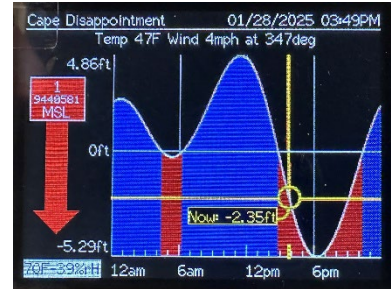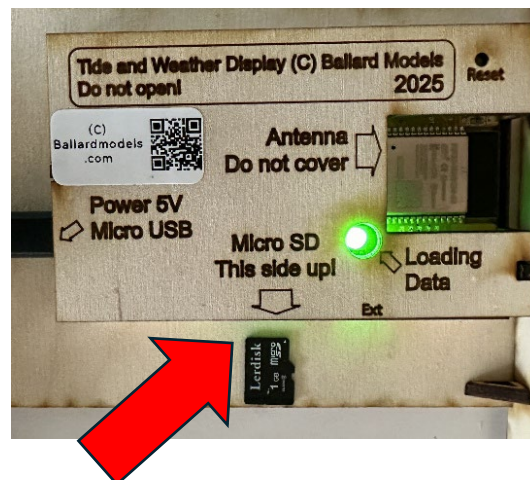# Quick Start Guide

Version 2.1.0 UNI – 6/7/2025

Hello and welcome to the Weather and Tides Display quick setup guide. Please refer to the user manual you can find here for detailed instructions:

To get your device to work in your home or business, you first must connect it to your Wifi network.

IMPORTANT: Your WiFi network needs to run on the 2.4GHz frequency band. If you have a 5GHz router, please enable the 2.4GHz band. The device will <u>not</u> be able to connect to the 5GHz band. You can set the `ShowWifiNetworksOnBoot` parameter to "1" (see the user manual) to see if your WiFi network is displayed in the list on boot. If the device can see the network, it is able to connect to it.

The device comes with a MicroSD card that is already installed. The card contains a file that stores the WiFi login information: Config.cfg. The card is a Micro SD card and you can plug it into your computer using the appropriate slot or a Micro USB card reader that can plug into your computer. You can buy them everywhere. You can find the Micro SD card here (the picture shows the card removed from the slot):

You can remove the card by pushing on it, it is loaded with a little spring and will push out a little. To remove it completely you can use tweezers or a little screwdriver to pull it out. Insert it into your SD card reader on your computer. On the card, you will find the Config.cfg file. Open it with a text

editor like Notepad on Windows. You will see two setting in the file that pertain to the WiFi network, SSID and WiFiPassowrd. In the quotes, replace the current setting with the name of your WiFi network (SSID) and the password. Make sure the settings are enclosed in quotes:
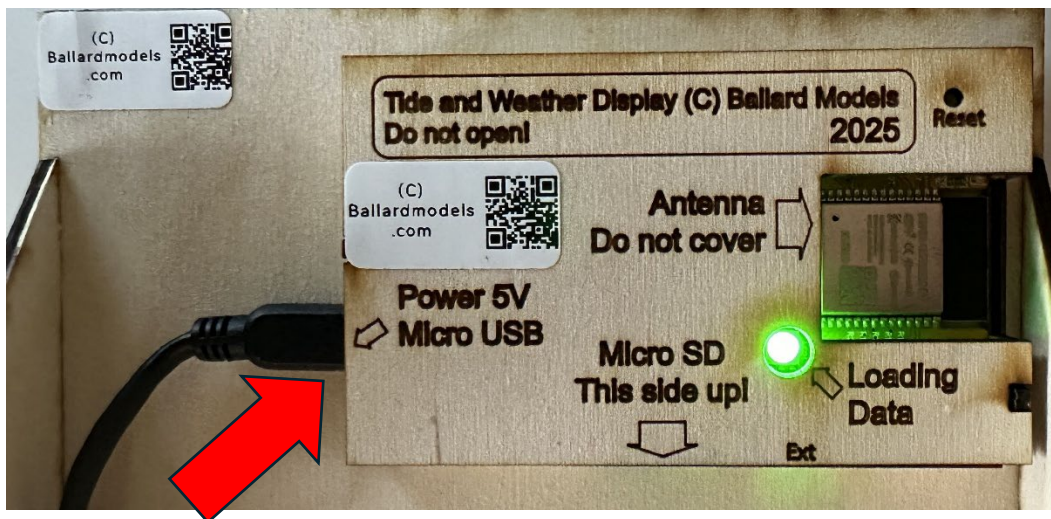
$$SSID="YourNetworkName"$$

$$WiFiPassword="YourPassword"$$

Save the file back to the card and reinsert it, label side up, into the device in the slot seen here:

Push the card in until you hear a slight 'click' sound.

Now power on the device by connecting it to a Micro USB power supply (5 Volts) here:


You are done! Enjoy your device.

The Tides and Weather Display User Manual

Setup and Operation – V1.4.1

I live in Ocean Park, WA on the beach and I have spent my entire life working on commercial software development. I am really passionate about my family that includes our wonderful puppies. Walking the puppies on the beach every day is one of my favorite pastimes and I love to know the tides before I go. I like to know how much beach we will have to play and run, so before we leave, I check the current tide level.
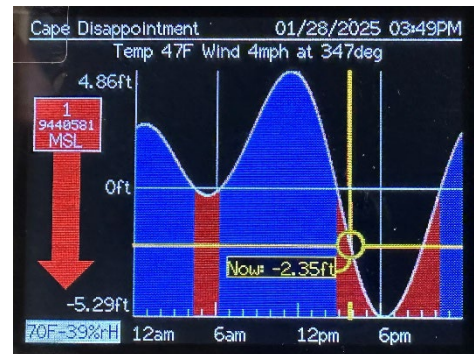
How it works

The display is utilizing the daily tide predictions provided by NOAA. They are based on a combination of historical tidal data, astronomical observations, and sophisticated mathematical models. The primary factors influencing tides are the gravitational forces exerted by the moon and the sun, as well as the Earth's rotation. NOAA collects extensive tidal data from numerous tide stations along the coastlines and uses this data to develop harmonic constants that describe the tidal patterns at each location. These constants are then used in harmonic analysis to predict future tides with a high degree of accuracy. The predictions take into account the relative positions of the moon, sun, and Earth, as well as other factors such as local geography and weather conditions.

The daily tide predictions provided by NOAA are essential for various activities, including navigation, coastal management, and recreational pursuits. Mariners rely on accurate tide predictions to ensure safe passage through coastal waters, while coastal managers use the data to plan and implement measures to protect shorelines and manage coastal resources. Additionally, recreational activities such as fishing, boating, and beachcombing are often influenced by tidal patterns, making reliable tide predictions valuable for planning and safety.

IMPORTANT: The data displayed on this device is for information and entertainment purposes only! Do not rely on the information to make any decision for navigation or any other purposes.

Through WiFi, the device is accessing the NOAA data daily, both to display the predicted tide levels for a given station and datum, and the daily high and low tides. To gather the information, the device accesses the NOAA data through web services provided to the public. You can configure the

display to cycle through up to three stations and utilize two display types, detailed, and large numbers.

The display comes in several sizes: 2.8, 5 and 7 inches (diagonal). There are a couple of differences between the displays besides the different sizes:

| Functionality	2.8 inch	5 and 7 inch
Resolution	480 by 320 pixels	800 by 600 pixels
Touch	No	Yes
Backlight	Dimmable	On or Off

See the different settings for the display sizes below.
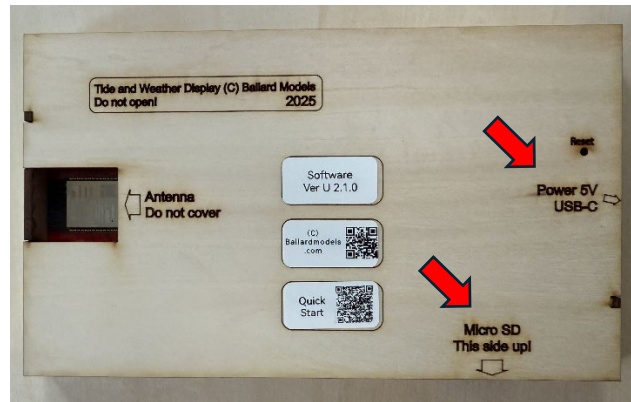
Quick Setup

To get your device to work in your home or business, you first must connect it to your Wifi network.

IMPORTANT: Your WiFi network needs to run on the 2.4GHz frequency band. If you have a 5GHz router, please enable the 2.4GHz band. The device will <u>not</u> be able to connect to the 5GHz band. You can set the `ShowWifiNetworksOnBoot` parameter to "1" (see below) to see if your WiFi network is displayed in the list on boot. If the device can see the network, it is able to connect to it.

The device comes with a MicroSD card that is already installed. The card contains a file that stores the WiFi login information: Config.cfg. The card is a Micro SD card and you can plug it into your computer using the appropriate slot or a Micro USB card reader that can plug into your computer. You can buy them everywhere. You can find the Micro SD card here (the picture shows the card removed from the slot):
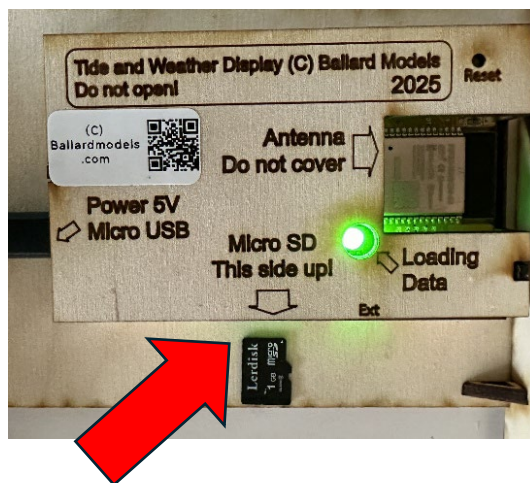
IMPORTANT: Images shown are for the 2.8 inch version of the display. The 7 inch and 5 inch display backside looks like this (note the different locations for the SD Card and Power):

You can remove the card by pushing on it, it is loaded with a little spring and will push out a little. To remove it completely you can use tweezers or a little screwdriver to pull it out. Insert it into your SD card reader on your computer. On the card, you will find the Config.cfg file. Open it with a text editor like Notepad on Windows. You will see two setting in the file that pertain to the WiFi network, SSID and WiFiPassowrd. In the quotes, replace the current setting with the name of your WiFi network (SSID) and the password. Make sure the settings are enclosed in quotes:
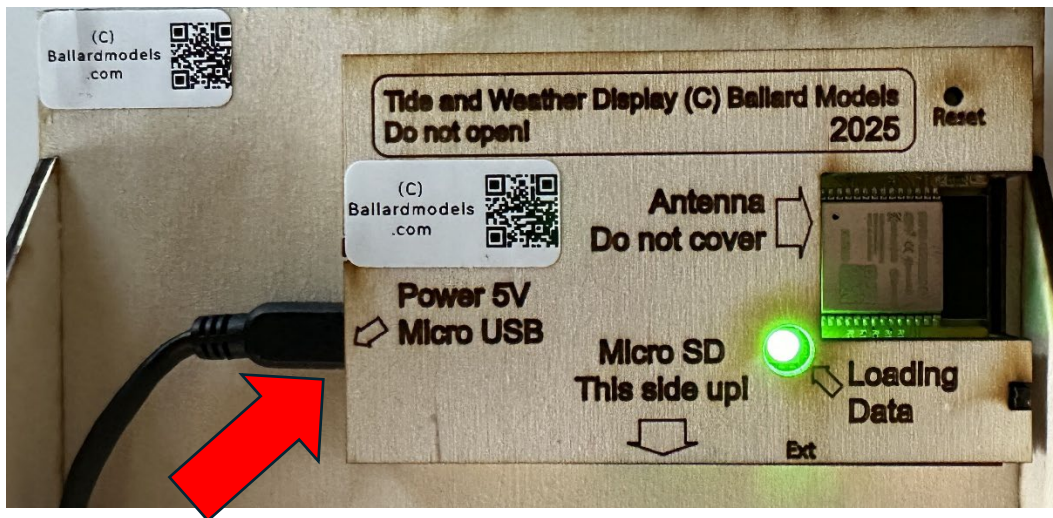
```
SSID="YourNetworkName"

WiFiPassword="YourPassword"
```

Save the file back to the card and reinsert it, label side up, into the device in the slot seen here:

Push the card in until you hear a slight 'click' sound.

Now power on the device by connecting it to a Micro USB power supply (5 Volts) here:

Set up the Tide and Weather Display

The display is using WiFi to connect to web services to retrieve the data it needs. In order to be able to connect the display you have to first specify the Network ID (SSID) of the wireless network and the password used to access the network. **The network needs to operate at 2.4GHz.**
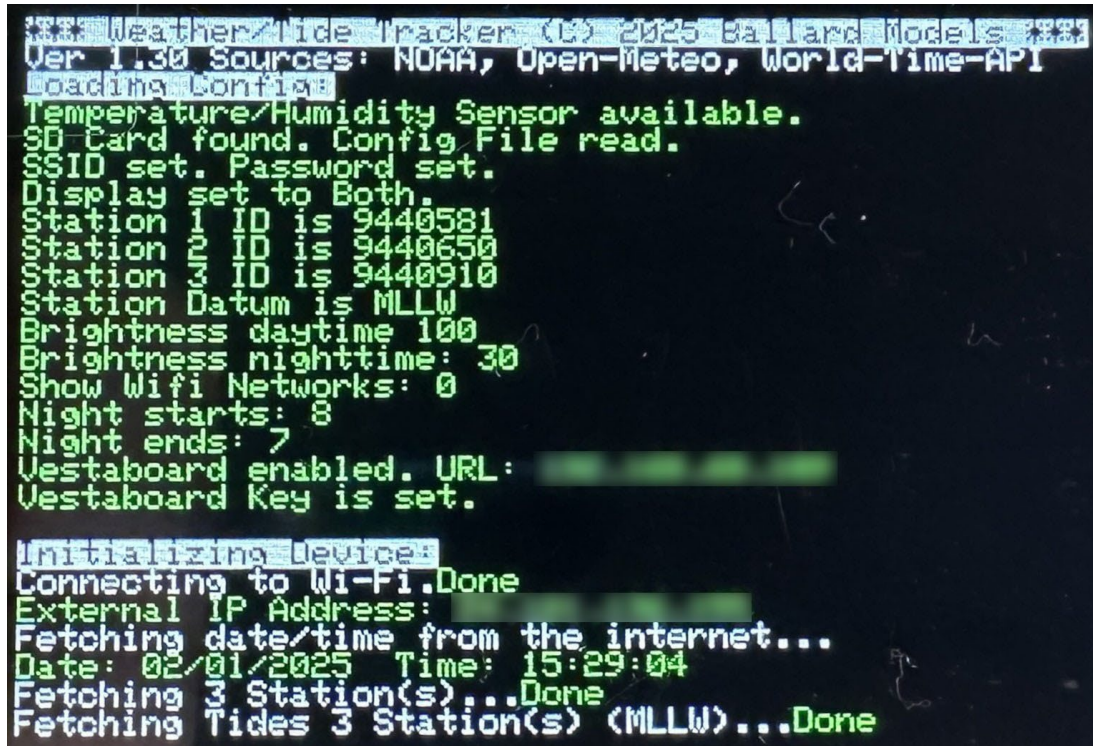
Locate the housing of the display on the backside of your device or map. On the bottom of the housing you will find a slot for the Micro SD card (supplied). Use your finger or a small screwdriver to push on the card to release it. The card is loaded with a little spring and should push itself out a little after you hear a click. Remove the card and place it in a card reader (not supplied) on your laptop or desktop computer. Once you mount the card you will find a file called "config.cfg" on the card. Open the file with a text editor like Notepad. The file will look like this:

```
SSID="YourNetworkName"
WiFiPassword="YourPassword"
DisplayFormat="Both"
StationID_1="9440581"
StationID_2="9440650"
StationID_3="9440910"
StationDatum="MSL"
Brightness="100"
BrightnessNight="30"
ShowWifiNetworksOnBoot="0"
NightStartHour="8"
NightEndHour="7"
ShowAlerts="1"
AlertsDiplaySeconds="30"
TouchEnabled="1"
```

Enter the network name of the network you would like to connect to after SSID, making sure it is in double quotes (" "). Do the same for the password. Save the file back on the Micro SD card and re-insert the Micro SD card into the display, the side with the labels should face up. Push the card in until you hear a click. Your display is now ready to connect and can be plugged into the Micro USB 5V power supply. For more details, see the configuration section below.

Startup screen

When the display is turned on, the boot sequence will show you valuable information. When completed, the screen looks like this:

The first section refers to loading the configuration from the config.cfg file stored on the Micro SD card. This will allow you to verify the settings you have stored on the card. If there are any issues with the file, there might be warnings in orange or errors in red. In case of errors, you will need to fix those in the config file before the device functions. In order to function properly, you will need a valid SSID for your WiFi network with the corresponding valid password. You will also need at least one valid Station ID and Datum. If you have a Vestaboard, you can enable the device integration, and the parameters will be displayed as well (see below).

After the config file is read and valid, the device will initialize. It will first connect to WiFi and then fetch information from the internet that will be used to display the tide and weather information. It will use public APIs (Application Programming Interfaces) provided by NOAA[1], Open-Meteo[2], External IP Address service, and the World-Time-API.

---

[1] The NOAA Tides API, provided by the National Oceanic and Atmospheric Administration (NOAA), offers a comprehensive suite of web services for retrieving tidal and current data. This API allows users to access real-time and historical data from various CO-OPS (Center for Operational Oceanographic Products and Services) stations. The data includes water levels, tide predictions, meteorological observations, and more. The API is designed to support both manual and automated data retrieval, making it a valuable resource for researchers, developers, and anyone interested in oceanographic data

[2] Open-Meteo is a free, open-source weather API that provides accurate weather forecasts for any location worldwide. It partners with national weather services to deliver high-resolution data, ranging from 1 to 11 kilometers. The weather data is retrieved by using the location of the device through the IP address that is assigned by the router.

Tide Data Displays

After a short delay, the display will show the tide information. Based on the display setting, it will show the Detail or Large view.

The detail view shows a 24 hour tide graph from midnight to midnight of the current day, as well as other detailed information. The numbers may be hard to read from a distance.
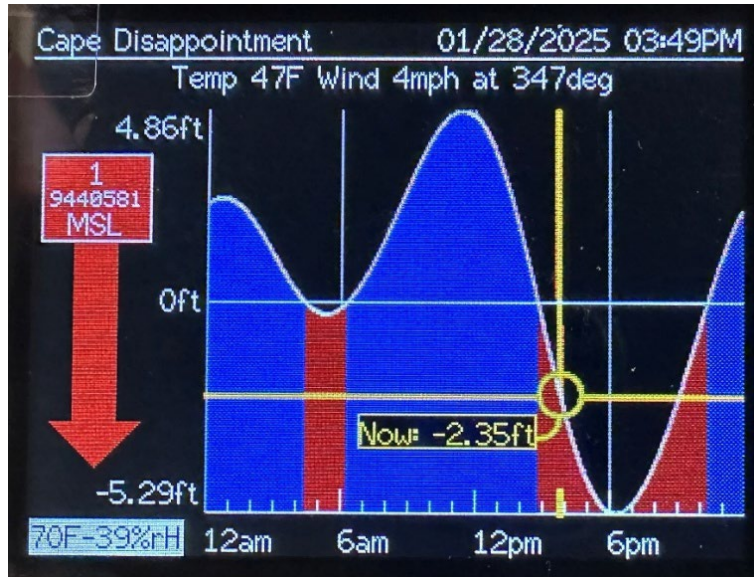
The Large view shows the high and low tides for the day with the respective times as well as the current tide level. All numbers are relative to the datum that is displayed above the current tide level. High tides are displayed in blue, low tides in maroon.
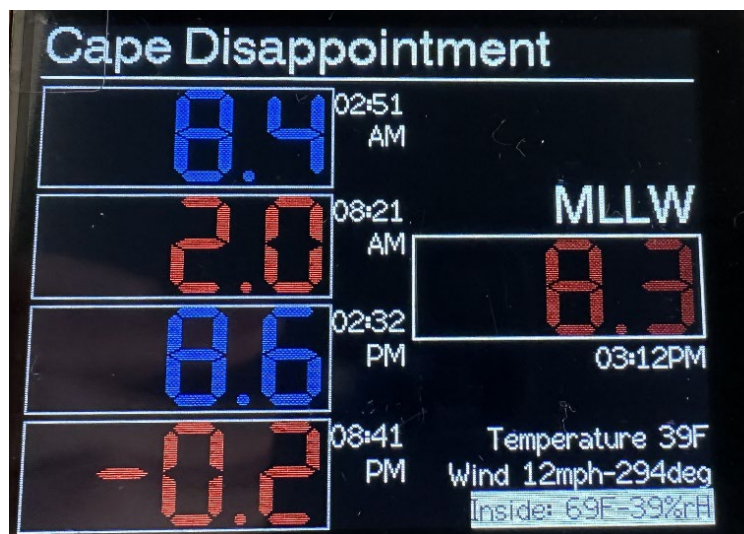
If a day has only three tide extremes[3] (two lows and one high, or two highs and one low), only three tides will be displayed:

[3] The number of tides in a day can vary depending on how close one of the tides is to midnight. Typically, coastal areas experience two high tides and two low tides each day, known as semi-diurnal tides. However, when one of these tides occurs close to midnight, it can create the appearance of having only three tides in a single calendar day. This happens because the tidal cycle spans approximately 24 hour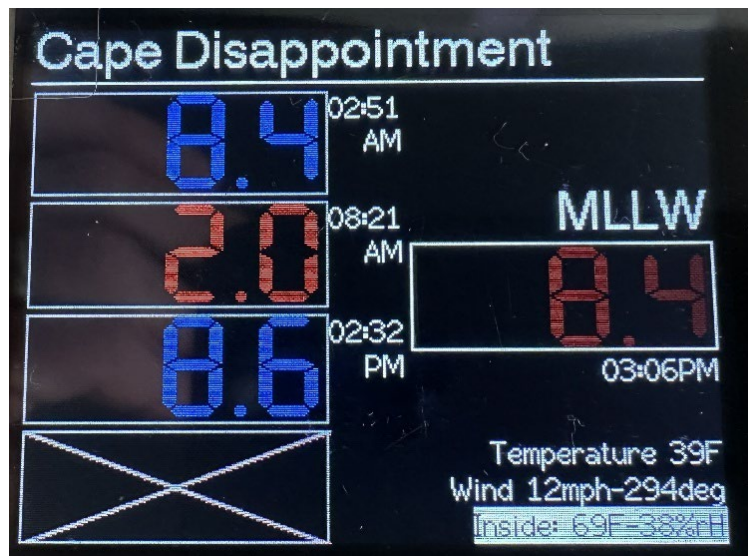s and 50 minutes, meaning that the timing of high and low tides shifts slightly each day. As a result, a high tide that occurs just before midnight may be followed by another high tide shortly after midnight, effectively splitting the tidal events across two different days.

Additionally, the shape of the coastline, the depth of the water, and local weather conditions can also influence the timing and height of tides. For example, strong winds or atmospheric pressure changes can amplify or diminish tidal extremes, leading to variations in the number of noticeable tides each day. These factors create a complex and dynamic tidal system that can vary significantly from one location to another, resulting in the observed differences in the number of tide extremes each day. Understanding these nuances helps explain why some days may have four distinct tides, while others appear to have only three.

Display Information

Detail

Current Station
Conditions
24hr Max Tide

Current Station
Name

Device
Date/Time

Current Station
Weather Alerts

Current Station
Index Number
ID
Datum
Tide Direction
24hr Min Tide

Current Station
24hr Tide Profile

Current Station
Current Level

Device
Temperature and Humidity (optional)
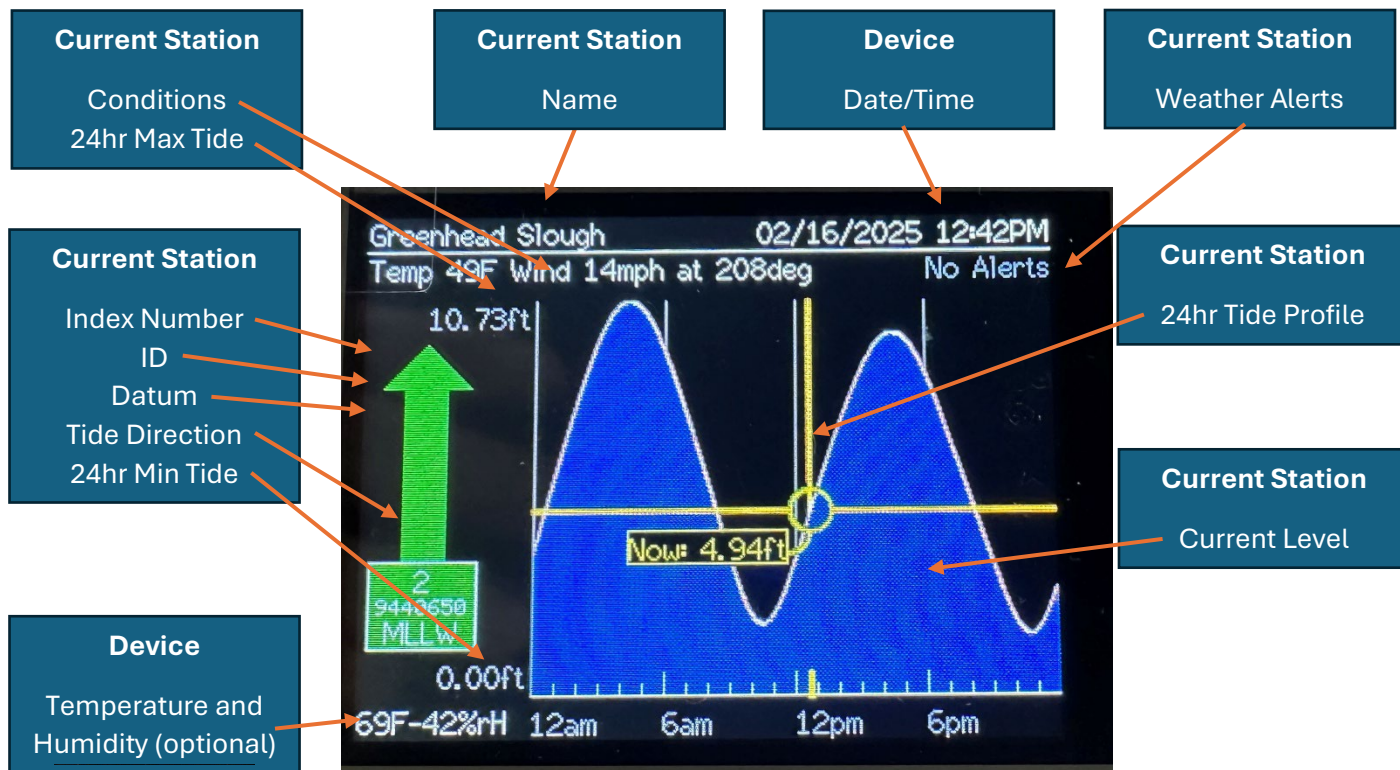
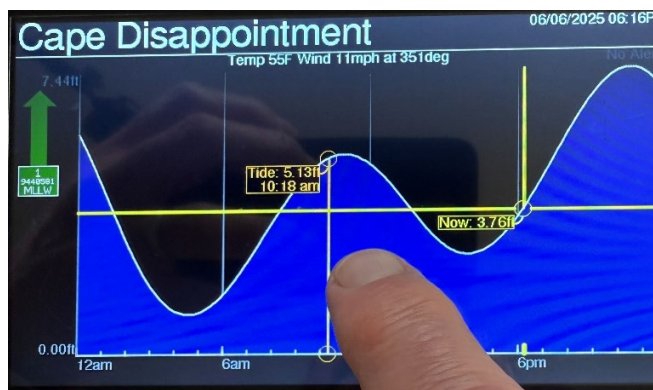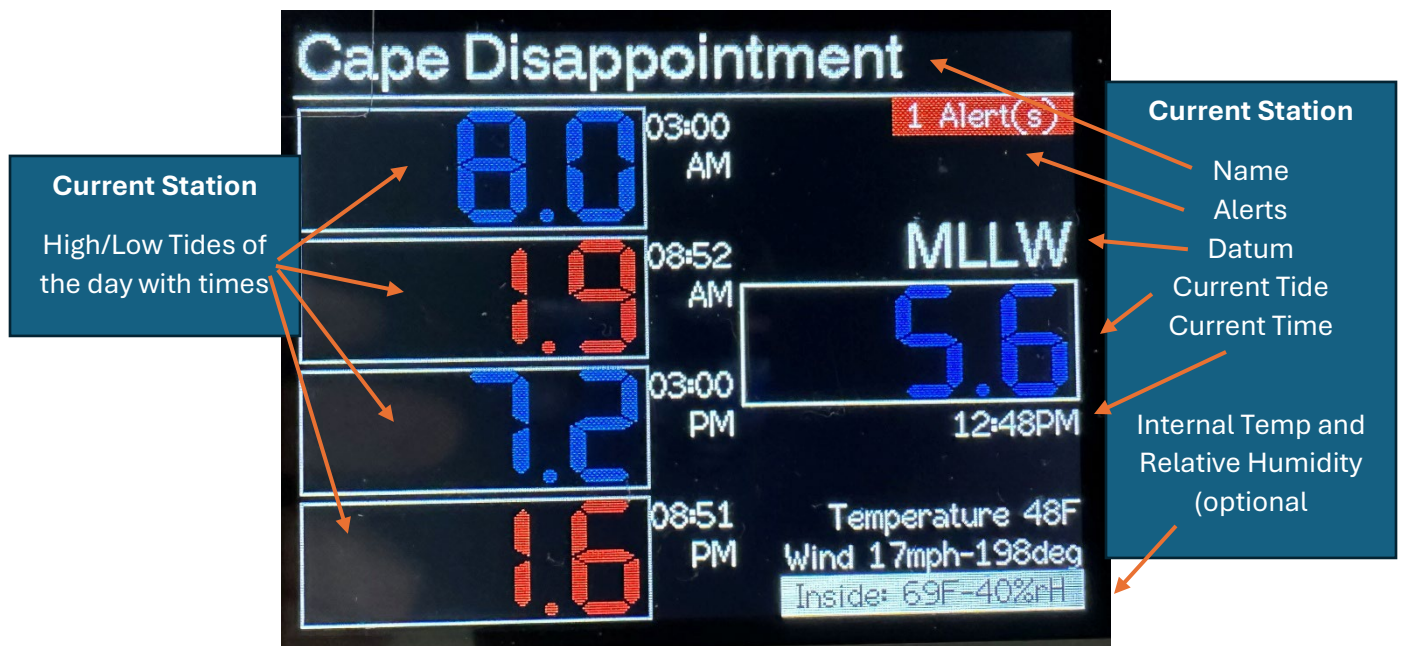The data displayed is relative to the set Datum. See
`https://tidesandcurrents.noaa.gov/datum_options.html` for a description of tidal datums.

7 OR 5 INCH DISPLAY: When touch is enabled (see settings below), you can touch the display graph to display the tide for a particular time of day. You can touch multiple times to display several data points. The points will be erased when the display cycles the next time.

Large

Current Station

High/Low Tides of the day with times

Current Station

Name
Alerts
Datum
Current Tide
Current Time

Internal Temp and Relative Humidity (optional
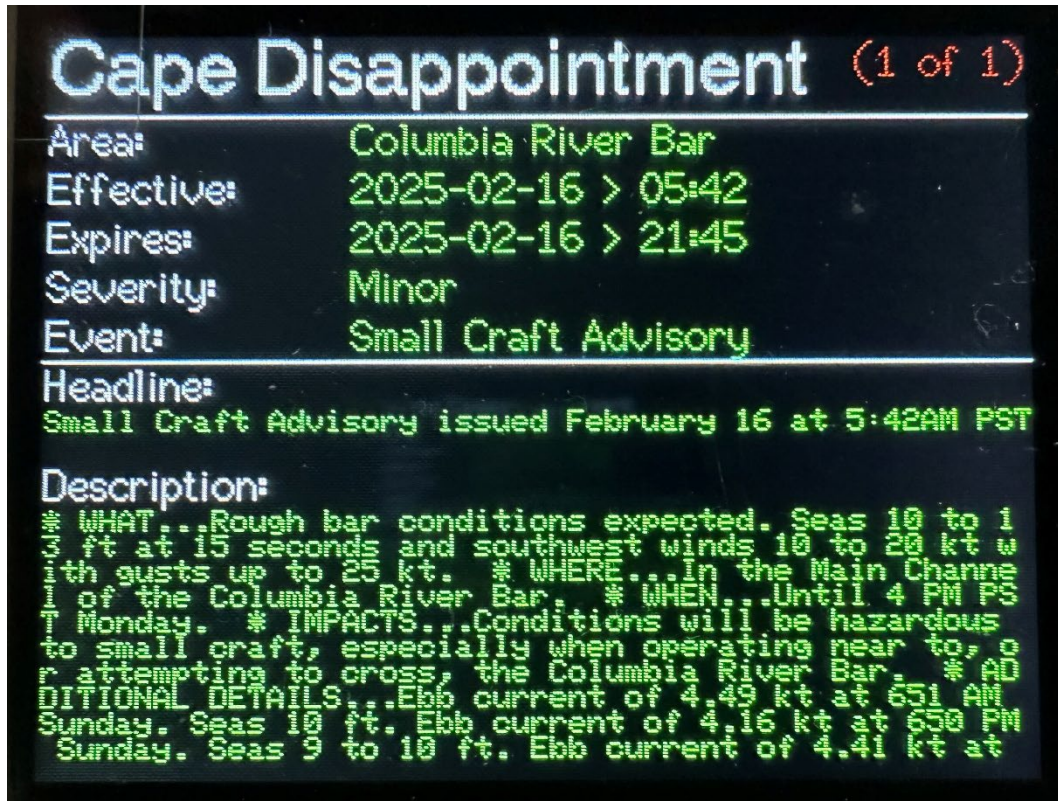
Weather Alerts

The National Weather Service (NWS) provides vital weather alerts for various locations across the United States, ensuring that communities are well-informed about potential weather hazards. These alerts are crucial for public safety, as they warn residents about severe weather conditions such as thunderstorms, tornadoes, hurricanes, blizzards, and floods. The NWS utilizes advanced meteorological tools and technologies to monitor weather patterns and predict these events with a high degree of accuracy. When a severe weather condition is anticipated, the NWS promptly issues alerts to the affected areas, enabling residents to take necessary precautions to safeguard their lives and property.

Weather alerts from the NWS are disseminated through multiple channels, including television, radio, internet, and mobile devices, ensuring that the information reaches a broad audience. In addition to general alerts, the NWS provides location-specific warnings tailored to the unique weather patterns and risks of different regions. For instance, coastal areas may receive hurricane and storm surge warnings, while inland areas might be alerted to potential tornadoes or flash floods. These alerts often include detailed information about the expected timing, intensity, and duration of the weather event, as well as recommended actions to minimize the impact on individuals and communities. The accuracy and timeliness of the NWS weather alerts are critical in helping local authorities and emergency responders coordinate their efforts to protect the community. By providing reliable and actionable information, the NWS plays a pivotal role in mitigating the effects of severe weather and enhancing public safety and preparedness.

For a specific location, the NWS continuously updates its alerts based on real-time data and changing weather conditions. The display provides a subscription to the NWS weather alerts and

the alerts are based on the location of the tide station(s) selected. The display shows the number of current alerts in the detail and large displays and will display the alerts when it cycles to display the data for a given station for the duration specified in the settings file (see below).

The alerts look like this:

Like all the other information provided by the display, it is only provided with entertainment and reference. It should not be relied upon to make any decisions in real life. The official source for all weather-related alerts is the NWS website. For Washington State, the address is: Active Alerts. Also note that the alerts are not displayed on your location, but rather on the geolocation of the station(s) you have selected.

Configure the display

The display can be configured using the Config.cfg file on the Micro SD card in the device. All settings need to be enclosed in double quotes "".

```
SSID=""
```

The name of the WiFi network you would like the display to connect to.

```
WiFiPassword=""
```

The password for the WiFi network.

```
DisplayFormat="Detail", "Large", or "Both"
```

This setting determines the display types to be used. When set to "Detail", the display will display the tides in the graph format, cycling through the stations (see below). The "Large" setting will cycle through the stations displaying large numbers of the low, high and current tides. When set to "Both", the display cycles through the detail view first, then the large view, then the next station etc. The cycles take six minutes each.

```
StationID_1="9440581"
StationID_2="9440650"
StationID_3="9440910"
```

You can configure up to three stations to be displayed, leaving station two and/or three empty ("") will ignore the setting and only show configured stations.

A NOAA tide station is a coastal monitoring site operated by the National Oceanic and Atmospheric Administration (NOAA) to measure and record tidal data. These stations are equipped with advanced sensors and instruments that continuously monitor water levels, providing real-time data on tides, currents, and other oceanographic conditions. The information collected by NOAA tide stations is essential for navigation, coastal management, and scientific research. It helps mariners safely navigate coastal waters, supports the development of accurate tide predictions, and contributes to our understanding of sea level changes and coastal dynamics. The ID for the NOAA Predictions data used to display the tides for the day. The IDs can be found here: Tide Predictions – NOAA Tides & Currents

Name	Id	Lat	Lon	Predictions
Columbia River				
Cape Disappointment	9440581	46.281	-124.046	**Harmonic**
Hammond, Oregon	9439011	46.2017	-123.945	**Harmonic**
Cathcart Landing, Youngs River	9438772	46.1243	-123.804	**Harmonic**
ASTORIA (Tongue Point), Oreg.	9439040	46.2073	-123.768	**Harmonic**
Skamokawa	9440569	46.2703	-123.457	**Harmonic**
Wauna	9439099	46.16	-123.405	**Harmonic**
Cape Horn	9440482	46.1517	-123.29	**Harmonic**
Barlow Point	9440483	46.1522	-123.039	**Harmonic**

Longview	9440422	46.1061	-122.954	**Harmonic**
Temco Kalama Terminal	9440357	45.9867	-122.837	**Harmonic**
Saint Helens	9439201	45.865	-122.797	**Harmonic**
Knapp Landing, Willow Bar	9440171	45.7417	-122.755	**Harmonic**
Rocky Point	9439189	45.6967	-122.868	**Harmonic**
Portland Morrison Street Bridge	9439221	45.51	-122.673	**Harmonic**
Vancouver	9440083	45.6312	-122.696	**Harmonic**
Washougal	9440047	45.5783	-122.382	**Harmonic**
Beacon Rock State Park	9440079	45.6203	-122.02	**Harmonic**
Willapa Bay				
Greenhead Slough	9440650	46.3722	-123.95	**Harmonic**
Toke Point	9440910	46.7075	-123.967	**Harmonic**
South Bend, Willapa River	9440875	46.6633	-123.798	**Harmonic**
Grays Harbor				
Westport, Point Chehalis	9441102	46.9043	-124.105	**Harmonic**
ABERDEEN	9441187	46.9683	-123.853	**Harmonic**
La Push, Quillayute River	9442396	47.9128	-124.636	**Harmonic**
Tskawahyah Island, Cape Alava	9442705	48.1711	-124.737	**Harmonic**

Only stations of the Predictions Type "Harmonic" can be used. You can set the station ID to any harmonic station in the United States.

The ID is used to display the name of the station as the latitude and longitude for the weather data. All information on the display is related to this ID, except for the date and time, which are based on the IP address of the device.

StationsDatum="MLLW"

This setting is very important. It will set the Datum[4] that will be used to display the tidal data. I like MLLW, as it shows the tides in an 'absolute' fashion in relation to the beach, not just the tides relative to themselves. MLLW basically will tell you how much beach there will be there when you head out.

---

[4] NOAA (National Oceanic and Atmospheric Administration) maintains several tidal datums, which are standard elevations defined by specific phases of the tide. These datums are used as references to measure local water levels and are crucial for various applications, including navigation, coastal management, and engineering. Some of the key tidal datums include Mean Higher High Water (MHHW), which is the average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch, and Mean High Water (MHW), which is the average of all the high water heights observed over the same period. Mean Tide Level (MTL) is the arithmetic mean of mean high water and mean low water, while Mean Sea Level (MSL) is the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch2.
Other important datums include Mean Low Water (MLW), which is the average of all the low water heights observed over the National Tidal Datum Epoch, and Mean Lower Low Water (MLLW), which is the average of the lower low water height of each tidal day observed over the same period. The Highest Astronomical Tide (HAT) is the elevation of the highest predicted astronomical tide expected to occur at a specific tide station over a 40-year period, while the Lowest Astronomical Tide (LAT) is the elevation of the lowest predicted astronomical tide expected to occur over the same period. These datums provide a standardized reference for understanding and predicting tidal behavior, ensuring consistency and accuracy in various coastal and marine applications.

```
Brightness="100"
```

2.8 INCH DISPLAY: This setting determines the brightness of the display during daytime hours (see below). The number needs to be between 1 and 100.
7 OR 5 INCH DISPLAY: This setting is ignored as these displays can only be turned on or off.

```
BrightnessNight="30"
```

2.8 INCH DISPLAY: This setting determines the brightness of the display during night time hours (see below). The number needs to be between 1 and 100. If you do not wish the display to ever dim and stay at the same brightness, make the two numbers equal.
7 OR 5 INCH DISPLAY: If this setting is anything but '100', the display will turn off at night hours. The device is still running during that time.

```
ShowWifiNetworksOnBoot="0"
```

If you set this to "1", the display will show all WiFi networks at boot time. This can help identify issues with connectivity. After displaying the networks, the boot process will continue after 15 seconds.

```
NightStartHour="8"
```

Start time of the night brightness to start. "8" means 8pm.

```
NightEndHour="7"
```

End time for the night brightness. "7' means 7am.

```
ShowAlerts="1"
```

This setting controls whether the device will display weather alerts provided by the National Weather Service. When set to "1', alerts will be displayed based on the location of the station selected to provide tide information, "0" will turn off alerts.

```
AlertsDiplaySeconds="30"
```

The time in seconds the weather alerts are displayed. The number needs to be between 10 and 60 seconds and will default to 30.

```
 TouchEnabled="1"
```

2.8 INCH DISPLAY: This setting is ignored.
7 OR 5 INCH DISPLAY: Set this to turn touch functionality to on ("1") or off ("0"). Default is touch enabled.

Refresh

The display refreshes every six minutes and shows the new date and time, current tide level and weather information. The data provided by NOAA is in six-minute intervals, so the refresh rate is aligned with the available data.

2.8 Inch Display: Data LED

The data LED in the back of the display shows when data is retrieved from the internet. It shows green when the display is downloading tide and related metadata and blue when the weather data is loaded. The LED will be on when the display first starts up and then every six minutes when it refreshes as well as at midnight when it loads the data for the next day.