200-WS-02F

User Manual

200-WS-02F

Wind Speed and Direction Sensor

Phone (530) 823-7185 **USA Toll Free** (800) 321-3577 **Fax** (530) 823-8997
Email nova@novalynx.com **Website** www.novalynx.com

Receiving and Unpacking

Carefully unpack all components and compare to the packing list. Notify NovaLynx Corporation immediately concerning any discrepancy. Inspect equipment to detect any damage that may have occurred during shipment. In the event of damage, any claim for loss must be filed immediately with the carrier by the consignee. Damages to equipment sent via Parcel Post or UPS require the consignee to contact NovaLynx Corporation for instructions.

Returns

If equipment is to be returned to the factory for any reason, call NovaLynx between 8:00 a.m. and 4:00 p.m. Pacific Time to request a Return Authorization Number (RA#). Include with the returned equipment a description of the problem and the name, address, and daytime phone number of the sender. Carefully pack the equipment to prevent damage or additional damage during the return shipment. Call NovaLynx for packing instructions in the case of delicate or sensitive items. If packing facilities are not available take the equipment to the nearest Post Office, UPS, or other freight service and obtain assistance with the packaging. Please write the RA# on the outside of the box.

Warranty

NovaLynx Corporation warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from the date of shipment from the factory. NovaLynx Corporation's obligations under this warranty are limited to, at NovaLynx's option: (i) replacing; or (ii) repairing; any product determined to be defective. In no case shall NovaLynx Corporation's liability exceed product's original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by NovaLynx Corporation, or that has been subjected to misuse, negligence, or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

Address

NovaLynx Corporation
431 Crown Point Circle, Suite 120
Grass Valley, CA 95945-9531 USA
Phone: (530) 823-7185
Fax: (530) 823-8997
Email: nova@novalynx.com
Website: www.novalynx.com

CONTENTS

1 FORWARD

Thank you for purchasing NovaLynx products. NovaLynx has been designing and manufacturing weather instruments since 1988. NovaLynx represents several well-known brands of quality manufacturers, including Gill Instruments, RM Young, Kipp & Zonen, and Vaisala. It is our hope that our products will meet all your monitoring requirements.

2 INTRODUCTION

The 200-WS-02F Wind Sensor assembly consists of two major parts: a rotating cup style anemometer for measuring wind speed and a wind vane for measuring horizontal wind direction. The anemometer's rotating magnets cause a reed switch to close momentarily 3 times per revolution of the cup assembly. The coaxially mounted wind vane is connected to a potentiometer whose resistance changes proportionally to the direction the vane is pointing. The complete sensor assembly is designed to mount on a 1" diameter pipe stub. The standard 40-foot (12 m) cable is stripped and tinned for connection to the user's monitoring equipment.

This manual contains information to aid in the design of custom interface circuits for use with the NovaLynx Model 200-WS-02F Wind Sensor. This information is supplied to systems integrators with the express understanding that NovaLynx Corporation assumes no responsibility or liability for the operation of the wind sensor as a part of any equipment that has been designed or furnished by any organization other than NovaLynx.

3 TECHNICAL SPECIFICATION

3.1 Anemometer Details

The anemometer is rated for wind speeds up to 125 miles per hour and has a starting threshold of approximately 1.2 mile per hour. The approximate speed constant for the anemometer is 1.25 mph/Hz.

Air movement (wind) causes the 3-cup and hub assembly to rotate, moving the permanent magnets embedded in the hub over a magnetic reed switch fixed in the base. Three closures of the reed switch will be produced for each revolution of the cup assembly. The ratio of closed-to-open time is nominally 1/10 of the total period for a revolution of the wind cups. This duty cycle may change slightly as the sensor ages and with exposure to temperature extremes.

The magnetic reed switch capsule is rated to carry a maximum current of 10.0 mA with an applied voltage of no more than 50 volts AC or DC.

3.2 Wind Vane Details

Air movement (wind) impinging on the tail fin causes the wind vane to align with the wind direction. Fluctuations in the wind direction are measured by the sensor as the aerodynamics of the counterweight and the tail try to keep aligned to the path of the wind.

The wind vane is coupled to a 20K ohm single turn potentiometer. When connected to a well-regulated voltage source the output voltage of the sensor is proportional to the wind direction and can be read by a single-ended analog input channel.

There is a gap (“dead band”) of approximately 5 degrees between the ends of the resistive media in the potentiometer. This gap is aligned to the North indicator on the body of the sensor.

Anemometer Specification	
Measurement Range	125 mph max (55.88 m/s max)
Speed Threshold	1.2 mph (0.5364 m/s)
Speed Constant	1.25 mph = 1 Hz (0.5588 m/s = 1 Hz)
Accuracy	1 mph (0.4470 m/s) or ±3%
Transducer Type	Reed switch, magnet activated
Maximum Rating	10 mA @ 50 V (ac or dc)
Turning Radius	4 inch (10.16 cm)
Wind Vane Specification	
Measurement Range	0-360 degree azimuth
Potentiometer Gap	5 degree (approximate)
Accuracy	±3 degrees
Vane Threshold	1.2 mph (0.5364 m/s)
Distance Constant	1.5 feet (45.72 cm)
Time Constant	2 seconds
Damping Ratio	0.4
Transducer Type	20k ohm, 20% tolerance, 1% linearity, bushing type bearing
Maximum Rating	1/4 watt
Turning Radius	10.5 inch (26.67 cm)
Overall Specification	
Cable	40 feet (12 m), 5 conductor, 24 AWG, shielded, tinned leads
Mounting	1.07 inch diameter by 0.82 inch socket (27 mm dia x 21 mm)
	(fits standard 3/4" pipe)
Assembled Dimensions	17 x 12 x 8 inches (43 x 30 x 20 cm)
Shipping Dimensions	10.5 x 6.75 x 6.25 inches (27 x 17 x 16 cm)
Weight / Shipping	2 lbs (0.9 kg) / 4 lbs (1.8 kg)

4 SITING CONSIDERATIONS

WARNING: Avoid overhead power lines whenever possible. If there are overhead power lines, use extreme care to prevent contact with the power lines while installing the equipment. NovaLynx recommends using only experienced equipment installers to avoid injury and serious problems.

Choose a mounting location for the wind sensor that is free of obstructions since nearby objects can create eddy currents that will affect the wind measurements. Try to locate the wind sensor so that the nearest object is 10 x T away from the wind sensor mast, where T is the height of the object.

Roof mounted sensors should be placed on the upwind side of the building and away from all exhaust vents. If the sensor is located on top of a building the sensor height should be 1.5 x H, where H is the height of the building.

In all cases when the wind sensor data is to be correlated to National Weather Service data or World Meteorological Organization data, the standard exposure is 33 feet (10 meters) above the ground.

5 TAIL ASSEMBLY

The tail piece must be assembled to the vane shaft before installing the sensor. Locate the tail piece (packed with this manual). Remove the blue tape from the shaft and save the two screws stored there. Slide the tail piece into the slot in the shaft and align the screw holes. Secure the tail with two screws using a #1 Phillips screwdriver.

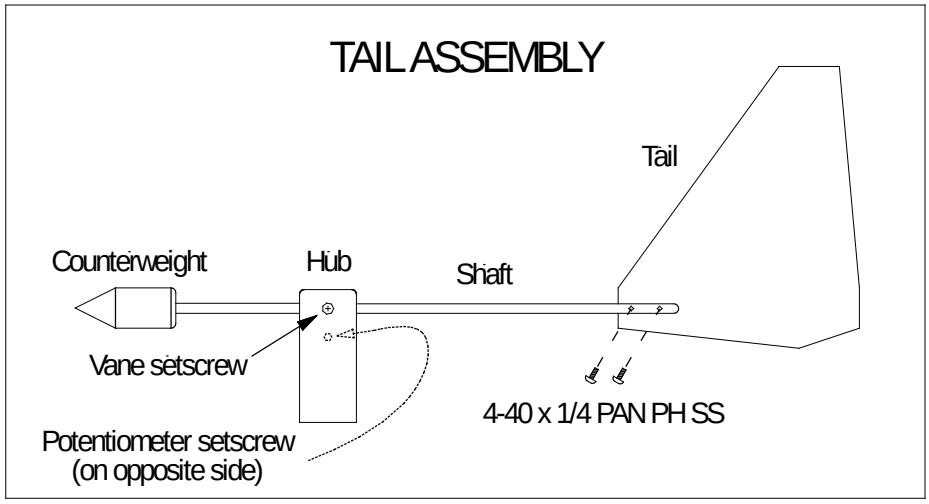

Figure 1

6 MOUNTING

CAUTION: Always be careful when working on equipment that is mounted above you. Do not allow others to stand below when equipment is being installed as falling objects can be hazardous.

The 200-WS-02F anemometer is often mounted to the top of the supporting mast. A mounting arm (Part number 200-153) is available for mounting to the side of the mast or tower. The base of the sensor accepts ¾" IPS pipe size or any other 1" to 1-1/16" (25 to 27 mm) outside diameter pipe.

The mast should be easy to reach for servicing the sensor and should be properly anchored and grounded. A tilt-down arrangement can eliminate the need for lifts or ladders during installation and service.

If the supporting mast or tower is metal it should be properly grounded to minimize lightning damage. It may be necessary in some locations to contact a local contractor to ensure that local electrical codes have been met by the installer.

Position the wind sensor onto the end of the mast or mounting arm. Align the North indicator label to geographic (true) north and secure the sensor to the mast using the set screws provided in the sensor base. Do not use excessive force when tightening the screws. Tighten the screws until the sensor base can no longer be manually rotated.

NOTE: Wind direction sensors are usually aligned to true north, rather than magnetic north. True north is usually found by reading a magnetic compass and applying the correction for magnetic declination. On-line calculators are available to enter your location and obtain the correction factor. One such website is:
https://www.ngdc.noaa.gov/geomag-web/#declination

7 CABLE INSTALLATION

The PVC jacket of the cable will last for many years outdoors under normal circumstances. In harsh environments it may be necessary to protect the cable with conduit.

Route the sensor cable down the mast and to the monitoring equipment in the most direct manner. Leave a "drip loop" of cable below the entry point to the equipment enclosure to help keep moisture out. Fasten the cable to the mast with cable ties to prevent whipping during high velocity winds. For best results, use plastic cable ties that are resistant to ultra-violet radiation and place them at two foot intervals. Do not over-tighten. Avoid sharp bends, excessive twisting, scrapes and nicks.

8 WIRING DIAGRAM

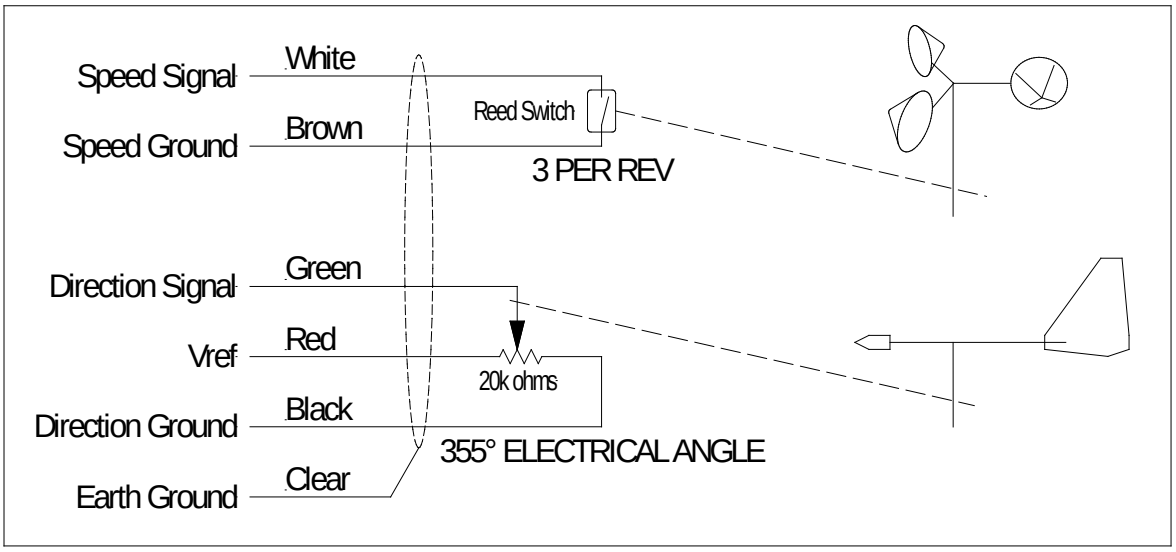

Figure 2

9 SENSOR MAINTENANCE

Wind sensors experience vibration due to high velocity wind. The vibration can loosen the mounting screws or the support structure. Regular inspection of the mounting hardware is required to prevent damage to the sensor.

1. Inspect the wind vane to ensure the tail is vertical and the screws holding it to the vane are snug. If the vane has loosened then it must be re-balanced before tightening. First, inspect the counterweight to ensure it is firmly cemented to the vane. Repair if necessary. Next, remove the entire sensor and hold it horizontal to the ground. Adjust the distance of the counterweight until it exactly balances the tail. Make sure the tail is vertical to the sensor and then tighten the vane. Re-check the balance.

2. With the sensor mounted on the mast make sure the North indicating label is oriented correctly, then tighten the mounting screws (do not strip the threads in the plastic base of the sensor).

3. Spin the anemometer cup assembly. It should turn freely. A short spray of light oil such as WD40 can be applied to the bearing located in the hub of the cup assembly.

4. Inspect the cable and ensure it is secured to the mast to prevent damage due to wind whipping.

5. A repair kit (Part number 200-WS-02F-ASSY) is available in case one of the cup arms is broken.

10 FUNCTIONAL TESTS

The following checks can be done with an ohm-meter after the sensor has been dis-mounted from the weather station mast or tower. These tests can help determine whether the sensor needs repair or adjustment.

10.1 Anemometer Electrical Test

Set the ohm-meter to a low resistance range and touch its leads together to check for zero ohms. If it is an analog meter adjust the dial to read zero ohms. Connect the ohm-meter to the white and brown signal wires from the anemometer (polarity is not important).

Rotate the cup assembly slowly until you notice the meter reading drop to less than 10 ohms. Continue to rotate until the switch opens (high resistance). Do this for each of the 3 magnets in the cup assembly. If the meter always reads a low resistance then the reed switch is not opening (the contacts may have welded together) or there may be a short circuit in the cable. If the switch never closes then there may be a break in the cable or the magnets are not near enough to activate the switch. Check the distance between the cup assembly and the base. The gap should be about 1/16" (1.6 mm).

10.2 Potentiometer Electrical Test

Wind vane calibration involves checking the potentiometer output and verification of the sensor alignment to north.

Set the ohm-meter to the 20k range (or greater range if needed). Connect the black meter lead to the black sensor wire, and the red meter lead to the red sensor wire. The reading on the meter should be a stable output of about 20,000 ohms (+/-20%). Rotate the vane once around while watching the meter to ensure the reading does not change.

Connect the red meter lead to the green wire. Observe that the meter reading changes as you rotate the vane. Check the "dead band" where the meter goes to "infinite" and verify that the counterweight is pointing the same direction as the North indicator label on the base of the sensor. Now rotate the vane slowly clockwise and observe that the resistance changes smoothly from near zero to the maximum just before hitting the "dead band" again as you approach north.

If the "dead band" does not align with the North label then the position of the vane can be changed to correct the alignment:

1. Using a 1/16" Allen wrench, loosen the potentiometer set screw located on one side of the hub (See Figure 1 on Page 6).
2. Lift upwards to remove the vane assembly from the sensor. Note that the potentiometer body is bonded to the sensor body and should not move.
3. Using an ohmmeter to monitor the potentiometer output, turn the potentiometer shaft until the center of the gap is located. You may wish to make a mark on the shaft aligned to the North label.

4. Aim the counterweight in the same direction as the North label and carefully lower the hub onto the potentiometer shaft. Tighten the set screw.
5. Check your work by observing the meter as you swing the vane across North.

The potentiometer test will indicate whether the sensor is working correctly. If there is no signal or the signal is not changing then either there is a problem in the cable or inside the sensor. Minor problems with the cable can be repaired, but if the potentiometer is bad the whole assembly must be replaced. The repair kit (Part number 200-WS-02F-ASSY) includes the cable as well as the potentiometer.

11 ADDITIONAL PRECAUTIONS

11.1 Lightning Protection

The shield wire in the sensor cable is electrically connected to the metal hub / vane assembly. The purpose is to bleed off static that would otherwise affect the sensor output. Therefore it is important to earth ground the shield wire for best results.

Installations where nearby lightning strikes are likely should include a properly grounded lightning rod above the level of the sensor, preferably on a separate tower.

11.2 Bird Perch

Birds of all sizes find the shaft of the wind vane a desirable place to land. The weight of a large bird can easily damage the potentiometer by breaking it loose from the body of the sensor. The best way to reduce this hazard is to provide an alternate landing site nearby that would be more attractive to the weary bird.

11.3 Falling Parts Hazard

Always be careful when working on equipment that is mounted above you. Do not allow others to stand below when equipment is being installed as falling objects can be hazardous. Be extra careful if your sensor has been damaged, particularly if the vane assembly is not in the correct position.

11.4 Handling

The cup assembly is fragile, and it is easy to break a cup from its stem unless one is careful. Unpack the unit carefully, and avoid laying the sensor on its side which would place strain on the cup assembly.