and digital thermometers (from other weather stations) are not a good source and have their own margin of error. Using a local weather station in your area is also a poor source due to changes in location, timing (airport weather stations are only updated once per hour) and possible calibration errors (many official weather stations are not properly installed and calibrated).

Place the sensor in a shaded, controlled environment next to the fluid thermometer, and allow the sensor to stabilize for 48 hours. Compare this temperature to the fluid thermometer and adjust the console to match the fluid thermometer.

(2) Humidity is a difficult parameter to measure electronically and drifts over time due to contamination. In addition, location has an adverse effect on humidity readings (installation over dirt vs. lawn for example).

Official stations recalibrate or replace humidity sensors on a yearly basis. Due to manufacturing tolerances, the humidity is accurate to ± 5%. To improve this accuracy, the indoor and outdoor humidity can be calibrated using an accurate source, such as a sling psychrometer.

(3) The display console displays two different pressures: absolute (measured) and relative (corrected to sea-level).

To compare pressure conditions from one location to another, meteorologists correct pressure to sea-level conditions. Because the air pressure decreases as you rise in altitude, the sea-level corrected pressure (the pressure your location would be at if located at sea-level) is generally higher than your measured pressure.

Thus, your absolute pressure may read 28.62 inHg (969 mb) at an altitude of 1000' (305 m), but the relative pressure is 30.00 inHg (1016 mb).

Official Barometric Pressure

The standard sea-level pressure is 29.92 in Hg (1013 mb). This is the average sea-level pressure around the world. Relative pressure measurements greater than 29.92 inHg (1013 mb) are considered high pressure and relative pressure measurements less than 29.92 inHg are considered low pressure.

To determine the relative pressure for your location, locate your local "official" barometric pressure reading on www.AmbientWeather.net/baro or scan QR code above. To access the pressure relative pressure calibration screen of your console (see page 40) and enter the value.

NOTE: *Calibration setting is saved until console is factory reset. If the console location elevation changes it will need to be recalibrated.*

(4) Only use this if you improperly installed the weather station sensor array and did not point the direction reference to true north.

(5) The default conversion factor based on the wavelength for bright sunlight is 126.7 lux/w/m². This variable can be adjusted by photovoltaic experts based on the light wavelength of interest, but for most weather station owners, is accurate for typical applications, such as calculating evapotranspiration and solar panel efficiency.

(6) Wind speed is the most sensitive to installation constraints. The rule of thumb for properly installing a wind speed sensor is 4× the distance of the tallest obstruction. For example, if your house is 20' tall and you mount the sensor on a 5' pole:

Distance = 4 x (20 – 5)'= 60'.

Many installations are not perfect and installing the weather station on a roof can be difficult. Thus, you can calibrate for this error with a wind speed multiplier.

In addition to the installation challenges, wind cup bearings (moving parts) wear over time.

Without a calibrated source, wind speed can be difficult to measure. We recommend

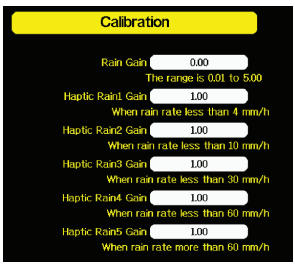
using a calibrated wind meter (available from Ambient Weather) and a constant speed, high speed fan.

> **NOTE**: *The purpose of calibration is to fine tune or correct for any sensor error associated with the devices margin of error. Errors can occur due to electronic variation (example, the temperature sensor is a resistive thermal device or RTD, the humidity sensor is a capacitance device), mechanical variation, or degradation (wearing of moving parts, contamination of sensors).*

Calibration is only useful if you have a known calibrated source, you can compare it against and is optional. This section discusses practices, procedures, and sources for sensor calibration to reduce manufacturing and degradation errors. 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.

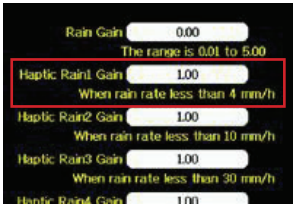
Calibration > Rain Gain

Move the selector to highlight “Setup” and press the ⊕ button. You will then see options for calibrating the rain gauge, including the ability to calibrate based off various rain rates. The calibration is broken down into 5 sections of rainfall rates. This calibration needs to be done once upon sensor installation, and if it is relocated or exposed to a singularly intense rain event, such as a tropical storm or other similarly intense rainfall. For best accuracy, you may compare your rainfall data with a trusted source as often as once every six months.



Calibration is done by comparing the total rainfall observed by the Haptic sensor to a trusted source within a specified rate of rainfall. The gain figure is obtained by dividing the value from the Haptic sensor by the trusted source. The resulting number is to be entered into the value on the console for that rate of rainfall. If the rate of rainfall increases or decreases to another threshold, the calculation is repeated. The thresholds are under 0.16" per hour, then 0.17"-0.40" per hour, 0.41"-1.18" per hour, 1.19"-2.40" per hour, and over 2.40" per hour. There is an event during which a trusted source measures rain at 0.3" per hour, the amount of rain observed by the WS-4000 is 0.8", while the trusted source observes 1.1". The calculation proceeds as (Trusted Source ÷ Haptic = Gain). So 1.1" ÷ 0.8" = 1.375.

The figure of 1.375 is then entered into the Rain Gain within the specified rate of rainfall. In this example, rate of rainfall being 0.3" per hour, the 1.375 is entered here:

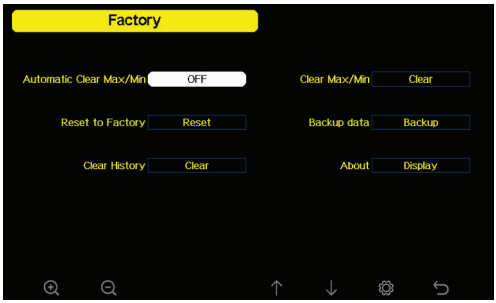


If/when rainfall rates are observed within the remaining sections, you may repeat this process for each of the sections. If you never see rain rates above 1.19" per hour, for example, you do not need to adjust the gain for that section.

Factory and Data Export

× 4

NOTE: The location of the Set icon changes after the first press.



Select Setting	Select Setting	Scroll Left	Scroll Right	Scroll Field Up	Scroll Field Down	Enter Sub-Setup Mode	Return to Home

1. **Automatic Clear Max/Min:** Clears all the minimum and maximum values in stored memory at Midnight every day. Press ↓ to highlight this field.
2. **Reset to Factory:** Clears all stored memory, calibrations and other variables to factory default. Press ↓ to highlight this field.

   Press ⊕ to proceed. Press ⊕ or ⊖ key to open the message box "Are you sure you want to reset to factory default?" Press ↑ or ↓ to select **Yes** or **No**. Press ⊕ key to confirm the selection.
3. **Clear History:** Clears all the historical data in archive memory. Press ↓ to highlight this field. Press ↑ or ↓ key to select "Re-Register Indoor transmitter." Press ⊕ or ⊖ key to open the message box "Are you sure you want to clear history?" Press ↑ or ↓ key to select **Yes** or **No**. Press ⊕ or ⊖ key to confirm the selection.
4. **Clear Max/Min:** Clears all **Maximum** and **Minimum** data from the console.

5. **Backup data:** Backup data to micro-SD/TF card. Insert the micro-SD/TF Card into the slot.

   Press the ↑ key to select **Backup data**. Press the ⊕ key to open the message box "Copy history data to SD card?" Press ↑ to select **OK** or **Cancel**. Press ⊕ key to confirm the selection.

   The data is stored in comma separated value (csv) file format, which can be opened in Microsoft Excel. The TF card can be read by a computer with an SD card adaptor.

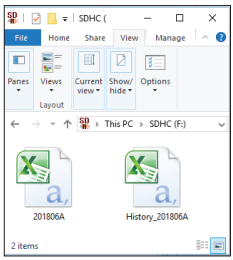
   It may take several minutes to write the data to the SD Card. The popup message "Successful completion of the backup" will be displayed. Press ↩ to return.

Exporting Data File Format (Data Logging)

Plug the Micro SD Card into your computer and view the SD Card Drive. There are two files listed.

History_YYYYDD.csv: The history data file as shown at right.

YYYYDD.csv: The remaining data during the download. For example, if it takes three minutes to download, it the last three minutes of data.



The format of the data is csv (comma separated value) and can be opened in a spreadsheet program such as Microsoft Excel for advanced data analysis, with the following headers:

Exporting Channel 1-8 Data

COLUMN	PARAMETER
1	No (data point number)
2	Time
3	Indoor Temperature (°F)
4	Indoor Humidity (%)
5	Outdoor Temperature (°F)
6	Outdoor Humidity (%)
7	Dew Point (°F)
8	Feels Like (°F)
9	Wind (mph)
10	Gust (mph)
11	Wind Direction (°)

COLUMN	PARAMETER
12	ABS Barometer (inHg)
13	REL Barometer (inHg)
14	Solar Rad. (lux)
15	UV Index
16	Rain Rate (in/h)
17	Event Rain (in)
18	Daily Rain (in)
19	Weekly Rain (in)
20	Monthly Rain (in)
21	Yearly Rain (in)

The SD Card must be inserted into the console and remain inserted to record channel 1-8 sensor data. Whenever there is a new data set recorded, it will be added to this file.

The sensor data is not saved to on-board flash due to memory constraints; it is only saved to the SD card.

YYYYCH1A.csv is the channel sensor data and is only generated when the SD Card is inserted into the console.

About

Provides detailed information for troubleshooting purposes.

UPDATING FIRMWARE

What is firmware?

Firmware is software that is embedded on chip inside the weather station hardware. Firmware is the software for the hardware. The firmware tells the hardware what to do with the data and when and how to send it to the internet.

The WS-4000 has two types of firmware: console firmware and Wi-Fi firmware. Both are updated utilizing Wi-Fi on the console and can be set to update automatically or manually.

Updating Console Firmware

NOTE: *The console must be connected to Wi-Fi to update the console firmware.*

At the home screen, press the Set key once to get into the **Setup** page, then three more times to get to the **Factory** page.

NOTE: *The location of the Set icon changes after the first press.*

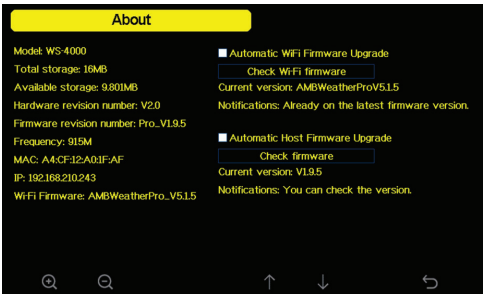
With the arrows, highlight **About/Display** and press the key to select.

On the **About** page, use the ↑ ↓ arrows to navigate and the ⊕ key to select. If you would like your console to automatically upgrade firmware when new ones are released, highlight and check the box that says, “Automatic Host Firmware Upgrade”.

If you prefer manual updates, leave this box empty. If it is checked, pressing the ⊖ button when highlighted will uncheck the box. When you want to upgrade firmware, highlight the “Check firmware” and follow prompts if a new one is available. The latest firmware will be noted below the “Check firmware” box, and the current firmware on your console will be noted to the left in the “firmware revision number:” line.

Wi-Fi Firmware Update

To update the Wi-Fi firmware on your WS-4000 display console, your console must already be connected to Wi-Fi. You will access the about screen and select **Upgrade Wi-Fi Version** you will receive a notification if it is successful.



Like the **Console Firmware** upgrade, navigate to the **About** page by pressing the Set button ⚙ once at home screen, then three more times to access the Factory page.

NOTE: *The location of the Set icon changes after the first press.*

When at the **Factory** page, navigate to the **About** section and press the symbol to select it.

When in the **About** page, use the ↑ ↓ arrows to move the selection to the **Wi-Fi** section. You may set the Wi-Fi to upgrade automatically by highlighting the “Automatic WiFi Firmware Upgrade” and pressing the ⊕ button. Pressing the ⊖ button will deselect the box when highlighted. If you prefer to manually upgrade firmware, leave the box unchecked and select the “Upgrade Wifi Version” box below it.

The latest available Wi-Fi firmware will be noted just below the “Upgrade Wifi Version” box. The version that is currently on your console will be notated on the left side of the screen, toward the bottom of the screen as “Wi-Fi Firmware:”

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.
Feels Like	The Feels Like temperature is a combination of Heat Index when it is hot outside, and Wind Chill when it is cold outside. Wind Chill temperature is defined by the National Weather Service for temperatures at or below 40 °F and wind speeds above 5.0 mph. Heat Index is not valid or calculated below 80 degF. Thus, when the outdoor temperature is between 40 degF and 80 degF, the feels like temperature is the same as the outdoor temperature. If the temperature is below 40 degF, the feels like temperature is the same as the outdoor temperature when the wind speed is less than 5 mph.
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
Haptic Rain Gauge	A rain gauge is a device that measures liquid precipitation (rain), as opposed to solid precipitation (snow gauge) over a set period. A haptic rain gauge works by sensing the pressure change of a rain drop hitting the sensor, measuring the force and deriving volume of water. It is also known as a Piezoelectric rain gauge
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.
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.
Ultrasonic Wind Gauge	An ultrasonic wind gauge works by sending a sound pulse from a transmitter to a receiver within the array. Though only over a few inches, the wind will change the signal strength of the sound pulse in a way the receiver can interpret wind speed and direction.

SPECIFICATIONS

Wireless Specifications

Line of sight wireless sensor array RF transmission (in open air): 1,000', 300' under most conditions

Line of sight Wi-Fi RF transmission (in open air): 80'

Outdoor Sensor Update Rate: 4.9 seconds

Indoor Sensor Update Rate: 49 seconds

Sensor Array RF Frequency: 915 MHz

Wi-Fi Console RF Frequency: 2.4 GHz

Measurement Specifications

The following table provides the specifications for the measured parameters.

MEASUREMENT	RANGE	ACCURACY	RESOLUTION
Indoor Temperature	14 to 140 °F	± 2 °F	0.1 °F
Outdoor Temperature	-40 to 140 °F	± .6 °F	0.2 °F
Indoor Humidity	10 to 99%	± 5%	1%
Outdoor Humidity	1 to 99%	± 3.5%	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 200Klux	± 15%	0.1 Klux
Ultra Violet Index	15-Jan	±2	1
Solar Irradiance	0 to 2367.798W/ M2	± 15%	0.001W/M2
Rain	0 to 236 in.	± 5%	0.004 in
Wind Direction	0 - 360 °	<5mph, ± 10° ≥5mph, ±7°	1°
Wind Speed	0 to 89 mph (operational)	< 22 mph, +/- 1 mph ≥ 22 mph, +/-5%	.2 mph

Power Consumption

Display Console: 5V DC Adapter (included).

Power Consumption: 0.5 Watts (1.25 Watts during Wi-Fi configuration mode)

Outdoor Sensor Array: 2× AA batteries (not included). The primary power source is the solar panel. The batteries provide backup power when there is limited solar energy.

Indoor Sensor: 2× AA battery (not included)

ARRAY MAINTENANCE

1. Remove any dirt, debris, and insects. If bug infestation is an issue, spray the array lightly with insecticide.
2. Clean the solar radiation sensor and solar panel every 3 months with damp cloth.
3. Replace batteries every 1-2 years. If left in too long, the batteries may leak due to environmental challenges. In harsh environments, inspect the batteries every 3 months (when cleaning the solar panel).
4. When replacing the batteries, apply a corrosion preventive compound on the battery terminals, available at Amazon and most hardware stores.
5. In snowy environments, spray the top of the weather station with anti-icing silicon spray to prevent snow build up.

TROUBLESHOOTING GUIDE

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

Online Support:
https://ambientweather.com/faqs/question/tags/tag/WS-4000/

Email Support: support@ambientweather.com

Technical Support: 480-346-3380 (M-F 8am to 3pm Arizona Time)

PROBLEM	SOLUTION
Outdoor sensor array does not communicate to the display console.	• Reset the sensor array by pressing the **RESET** button. • Take out the batteries and wait one minute, while covering the solar panel to drain the voltage. • Put batteries back in and resync the console with the sensor array about 10' away. • The LED next to the battery compartment will flash every 5 seconds. If the LED is not flashing every 5 seconds… • Replace the batteries in the outside sensor array. • If the batteries were recently replaced, check the polarity. If the sensor is flashing every 5 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 (remove AC power, wait 10 seconds, and reinsert AC power).

Temperature sensor reads too high in the daytime.	• 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 pages 40-42.
Relative pressure does not agree with official reporting station	• You may be viewing the absolute pressure, not the relative pressure. • Select the relative pressure. Make sure you properly calibrate the sensor to an official local weather station. Reference pages 40-42.
No Wi-Fi connection	• Check for Wi-Fi symbol on the display. If wireless connectivity is successful, the Wi-Fi icon will be displayed in the time field. • Make sure your modem Wi-Fi settings are correct (network name, and password). • Make sure the console is plugged into AC power. The console will not connect to Wi-Fi when powered by batteries only. • The console only supports and connects to 2.4 GHz routers. If you own a 5 GHz router, and it is a dual band router, you will need to disable the 5 GHz band, and enable the 2.4 GHz band. • The console does not support guest networks.
Exclamation point ! next to the Wi-Fi icon	If there is an exclamation point (!) next to the Wi-Fi icon on the WS-4000 display, it means the display is connected to Wi-Fi but the Wi-Fi is not connected to the Internet. Make sure the 2.4 GHz band on your router is connected to the Internet. If the problem persists, try rebooting your router.
Time off by increments of an hour, or date is off by one day.	The time zone is entered incorrectly. Reference page 21.

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, ground stakes and more.
WS-4000-CONSOLE-AC	Add as many display consoles as you like to your weather station.

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 this 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.

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:

- This device may not cause harmful interference.
- 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 a dealer or an experienced radio/TV technician for help.

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 an 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.

CALIFORNIA PROP 65

WARNING: *Use of this Ambient Weather product can expose you to chemicals, including lead and lead compounds, which are known to the State of California to cause cancer and bisphenol A (BPA), and phthalates DINP and/or DEHP, which are known to the State of California to cause birth defects or other reproductive harm.*

Can I Trust that Ambient Weather Products are Safe Despite this Warning?

In 1986, California voters approved the Safe Drinking Water and Toxic Enforcement Act known as Proposition 65 or Prop 65. The purpose of Proposition 65 is to ensure that people are informed about exposure to chemicals known by the State of California to cause cancer, birth defects and/or other reproductive harm. A company with ten or more employees that operates within the State of California (or sells products in California) must comply with the requirements of Proposition 65. To comply, businesses are: (1) prohibited from knowingly discharging listed chemicals into sources of drinking water; and (2) required to provide a "clear and reasonable" warning before knowingly and intentionally exposing anyone to a listed chemical. Proposition 65 mandates that the Governor of California maintain and publish a list of chemicals that are known to cause cancer, birth defects and/or other reproductive harm. The Prop 65 list, which must be updated annually, includes over 1,000 chemicals, including many that are commonly used in the electronics industry.

Although our manufacturing process is "lead-free" and RoHS compliant, it remains possible that trace amounts of lead could be found in components or subassemblies of Ambient Weather Products. Bisphenol A (BPSA) could conceivably be present in minute amounts in our plastic housings, lenses, labels, or adhesives, and DEHP & DINP (phthalates) could possibly be found in PVC wire coatings of our cables, housings, and power cords. Unlike RoHS, Prop 65 does not establish a specific threshold for reporting on the substances of concern and instead sets forth a much less definitive standard requiring that the business demonstrate with certainty that there is "no significant risk" resulting from exposure. With respect to carcinogens, the "no significant risk" level is defined as the level which is calculated to result in not more than one excess case of cancer in 100,000 individuals exposed over a 70-year lifetime. In other words, if you are exposed to the chemical in question at this level every day for 70 years, theoretically, it will increase your chances of getting cancer by no more than 1 case

in 100,000 individuals so exposed. With respect to reproductive toxicants, the "no significant risk" level is defined as the level of exposure which, even if multiplied by 1,000, will not produce birth defects or other reproductive harm. In other words, the level of exposure is below the "no observable effect level," divided by 1,000. (The "no observable effect level" is the highest dose level which has not been associated with observable reproductive harm in humans or test animals.) Proposition 65 does not clarify whether exposure is to be measured only in normal operation, or in the event of misuse such as intentionally damaging, incinerating or consuming an Ambient Weather Product or component and Ambient Weather has not attempted to evaluate the level of exposure.

A Proposition 65 warning means one of two things: (1) the business has evaluated the exposure and has concluded that it exceeds the "no significant risk level"; or (2) the business has chosen to provide a warning simply based on its knowledge about the presence of a listed chemical without attempting to evaluate the exposure. **The California government has itself clarified that "The fact that a product bears a Proposition 65 warning does not mean by itself that the product is unsafe." The government has also explained, "You could think of Proposition 65 more as a 'right to know' law than a pure product safety law."**

While using Ambient Weather Products as intended, we believe any potential exposure would be negligible or well within the "no significant risk" range. However, to ensure compliance with California law and our customers' right to know, we have elected to place the Proposition 65 warning signs on Ambient Weather Products.

For further information about California's Proposition 65, please visit https://oehha.ca.gov/prop65/background/p65plain.html

CUSTOMER SERVICE

Email Support:
support@ambientweather.com

Technical Support:
480-346-3380 (M-F 8am to 4pm Arizona Time)

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MADE IN CHINA