# Solar-Current.com

# Backyard Anemometer

### Draft Product Manual v1.1

Heavy duty Wind Sensor with flat two hole mounting bracket, 25' cable, and optional rugged metal cups.

Sensor Range: 125+ MPH

Backyard Anemometer CPU inside Rugged outdoor Weather Tight Aluminum enclosure with Weather Tight cable grips

Built in Home Automation router and external antenna with a range up to 300 feet obstructed to 2 miles unobstructed in clear line of site

Weather tight Power Supply
Input: 100 to 240vac,
Output: +5vdc

## Backyard Anemometer Overview

Solar-Current.com's Backyard Anemometer wirelessly monitors and reports local wind speed, facilitating integration of real time wind information into the user's Home Automation network.  Unlike other wind monitoring devices that are based on closed proprietary systems, the Backyard Anemometer is based on open industry standard home automation protocols.  The Backyard Anemometer requires a ZigBee Home Automation hub (not included), and work best with the SmartThings Hub.
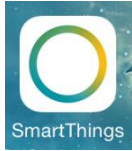
With the Backyard Anemometer's wind data, SmartThings' SmartApps can make decisions based on your local real-time wind speed.  Say you have a sprinkler system controlled by SmartThings. With real-time wind data from your backyard the SmartThings app that controls your sprinklers can wait until the wind speed is just right before sending the on command.  This can avoid wasting water by not turning on the sprinklers during high wind blowing the water over to your neighbor's yard.

When local wind speed data is integrated into your home's automation network based on home automation standards all home automation devices can take advantage of it. This data can be incorporated into any number of applications.   Here is a short list of possible home automation applications that could take advantage of the Backyard Anemometers wind data:

- Turn on your sprinklers when the wind speed is less than 5 MPH. Turn off your sprinklers if the wind is above 10 MPH. (Requires an automated sprinkler system that is connected to a SmartThings hub)
- Turn on your landscaping's waterfall after the wind speed has dropped to 0 MPH and maintained 0 MPH for 15 minutes. (Requires an automated power plug or relay that is connected to SmartThings)
- Control a floating pond fountain based on wind speed.  If it is too windy blowing the water out of your pond wasting both water and electricity you can set the Backyard Anemometer to send an off command at any wind speed. (Requires a heavy duty 15amp to 30amp relay or motor start relay connected to your SmartThings hub)
- Close the garage door if the wind is too high. (Requires an automated garage door system connected to SmartThings)
- Set a Color light bulb in your house based on the wind speed.  A SmartApp could be written to turn a Color light bulb green if the wind was 0 to 10 MPH, yellow if 11 to 20 MPH, and red if above 20MPH.  (requires a Hue hub and Hue bulb that is connected to SmartThings)
- Play a sound or activate a siren if the wind speed is too high.  (requires a siren or sound system connected to a SmartThings hub)
- Send an alert to your SmartThings smart phone app if the wind speed is too high.

The wind speeds in the above examples can be set to your desire.  Some of the above examples will require custom scripts to be written in the free SmartThings' WEB based IDE (Integrated Development Environment).  Please contact Support@Solar-Current.com for any questions on product compatibility and help with custom SmartApps.
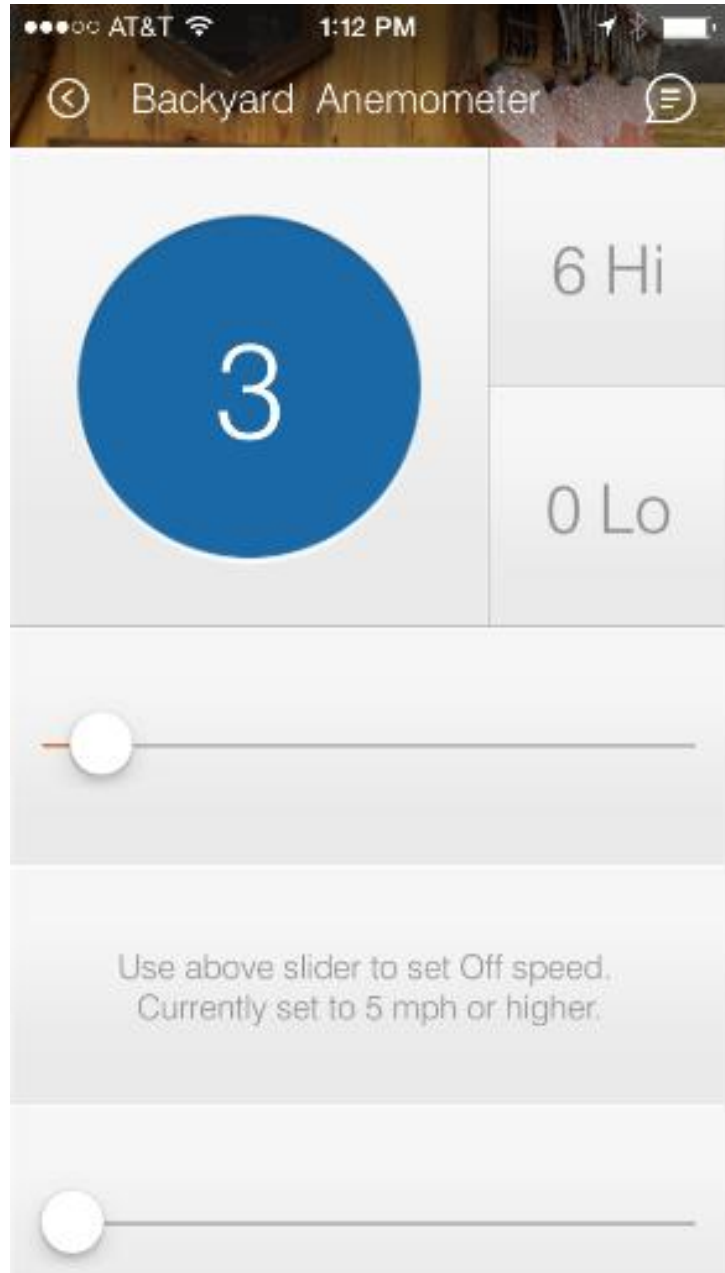
## Overview

Once the Backyard Anemometer is installed and connected to the SmartThings hub it will appear in your smart phone's SmartThings application. You can see the wind speed by tapping on the "Things" section and scrolling the screen until you see a round icon with a number in it.

If you tap on the wind speed number you will see detailed wind information as shown on the right. Here you can see the current wind speed, the recorded high and low wind speeds, as well as sliders to change the configuration of the Backyard Anemometer.

In addition to displaying wind speed, the Backyard Anemometer is designed to turn devices on and off based on wind speed. The configuration sliders allow you to change the on and off wind speed thresholds tailoring the Backyard Anemometer to your needs.

**For example**: If the Backyard Anemometer is bound to a wireless on / off device that controls the power to a water fountain pump it can turn the pump on and off based on wind speed. By default the Backyard Anemometer will send the off command if the wind is too high (5 MPH or higher). When the wind drops back down to 0 MPH and maintains 0 MPH for 10 uninterrupted minutes it will send the on command turning the water fountain back on.
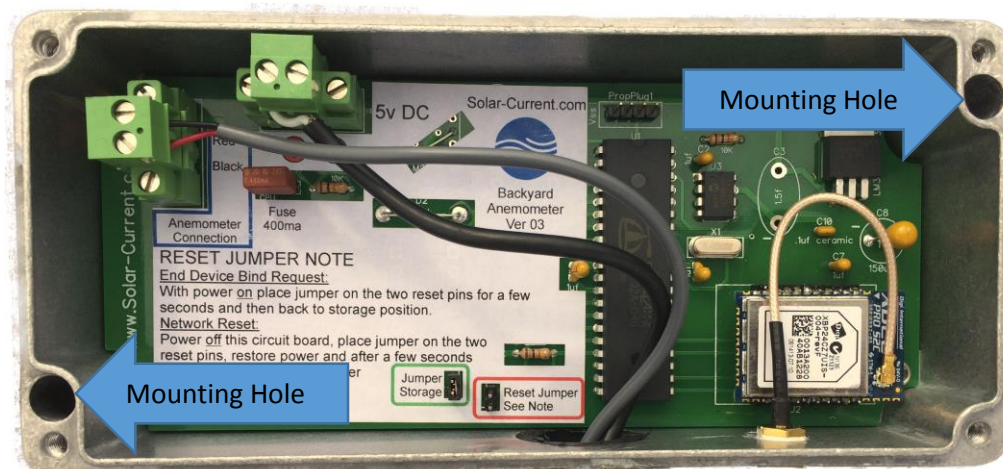
## Installation

### Hardware Setup

If you haven't setup your SmartThings hub please follow the instructions that came with the hub and make sure it is setup and working.  Also make sure to install the SmartThings App on your smart phone, login, and connect to your SmartThings hub.

1. Pair the Backyard Anemometer to the SmartThings home automation network
    a. Set the Backyard Anemometer metal box close to the SmartThings hub and plug it into your AC Power.  The Backyard Anemometer will start looking for a home automation network to join as soon as it is plugged in.
    b. User your smartphone to navigate to the SmartThings hub and tap the plus sign to add a new device.  This will start the pairing process.  After several minutes you will see the Backyard Anemometer appear on your smartphone.  At this point the Backyard Anemometer is connected and will remember the connection even if the power is removed.
2. After you have completed step 1 and paired with the hub move the Backyard Anemometer outside keeping in mind it must wirelessly communicate with the SmartThings hub inside.  It may be necessary to mount the Backyard Anemometer on the side of the house closest to the SmartThings hub or move the hub to be closer to the Backyard Anemometer.
    a. Mount the Backyard Anemometer's metal box so the cables and the antenna are facing down and away from possible rain.  The metal box is water tight but cannot be submersed in water, it should be up out of any pooling water.
    b. To access the two mounting holes remove the top lid to expose the two mounting holes as shown below.
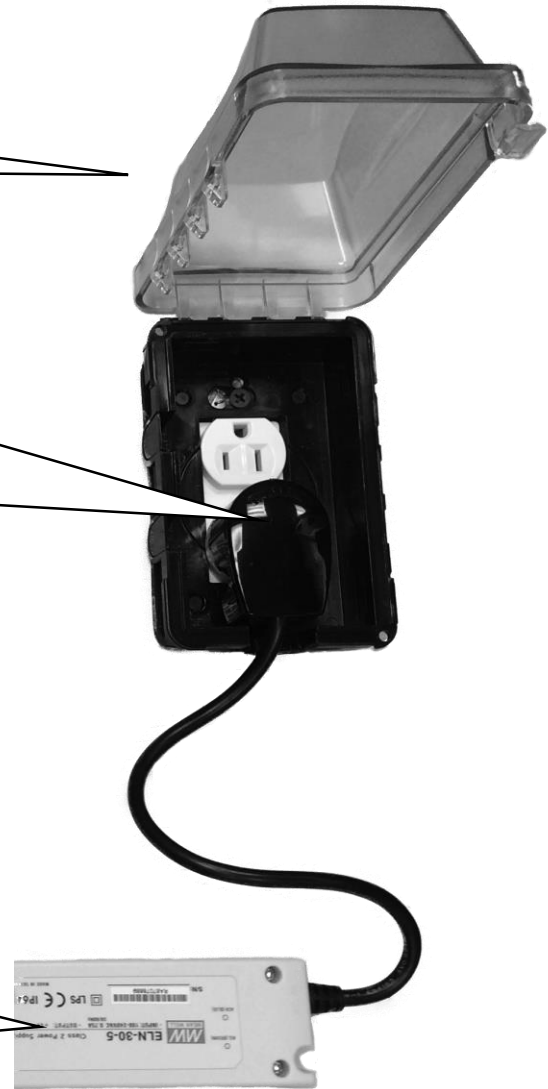


    c. Mount the 5v DC power supply in a non-damp location.  The AC plug cannot get wet or be exposed to rain or splashing water.  Make sure the AC plug is plugged into a weatherproof AC outlet as pictured below.

3.  Mount the Wind Click to a structure that is up in the flow of the wind you would like to measure. It has a long cable allowing it to be located away from the metal box if desired.  Secure the cable with wire ties to make a neat install.
4.  Lastly check that the Backyard Anemometer is working by looking at your smart phone and observing the wind speed in your SmartThings App.

UL Approved Weatherproof Electrical Outlet with cover.  Supplied by user.

# Warning!

AC Plug is not weatherproof and must be protected from the elements! It must be plugged into an UL Approved Weather proof Electrical Outlet.

It cannot be plugged into an extension cord if exposed to the elements.

The 5V DC power supply is weatherproof and can be mounted outside away from heat and direct sunlight.  The power supply should be mounted up away from pooling or splashing water.

## Backyard Anemometer Configuration

After you have completed the above hardware setup you can use the SmartThings Backyard Anemometer details view to configure the Backyard Anemometer. The details view has sliders that allow you to set the wind on / off speed and delay time in minutes.  The default factory setting is to send the on command if the wind is 0 MPH for 10 minutes and off if the wind is 5 MPH or greater.

### Off Threshold Settings

Use the OFF Speed slider and OFF Delay slider to set a wind speed threshold and time in minutes that the threshold must be met before sending the off command.  For example, if the OFF Speed slider is set to 10 MPH and the OFF Delay is set to 2 minutes, the wind will have to be 10 MPH or above for 2 minutes before the off command is sent.  If at any time during the 2 minutes the wind drops below 10 MPH the timer will be reset to zero, and another 2 minutes of 10 MPH wind or higher will have to occur before the off command is sent.  Note: If the OFF Delay slider is set to 0 minutes the off command will be sent as soon as the wind reaches the off speed setting.

### On Thresholds Settings

Use the ON Speed slider and the ON Delay slider to set a wind speed threshold and time in minutes that the threshold must be met before sending the on command.  For example, if the ON Speed slider is set to 3 MPH and the ON Delay is set to 20 minutes, the wind will have to be at 3 MPH or lower for 20 minutes before the off command is sent.  If at any time during the 20 minutes the wind rises above 3 MPH the timer will be reset to zero, and another 20 minutes of wind at 3 MPH or lower will have to occur before the on command is sent.  Note: If the ON Delay slider is set to 0 minutes the on command will be sent as soon as the wind reaches the on speed setting.

### Additional Commands

Scroll to the bottom of the details view past the sliders to find additional command tiles.  Some of these tiles can be tapped to send commands and others are information only.

**Refresh Tile**: By tapping the Refresh tile a refresh command will be sent to the Backyard Anemometer. The Backyard Anemometer will respond with an update of all its current settings.  This can be done to make sure the SmartThings App is displaying current data.  It is not necessary to do a refresh to update the current wind speed.  The wind speed number will be updated every time a wind speed change is detected but is limited to sending updates no quicker than every 20 seconds.  The factory default is every 60 seconds and it can be changed by sending a ZigBee Configure Reporting Command to End Point 0x38, Cluster 0x000C, attribute 0x0055.

**Reset Hi/Low Tile:** Tapping the Reset Hi/Low tile will send a reset command to the Backyard Anemometer telling it to reset the recorded high and low wind speeds.  This can be done at the beginning of the day if you would like to see that day's high and low wind speeds.  The Hi and Low wind speeds are not automatically reset so if you don't push the Reset Hi/Low button for a month they will reflect the high and low wind speeds observed for that month.

**Open / Closed Contacts Tile**: The open or closed contact tile is an information only tile.  It illustrates the state of the virtual contacts used by the SmartThings device driver.  When the Backyard Anemometer sends an ON command to the SmartThings hub, the contacts are set to the Open position.  This allows the incorporation of the Backyard Anemometer into built in SmartApps that can react based on a set of contacts opening and closing.

**Activity Tile:** Tapping on the activity tile will open a real time traffic log.  This log can be used to help troubleshoot and see detailed data that is sent or received from the Backyard Anemometer.

**Preferences Tile**:  Tapping on the preferences tile will allow you to rename your Backyard Anemometer.

## Incorporate the Backyard Anemometer into SmartThings Lights and Switches

SmartThings Lights and Switches can be configured to turn on or off any device based on the Backyard Anemometer's settings.  In this example we will set SmartThings to turn on a Hue Light bulb when the wind reaches or drops below 3 MPH for 20 minutes and off when the wind reaches 10 MPH or above for 2 minutes.

1. Make sure the Backyard Anemometer's wind and delay time thresholds are set according to the settings in the Backyard Anemometer Configuration section above.
2. Open the SmartThings application on your smartphone and tap on the Lights & Switches section.
3. Tap on the little gear symbol at the top of the screen, then tap on the "Add new light/switch".  Type in "Hue Wind Test" for the name and tap the "Next" box at the top right of the screen.
4. Tap on "Choose devices for Hue Wind Test", select a light bulb from your list (if you don't have Hue bulb you can choose another on/off device), tap "Done"
5. Tap "Done" a second time to bring up the Customize and control the Hue Wind Test screen. Tap on "Turn on when a door or window is opened", tap on "Choose a contact sensor(s)", tap to select the Backyard Anemometer from the list and click "Done".  Then click on "Next" and "Done" to get you back to the Lights & Switches section.

Bang you have it.  Now when the wind falls below 3 MPH for 20 minutes your Hue bulb will turn on.  SmartThings allows you to add all kinds of logic to this decision.  You can set it to only do this if you are home, only do it on weekends etc.  Very powerful stuff!!  Of course you don't have to turn a Hue bulb on and off.  You can turn any device on or off that is connected to your SmartThings Hub.

## ZigBee Command Reference

### End Point Configuration

| End Point | 0x38 | Backyard Anemometer End Point |
|---|---|---|
| Profile ID | 0x0104 | Home Automation Profile |
| Application Device ID | 0x0002 | On/Off Output |
| Input Cluster | 0x0000 | Basic Cluster |
| Input Cluster | 0x000C | Analog Input Cluster |
| Output Cluster | 0x0006 | On /  Off Cluster |

### End Point 0x38, Analog Input Cluster 0x000C.  Attributes supported by Anemometer

| Attribute ID | Description | Read Attribute | Write Attribute | Reportable Attribute | Attribute's Reporting is Configurable |
|---|---|---|---|---|---|
| 0x0041 | Maximum Present Value | Yes | No | Yes | No |
| 0x0045 | Minimum Present Values | Yes | No | Yes | No |
| 0x0055 | Present Value | Yes | No | Yes | Yes |
| 0x0400 | Commands:<br>0 = Reset Wind Hi / Lows<br>1 = Reboot Propeller<br>2 = Clear ZigBee binding and group table<br>3 = Force End Device Bind Request (same as user placing jumper on pins) | No | Yes | No | No |
| 0x0401 | Off Wind Speed Threshold | Yes | Yes | No | No |
| 0x0402 | On Wind Speed Threshold | Yes | Yes | No | No |
| 0x0403 | Minutes Before On is sent | Yes | Yes | No | No |
| 0x0404 | Minutes Before Off is sent | Yes | Yes | No | No |

## Bind Commands

### To turn devices on or off based on wind speed, bind to End Point 0x38, Cluster 0x0006 On/Off

Bind Example:  To turn a Hue Light bulb on and off that is at the address of 0x17880100D79133 and supports cluster 0x0006 on/off on endpoint 0x0B.

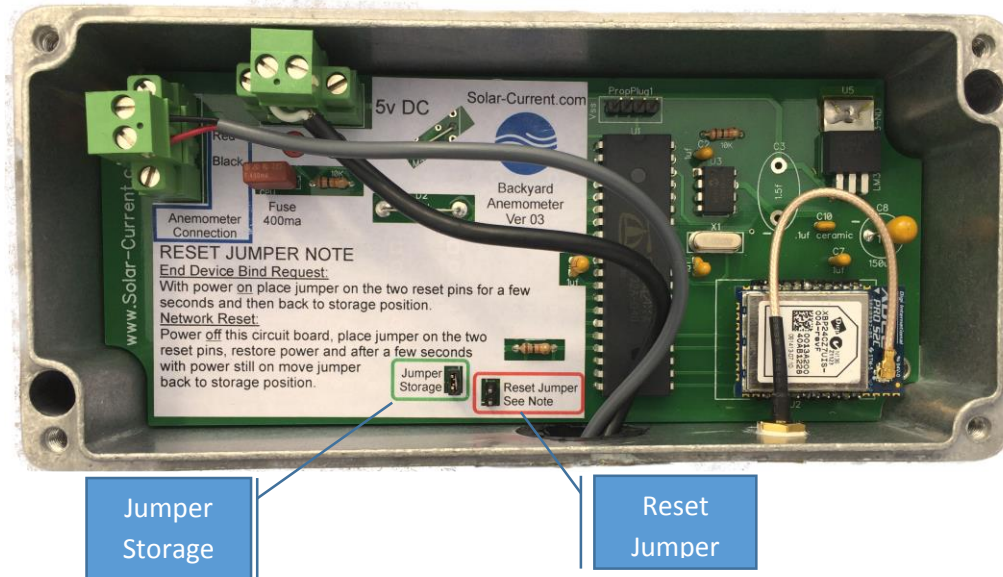| | | |
|---|---|---|
| Source IEEE Add | 0x13A20040AB1216 | IEEE Address of Anemometer (Send the bind command to this address) |
| Source End Point | 0x38 | 0x38 is the Anemometer's End Point for the On/Off Cluster |
| Cluster Number | 0x0006 | On/Off Cluster |
| Target IEEE Add | 0x17880100D79133 | IEEE Address of Hue Bulb |
| Target End Point | 0x0B | Hue Bulb's End Point that supports the On / Off cluster 0x0006 |

### To receive reportable wind speed attributes bind, to End Point 0x38, Cluster 0x000C Analog IO

Bind Example: Send reportable wind speed attributes to a ZigBee Coordinator

| | | |
|---|---|---|
| Source IEEE Add | 0x13A20040AB1216 | IEEE Address of Anemometer (Send the bind command to this address) |
| Source End Point | 0x38 | 0x38 is the Anemometer's End Point for the On/Off Cluster |
| Cluster Number | 0x000C | Analog Input cluster |
| Target IEEE Add | 0x0000 | IEEE Address of Coordinator |
| Target End Point | 0xFF | FF = target End Point to send to |

## Circuit Board Overview and Configuration Jumpers

Inside the Backyard Anemometer's metal box you will find the main PCB (Printed Circuit Board).  The PCB has a set of pins shown below that can be used to configure the Backyard Anemometer.  The set of pins inside the green box labeled Jumper Storage should have a shunt on them.  This shunt can be pulled off with your fingers and placed over the two pins inside the red box labeled Reset Jumper.



## End Device Bind Request

To perform an End Device Bind Request (Bind this device to an on/off device) follow these instructions:

1. Make sure the power is on to Backyard Anemometer and it has joined a home automation network.
2. With the power still on pull the shunt off the two Jumper Storage pins and place it over the two Reset Jumper pins for a few seconds and then back to the storage location.  This will cause the Backyard Anemometer to send an End Device Bind request to the Home Automation Coordinator (SmartThings Hub)
3. Make sure the shunt is back on the storage pins.
4. Press the program button on the device you would like to bind to (for example a ZigBee Power Outlet).  Follow the instructions that came with the device to send an "End Device Bind Request".
5. Double check the shunt is back to the Jumper Storage location (inside the green box) on the PCB.

Now when the Backyard Anemometer sends an on or off command it will be sent to the device bound by this process.  Repeat the process to remove a bound device.

## Network Reset

To leave a Home Automation network and start looking for a new ZigBee Home Automation network to join follow these instructions:

1. Unplug the power to the Backyard Anemometer.
2. With the power off pull the shunt off the two Jumper Storage pins and place it over the two Reset Jumper pins.
3. With the shunt still over the two Reset Jumper pins plug in the power to the Backyard Anemometer.  Wait about 5 seconds after applying power and move the shunt back to the storage location with the power still on.
4. Double check that the shunt is back over the two storage location pins.

Now the Backyard Anemometer will start searching for an available Home Automation network to join. It may be necessary to tell your Home Automation network to allow joining by pushing a button on the hub or through an application on your smart phone.  If a ZigBee Home Automation network is within range and it is allowing new devices to join the Backyard Anemometer will join and send a device announce packet to the network.

## Power and Anemometer Cable Connections

The Backyard Anemometer requires a 5 volt power source and a connection to the Anemometer to function properly.  The power connection is labeled "5v DC" and has a red + (plus) and black – (minus) showing the proper polarity for each wire on the PCB.  If the polarity of these wires are not hooked up correctly and to the correct voltage, damage to the PCB may occur and the warrantee will be void.

The anemometer connection is also labeled on the PCB.  The two wires for the Anemometer can be connected to either terminal.  The Anemometer is a reed switch so either wire can be connected to each screw.

# Safety Instructions and Product Usage Guidelines

## Safety Instructions

- Please keep and follow these instructions.
- Heed all warnings.
- Do not submerse or allow any component of this product to be submersed in water.
- Do not allow the power supply or the power supply's 110v AC plug to be exposed to dripping or splashing of any water or liquid.
- Do not install near any heat sources such as radiators, heat registers, stoves or other apparatus that produce heat.
- Only use attachments and accessories specified by Solar-Current.com.
- **WARNING:** To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance are not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

## Product Usage Guidelines

- Data accuracy and consistency from the Backyard Anemometer sensor is not guaranteed.  Therefore, you should not rely on that data for any use that impacts health, safety, security, property or financial interests.
- Solar-Current.com's Backyard Anemometer allows for the control of electronic devices through wirelessly bound pluggable outlets, relays and controls.  Where possible, Solar-Current.com has worked to ensure message delivery and control reliability, but many factors can impact this, including electromagnetic interference, solar flares, wireless and cellular connectivity, and the natural complexity of software and firmware instructions.  These and other issues can cause commands to not be delivered, to be delivered repeatedly, or to be delivered in rapid succession.  Therefore, do not use Solar-Current.com's Backyard Anemometer to control any device that may have an impact on health, safety, security, property, or financial interests, or where the device is sensitive and could be damaged by power cycling or power surges.  For example, do not control medical equipment or expensive electronics with the Backyard Anemometer.
- While Solar-Currrent.com supports the ZigBee communications standard, we cannot guarantee the implementations of this standard by third party devices.  The Backyard Anemometer has not gone through ZigBee Home Automation certification and is not an officially certified ZigBee Home Automation device.  Certain devices may not work, or may cease to work with Solar-Current.com's Backyard Anemometer despite supporting the same standard.  We provide no guarantee or warranty of compatibility for third party devices.

## Certifications

### United States (FCC)

#### Contains FCC ID:MCQ-XBPS2C

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 and (2.) this device must accept any interference received, including interference that may cause undesired operation. This device may only be used with the supplied antenna.

#### IMPORTANT:

The RF module inside the Backyard Anemometer has been certified for remote and base radio applications. If the module will be used for portable applications, the device must undergo SAR testing. 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: Re-orient or relocate the receiving antenna, Increase the separation between the equipment and receiver, Connect equipment and receiver to outlets on different circuits, or Consult the dealer or an experienced radio/TV technician for help.

### Canada (IC)

### Contains Model XBee PRO Radio, IC: 1846A-XBPS2C

This device has been designed to operate with antennas having a maximum of 19 dB of gain.  Antennas having a gain greater than 19 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

## 90 Day Limited Warranty

Solar-Current.com, Inc. ("Solar-Current") warrants this product (the "Product") against defects in materials and/or workmanship under normal use for a period of 90 days from the date of purchase by the original purchaser ("Warranty Period").  If a defect arises and a valid claim is received within the Warranty Period, then as your sole remedy (and Solar-Current's sole liability), Solar-Current will at its option either 1) repair the defect at no charge, using new or refurbished replacement parts, or 2) replace the Product with a new product that is functionally equivalent to the original, in each case within 60 days following receipt of the returned Product.  A replacement product or part, assumes the remaining warranty of the original Product.  When a Product or part is exchanged, any replacement item becomes your property and the replaced Product or part becomes Solar-Current's property.

**Obtaining Service:** To obtain warranty service, visit http://solar-current.com to speak with a service agent or open a service request. Please be prepared to describe the Product that needs service and the nature of the problem. A purchase receipt is required. The Product must be insured, and shipped fright prepaid and securely packaged.  You must contact support for a Return Material Authorization Number ("RMA Number") before shipping any Product, and include the RMA Number, a copy of your purchase receipt and a description of the problem you are experiencing with the Product. Any claim under this Limited Warranty must be submitted to Solar-Current before the end of the Warranty Period.

**Exclusions:** This warranty does not apply to: a) damage caused by failure to follow instructions relating to the Product's use or the installation of components; b) damage caused by accident, abuse, misuse, transport, neglect, fire, floods, earthquake or other external causes; c) damage caused by service performed by anyone who is not an authorized representative of Solar-Current; d) accessories used in conjunction with a covered Product; e) a Product or part that has been modified to alter functionality or capability; f) items intended to be periodically replaced by the purchaser during the normal life of the Product, including, without limitation, batteries, bulbs or cables; g) a Product that is used commercially or for a commercial purpose, in each case as determined by Solar-Current.

Solar-Current shall not be liable for (I) any lost profits, cost of procurement of substitute products, or any incidental or consequential damages, or (II) any amounts in excess of the purchase price for the product, in each case weather resulting from the use or inability to use the product, or arising out of any breach of this warranty.

To the extent permitted by applicable law, Solar-Current disclaims any and all statutory or implied warranties, including without limitation, warranties of merchantability, fitness for a particular purpose and warranties against hidden or latent defects. If Solar-Current cannot lawfully disclaim statutory or implied warranties, then to the extent permitted by law, all such warranties shall be limited in duration to the warranty period.