Search #1

**Keywords: “**Weather testing device”

[Results Link](https://www.google.com/search?q=weather+testing+device&rlz=1C1RXQR_enUS967US968&oq=weather+testing+device&aqs=chrome..69i57j0i22i30l3j0i390l3.6692j1j7&sourceid=chrome&ie=UTF-8)

Selected Products:

1. [Ambient Weather WS-2902 WiFi Smart Weather Station](https://www.amazon.com/Ambient-Weather-WiFi-Station/dp/B01N5TEHLI/ref=pd_lpo_4?pd_rd_w=RPJAs&content-id=amzn1.sym.116f529c-aa4d-4763-b2b6-4d614ec7dc00&pf_rd_p=116f529c-aa4d-4763-b2b6-4d614ec7dc00&pf_rd_r=KJQENBMJE3GHXEJ75ZJM&pd_rd_wg=Dq6Jb&pd_rd_r=43f80a52-651e-4b87-815c-4cb49d69a1c9&pd_rd_i=B01N5TEHLI&psc=1)



* Price: $189.99
* Vendor: Amazon
* Description: Ambient Weather's WS-2902 personal weather station allows you to monitor your home and backyard weather conditions with the brilliant, easy-to-read LCD color display. Monitor indoor and outdoor conditions, including wind speed, wind direction, rainfall, UV, solar radiation, barometric pressure, indoor/outdoor temperature (F and C), indoor/outdoor humidity, and more. The weather station also calculates dew point, wind chill, and heat index.

Positive Comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “Since I am a weather geek, I looked at several units and bought this one. Easy to assemble, but be careful as it is a bit fragile so care should be taken. I installed a third-party pole mount bracket on my barn shed and brought a 2" wood dowel rod and raised it up above the roof line. So far, very nice performance. Seems to be really accurate and setting it up on the web was easy. The wind direction seems to move a lot, but honestly, when I am in my yard working I notice variable wind direction all the time. The wind speed is usually lower than reported by Weather Underground....the pressure measurements coincide with expected drops and increases. I have not calibrated the pressure yet, might need tech support for that. In three months' time I have noticed only one anomaly, and that was no rain was reported during one recent rain event, and I thought maybe a leaf clogged something......but two days later it was back to working perfectly. So, I'll leave it alone for now. I like the idea of looking at other people's weather systems, and mine correlates well with those. The outdoor unit communicates seamlessly with the indoor display at a distance of at least 75 yards, maybe a bit more (???). I should have installed Lithium batteries, as you should too.......but I could not find them at the time I needed them, so I used Alkaline. The iPhone GUI reports the battery level and it's still full after three months. 3 AA's required. All in all, great unit. My only concern is how long will it last. Time will tell. If I could add something to the GUI, I would ask for a report over time, stored data for perhaps up to a year that can be presented logically. For example, when I cover my pool I'd like to know how much rain we got in a 1-2-3 month time frame to know when/if it needs to be pumped to keep the water line below wall tiles. Minor point. Have not required Tech Support, so no rating is possible.” | * Device is simple to assemble (explicit) * Device has a sturdy body (explicit) * Device setup is user friendly (explicit) * Device has little to no maintenance (explicit) |
| “I bought the WS-2902A (precursor to 2902B and C) back in June of 2019, and installed it on my family's saltwater dock. I used a steel curtain rod bought from Home Depot to mount it on. This was my very first PWS, and it served as an excellent entry into the weather hobbyist world. Today (8-12-22) I finally removed it from service, as the solar cells responsible for charging the supercapacitor have deteriorated in the corrosive salt air environment, and I was having to replace the batteries more and more often. Am I upset? No, this unit lasted as long as I expected it to in the conditions I asked it to perform. To repair it, I would need to buy a nearly complete sensor array, and I just elected to replace the weather station altogether.  The Ambient Weather app, website, and supported software (AmbientCWOP) have been great, and the data recorded by my station has consistently passed the NOAA-MADIS QA/QC checks for most variables after I properly calibrated them (wind and wind gust is almost impossible to get past QA/QC). During over 3 years of service, it rode through multiple glances by tropical cyclones (Isaias, Elsa, Mindy, Sally, Dorian, and more), recorded multiple wind gusts greater than 50 mph, endured torrential rainfall, and more. I recommend adding the bird-spike kit and epoxy gluing it to the rain funnel (mine initially slid off). I added some adhesive reflective tape that I thought would keep birds off, and though the tape faded, I never really had an issue with birds trying to roost on the sensor array. I highly recommend this series of weather station for anyone looking to enter the Personal Weather Station (PWS) community.” | * The device battery life is within an acceptable range. (explicit) * The device is effortlessly repaired (explicit) * The device does not attract wildlife (latent) |
| “As an amateur weather enthusiast I wanted to obtain a weather station that would measure the rainfall in a 24hr period, without me having to get wet to read a manual gauge. Accuracy is spot-on running off the AC adapter for Wind, Rain and indoor/outdoor temp. I would have liked to see the barometer function setup be automated. The desktop display is easy to read although I am not sure how to access any dated log, however there doesn't seem to be one, unfortunately. Tech support is not really necessary as if you follow the instructions you should be fine. That said however, configuring the device on the various weather sites ie WeatherUnderground does need patience. What I am wondering is if the rainfall/wind speed value is reset each midnight, how can the rainfall for the previous day be noted unless noting a change in the weekly/monthly total? What I do not know is how the device will fare in South African sun and how to get replacement parts. Overall a good purchase but not will ALL the bells and whistles.” | * Device is reasonably accurate (explicit) * Device is able to withstand the elements well (explicit) * Device caters to all skill levels (explicit) |

Negative Comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “I bought this unit because it is easy to clean in place. However, it is easier for spiders to immobilize the rain cup than the old AcuRite unit it replaced. It rained just 2 days after installation and the unit read 00.00 rain. A spider has built a nest on the back of the cup. I cleaned it out and placed insecticide-soaked rolled up paper towels on each side to the cup and for the next rain everything worked fine. The display is much too small and hard to read from a distance. Also, angle of view is very small in the up and down direction. However, the left and right is OK. Our AcuRite provided the current, average and gust airspeed at the same time. For this unit, you have to punch the "Wind" button to get each of the measurements. You cannot read the wind circle unless you are very, very close to the display. Our AcuRite provided the day (24 hr), month and total rain at the same time. This unit provides the "Event" (not sure what that is), Daily, Month, Weekly and total, but you have to press the "Wind" button to get each. For my old AcuRite, I had to remove the outside unit and take it apart to clean it. For this unit, you can remove the rain funnel and clean in place which I love!!! If it had a better display, I would give it a 5 star.” | * Device keeps insects out of working components (latent) * Device has a well lit display (explicit) * Device has a simple user interface (explicit) |
| “Whoever designed the graphic interface obviously did a HORRIBLE job.  It could have been a 5 stars product with the right interface  PROS:  -It gathers desired parameters  CONS:  -The most important parameter is obviously wind speed & direction. The interface has a very tiny sub screen for wind (no numeric direction however), and a HUGE display for the TIME & DATE. I am not buying a wall clock, I was buying a Weather Station !  -It has other parameters, reasonably well displayed, most of them semi-useless, but the most important ones (WIND SPEED & DIRECTION), are either too small or hidden in sub menus. I guess whoever designed the interface has not idea of hurricanes, tornadoes or storms.  -The interface display can only be seen from above, it you look at eye level, the screen fades. Not sure the rationale for that  -Some components seems like cheap plastic  -Phone app is ok, don't expect wind direction/speed on same screen either real time. You can indirectly gather information extracted for weather services, but of course, not real time.  It could have been a 5 stars product otherwise” | * Device displays information the user needs simply (explicit) * The device is customizable (explicit) * Device can withstand high winds (explicit) |
| “I buy a lot of things on Amazon and I very rarely if ever write reviews. This product and the customer support of the company has moved me to do so. First to say I have owned the Ambient WS-1002 for many years and it was a good product. When it finally died I had ordered the now standard new version the WS-2902. The first problem came with the display. As others have noted it is not of high quality. In fact we sent ours back but received a replacement with exactly the same issues. I can categorically state that the photograph in the product info on line has been heavily edited. The screen does not look this good from any angle. Straight on it looks OK but from even a small angle it can become almost unreadable. It seems to be using color screen technology from around 1990. The second issue came with the external instrument itself. It became apparent after a month or so that it was not reading accurately. We have a number of weatherstations within a close radius so it is easy enough to compare. In fact I am a data scientist so I prepared comparisons of the readings from our unit which were very significantly different from neighboring units that track closely together. I sent this information to Ambient. They did not reply. I followed up with them. They did not reply. I wish I could say I was surprised but I was not as our experience with the display return was that they seemed largely unconcerned with customer issues. I guess if you have 4+ stars on Amazon maybe you can afford to be that way. Anyway if you are in the market for a weather station I would strongly recommend that you look elsewhere.” | * Device uses up to date technology (latent) * The device parts can handle constant use (explicit) * Device has simple troubleshooting methods (explicit) |

1. [U UNNI Wireless Weather Station](https://www.amazon.com/U-UNNI-Unni-Weather-Station/dp/B08LTRGTJL/ref=sr_1_45?crid=273J7ID8A7CP0&keywords=weather%2Btesting%2Bdevice&qid=1674032400&sprefix=weather%2Btesting%2Bdevice%2Caps%2C149&sr=8-45&th=1)

Price: Unavailable at this time

Vendor: Amazon

Description:

- high-definition color display

·max/min indoor/outdoor temperature and humidity with trend display

·12/24-hour format

·alarm with snooze function

·temperature in both celsius and fahrenheit format

·moon phase display

·mold indicator, dew point and heat index

·able to connect up to 3 wireless outdoor sensors

·low battery indicator for both weather station and outdoor sensor

·dressing index and comfort indicator

·switching adapter included

Positive comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| Very good product and customer service with good communication. Can't really gauge the accuracy of the temperature/humidity reading but it works and appears accurate. Muli-zone function is a nice feature. Only drawback is the noise of beep when traversing brightness settings. Also, would be nice if there was a feature where you touch the display brightness button and it stays on for a few seconds, then dims. In fairness, it may already be there. | * Product is easy to use (explicit) * Product displays accurate information (latent) * Device instructions are simple (latent) |
| I got this weather station for my home office, so I know when to open the windows and turn on off the AC in the summer. The big selling point for this unit was that it shows the humidity for inside and outside, whereas a lot of other units appear to only read the inside humidity. It seems to be very accurate and I've had no issues with range, even with the remote sensor being on the other side of three walls and a floor. The weather forecasts are not always perfect, but I didn't really expect them to be anyways. Overall I would recommend this product to anyone looking for a simple weather station for their home. | * Product is easy to use (latent) * Device performs as expected (explicit) * Device displays accurate information (latent) |
| I bought a similar indoor/outdoor thermometer from a different company and it stopped working within days. I bought the U UNNI Weather Station Wireless Indoor Outdoor Thermometer and couldn't be happier! The numbers are large so my old eyes have no problem reading it. It provides all the information I need. The humidity indicator is great to have because it helps me determine whether or not to participate in certain activities in hot weather. The device that is placed outside is very useful because I can know the temp/humidity when I'm outside. I would absolutely recommend this product. | * Product performs well compared to competing products (explicit) * Device displays readouts easily visible to users (latent) * Device functions as intended (explicit) |

Negative comments:

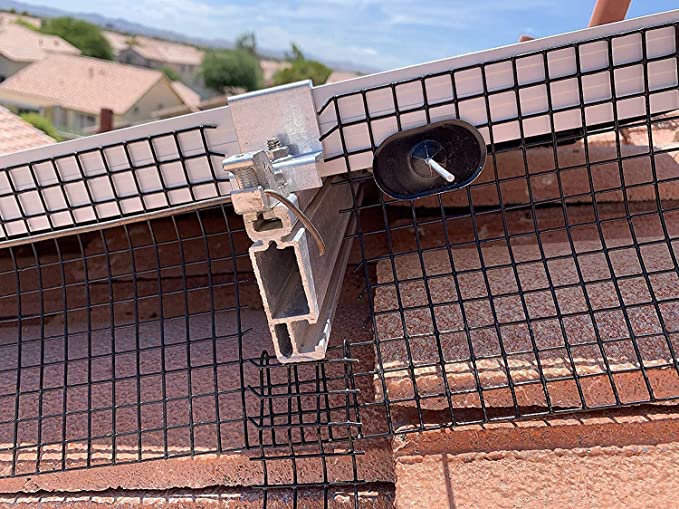
| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| I have to supplement my review and give this thing a serious downgrade. It can no longer maintain a reliable connect to the outside sensor. I've change the batteries, put the sensor: right next to it, across the room, and outside (about 20 feet away). It still loses connection with a couple hours. Every time, I take out the batteries from the sensor and main unit (plus unplug main unit), put the batteries back in, and everything links up. A few hours later, the connection is lost. The worst part is that the main unit does save its setting or fetch the time automatically. That stuff has to be reentered, making it somewhat of a failure as a clock. Now it's a failure as a weather station too.  ----- original review below ------  This thing is -nice- and anything negative in this review is intended for the product devs because they seem to care about what they're putting out there. I'm guessing this based on the attention to detail that's apparent from this weather station.  Set up was fast and easy. For a change, I actually checked the manual before powering the device on. The manual had clear instructions about what to do. All I did was follow the directions and the thing was set up. The buttons and stuff for setting it up are easy to press. This was a welcome change from other devices that have you sticking a paper clip through a hole in the back n' stuff.  I ordered this device because it measures indoor and outdoor humidity. That's something I want to know because I use an evaporative cooler and the outside humidity determines how well the cooler will work.  Initial test - set it next to the other clock thermometer device and see if they agree. I put the outdoor unit right next to the indoor unit. All the devices showed pretty close temperature measurements. My old device doesn't do humidity. This weather station's indoor and outdoor unit's humidity measurements were in good agreement. Cool. Now the outside unit really is outside. Nice.  Sooo, what's off or could be done better... It was weird setting the date and time because the weather station doesn't use the time/date signal like all those atomic clocks do. This would be a great upgrade. Especially because you never know when the dates for daylight savings time are going to change again. The time/date signal contains that info.  I'm not sure about the display. It is nice and bright and beautiful. I don't know if it will last a decade like the old school monochrome LCD screens though (and those things last forever). That leaves me a bit unsure because my old device (just time and temp, including outside temp via outside sensor) can run years on a couple batteries and has lasted for well over a decade. So, there's the old reliable and the hot and pretty new. I dunno. Maybe this weather station will be my old reliable many years from now. | * Product is reliable (explicit) * Product functions as intended (latent) * Sensor readouts are consistent (explicit) |
| The unit itself is easy to read and I really like that it provides humidity readings. The issue is that it loses connectivity frequently. (Multiple times a day) I wish I had read all the reviews prior to buying. I have tried everything all the others reviewers have tried (changing batteries, moving the units closer) it works for a while and then stops working. We live in Wisconsin I saw one person mention it stopped working when it was 40 or below. Ours worked at the low temps we have had so far (19 F) so don't think it's that. It just randomly stops working. Very frustrating and wish we could return it. | * Product is reliable (explicit) * Device troubleshooting is simple (latent) * Product can be returned if necessary (latent) |
| Like the graphics but that design at the bottom with the flower looks like it was cut and pasted on. Everything was reading fine at the start temp was only 2 degrees off. The graphics showed rain and it was raining outside showed cloudy day and it was cloudy outside. But a week later temperature is off by 20 degrees and it's a sunny day with no clouds and it's showing its a cloudy day in the graphics. | * Readings are consistent with product’s design (explicit) * Product functions correctly for a long time period (latent) * Product functions as intended (latent) |

Search #2

**Keywords: “**Solar panel protection”

Selected Products:

1. [Galvanized Black PVC Coated ½ inch Wire Roll Mesh](https://www.amazon.com/SZT-Critter-Prevent-Critters-Entering/dp/B07MR559X4/ref=sr_1_1_sspa?crid=1OJM5SV0VIR06&keywords=solar%2Bpanel%2Bprotection&qid=1674000773&refinements=p_72%3A2661618011&rnid=2661617011&sprefix=%2Caps%2C526&sr=8-1-spons&ufe=app_do%3Aamzn1.fos.006c50ae-5d4c-4777-9bc0-4513d670b6bc&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUExTkVJNVRUUFZOTjA3JmVuY3J5cHRlZElkPUExMDQ0NTg1MTVMNERUVVVST0lNNiZlbmNyeXB0ZWRBZElkPUEwODQwMzAzMkUzTlgzT0tDQzBGSyZ3aWRnZXROYW1lPXNwX2F0ZiZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU&th=1)



Price: $89.98

Vendor: Amazon

Description:Rotak 6in x 100ft Solar Panel Bird Critter Guard Heavy Duty Mesh Roll | Galvanized Black PVC Coated ½ inch Wire Roll Mesh | Prevents Birds Nesting Under Solar Panels

Positive comments

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “ purchased Bird/Critter Guard because I just had solar panels installed and I saw the migration of my neighbors' pigeons migrate to my roof top. Also, I was sent a picture of a nearby home where the entire rain gutter was filled with pigeon waste! My Bird/Critter Guard was installed by a friend, and he said it was easy to install and secure. It has only been up for three weeks, and I am glad to see the pigeons did not have enough time to establish a new home territory. Currently, my neighbor who has the pigeons nesting under his solar panels, is waiting for his order of Bird/Critter Guard to arrive from Amazon! It is the best solution to a very nasty problem.” | * Easy to use (explicit) * Good quality of materials (explicit) * Prevents damage by wildlife (latent) |
| “Just installed this and it works great. Put hooks in roughly every 12inches. I used one continuous run instead of cutting and my perimeter was roughly 50’. Very easy to bend and cut. I bought the eight inch due to the fact I wanted the the netting to bend down at an outwards curve to prevent critters from going underneath. My panels were about 6” high. So I was about 10’ from being done when a haboob rolled in. Had to jump off and finish in the am. It withheld the strong winds! I recommend anyone with solar panels to use this product! I was quoted $900 for a company to to it. Very satisfied! Took about 2hrs to install.” | * Easy to modify (latent) * Quick installation (explicit) * Resistance to weather (latent) |
| “I only have one other cheaper critter guard to compare this to, and this is by far better. The metal is thicker and stronger. It seems coated properly where the other guard already appeared to show signs of rust while still in the package. The spacing of the squares was precise, where the other product wasn’t always. The hooks and “washers” or whatever they are worked very well.. the washer would tightly hold onto the hook, as where my other product the washer holes were either too big, or they gave me hooks that were too thin, forcing me to tighten and bend the hook to try and keep the mesh in place. For a one-time do it yourself job, this was perfect. Wear gloves, the black coating will mess your clothes and hands.” | * Consistent in quality (latent) * Long lasting (explicit) * Reliable attachment (explicit) |

Negative comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “UPDATE JULY 20:  I returned it and got credit for two items but for the third item, it says it is still not received. I sent two items in a big box and one item in its own box - this is exactly how I got them. Both were sent at the same time. There is no other way of communicating here so I have to put this in my review. Can the merchant check this and issue the credit ? I also sent a feedback and there is absolutely no response from the merchant. I wanted to install this a week ago but the product had wet paint all over and it did not dry after a couple of days. So I decided to return and buy 3 rolls again from another merchant. I now realize that the ones I returned were better quality. Now I think I should probably buy these again and ask someone to ensure they ship me rolls which are dry. This is frustrating to say the lease. I cannot communicate to the merchant- it does not allow me to contact from the order. I am just losing time and patience on this.  Review after opening the product:  It said it has PVC coating. All it had was paint on top of the mesh and my hands got all the paint. Not sure if I install this. I researched and found this to be the best match to install on my Solar panels over the roof. I needed something that has PVC coating which can last long. Now with the paint still not dried, I don’t know if I should use this now or if this is the right product for my Solar roof.” | * Quality materials(explicit) * Honesty in marketing (explicit) * Clear instructions (explicit) |
| “The wire is great and exactly what you’d want for bird proofing your solar panels. The clips supplied with this product should just be thrown away. Do not waste your time trying to use them they’ll only cause frustration. Make sure you order high quality clips from a different company so everything comes at the same time so you can start installation.  I’m waiting for an order of clips from Nixalite...very pricy at $2/clip after shipping but they look like screw posts and I think they should work.” | * Quality materials(explicit) * Easy of use (explicit) * Easy to install (explicit) |
| “Did not receive my 100 j clips and very disappointed. Received a damaged package missing parts” | * Reliable product (explicit) * Reliable packages (latent) * Be able to survive shipping (latent) |

1. [MAPORCH 6"x120FT Solar Mesh Screen](https://www.amazon.com/MAPORCH-Proofing-Galvanized-Fastener-Included/dp/B0989Y7VGL)



Description: 







### **Solar panel bird kit - Great design for your roof**

Material: Black PVC Coated, galvanized welded steel mesh

Solar panel bird mesh kit contains:

* 6" x 120FT galvanized & UV PVC coated wire mesh
* A cutting scissor
* 60 x Fasteners
* 2 protective gloves to assist with installation



### **Easy to use**

* No drilling required, easy installation.
* The solar panel bird kit is virtually invisible once installed.
* This wire mesh can easily be removed for service or repair to the solar panels.
* Don't scratch or affect the integrity of your solar panels.

Positive Comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| This product did met my expectations and once installed is keeping the pigeons from returning to under my solar panels. I was concerned because my roof has curved tiles rather than flat which did require that I either slant or bend the screen in some places to ensure the gap is covered. If you roof has flat tiles it will be even easier to install. Only recommendation if ordering you may want to also order extra fasteners, otherwise great product. If the need arises, I would purchase again. | * Mesh works with both curved and slant tiles (latent) * Mesh performs function as advertised (latent) * Mesh is bendable to fit multiple gaps (explicit) |
| Most rolls are 100 ft but I needed 112ft more so the length was perfect. You only get 60 fastener clips which is a rather long span - I would have preferred 80. The mesh seems a bit light duty, but it does mean it is easy to bend. In the end it did the job as the racoons don't go on my roof anymore! | * Mesh easily bends despite expectations (explicit) * Product performs its function (explicit) * Roll length is correct (explicit) |
| This is the PERFECT product! Includes wire mesh, shears, gloves AND some really awesome and easy to use fasteners! | * Tools for installation included (explicit) * Kit works correctly (latent) * Easy to use parts (latent) |

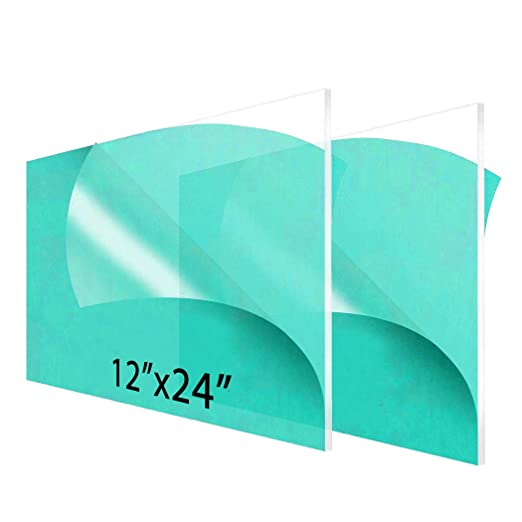
Negative Comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| Mesh is very flimsy, had to use more clips than I normally would to stop the mesh from bulging out. I bought this brand since its price was about 30 dollars cheaper from RoTak brand I bought last time., so I gave them a shot. Regret it, the RoTak brand came with 100 clips. Now I will have to buy clips separately to finish my install and will come out more than the RoTak brand. The edges on the mesh are not tapered either, so the mesh would get easily get caught on objects and my clothes. Giving two stars only because it came with scissors and gloves.  \*\*\*update\*\*  after 3 days the pigeons just pushed past it due to how flimsy the metal is. I do not recommend. I had to go back and double the mesh in some parts to prevent the pigeons from getting in. Worst part, I had to unhook a section in order to get the pigeons out. Save your time and money and get better quality mesh. | * Parts are consistent (latent) * High quality parts (latent) * Product is functional (explicit) |
| Comparing this solar mesh to other similar products this one is just to thin and bends and flexes very easy, as a professional installer I don't recommend this if you are trying to keep animals out of underneath your solar panels. | * Product is reliable (explicit) * Product is up to standard (latent) * Product displays professional quality (latent) |
| I bought two rolls of wire and installed the first one OK, but then I opened the 2nd box and it came with 1" diameter self-locking washers vs. the 2" self-locking washers that were in the first box (and in the product pictures). If the washer was going up against the mesh, a 1" washer would work, but I am installing the wire mesh on solar panels under a decorative skirt and the washer is straddling the gap between the skirt and the panel, and 1" is barely big enough so it could slide in one direction and be pulled into the gap. Now I have to spend another $20 buying more clips. Not happy. | * Device has correct components (latent) * Amount of parts in kit is correct (latent) * Device performs well under specific conditions (latent) |

Search #5

**Keywords: “**polymethyl methacrylate (PMMA) sheets”

1. Selected Products:Clear Acrylic Sheet Plexiglass



Price: $37.99

Vendor: Amazon

Description:2-Pack 12 x 24” Clear Acrylic Sheet Plexiglass – 1/8” Thick; Use for Craft Projects, Signs, Sneeze Guard and More; Cut with Cricut, Laser, Saw or Hand Tools – No Knives

Positive comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “After reading a number of reviews stating items arrived with cracks or chips, I was concerned but decided to take a chance anyway. I was pleased that, not only did my order arrive timely, the plexiglass sheets were perfect. The size was true to the description and worked perfectly to replace glass that was broken during a move. My lovely, large, Ansel Adams prints are back in business and ready to be hung on the wall.” | * Durable (explicit) * Correct dimensions (explicit) * Handle impacts (latent) |
| “with the right saw and blade, i cut it into shape, it had round corners so a belt sander worked well. with a home made bench to mount my saw and the belt sander. cutting this plastic is tricky it will crack and break. use a fine plastic cutting saw blade, a jig saw will work but a table saw it better, a knife will not work.” | * User friendly (latent) * Must survive installation (latent) * Must be compatible with tools to use for installation (latent) |
| “This product exceeded my expectations! It was sturdy, perfectly clear, and their customer service was very quick to solve my shipping issue. Unfortunately, Amazon did not pack the product appropriately, which caused damage to the corners. They literally had no sort of cushion, just the product and the box, and then from there was tossed around a lot by the warehouse through delivery (box was completely beat up). For this type of product, I assume this was a one-off occurrence. I’m happy to have found my go-to small business to purchase these products for my client’s signage.” | * Must be of good quality (explicit) * Must be able to survive impacts (latent) * Must be able survive storms (latent) |

Negative comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “ordered (x2) 1/8" thick 12" x 24" acrylic sheets for a little shop towel and glove dispenser concept for my workshop. They arrived with both acrylic sheets in a big ziploc (no additional padding whatsoever) in an oversized box—the box says 3A3 (B75) and the dimensions amazon have listed for this particular box are 20.5W x 31L x 3.5H, i.e. more than enough room for the acrylic to rattle around. Both arrived uncracked in spite of their poor shipping packaging. the sheets appeared to be frosted but it wasnt until after i scored and snapped the first piece i realized it was just the protective film (film on both sides); underneath, the sheets are very clear. these turned out to be harder to work with than anticipated and gave off a plastic smell when cutting, deburring, sanding, polishing edges, etc. which most likely means it is extruded acrylic, not cast.  All in all, they arrived quick and, for my purpose, they worked fairly decent but weren't what was advertised/what was expected. You get what you pay for.” | * Must be easy to work (explicit) * Must be safe to use (explicit) * Must be honest in product description (explicit) |
| “From the Amazon questions and answers section some genius said this was cast acrylic and that you can etch on it. It is NOT cast acrylic. When attempting to laser cut and etch the fumes were at toxic levels and not even my fume extractor could handle it. The etches come out partially melted and the smoke/fumes are so bad that hey come back to hit acrylic leaving extremely sticky residue. Totally not for laser cutting.” | * Must be safe to handle (explicit) * Must be able to handle multiple uses (latent) * Must work under normal handling conditions (latent) |
| “I ordered three 2-packs of the 18"x24" acrylic sheets. I'm pleased for the most part, but one of them had a 1.25" crack, inside the edges (i.e., not right on an edge. The film that covered it had a longer scratch/blister/whatever that included the length of the crack. Makes me wonder if this crack will spread, and how durable the rest of the rest of the sheets are.” | * Quality materials (explicit) * Must be durable (explicit) * Must be long lasting (explicit) |

1. [AcuRite Iris (5-in-1) Professional Weather Station with LCD Display and Lightning Detection](https://www.amazon.com/AcuRite-01022M-Lightning-Temperature-Detection/dp/B01MEFGGMF/ref=sr_1_23?crid=3C6DF1X2DHWU&keywords=storm+detector&qid=1674017214&s=lawn-garden&sprefix=storm+det%2Clawngarden%2C2298&sr=1-23)



* Price: $119.98
* Vendor: Amazon
* Description: Real-Time Weather Conditions: Receive readings for indoor outdoor temperature and humidity, wind speed/direction, barometric pressure, and rainfall directly to your home weather station. Lightning Detection Weather Station: Provides an estimated distance to lightning-producing storms; lightning strike counter displays running total of lightning strikes detected, plus weekly and monthly totals.Weather Forecast: Patented, self-calibrating technology provides a hyperlocal, personalized weather forecast 12 hours from your current conditions using a unique algorithm to analyze changes in pressure and temperature over a time period. The Best Weather Station to View Comprehensive Weather Conditions: Monitor pressure trends with trend arrow, heat index, dew point, feels like temperature, rainfall and lightning records, and more. Weather Clock with Alerts: Illuminated color display with the current time, date, auto-dimming brightness, and programmable notifications make it convenient to read and easily view indoor and outdoor data, time, and conditions from various angles. Company Based in Lake Geneva, WI, USA - Since 1943

Positive comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “I live in an area that has its own micro weather because of its openness of a desert and the local weather stations are far away from me so having this I can know how much rain has fallen and because of the wind at times are quite strong I want to find out how much exactly and because I do have Monsoon's and the thunderstorms have been quite severe in the past two years with a lot of lightning strikes all around me this is why I bought this Weather station and so far it has done exactly what I wanted. It was easy to read the instructions and was fairly easy to mount on the roof of my house I did have to put up guy wires up to hold it up right and level because of the winds that comes through sometimes severe.” | * Device accurately measures weather (explicit) * Device measures wind speeds (explicit) * Device is secure and stable once placed (latent) |
| “I bought this AcuRite weather station for my daughter and grandson because it has a Lightening detector that we need living in Colorado. I've owned an AcuRite weather station for years, the same unit, it's very accurate and reliable, the batteries last almost a year and the only problems I've had was hail breaking the wind cups which are replaceable.  This is a nice weather station for the price and accuracy.” | * Device measures accurate values needed by user (explicit) * Device is able to withstand the elements (explicit) * Device needs to be priced appropriately (latent) |
| “Oh my it sure did meet my expectations! I especially like the lightening indicator. We had over 1000 strikes within 20 miles one day. This was extremely helpful since we have a dog that runs off when there is lightening, we can bring him in when it is still quite a ways off. The rain gauge is very accurate compared to our old fashioned ones that have to be emptied. I especially like that everything is all in one unit (except the lightening indicator which isn't a big deal). I have recommended it to my sister-in-law to give to all of her kids for Christmas.” | * Device can serve more than one purpose (latent) * Device requires minimal maintenance (latent) * Device is able to keep track of certain variables (explicit) |

Negative Comments:

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “Lots of nice features, too bad they are so inaccurate that they're useless. It rained the entire day and my yard was flooded, but my rain gauge said it had rain one-tenth of an inch. All other stations around me measured at least an inch and a half of rain (I checked to see I'd something had blocked the gauge, but nothing was there). Also, the wind gauge is totally inaccurate. We had a windstorm that blew down hundreds of trees and the news reported the gusts were +75 MPH, but my gauge said 30 MPH was my maximum gust. Lastly, the temperature gauge is off by at least 4 degrees, sometimes more. All my gauges were installed per the manufacturer's guidelines, so the entire system is worthless, unless you want your display to serve as a nightlight, because that's the only value the display provides.” | * Device has reasonably accurate measurements (explicit) * Device should have replaceable components (explicit) * User should be able to simply fix the device (latent) |
| “This weather station quit working again . I have tried everything In the manual to get it to work. I tried lithium batteries and alkaline batteries galore but the sender unit just won't send to the inside unit. It is all set up correctly and is only 30' from each other with line of sight through a window. I want to return it and get my money back but it has supposedly passed the return deadline of 31 Jan 2020. I bought two of these of different brands and the other one is working fine for my son. Mine has just continually quit me and now it doesn't work at all.” | * Easy to set up (explicit) * Power Supply should be generic (latent) * Device should link easily with other parts |
| “I had two computer programmers attempt to set it up after I worked with it over a few weeks. No one could get all features working. The last person concluded that there is a defect in the temp aspect or the sensor we placed outside.I have packaged it carefully and will return it. HOWEVER< I MUST RECEIVE A MAILING LABEL IN THE MAIL BECAUSE I CANNOT PRINT FROM MY NET BOOK. Please access my ino and send a label by mail. Thank you.” | * Minimal setup (explicit) * Less moving parts (latent) * Device testing to ensure functionality (latent) |

# [Eve Weather - Apple HomeKit Smart Home, Connected Outdoor Weather Station for Tracking Temperature, Humidity & Barometric Pressure, Precision Sensors, Wireless, Bluetooth and Thread](https://www.amazon.com/Eve-Weather-Connected-Temperature-Barometric/dp/B08YFKWPFB/ref=zg_bs_397435011_sccl_50/133-9788757-2307644?psc=1)



* **Price:** $69.95
* **Vendor:** Amazon
* **Description:** Eve Weather, tracks your current outdoor temperature, humidity and barometric pressure, and sees the weather trend at a glance – on your iPhone or directly on the display. Review current and past climate data, empowering you with insights of the weather on your doorstep. Or ask Siri what the temperature is like outside, so you can dress for the day's weather before setting out. With a sleek & sophisticated design and IPX3 weather resistance, Eve Weather offers truly wireless, energy-efficient operation with support for Bluetooth and Thread. Eve Weather joins your Thread network automatically, and is Apple HomeKit-enabled for outstanding ease of use with iPhone, iPad, and Apple Watch. And the best thing about all Eve accessories is how they protect your privacy: Eve does not harvest your personal data and there is no Eve cloud, so your data won’t get exposed.

**Positive comments:**

| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “Seems like very few options are out there for weatherproof smart temp sensors that can be linked to HomeKit. This is one, and it’s a solid product that is relatively sleek/elegant. I’ve linked its output (via HomeKit) to a smart outlet that controls a heat trace, and so far it’s working as it should. It wishes more of this sensor's data could be displayed via the HomeKit app, but alas. In order to take full advantage (graphs of temp, pressure and humidity over time) you need to use the Eve app, which is reasonably slick so it’s not too much of a bummer. Overall, it’s about 95% of what I was looking for.” | * Device is Weatherproof (explicit) * Device is compatible with HomeKit(explicit) * Wishes more sensor data could be displayed through the HomeKit app(explicit) * Device needs to use the Eve app to access full data (graphs of temperature, pressure, and humidity over time) (explicit) |
| “So I am a bit of a home weather station geek with several different ones from different brands, Acurite, Ambient Weather, Sensor Push and even an old Oregon Scientific. Each has their merits. I got the eve to try it out and because I thought it looked pretty cool. And I have not been disappointed. Really at all.When I first got it several months ago I had an iPhone 6 running ios12 so the eve app would not run on my phone. However I had an iPad running iOS 14 so I set it up on that. It uses the home app and it's pretty cool. The software interface is intuitive and easy to use and the sensor itself is very elegantly designed. Both are easy to read and understand and best of all proved to be among the more accurate of all my devices! So great little gadget, great gift, highly recommended for a simple remotely accessible temp/hygrometer barometric trend indicator. Go ahead and see for yourself, get one!” | * Customer finds the software interface and sensor design to be intuitive and easy to use(explicit) * Customer finds the eve weather station to be one of the most accurate of all their devices (explicit) * Customers recommend the eve weather station as a great gift and simple remotely accessible temp/hygrometer barometric trend indicator.(explicit) |
| “With Eve Weather, I get an easily accessible, constantly updated report on outdoor temperature and humidity, which is a huge help when planning my day. In addition, my outdoor weather history visible through the Eve app helps me to look at local trends and try to predict how today's weather will work out.  The Eve Weather device itself was simple to set up, and worked flawlessly using Thread to communicate with my existing HomePod Mini. Since purchase the battery has proven itself to have extremely long life, still appearing at 100% in the Eve app.Eve Weather is an absolutely invaluable gadget if you live in any area where your local weather isn't accurately explained by local weather apps.” | * Devise easily accessible and constantly updated outdoor temperature and humidity report(implicit) * Ability to view outdoor weather history * Simple setup process(explicit) * Works seamlessly with existing HomePod Mini using Thread * Long battery life(explicit) * Valuable tool for areas where local weather is not accurately explained by local weather apps.(explicit) |

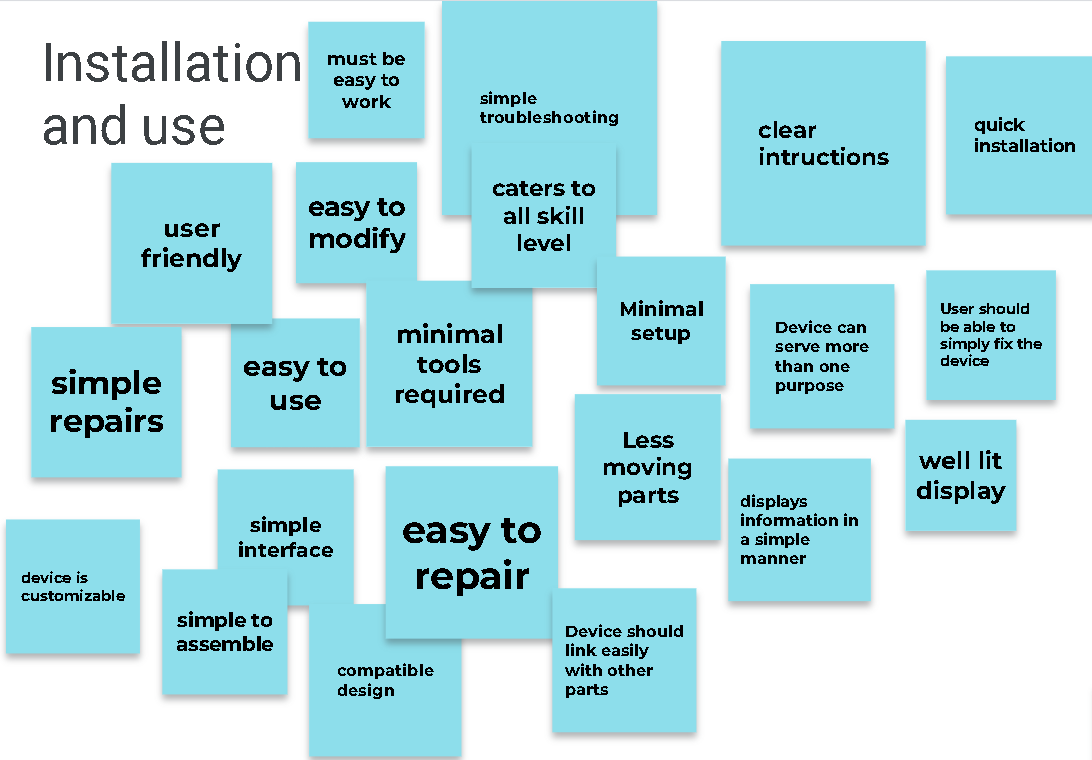
**Negative Comments:**

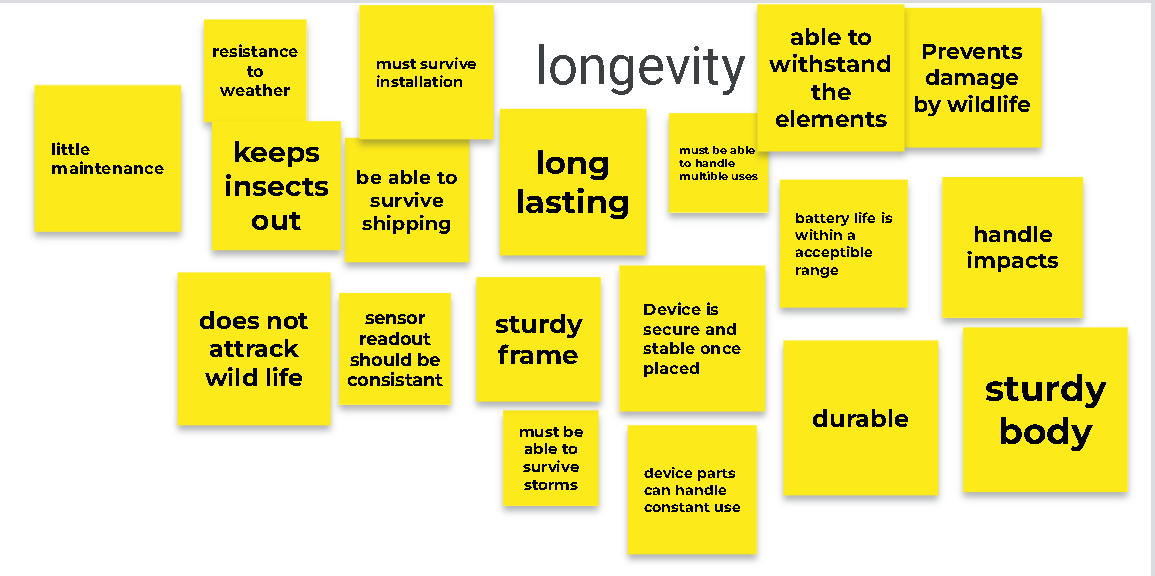
| **Voice of the Customer** | **Restated Customer Need** |
| --- | --- |
| “I like the IDEA of the Weather: it's well-designed, includes a display, and is HomeKit/Thread compatible. Also, their tech support gets high marks. Unfortunately, there are two issues that led me to rate it more harshly:The LCD display is very hard to read unless it's in bright light. I put it in a protected spot outside our kitchen window. Unfortunately, the display wasn't really readable from about 6 feet away. I tested a different thermometer with an E-ink display, which was great. However, E-ink displays have a narrower operating temperature range (0-50°C). The display problem is relatively minor if you're using your phone to check the temperature. However, the Bluetooth range is a much bigger problem. I added the Weather to HomeKit on my iPhone. The only time I could get it to work was if I was within 10 feet of the Weather unit. That kind of defeats the purpose of having an outdoor temperature sensor. Eve does support Thread, which should theoretically improve the range. I have an Eero mesh WIFI system that includes Thread support, but it's apparently not compatible with the Weather. According to Eve tech support, the only device it works with at this time is the HomePod mini. Even if I had a HomePod mini, I'm guessing it would have to be positioned pretty close to the Weather unit to work.I also tested a remote thermometer from "SensorPush". It doesn't include a display or HomeKit support (though it does have a well-designed iOS app). But more importantly, I can get temperature/humidity readings from anywhere in my house or yard. They claim it has a 325 foot range and I have no reason to doubt that.I don't know why SensorPush has such a long range and Eve Weather doesn't. They both use Bluetooth and both have 3V lithium batteries. Maybe it has to do with the case construction or the Bluetooth antenna. I applaud Eve for supporting the latest technologies like HomeKit and Thread. However, the useful range is even more important to me, so I decided to keep the SensorPush and return the Eve Weather.” | * Customer likes the overall design and features of the Eve Weather device, including the display and HomeKit/Thread compatibility (implicit) * Customer has had positive experiences with Eve's tech support * (explicit) * Customer has issues with the LCD display being difficult to read in low light and not being readable from a distance of 6 feet. (explicit) * Customer tested an E-ink display thermometer, which was better but has a narrower operating temperature range (explicit) * Customer has a bigger issue with the Bluetooth range of the Eve Weather device, only being able to connect when within 10 feet of the unit (explicit) * Customer has a mesh WIFI system with Thread support, but it is not compatible with the Eve Weather (explicit) * Customer tested a different remote thermometer (SensorPush) which does not have a display or HomeKit support but has a much longer range and better connectivity(explicit) * Customer is returning the Eve Weather device due to the Bluetooth range being a more important factor for them.(explicit) |
| “Works with Apple and only Apple. I have to borrow my kid's ipad to see the data it's collecting, just because they don't feel like supporting anything else I guess.” | * Customer has had issues with the Eve outdoor weather and Eve indoor air quality monitor not working properly(explicit) * Customer has tried resetting the device and troubleshooting steps but still having issues(explicit) * Customer want a product which can work with more devices, not just apple.(implicit) |
| “Eve outdoor weather and Eve indoor air quality monitor didn't work well for me at all. The devices themselves showed data but wouldn't report back to the EVE app or Homekit. When reset they would work for a day or two and then stop reporting again. Added an EVE energy plug with thread to see if that would help and it was also doing the same thing, in disconnecting and not being accessible in the Homekit app. These are rubbish from my experience. They appear to work well for others, so maybe something in my environment was problematic. followed all oft tips/tricks and troubleshooting steps to no luck.” | * The customer experienced issues with the Eve outdoor weather and Eve indoor air quality monitor not working properly (explicit) * The devices were able to display data, but did not report back to the EVE app or Homekit (explicit) * The customer experienced issues with the devices disconnecting and not being accessible in the Homekit app   (explicit) |

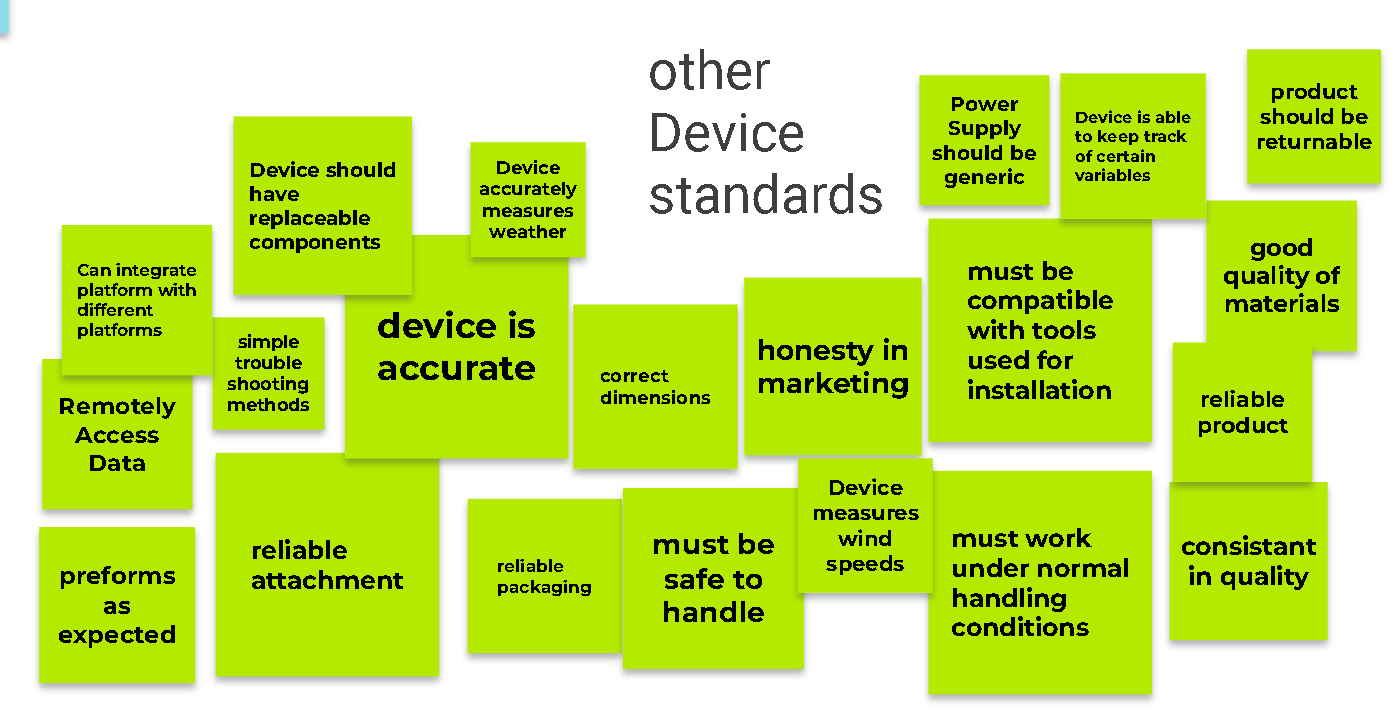
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**Organize**

Our team organized our consumers' needs into the following three categories.

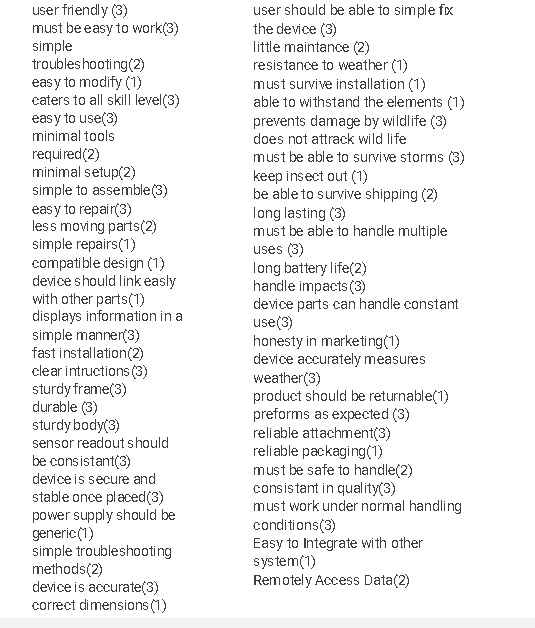






**Ranked**

We then ranked all of our customers’ needs based on their individual importance to the project and the product. We scored each one out of a score of three, three being the highest or most important.

****

1. **U**ser friendly
2. Must be easy to work
3. Caters to all skill levels
4. Easy to use
5. Simple to assemble
6. Easy to repair
7. Displays information in a simple manner
8. Clear instructions
9. Sturdy frame
10. Sensor readout should be consistent
11. Device is secure and stable once placed
12. Device is accurate
13. User should be able to simple fix the device
14. Prevents damage by wildlife
15. Must be able to survive storms
16. Long lasting
17. Must be able to handle multiple uses
18. Handle impacts
19. Device parts can handle constant use
20. Device accurately measures weather
21. Performs as expected
22. Reliable attachment
23. Consistent in quality
24. Must work under normal handling conditions
25. Simple troubleshooting
26. Minimal tools required
27. Minimal setup
28. Less moving parts
29. Fast installation
30. Simple troubleshooting methods
31. Little maintenance
32. Does not attract wildlife
33. Be able to survive shipping
34. Long battery life
35. Must be able safe handle
36. Remotely Access data
37. Easy to modify
38. Simple repairs
39. Compatible design
40. Device should link easily with other parts
41. Power supply should be generic
42. Correct dimensions
43. Resistance to weather
44. Must survive installation
45. Able to withstand the elements
46. Keep out insects
47. Honesty in marketing
48. Product should be returnable
49. Reliable packaging
50. Easy to integrate with other system
51. Data should be easy to access
52. Should have a customizable size
53. Must be able to receive customer feedback
54. must be cost effective
55. Should be affordable
56. Should be set and leave
57. Should not require training to use
58. Must be waterproof
59. Must not be affected by power outages
60. must have internal power as well as power from the panels
61. Must have a way to remove without power
62. Must be able to survival hail

**Product Requirements Document**

**Innovation Showcase**

**Arizona State University**

**EGR 314**

Project Manager: Team 302

Date of Creation: 01/18/2023

Version 1.0

**Introduction**

Weather protection for solar panels is almost non-existent. With our product we will be able to provide a weather monitoring system that when a storm is detected will deploy a protective cover to protect the solar panels from hail and other debris. Users have expressed the need to protect their solar panels in a quick and simple means.

**Objectives**

The purpose of this project is to create a device that is capable of withstanding the elements and responding to the environment that it is exposed to. The design is required to be a unique design that employs learning and solves a problem. The data that is collected by this device should also be capable of broadcasting the data collected over WiFi using the MQTT protocol. The environmental data will be collected via two serial sensors that will use the data collected to share data with the user and serve the purpose specified by the user.

**Stakeholders**

**Target group.** Weather enthusiasts, home owners, and students.

**Target purchaser***.* Weather enthusiasts, home owners, and students that have a focus in STEM careers.

**Customer service.** A device that has simple repairs, is a durable product, and is budget friendly.

**Marketing & Sales division**. Adequate design that can withstand the elements and meets all the product requirements.

**Senior Management***.* Ensures compliance to Apple Brand Identity, determines operational constraints, and sets research and development budgets.

**Retailers**. Products that are budget friendly and durable enough to withstand the elements and are able to respond to its environment.

**Regulatory instances***.* The product needs to comply with guidelines set by the product requirements appropriate for the Innovation Showcase.

**Use Cases**

**User Story #1: Edward**

Edward, 26 is a young upstart meteorologist intern who finished his degree several months ago and has been looking for a device that can track accurate weather information on the go, as he travels a lot around the country with family for the past year. Ed has been trying to catalog different weather patterns across the US for his research in order to get a broad understanding of the northern states’ expected weather in the Fall.

Edward really could use a device that is highly resistant to the elements, as well as general wear and tear, but is also accurate to the nearest degree and mile per hour to track accurate wind speeds. He also needs a new barometer as his previous one was broken by his little sister on a flight home from Nebraska.

The WeatherMaster 3000 tracks everything that he needs to catalog, and more. He has expressed his sincerest gratitude to the development and marketing teams that sold him it, and it easily travels with him everywhere he goes with minimal effort. The built-in Wifi unit has fantastic bandwidth even on spotty connections, and is within almost 25% of the most accurate readings that are possible for a device of this type.

**User Story #2: Keith**

Keith, 82 is the former CEO of a major weather company that has served the greater Kansas region for nearly 50 years. He lives with his wife and grandchildren in a small farming community that is not far from Tornado Alley. Keith has been teaching his grandchildren how to predict dangerous weather formations, and has been using his skills to help keep himself and his family safe from turbulent supercells and tornadoes for the last decade since they moved in from Chicago.

Keith enjoys the WeatherMaster 3000 tremendously, as it accurately can trace threatening cloud formations and send alerts via an app installed on the family’s phones if a funnel cloud is moving their direction, and at what speeds. This feature, he says, is probably his favorite, since the app uses local cell service to send text alerts instead of completely relying on Wifi which usually goes down during the worst kinds of storms, especially if an F5 tornado is spotted.

**User Story #3: Stephanie**

42 year old Stephanie is a stay-at-home mom with four children who regularly play outside in their small suburban neighborhood in Colorado Springs. She loves having the WeatherMaster 3000 at her disposal during the summer to have on-demand accurate forecasting of potential thunderstorms, and is able to send the information to her kids whenever they are out playing to warn them to come home if a storm is going to be potentially bad.

With the WeatherMaster’s Wifi settings, Stephanie is able to keep a constant watch on weather patterns without having to subscribe to any online services, or risk inaccuracies with erroneous forecasts, and can take the WeatherMaster with her to work, and have it at her desk for real-time weather updates without it being too cumbersome for her office space. Stephanie loves the ease of use of the WeatherMaster, and has recommended it to several of her friends and their families.

**Aspects**

**1.** **Product Design**

The product design will respond to its environment as a mobile weather station that will broadcast its data over WiFi.

Requirements:

1.1 The product should have a durable and sturdy construction to withstand the environment it is to be placed in.

1.2 The product should be the appropriate dimensions based on the user's desired application.

1.3 The product will avoid materials that can be easily damaged or punctured.

1.4 The product will include a method for the user to interact with the product.

1.5 The product will have few gaps or openings to avoid animal/insect infestation.

1.6 The product will collect reasonably accurate data of its environment for the user.

1.7 The product will have an appropriate power source.

**2** **Functionality**

2.1 The product will have sensors that will allow it to collect data for the user.

2.2 The product will include a motor that will fulfill the user's needs.

2.3 The product will sense two environmental conditions.

2.4 The product shall have two serial sensors to complement the sensing of the environment.

2.5 The product shall offer two different power source options based on the user’s needs.

2.6 The product will broadcast data via WiFi.

2.7 The broadcasting system shall make use of the MQTT protocol.

3 **Interactivity**

3.1 The product shall function and pair to a motor to complete an action needed by the user.

3.2 The product shall offer at least two different sensors that will measure and collect data from the environment it is placed in.

3.3 The product will include a method of interaction for the user.

3.4 The product shall use WiFi to transmit the data for the user remotely.

3.5 The user interface shall be intuitive for all users.

4 **Customization**

4.1 The product shall offer multiple sizes depending on its application.

4.2 The product shall offer interchangeable sensors to better fit the users needs.

4.3 The product shall be offered with an additional coding method for more tech savvy users.

4.4 The product will include two different methods of powering the device to fit the user's needs.

5 **Manufacturing**

5.1 The total FOB cost price of the product shall be <$240.

5.2 Parts can be 3D printed in order to be cost effective.

5.3 The product shall be designed to be only as big as needed by the user.

5.4 The position of any component cannot change after assembly.

5.5 Function of the device shall be easy to check by the user.

5.6 The product shall be designed to consist of the minimum possible amount of parts.

6 **Safety**

6.1 The product shall meet Ingress Protection rating IP-X4 for water and sweat resistance under IEC standard 60529. (P9)

6.2 The product shall pass a guided drop test based on IEC 60068 guidelines. The product will be dropped from a height of 1.22m onto lauan plywood from 26 different directions. (P9)

6.3 The product shall pass vibration testing. It will be tested in 3 directions for one hour each, subjected to frequencies from 20 to 2,000 Hz. (P8)

6.4 The product shall pass hammer impact testing based on IEC 60068-2-75 guidelines. (P9)

6.5 The product shall have a 100% pass rate in an ALT, including swinging temperatures, stress, strain, and corrosion. (P8)

**Open Questions**

· Can we create a mobile weather station that gives accurate readings comparable to other weather stations and sensors?

· Can we improve the accuracy of our weather sensors?

· Can we implement doppler radar somehow as an extra feature?

· Could we make our unit usable by kids as well as seniors?

· What can we do to ease the mobility of our device for easy storage and transportation?

**Milestones**

Check Point 1 : TBA

Check Point 2: TBA

Check Point 3: TBA

Innovation Showcase Presentation: 04/28/2023