

Using the Gill Instruments WindSonic Opt 3 Wind Speed and Direction Sensor with the HOBO® RX3000 Station



This application note describes how to connect and operate the Gill WindSonic sensor (Opt 3 with analog outputs) with the HOBO RX3000 station. The sensor is compatible with any RX3000 configuration (cellular, Ethernet, or Wi-Fi) that is equipped with the optional four-channel analog input module (RXMOD-A1). We suggest using a 6-watt solar panel to ensure the battery maintains a charge properly.

Note: A connector housing and terminals are included with each sensor. However, you must purchase cable for connecting the sensor to the RX3000 station. Compatible cable:

- Gill 3-pair cable (026-02660)
- Belden (9730)

Additional mounting option (more information about mounting is included later in this document):

- Gill WindSonic Mounting Bracket (1771-PK-115)

Note: The default configuration of the Gill WindSonic Opt 3 sensor is compatible with the RX3000 station as depicted in these instructions. No changes to the as-received configuration are required.

Portions of the Gill WindSonic Technical Manual are used within this application note, but the full manual is available at <https://gillinstruments.com/compare-2-axis-anemometers/windsonic-2axis/>.

Important: Currently neither the RX3000 station nor HOBOLink® software have the ability to calculate vector averaging for wind direction. Vector averaging your wind direction data is very important in accurately measuring wind direction. If this Gill WindSonic sensor is deployed, you will need to calculate vector averaging in Microsoft® Excel® or another program using the raw wind direction data recorded by the logger. Information on how to do this is included in this document. (Onset's smart sensor-based wind direction sensors have vector averaging included in their smart sensor electronics).

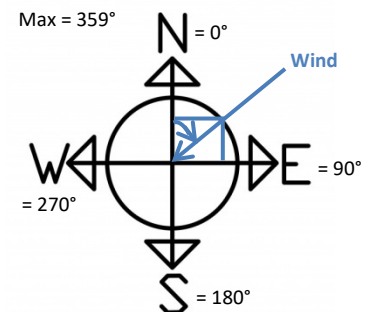
Why is vector averaging needed?

Wind direction is logged as the number of degrees from north, on a scale of 0 to 359. For example, wind from the northeast is logged as 45°. Straight (linear) averaging does not work for directions going from 359 to 0. For example, if you apply a linear average of direction readings of 354 and 2 degrees, you get an average of 178 degrees rather than the correct direction average of 358.

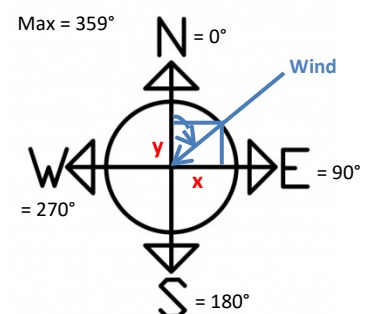
Follow these steps to calculate vector averaging in Excel:

1. Calculate sines: $\text{SIN}(\text{RADIANS}(\text{angle}))$
2. Calculate cosines: $\text{COS}(\text{RADIANS}(\text{angle}))$
3. Calculate x and y components as averages over desired range of readings:
 $x = \text{AVERAGE}(\text{sines})$
 $y = \text{AVERAGE}(\text{cosines})$
4. Convert the x & y components to degrees:
 $\text{MOD}(\text{DEGREES}(\text{ATAN2}(y,x)),360)$
ATAN2 is arctangent with two arguments
MOD is used to ensure angle is 0–359

Note: You can find a helpful spreadsheet calculator on the resources page (<https://www.onsetcomp.com/resources/tech-notes/wind-data-averaging>). It includes the calculations described above. This spreadsheet also helps you to process the wind data into the desired output logging interval. For



Wind Direction Logging



Vector Averaging

example, if you want data at 15-minute intervals, set up the module to log at 1-minute intervals and then use the spreadsheet to process 15-minute data for average wind speed, maximum wind gust, and average wind direction.

WindSonic™

Wind Speed & Direction Sensor

GILL

Key Features

- Wind Speed & Direction Sensor
- 0-60m/s (116 knots) Wind Speed
- 0-359° Wind Direction
- NMEA output
- Low Power consumption
- Fast start-up
- Solid-state – maintenance-free
- Corrosion Free

The Gill WindSonic is a low-cost anemometer, which utilises Gill's proven ultrasonic technology to provide wind speed and direction data via one serial or two analogue outputs. To confirm correct operation, outputs are transmitted together with an instrument status code.

With a robust, corrosion-free polycarbonate housing, this small, lightweight wind sensor is recommended for use in harsh environmental conditions and is particularly suited to marine & offshore (ships, data buoys) and land based installations. The WindSonic has no moving parts, offering maintenance-free operation in a wide range of applications.



WIND SPEED

Range	0 - 60 m/s (116 knots)
Accuracy	±2% @12 m/s
Resolution	0.01 m/s (0.02 knots)
Response Time	0.25 seconds
Threshold	0.01 m/s

DIRECTION

Range	0 - 359° (No dead band)
Accuracy	±2° @12 m/s
Resolution	1°
Response Time	0.25 seconds

MEASUREMENT

Ultrasonic Output Rate	0.25, 0.5, 1, 2 or 4 Hz
Parameters	Wind Speed & Direction or U and V (vectors)
Units of Measure	m/s, knots, mph, kph, ft/min

OUTPUTS

Option 1	RS232
Option 2	RS232 + RS422 + RS485 + NMEA*
Option 3	RS232 + RS422 + RS485 + NMEA* 0-5V or, 0-20mA or 4-20mA
Option 4	SDI-12 (refer to manual or separate datasheet for technical specification)
Baud Rate	2400 to 38400
Anemometer Status	Supplied as part of standard message

* NMEA 0183

** Download software free from www.gill.co.uk

POWER REQUIREMENT

Anemometer	5-30VDC Option 1 & 2
	7-30VDC Option 3
	9-30VDC Option 4
Current Drain	Dependent on option selected e.g. < 2mA @ 12V (SDI-12) to 44mA @ 1.2V (4-20mA) Refer to manual for further advice
	Start up time < 5 seconds

MECHANICAL

External Construction	LURAN S KR 2861/1C ASA/PC
Size	142mm x 160mm
Weight	0.5kg

ENVIRONMENTAL

Protection Class	IP66
Operating Temperature	-35°C to +70°C
Storage Temperature	-40°C to +80°C
Operating Humidity	< 9% to 100% RH
EMC	EN 61326:1998

OPERATIONAL

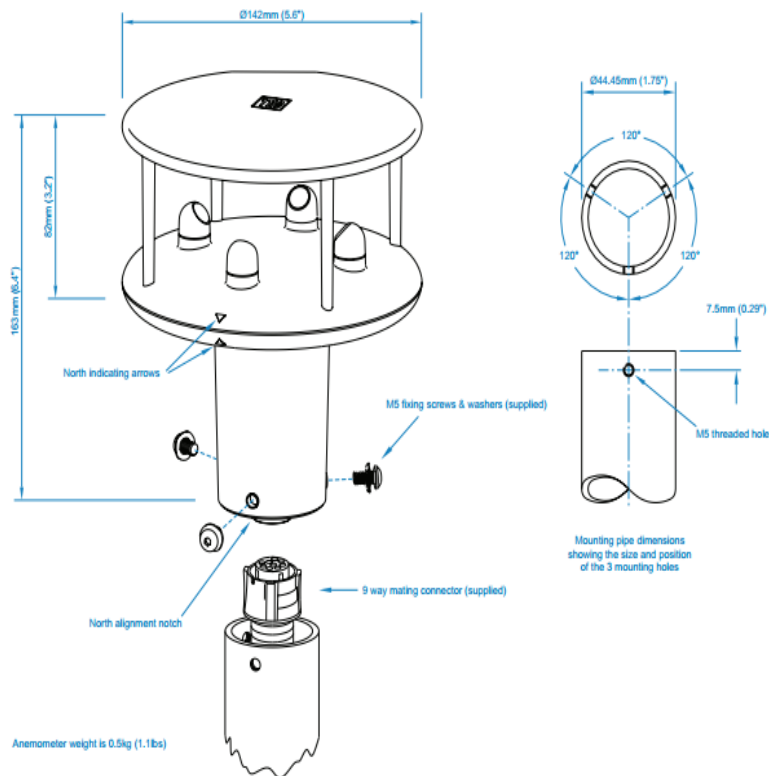
MTBF	15 years
Warranty	2 years
Factory Calibration	Traceable to National Standards

ACCESSORIES

Pipe Mounting	44.45mm (1.75 in) diameter
Wind Software	Display / Logging**
Cables	Available to match output options
Display	See Gill Display datasheet

Typical Applications

- Remote weather monitoring stations
- Building controls
- Data buoys
- Marine vessels
- Small airports & helipads
- Road & rail tunnels
- Environmental field sites
- Ports & harbours
- Mobile weather monitoring vehicles
- Coastal weather monitoring stations



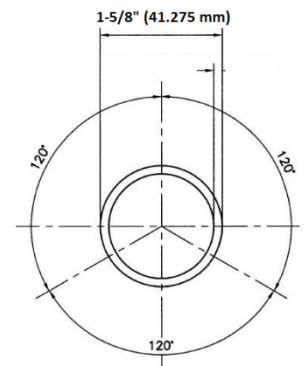
Specifications may be subject to change without prior notice.

Mounting

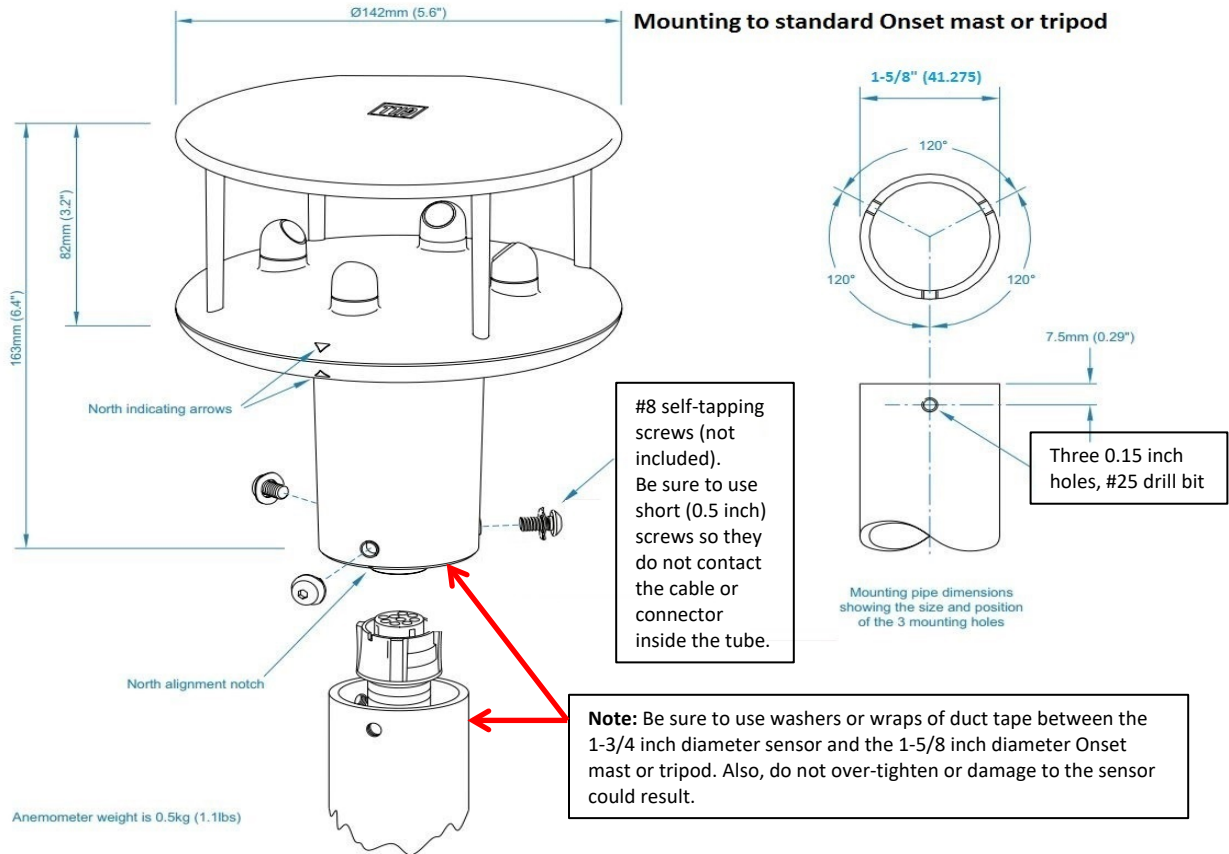
The WindSonic sensor is designed to be mounted on a 1-3/4 inch (44.45 mm) tube or Gill mounting bracket. You can purchase this bracket from Gill; it will fit on any standard Onset 1-5/8 inch (41.275 mm) tripod or bracket.



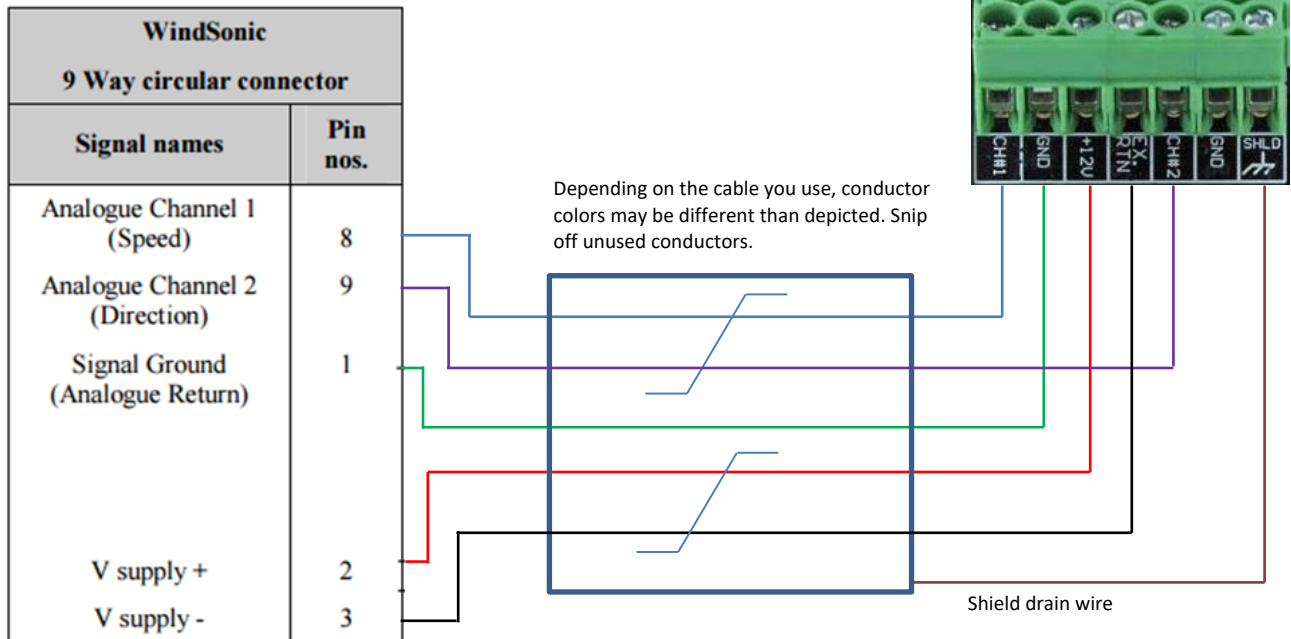
Gill WindSonic Mounting Bracket (1771-PK-115)



If you plan on mounting the sensor to a standard Onset tripod or mast, drill three mounting holes in the top of the mast or tripod (see the following drawing for more detail). Note that when using an Onset mast or tripod, the sensor cable must pass completely through the tripod or mast to be properly connected to the RX3000 station.



Wiring to the RX3000 Station Analog Module (RXMOD-A1)



The full Gill manual that includes the Gill wiring diagrams is here:

<https://gillinstruments.com/compare-2-axis-anemometers/windsonic-2axis/>

Configuring the Analog Module with HOBOLink

1. In HOBOLink, select Devices then click the wrench icon on your station's tile.
2. Select Analog Sensors Logging.
3. Set the Logging Interval and the Sampling Interval. We recommend that you use a 1 minute Logging Interval—the fastest interval—so that you get as many wind direction readings as possible for vector averaging later. You can use a product like Excel to process the data into the desired logging intervals.
4. Select Use Excitation Power and select Continuous.
5. Tap Save.

Note: This configuration was successfully used in a location with plentiful sun, a 6-watt solar panel and typical weather station sensors attached. These include:

- Temp/RH
- Rainfall
- Soil Moisture
- Solar Radiation
- Barometric Pressure

For applications using additional analog sensors or where sunlight is limited at the installation location, you may need to adjust these settings to conserve battery power. See [Monitoring and Conserving Power](#) for more details.

Also, this sampling configuration provides Maximum and Average values for both wind speed and direction based on 3-second samples. This means that along with the raw 1-minute data from each sensor there are additional Average and Maximum data columns based on 20 samples every minute. These average data values should be used only for the wind speed data! Do not use the average wind direction data directly from the RX3000 station; it is not valid because it does not include vector averaging. You can access data with a custom export configuration; see [Creating a Custom Export Data Query for Wind Speed and Direction Data](#) for details.

Important: Statistical sampling is applied globally to all analog channels within a single analog module on the RX3000 station, which in this case is both wind speed and wind direction. The recommended configuration described above produces the required data for both sensors: the Average and Maximum data for wind speed and the raw 1-minute logged data for wind direction that is used for vector averaging. If this configuration becomes a problem and the second analog module slot is open on your RX3000 station, consider purchasing a second analog module (RXMOD-A1) to accommodate the wind direction output for the WindSonic sensor. This would allow the wind speed and direction to be logged by independent modules.

Configuring the Wind Speed Channel with HOBOLink

Configure the Ultrasonic Wind Speed channel as follows.

1. Select Devices, then tap the wrench icon on your station's tile.
2. Select Analog Sensors Logging.
3. For your sensor, select Enable Channel.
4. Enter a Label, if you want to use one, such as Gill Windsonic.
5. Select RAW-V-5 from the Sensor/Input Type dropdown.
6. Select Enable Scaling.
7. Select a Scaled Measurement Type or add one.
8. Enter Scaled Units. Then enter Real Low and Scaled Low and Real High and Scaled High.
9. Tap Save when you are done.

Configuring the Wind Direction Channel with HOBOLink

Configure the Ultrasonic Wind Direction channel as shown below.

1. Select Devices, then tap the wrench icon on your station's tile.
2. Select Analog Sensors Logging.
3. For your sensor, select Enable Channel.
4. Enter a Label, if you want to use one, such as Gill Windsonic.
5. Select RAW-V-5 from the Sensor/Input Type dropdown.
6. Select Enable Scaling.
7. Select a Scaled Measurement Type or add one.
8. Enter Scaled Units. Then enter Real Low and Scaled Low and Real High and Scaled High.
9. Tap Save when you are done.

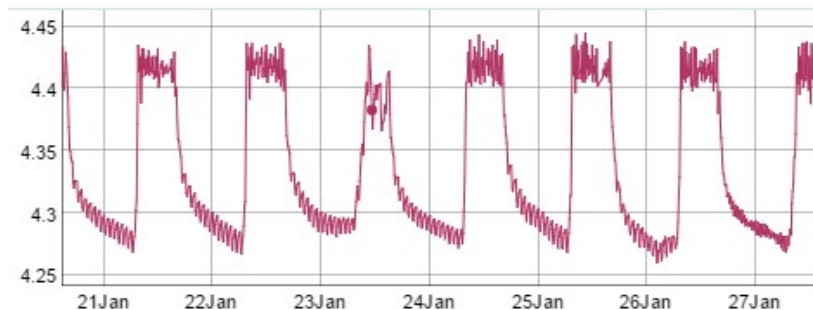
Checking Latest Conditions in HOBOLink

Select Devices and then select your station to check the current readings.

Monitoring and Conserving Power

If you deploy an RX3000 station that has the optional analog module configured to provide excitation to a sensor, follow these guidelines for monitoring and conserving power.

Monitor the recharging pattern of your battery as depicted in HOBOLink. This requires the graph to be enabled for the battery channel. (From your device page, select Module/Sensor Configuration. Select Battery and then select Enable Graph and click Save.) Below is an example of an RX3000 station that is efficiently recharging each day over a one-week period.



If your RX3000 does not appear to be recharging properly with this configuration, try the following (one at a time):

- Remove un-needed sensors.
- Decrease the connection interval for the station in Readout Configuration.
- Decrease the analog module sampling interval in Module Configuration.
- Use a sensor warm-up time for excitation power instead of continuous power. Note that the sensor needs at least a 10-second warm-up time to stabilize.

Setting up System Alarm Notifications in HOBOLink

You can configure HOBOLink to send a notice when there is a missed connection, a low battery, or a sensor failure. HOBOLink will send an alarm notification to your email address. To do this:

1. In HOBOLink, select Devices and then tap the wrench icon on the tile for your station.
2. Tap Alarms.
3. Tap to turn on System Alarms.
4. Under Actions, select Send an Email and enter your email address.

Creating a Custom Export for Wind Speed and Direction Data

You can set up a custom export that includes the wind speed and direction data. To do this, see the topic *Create an On-Demand Export* in the HOBOLink User Guide or the [HOBOLink Online Help](#).

Important: Do *not* include Average Wind Direction as this will not include vector averaging, which must be calculated in Excel.