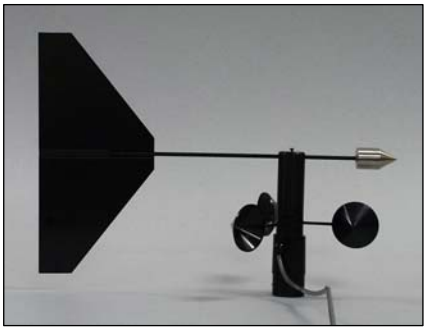
Wind Speed/Direction Smart Sensor (Part # S-WCA-M003)

The Wind Speed/Direction smart sensor is designed to work with the HOBO® Stations. The smart sensor has a plug-in modular connector that allows it to be added easily to a HOBO Station. All sensor parameters are stored inside the smart sensor, which automatically communicates configuration information to the logger without the need for any programming or extensive setup.



Inside this Package

- Wind Speed/Direction smart sensor
- Mounting Pole ½ inch (12.7 mm) diameter x 14 inch (356 mm) length

Specifications	Wind Speed/Gust	Wind Direction
Measurement Range	0 to 44 m/s (0 to 99 mph)	0 to 358 degrees, 2 degree dead band
Accuracy	± 0.5 m/s (± 1.1 mph) ± 3% 17 to 30 m/s (38 to 67 mph) ± 4% 30 to 44 m/s (67 to 99 mph)	± 5 degrees
Resolution	0.19 m/s (0.42 mph)	1.4 degrees
Starting Threshold	0.5 m/s (1.1 mph)	0.5 m/s (1.1 mph)
Damping Ratio	NA	0.4
Distance Constant	Approximately 3 m (9.8 ft)	0.8 m (2.6 ft)
Maximum Wind Speed Survival	In non-icing conditions: 45 m/sec (100 mph) peak, or 34 m/sec (75 mph) sustained (see warning in *Placement and Mounting Considerations*) In icing conditions: 34 m/sec (75 mph) peak, or 18 m/sec(40 mph) sustained (see warning in *Placement and Mounting Considerations*)	
Measurement Definition	Cup revolutions are accumulated every three seconds for the duration of the logging interval. Wind speed is the average speed for the entire logging interval. Gust speed is the highest three-second wind recorded during the logging interval (see *Measurement Operation*).	Unit vector averaging used; vector components for each wind measurement are calculated every three seconds for duration of logging interval (see *Measurement Operation*).
Operating Temperature Range	-40°C to +75°C (-40°F to +167°F)	
Environmental Rating	Weatherproof	
Service Life	2 to 5 years typical depending upon environmental conditions	
Housing	Anodized aluminum housing, injection-molded plastic cups, stainless steel fasteners, Acetal base, and black anodized aluminum mounting rod.	
Bearing Type	Stainless steel shielded ball bearing	Bushing
Turning Radius	108 mm (4.25 in.)	Approximately 305 mm (12.5 in.)
Dimensions	317 mm (12.5 in.) H x 419 mm (16.5 in.) W, 12.7 mm (0.5 in.) diameter mounting pole	
Weight	Approximately 700 g (1.5 lbs)	
Bits per Sample	8 for each channel, 24 total	
Number of Data Channels**	3	
Measurement Averaging Option	Automatic averaging (see *Measurement Operation*)	
Cable Length Available	3.0 m (9.8 ft)	
Length of Smart Sensor Network Cable *	3.0 m (9.8 ft)	
Part Number	S-WCA-M003	
CE	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).	

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Placement and Mounting Considerations

Warning: The S-WCA wind speed and direction sensor is designed for sensitivity, not ruggedness. It is not suitable for use in the following locations:

- On tall buildings
- In the wake of wind turbines or other locations with turbulence
- In locations with icing combined with high winds

The wind sensor must be mounted on a mast secured with guy wires to prevent the sensor from vibrating in high winds. For harsh applications we recommend using one of the following RM Young wind sensors, appropriate for your application, with one of our adapters: Wind Sentry Adapter (S-WCD-M003), Wind Monitor Adapter (S-WCE-M003), Wind Monitor AQ Adapter (S-WCB-M003) or Marine Wind Monitor Adapter (S-WCC-M003). Refer to onsetcomp.com for more details on adapter specifications and compatibility with wind sensor models.

In addition, follow these guidelines:

- The Wind Speed/Direction smart sensor should be mounted vertically in a location free of wind shadows.
- For accurate wind speed/direction measurements, mount the sensor at a distance of at least five times the height of the nearest tree, building, or other obstruction.
- Be sure to secure the sensor cable with cable ties to protect it from damage.
- Ground wire must be used. Attach it to the mounting pole or tripod.
- The sensor can be damaged with improper handling. Store the sensor in its shipping box until you are ready to install it.
- To minimize measurement errors due to ambient RF, use the shortest possible probe cable length and keep the probe cable as far as possible from other cables.
- Refer to the *HOBO Station Tri-pod Setup Guide* for more.

Mounting the Sensor to a Tri-pod Cross Arm

Accessories

- Full Cross Arm (Part # M-CAA)
- Half Cross Arm (Part # M-CAB)

Steps

1. Mount Sensor to Mounting Pole. Insert the Wind Speed/Direction smart sensor into the mounting pole and secure it at the base of the sensor using the two Phillips head locking screws, as shown below.

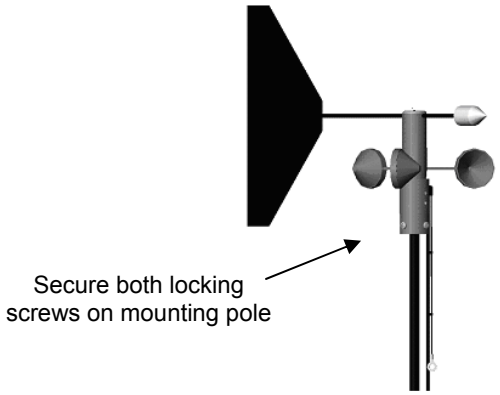

Figure 1: Mounting Sensor to Pole

2. Insert Mounting Pole into Cross Arm. Secure the ground wire to the lug nut on the cross arm.

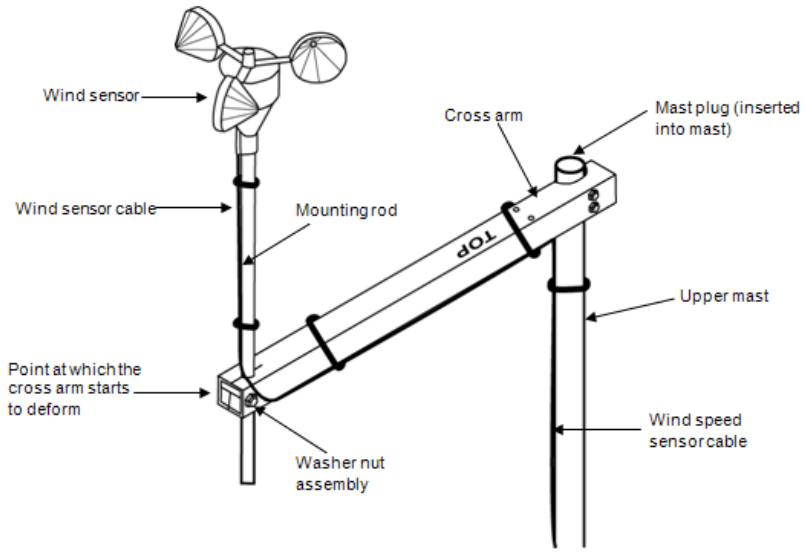

Figure 2: Inserting Mounting Pole into Cross Arm

3. Insert a 1/4-20 x 1 3/4 inch hex head bolt with a flat washer on it through the 1/4 inch hole on the end of the cross arm. Tighten with a 7/16 inch wrench until snug.
4. Install another flat washer and nylock nut on the bolt, allowing the black mounting rod to protrude 1/2 inch (1.3 cm) from the bottom of the cross arm.
5. Tighten the nut and bolt until the rod is clamped in place and the cross arm just starts to deform.
6. Adjust the height of the Wind Speed/Direction smart sensor in the cross arm as necessary.

   You can adjust the sensor height by raising and lowering the entire mast, the wind sensor on the cross arm, or a combination of both.

   a. Loosen the tri-clamp bolts and raise or lower the entire mast so that the wind sensor is close to the desired height. Make sure there is at least 5 cm (2 inches) of mast extending below the lower tri-clamp.

   b. Make sure the upper mast dimple is still facing north (if in northern hemisphere) and then re-tighten the tri-clamps. Once the tri-clamp bolts are tight, tighten the lock nuts to lock the bolts in place. This requires two wrenches: one to hold the bolt and one to tighten the lock nut against the tri-clamp.

   c. Loosen the bolt on the wind sensor mounting rod and raise or lower it as necessary so the center of the wind sensor anemometer cups is at the desired height. Re-tighten the bolt.
7. Secure the sensor cable to the bottom of the cross arm with cable ties. The gray tube in the middle of the sensor cable (not shown) is weatherproof and should be securely mounted to the cross arm with cable ties.

8. Secure Cables. Use cable ties to secure the sensor cables to the cross arm, bracket, and mast. The sensor cables should run below the cross arm and brackets to minimize the chance of birds pecking and damaging the cables. Cable ties should be spaced no more than .3 m (1 foot) apart.

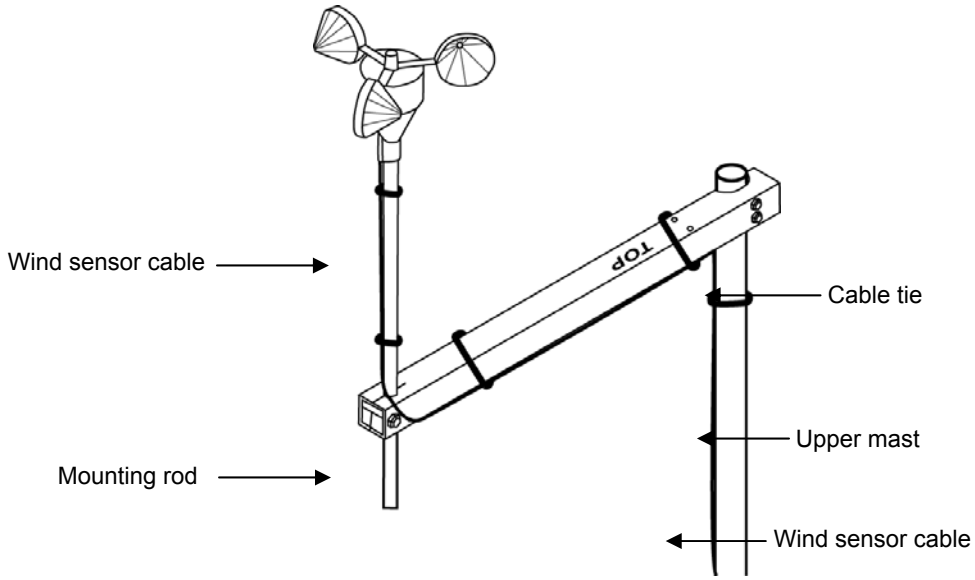

Figure 3: Securing Sensor with Cable Ties

9. Follow the steps in the *North Alignment* section.

Mounting the Sensor to a Pole

1. Insert the Wind Speed/Direction smart sensor into the mounting pole and secure it at the base of the sensor using the two Phillips head locking screws (see Figure 1).
2. Secure the Wind Speed/Direction smart sensor with two hose clamps (not included), as shown below. Adjust the height as necessary, but make sure the hose clamps are separated by at least 4 inches (10 cm).

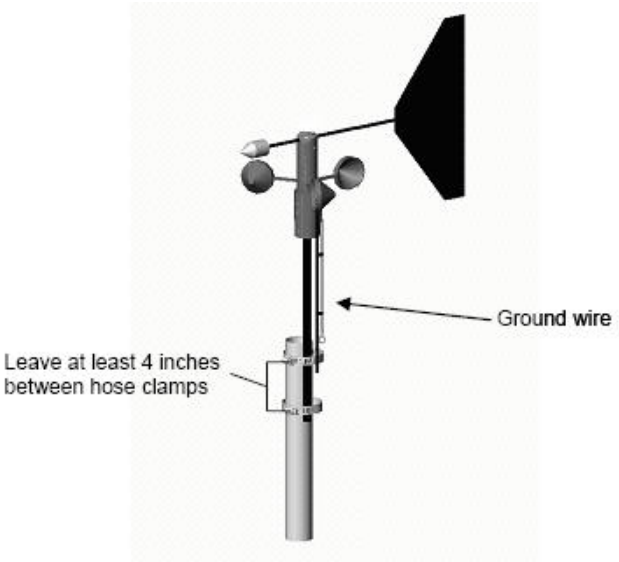

Figure 4: Securing Sensor with Hose Clamps

3. Secure the sensor cable with cable ties. The gray tube in the middle of the sensor cable (not shown) is weatherproof and should be securely mounted on the cross arm with cable ties.
4. Follow the steps in the *North Alignment* section.

North Alignment

The wind speed/direction sensor must be oriented properly to obtain meaningful data. This involves aligning the north sticker on the base of the sensor with true north. There are two methods to align the sensor:

- Compass Alignment
- Global Positioning Satellite (GPS) alignment.

Note: The magnetic declination must be known to align the direction sensor to true north using a magnetic compass. Worldwide declination information is available from the National Space Science Data Center at: http://nssdc.gsfc.nasa.gov/space/cgm/cgm.html.

Compass Alignment

Tools required:

- Compass
- Binoculars
- Tape (such as electrical, packing, or duct tape)

Two people are required to complete this procedure.

1. Align the stainless steel point of the wind vane with the north sticker on the base.
2. Secure the base and vane shaft with a piece of tape so that the vane cannot rotate.

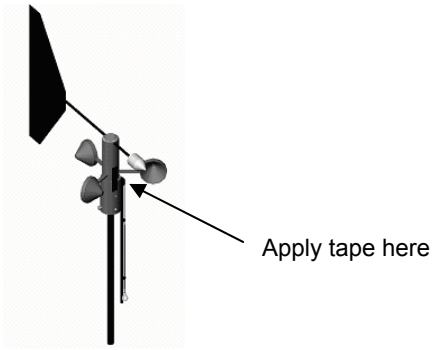

Figure 5: Securing Sensor with Hose Clamps

While standing 150 to 200 feet south of the sensor, use the compass to determine magnetic north. Align yourself so the compass points north and directly at the sensor.

5. While viewing the sensor through binoculars, instruct another person to rotate the sensor mounting post to point the vane north. The vane should seem to disappear from sight when properly aligned.
6. Once you've obtained the correct position, secure the sensor by tightening the two Phillips head screws at the base of the sensor until it is firmly attached to the ½ inch diameter black mounting pole (see Figure 1).
7. Remove the tape.

GPS Alignment

Tools required:

- Handheld GPS with WAAS-enabled receiver or any similar high accuracy GPS device
- Flag, orange cone, or other temporary marker
- Laptop computer with logger software installed

This procedure requires only one person, but is easier to complete with two people. In this procedure, you will be using the GPS receiver first to create an arbitrary waypoint and then to determine the bearing from the sensor to that waypoint. You will then align the sensor so that when the vane is pointed at the waypoint, the direction reported by the logger software matches the GPS receiver's bearing to the waypoint.

1. Connect the sensor to the HOBO Station logger (refer to the *Connecting* section below).
2. Connect the laptop to the logger with the PC interface cable.
3. Pick a visible location that is at least 100 meters (110 yards) away from the wind speed/direction sensor and walk to it. Establish a waypoint with the handheld GPS receiver. You may want to use averaging to minimize the waypoint position error if your GPS receiver is so equipped. (For best results, the estimated position error of the waypoint should be less than 10 feet if the distance to the sensor is 100 meters, and less than 20 feet for a distance of 200 meters.) Mark the waypoint with a flag, orange cone, or other suitable marker.
4. Walk back to the sensor and determine the bearing to the waypoint you just created with the GPS receiver. Again you may need to determine the average value of the bearing to keep the errors to a minimum.
5. Start the logger software and open the launch window (refer to the software manual for details about operating the software) to get real time readings or select "Get Status" to get the current reading.
6. Point the sensor vane directly at the waypoint flag or marker and rotate the sensor base until the wind direction sensor value in the logger software matches the angle obtained with the GPS receiver.
7. Once the vane is in position, secure the sensor by tightening the two screws at the base (see Figure 1) until it is firmly attached to the ½ inch diameter black mounting pole.
8. Double check that the reported angle is correct.

Connecting to the Logger

To start using the Wind Speed/Direction smart sensor, stop the HOBO Station logger and insert the modular jack into an available port. If a port is not available use a 1-to-2 adapter (Part # S-ADAPT). The next time the HOBO Station is launched, it will automatically detect the new smart sensor. Note that the HOBO Station supports a maximum of 15 data channels. This sensor requires three channels. Launch the logger and verify that the sensor is functioning correctly.

Measurement Operation

Wind speed and direction measurements are averaged over the logging interval or a 3-second timeframe (whichever is greater). If you set up the sensor to log faster than every 3 seconds, the same sensor reading will be recorded until a new 3-second average is calculated. For example, if the sensor is logging at a 1-second interval, the sensor will report the same wind speed and direction (its calculated average) for three samples before calculating and reporting a new value for another three samples.

Direction Averaging

Unit vector averaging is used to determine wind direction because traditional averaging would produce inaccurate results. For example, three measurements of 350, 11, and 12 degrees—which are all winds from the north—averaged together would result in 126 degrees, which incorrectly indicates a southeasterly wind. Instead, the vector components (North/South and East/West) for each wind measurement are calculated every three seconds for the duration of the logging interval. At the conclusion of the logging interval, the North/South and East/West components are averaged and then re-combined to calculate the average wind direction for the logging interval.

Maintenance

The Wind Speed/Direction smart sensor does not normally require any maintenance other than an occasional cleaning and lubrication. In dusty locations, the anemometer bearing should be lubricated with a light oil every 6 to 12 months. Squirt a spray oil (such as WD-40) into the gap above the three-cup assembly. If the cups or vane become dirty, rinse the sensor with mild soap and fresh water. Do not immerse the sensor in water or use any organic solvents to clean the unit.

Note: If the vane assembly is disassembled, apply a thread-locker (such as Loctite®) to the screws that hold the tail fin assembly together upon reassembly.

Verifying Sensor Accuracy

It is recommended that you check the accuracy of the Wind Speed/Direction smart sensor annually. The Wind Speed/Direction smart sensor cannot be calibrated. Onset uses precision components to obtain accurate measurements. If the smart sensor is not providing accurate data, then it is damaged or possibly worn out if it has been in use for several years. If you are unsure of the accuracy, you can send the smart sensor back to Onset for inspection and possible replacement of the mechanism or bearings if required. Contact Onset or your dealer for a Return Merchandise Authorization (RMA) number before sending the sensor.