

Quick, cheap, and easy home weather station

Jason Sutor
Sep 18, 2022

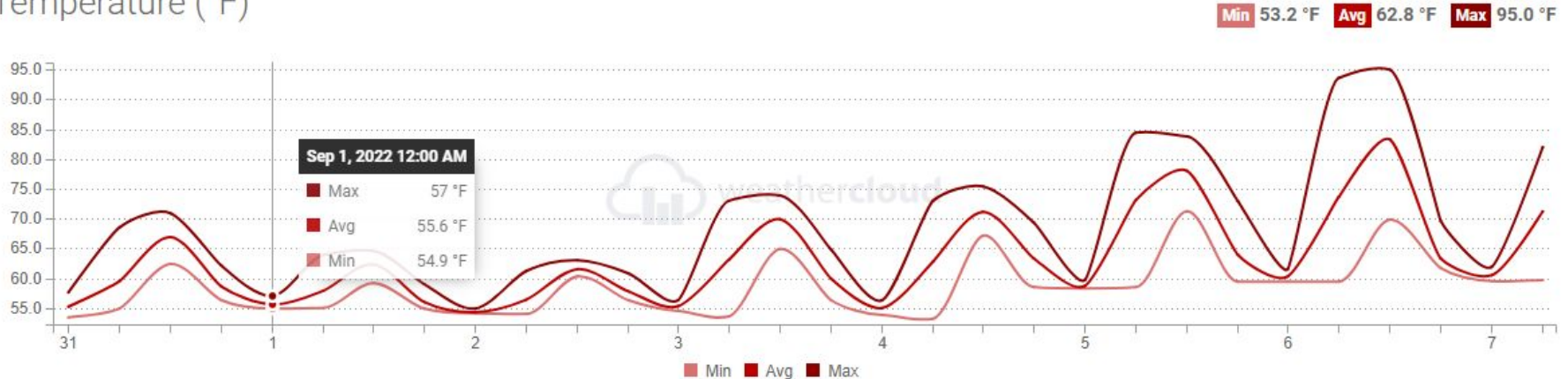


Why?

Why track your home weather?

- See your home microclimates
- Gather trends on chill and heat hours
- Help fine tune your watering schedule
- Be able to do zone comparisons and make more educated plant decisions
- View your station on sites like WeatherCloud and WeatherUnderground
- It's easy and fun!

Temperature (°F)



Explored paths...



- Top of the line for home weather - Davis Vantage Pro2 system \$600+
 - Too expensive!!!!
- I went to the Santa Cruz flea market and happened to find a new in box Acurite 5 in 1 station for \$25 (normally ~\$150)
- This provided temperate, humidity, rainfall, wind, etc. - BUT no way to get it online
- I built a Raspberry Pi system (x2 eventually) that connected up to the receiver and used WeeWx to transmit weather to WeatherUnderground
- This worked decently and was very cheap but was super ugly, very technical and required frequent maintenance to keep it going.
- Eventually it pretty much UV eroded and fell apart
- I wanted something new, something cheap and more elegant...

What?

- Ecowitt modular system (<https://www.ecowitt.com/>)



What?



Cost

Weather station (\$50 - \$169)

- GW1000 sensor gateway (\$34)
- WH32 Outdoor temperature and humidity sensor (\$16)
 - Don't accidentally buy the indoor version like I did, it will work but won't report temperature to weather services
- WS68 wind and UV sensor (\$69) - optional!
- WH40 rain sensor (\$50) - optional!

Cost – other options

- They make a bunch of other sensors that might be fun depending on your setup:
- More temperature gauges (indoor, outdoor)
- multi-channel thermo-hygrometer (up to 8)
- soil moisture sensors (up to 8)
- air particle sensors (PM2.5)
- NDIR Co2
- Leakage sensor (up to 4)
- lightning detector sensor
- leaf wetness sensor
- pool thermometer
- 7in1 sensor array
- solar radiation sensor
- ETC....

Cost

Mounting (\$0 - \$20)

- I used a spare 8' 2x4 as the 'pole' and another scrap piece to aid in mounting
- They suggest using metal poles
- Either works!

Other

- AA Batteries (preferably Lithium)
- Powered USB port
- Home WiFi

Where?

- The GW1100 gateway
 - It's essentially a mini PC running some software to upload weather data
 - It needs to be USB powered
 - It needs to connect to your home WiFi
 - It also needs to be able to communicate with all of your sensors so choose a location
- WH32 temp sensor
 - Shaded, out of direct sunlight, other weather
 - Beware radiated heat if near a structure
 - At least 4-5' off the ground with good air flow
- WS68 wind and UV sensor / WH40 rain sensor
 - About 6' off the ground (or more for wind)
 - No obstructions nearby
 - Needs to be level
 - Needs to face north (WS68 only)

Setup

- Hardware (30-90 minutes)
 - Determine location of the outdoor pieces and the indoor gateway
 - Make sure you have appropriate mounting hardware (i.e. screws)
 - Set up your mounting pole
 - **After** powering and pairing everything mount your outdoor equipment
- Software (30-120 minutes)
 - Time depends on how tech savvy you are
 - I recommend using two devices (i.e. phone & PC) during setup to make the process easiest
 - Make sure you know your WiFi password
 - First, setup your external accounts (WeatherUnderground / Weathercloud)
 - Second, setup your gateway
 - Third, one by one, power your sensors and make sure they pair
 - **Most of this is in more detail in the manual!**

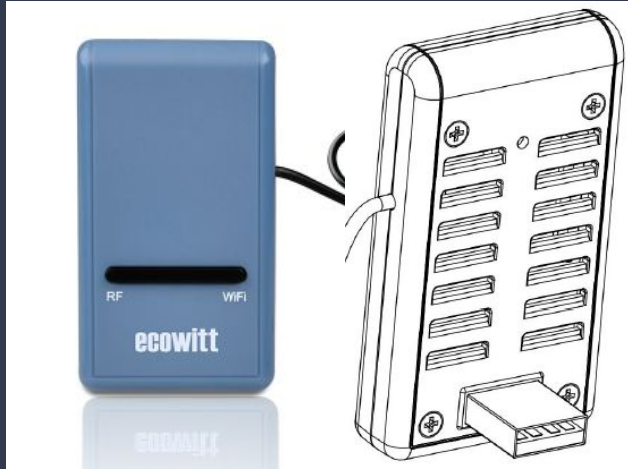
Setup – hardware location

- These are best practices, some are harder to meet at home
- Temperature sensor should be above level ground ~ 5'-6' off the ground. It should be away from paved surfaces and other sources of artificial heat
- The anemometer (wind) should be 33' above the ground and a distance of 10x the height of any nearby obstructions
 - Not really practical at home unless you mount on a roof
- The rain gauge should be mounted 4'-6' above the ground and a distance of at least four times the height of any nearby obstructions
 - Hard to meet in a back yard, just keep it as far away from trees as you can

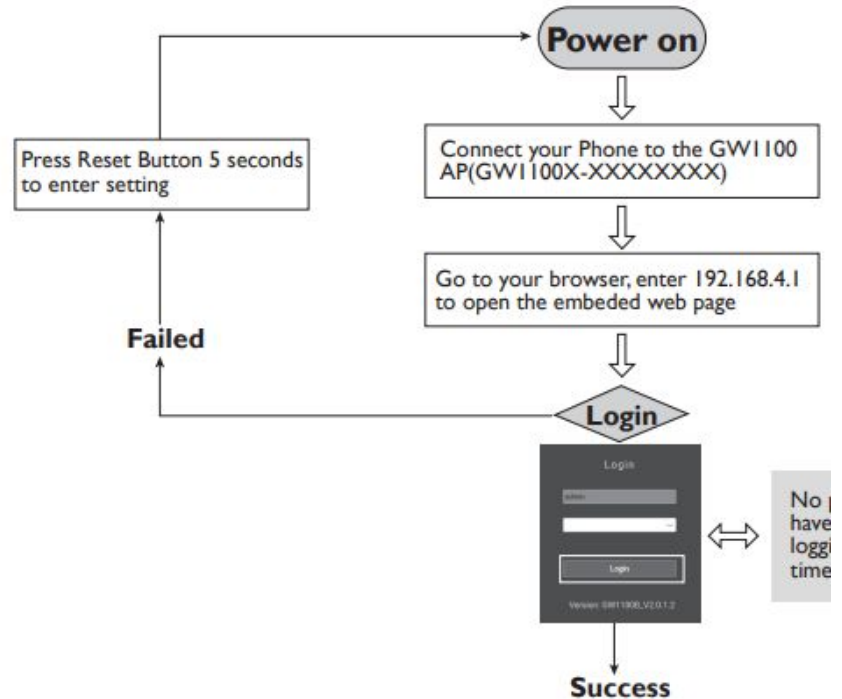
Setup – hardware location

- My setup ‘mistakes’:
 - Large pine tree ~10’ away
 - Wind sensor way too low (~6’)
 - After installation, added a ‘heat wall’ ~10’ away to slow wind and increase temperature
 - BUT - tall trees everywhere! There aren’t many better locations in my yard
- Results:
 - Temperatures probably higher than ambient outside my yard
 - Wind speeds likely lower
 - Rain (if we get any) totals may be lower

Setup – software



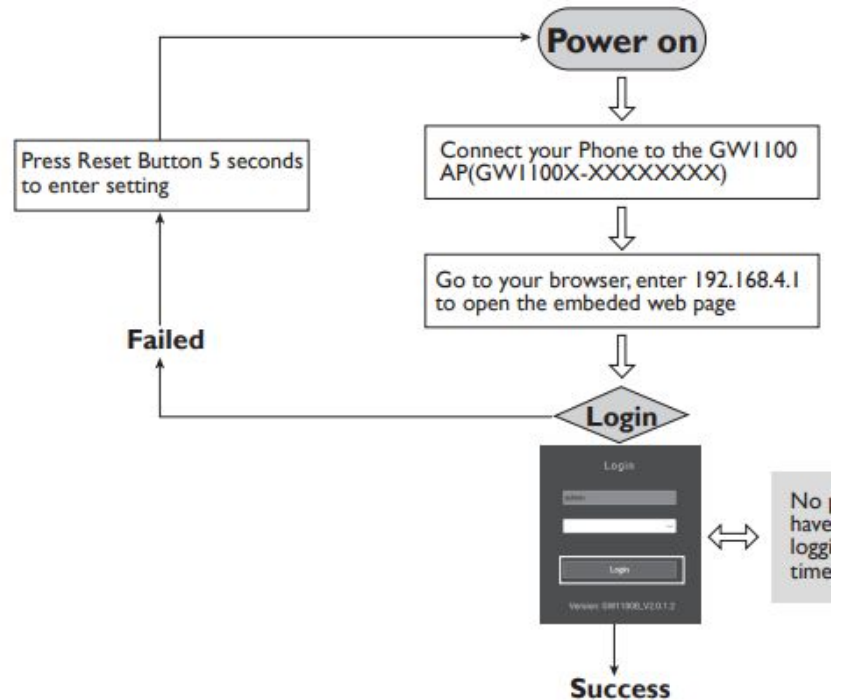
- Plug in your GW1100 (USB on back of unit) to power it on.
- Using your phone WiFi connect to the access point it has



Setup – software

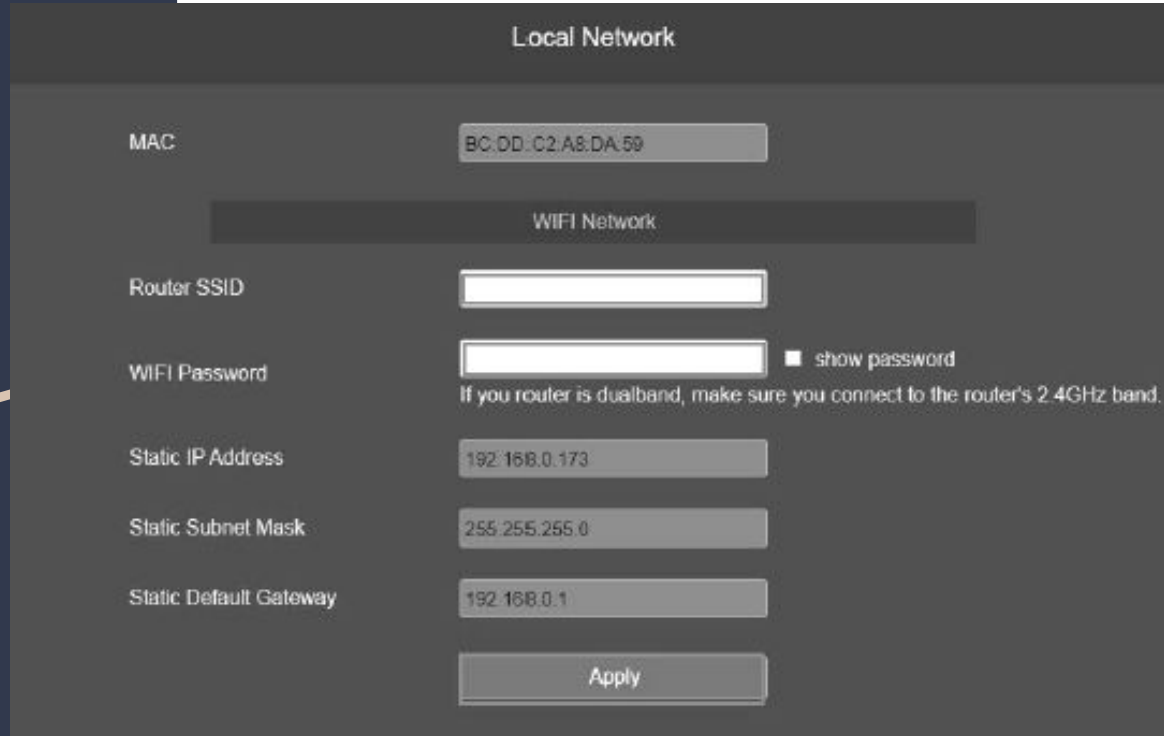


- Your phone may report that it doesn't have Internet access - this is expected and ok.
- Open your browser and go to '192.168.4.1'
- Login, no password required



Setup – software

- Enter your homeWiFi SSID (the name it shows up as) and password
- Press 'Apply' and verify it connects and an IP address shows up

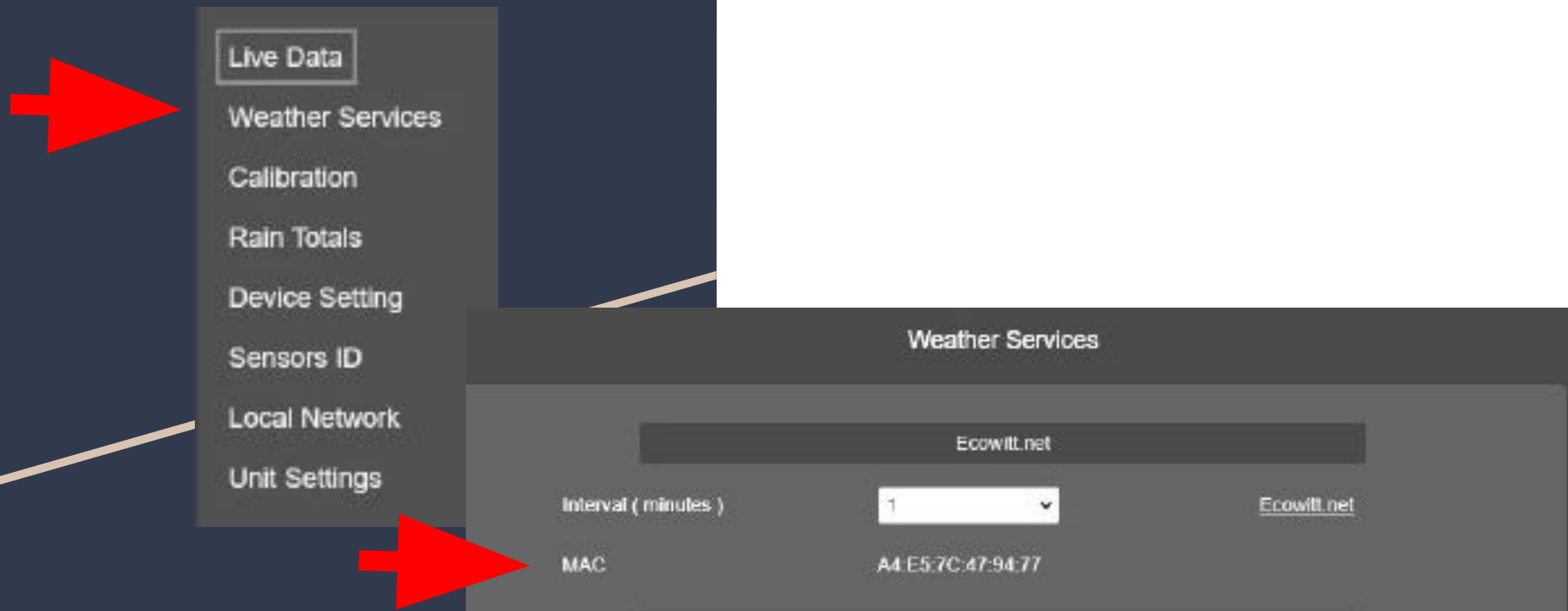


The screenshot shows a network configuration window titled "Local Network". It contains several input fields and a button. The "MAC" field is pre-filled with "BC:DD:C2:A8:DA:59". Below it is a section header "WIFI Network". The "Router SSID" field is empty. The "WIFI Password" field is empty, with a "show password" checkbox to its right. Below the password field is a note: "If you router is dualband, make sure you connect to the router's 2.4GHz band.". The "Static IP Address" field is pre-filled with "192.168.0.173". The "Static Subnet Mask" field is pre-filled with "255.255.255.0". The "Static Default Gateway" field is pre-filled with "192.168.0.1". At the bottom right is an "Apply" button.

MAC	BC:DD:C2:A8:DA:59
WIFI Network	
Router SSID	
WIFI Password	<input type="password"/> <input type="checkbox"/> show password
If you router is dualband, make sure you connect to the router's 2.4GHz band.	
Static IP Address	192.168.0.173
Static Subnet Mask	255.255.255.0
Static Default Gateway	192.168.0.1
Apply	

Setup – software

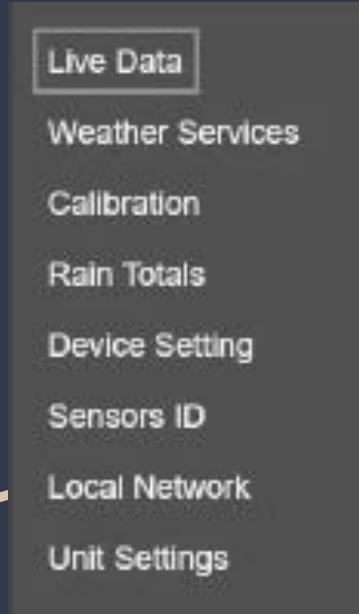
- Go to Weather Services from the menu
- Write down the MAC address shown - we'll be using it shortly



Setup – software

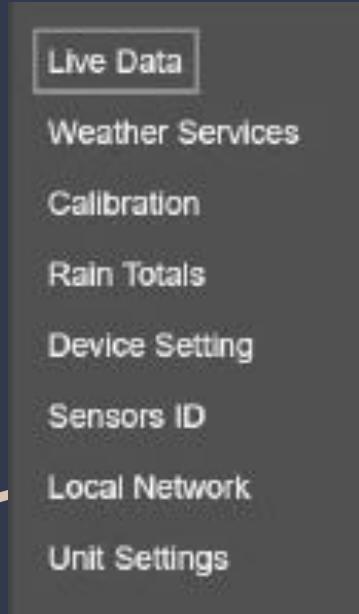
- On your other device (not the one connected to the gateway) go to www.ecowitt.net and register for an account.
- Under your account add your device by entering in the MAC address you just wrote down and fill in other setup information.
- You should be able to now see your weather station - though there aren't any sensors yet

Setup – software



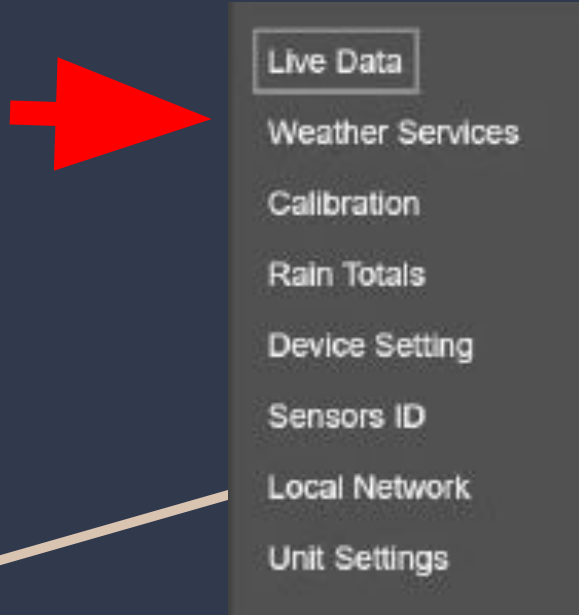
- Now it's time to power on your sensors!
- Make sure they're nearby (not mounted)
- Put the batteries in.
- Back on your first device...
Navigate to the Sensors ID tab
- Make sure your sensors show up here
- Then - on your second device, make sure they are showing up on the Ecowitt site

Setup – software



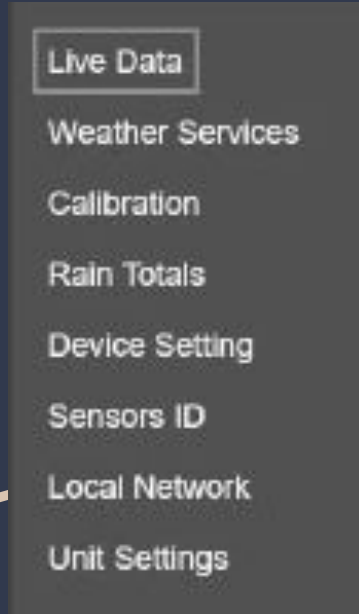
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Setup – software



- Now you can add other external services.
- Go to the Weather Services tab to do so.
- WeatherUnderground is specifically covered in the user manual.
- WeatherCloud is a similar process

Setup – software




- Time to wrap up the install
-
- On Device Setting
 - Make sure you are set to Automatically upgrade firmware
 - Enter a **strong** password, don't get hacked!
 - Press Apply
- Once you press apply the system will reboot and take a minute or two to be accessible again
- Make sure you can still login
- Disconnect your phone from the gateway Wifi

A screenshot of the 'Upgrade' settings screen. It features a checkbox for 'Automatically upgrade firmware' which is checked. Below this is a 'Save' button. The 'Login & AP Password' section has a text input field and a 'Show password' checkbox. A note states: 'It can be set to NULL or 8-64 characters, and the device will restart when password is changed.' At the bottom is an 'Apply' button.

My station!


- <https://app.weathercloud.net/d1777087519>
- <https://www.wunderground.com/dashboard/pws/KCAPACIF117>


 weathercloud


groveacres


📍 Pacific Grove | 10:49 AM (UTC-08:00)


🔄 Last updated 6 minutes ago


 **77°F**
Feels like 77°


 Calm


 **1013 hPa**






 7:01 AM

 5:45 PM

 **2224 m**


 WEATHER UNDERGROUND | Sensor Network | Maps & Radar | Severe

★ Popular Cities  **San Francisco, CA** 67 °F Sunny  **Manhattan, NY** 55 °F Sunny  **Schiller Park, IL** 42 °F Cloudy

Elev 89 ft, 36.61 °N, 121.93 °W

Grove Acres - KCAPACIF117

77.4 °F
Feels Like 76.3 °

 **ENE**

WIND & GUST
0.9 / 1.1 mph

DEWPOINT	PRECIP RATE	PRESSURE
44.4 °F	0.00 in/hr	29.93 in
HUMIDITY	PRECIP ACCUM	UV
31 %	0.00 in	5