

Wind Zero ©

Introduction

The Wind Zero is a tool for monitoring and analyzing wind speed and direction from several locations up to a mile away. It utilizes highly accurate ultrasonic wind meters for capturing the raw wind data combined with LORA radio transmitters for long distance data transfer to a LORA receiver for data collection. The receiver is connected by Bluetooth to a Wind Zero app on a tablet or phone for wind data display and analysis. Up to 4 hours of data can be saved and exported to a .CSV file for use in Excel or other tools.

Operation

The Wind Analyzer has 3 components

- Ultrasonic Wind Meter/Transmitter (up to three)
- Receiver
- Wind Zero App

Wind Meter

The wind meter consists of an ultrasonic wind meter mounted on a carbon fiber tube with a ¼"x20 mounting lug on the bottom for attaching to a tripod or pole. It must be oriented so the meter points in the correct direction i.e. at the target. The meter has an on/off button on the side and a green LED indicator that lights up when powered on and blinks when wind data is transmitted. It also has a USB-C port for charging the meter. Data (wind speed and direction) is transmitted once a second.



Receiver

The receiver is a small box that receives the data from the wind meters and sends it to the Wind Zero App. The receiver has an on/off button on the top and a green LED indicator that lights up when powered on and blinks when wind data is received. It also has a Blue LED that lights up when connected to a tablet/phone by Bluetooth and a USB-C port for charging the meter. There is a Red LED array indicating the charge level above the USB port. Each receiver has a unique name that the app uses to connect to and is on the back of the receiver. This allows multiple receivers to collect data from the wind meters.



Wind Zero App

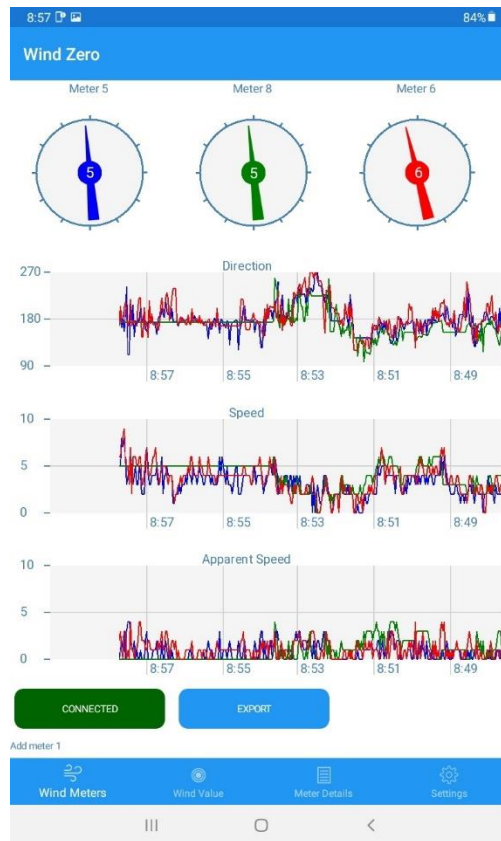
The Wind Zero App runs on an Android tablet/phone (IPad in the future) and displays data from up to three wind meters simultaneously. There are four separate pages in the app accessed using the tab bar on the bottom of the display.

Wind Meters Page

Instantaneous wind meter data is displayed at the top in a row of circular indicators. The needle indicates wind direction with the wind speed in the center. Past data is displayed in three trend charts:

1. Wind Direction in degrees
2. Wind Speed in MPH
3. Apparent Wind Speed in MPH (speed * cosine of direction)

Each chart has a trace for each meter displayed in the same color as the meter.

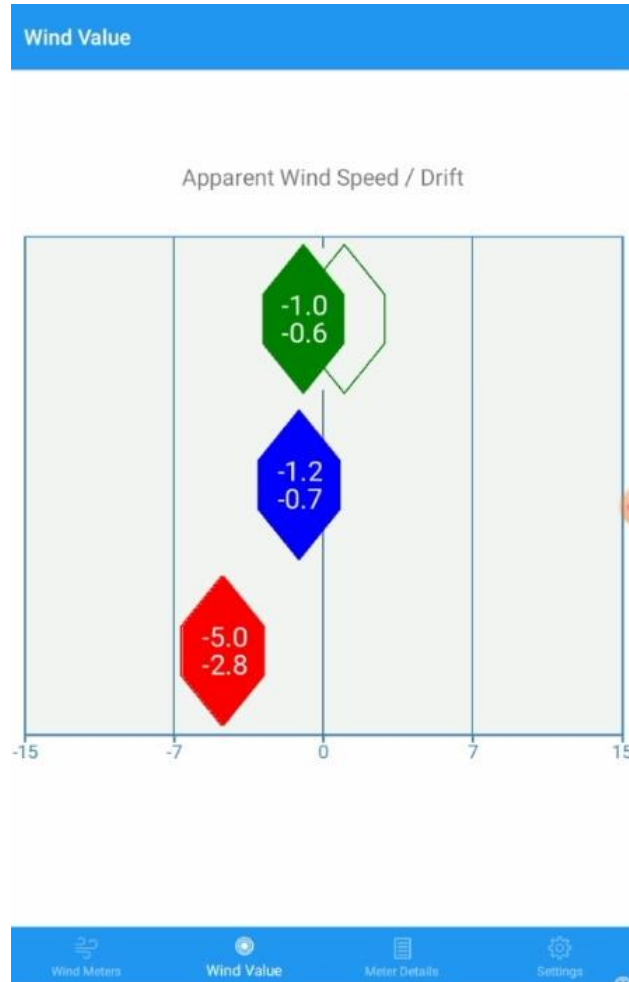


There are two buttons at the bottom of the display, Connect and Export.

1. The "Connect" button connects to the receiver specified by the Receiver ID on the "Settings" page. The "Connect" button will turn green and display "Connected" when a connection is established.
2. The "Export" button transfers all the recorded data to a comma separated value file in the Downloads folder on the device. The file is named WM History.txt

Wind Value Page

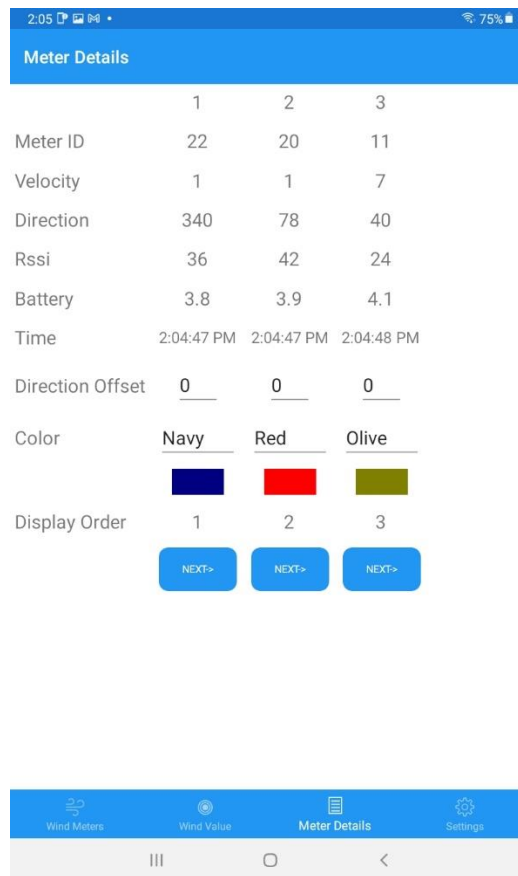
The apparent wind speed for each meter is displayed along with the corresponding wind drift value. The drift value is calculated using the apparent wind speed and the wind drift value entered on the "Setting" page. A smoothed value for each meter is also displayed as an outline of the symbol for the meter. The smoothing factor is entered on the Settings page.



Meter Details Page

The detailed data for each meter is displayed including wind velocity (speed), direction, signal strength (RSSI), battery voltage, and update time. Meter colors, display order and direction offset may also be changed. Values that may be changed are:

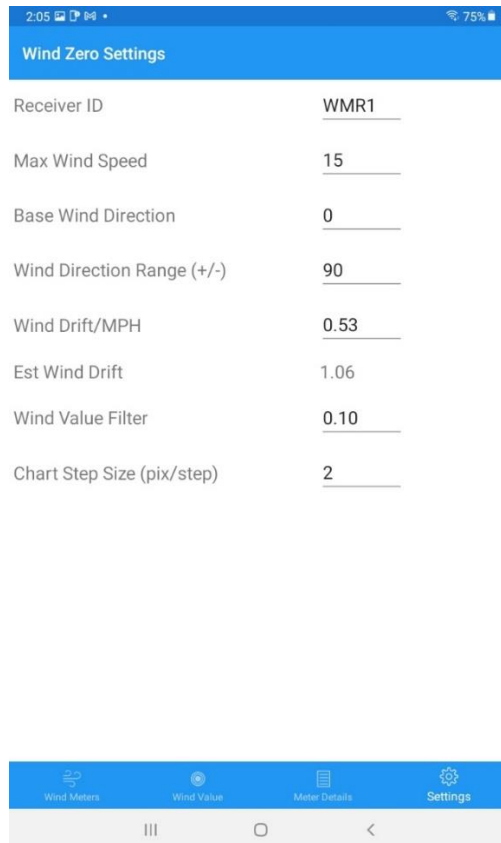
1. “Direction Offset” is a correction factor for a meter that is misaligned. This can happen when setting up the meter in the field. This number is added to the measured direction.
2. The “Color” of each meter can be changed by selecting the color name. A pop up menu will be displayed with a list of colors to choose from. The selected color will be displayed in the color box below the name.
3. The “Display Order” is used to adjust the sequence the meters are displayed on the Wind Meters and Wind Values page. Meters are added as they are received so this allows them to be arranged in the order they are located in the field. Select the “Next->” button to swap the values between columns. If only one meter is used this can be used to move the meter to the center of the display.



Settings Page

Application settings are maintained on this page.

1. "Receiver ID" is the name of the receiver the app connects to. This ID is located on the back of the receiver. This only needs to be set the first time the App is used or when connecting to a new receiver.
2. "Max Wind Speed" sets the max wind speed displayed on the wind speed charts.
3. "Base Wind Direction" sets the baseline on the wind direction chart. It should be set closest to the predominant wind direction. Selecting this value will pop up a list of directions (0, 90, 180, 270) to choose from.
4. "Wind Direction Range" will change the maximum and minimum values displayed on the wind direction chart. Selecting this value will pop up a list of ranges (+/- 45, 90, 135, 180) to choose from. If the wind direction is consistent use smaller numbers, if it is shifting constantly use larger numbers.
5. "Wind Drift/MPH" is used to calculate the estimated wind drift displayed on the Wind Values chart and the following number. This should be obtained from a ballistic app in whatever units you desire at the distance you are shooting.
6. "Estimated Wind Drift" is calculated by averaging all the measured apparent wind speeds and multiplying by the "Wind Drift/MPH".
7. "Wind Value Filter" (WVF) is used to smooth the Apparent wind speed (AWS) displayed on the Wind Values page. The formula is $(1.0 - \text{WVF}) * \text{Old AWS} + (\text{WVF} * \text{New AWS})$. For example if this value is set to .10 the AWS will be 90% of the old value added to 10% of the new value.
8. "Chart Step Size" controls the time scale on the charts. Selecting this value will pop up a list of values (1,2,3,4,5,10) to choose from. The smaller the number the more values plotted on each chart. Bigger numbers spread out the chart.



Operation

1. Install the app on a tablet or phone using the Wind Zero installation instructions.
2. Deploy the wind meters and turn them on making sure the indicator LED's are blinking green.
3. Turn on the receiver and make sure the indicator LED is blinking green.
4. Open the Wind Zero app on your tablet and go to the settings page and change the receiver ID to match the receiver name indicated on the back of the receiver. This only needs to be done once.
5. Go back to the Wind Meters page and select the "Connect" button. It will change to "Searching" and then "Connected" when a connection is achieved. The blue LED on the receiver will also turn on. At this point data should be displayed on the direction indicators and the trend charts.
6. Change the Base Wind Direction closest to the predominant wind direction.
7. Monitor the wind indicators and charts to value the wind effects on your shooting.
8. Compare measured wind values to flags and other indicators to learn how they are affected by the wind.
9. Export the data if desired