200-WS-23

User Manual

Current Loop Wind Sensor

200-WS-23 Wind Speed & Direction

200-WS-23S Wind Speed Only

Phone (530) 823-7185
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
Email: nova@novalynx.com
Website: www.novalynx.com

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200-WS-02FA Anemometer
Used with 200-WS-23 Wind Speed and Direction

200-WS-01B Anemometer
Used with 200-WS-23S Wind Speed Only

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-23 Wind Speed and Direction** system converts each measurement into a 4-20 mA output signal suitable for use with process control and monitoring systems. Each signal is loop powered by the monitoring equipment, so a separate power supply is not needed. The driver circuitry is protected in a NEMA enclosure suitable for indoor or outdoor mounting. The anemometer is a **200-WS-02FA Wind Speed and Direction** sensor that includes 40' of cable and is designed to be mounted at the top of a mast (not included).

The **200-WS-23S Wind Speed Only** system converts the wind speed measurement into a 4-20 mA output signal. The signal is loop powered by the monitoring equipment, so a separate power supply is not needed. The driver circuitry is protected in a NEMA enclosure suitable for indoor or outdoor mounting. The anemometer is a **200-WS-01B Wind Speed** sensor that includes 40' of cable and is designed to be mounted at the top of a mast (not included).

The anemometers are ruggedly constructed of UV-resistant ABS plastic and anodized aluminum parts. Each anemometer mounts to a 1.07" (27 mm) diameter mast (sold separately). The cable is 40 feet (12 m) long and can be extended up to 250 feet (76 m).

Wind speed is sensed by rotating cups connected to a hub with 3 magnets. A reed switch in the base senses the magnets and closes briefly three times per revolution of the cups. The speed constant is 1.25 mph = 1 Hz (0.5588 m/s = 1 Hz).

Wind direction is sensed by a 20k ohm potentiometer mechanically connected to the wind vane. A small excitation voltage across the potentiometer generates a voltage on the wiper element proportional to wind direction. The anemometer must be installed with the North indicating label oriented to the North Pole in order for the measurements to be meaningful.

It is important to earth ground the anemometer using the shield wire included in the cable. A screw terminal in the transmitter box is provided for connecting the shield wire, but it is up to the installer to connect the green earth-grounding wire to a suitable earth ground.

3 SPECIFICATIONS

Transmitter Specifications		
200-WS-02FA Wind Speed Transmitter	200-WS-23:	4-20 mA = 0-100 mph
	200-WS-23-M:	4-20 mA = 0-50 m/s
	200-WS-23-KM:	4-20 mA = 0-200 kph
200-WS-02FA Wind Direction Transmitter	4-20 mA = 0-360 degrees	
200-WS-01B Wind Speed Only Transmitter	200-WS-23S:	4-20 mA = 0-100 mph
	200-WS-23S-M:	4-20 mA = 0-50 m/s
	200-WS-23S-KM:	4-20 mA = 0-200 kph
Loop supply voltage range	8 to 30 Vdc	
Connection	Screw terminal	
Operating temperature range	-58° to +140° F (-50° to + 60° C)	
NEMA enclosure dimensions	4.7" x 4.7" x 2.25" (120 x 120 x 57 mm)	
Cable to user equipment	Not supplied / order separately	
Wind Speed Sensor (200-WS-02FA & 200-WS-01B)		
Measurement range	0-112 mph (0-50 m/s)	
Speed Constant	1.25 mph = 1 Hz (0.5588 m/s = 1 Hz)	
Transducer type	Reed switch	
Speed Threshold	0.8 mph (0.4 m/s)	
Accuracy	1 mph or ± 3%	
Wind Direction Sensor (200-WS-02FA)		
Range	0-360 degrees azimuth	
Transducer type	Potentiometer, 20k ohms, conductive plastic	
Potentiomenter gap	5 degrees	
Azimuth accuracy	± 3 degrees	
Threshold	1.2 mph (0.5 m/s)	
Bearings	Bushing	
General		
Anemometer mount	1.07" dia. (27 mm)	
Anemometer cable (200-WS-02FA)	5 conductor, 24 AWG, shielded, 40' (12 m)	
Anemometer cable (200-WS-01B)	2 conductor, 24 AWG, shielded, 40' (12 m)	

4 INSTALLATION

Please refer to the 200-WS-02FA or 200-WS-01B anemometer user manual for information on installation and maintenance of the anemometer. Pay particular attention to the location of the sensor and align the wind vane to North for best results. Route the cable to the location where the transmitter unit will be installed.

The transmitter enclosure may be mounted to the same mast as the anemometer, or wall mounted in a convenient location.

5 CONNECTIONS

The installer must provide cable that will connect the transmitter unit to the monitoring equipment. Use 4-conductor cable for the 200-WS-23 Wind Speed and Direction transmitter. Use 2-conductor cable for the 200-WS-23S Wind Speed Only transmitter. If the cable is shielded, connect the shield at the monitoring equipment end only. The wire gage of the cable depends on the length of cable and the applied loop voltage. Ensure the applied voltage is at least 8 volts at the transmitter circuit board at full scale (20mA) operation.

The transmitter is provided with a green earth grounding wire which must be connected to protect the electronic circuitry. If the wire must be extended, use 18 AWG wire.

- Refer to Appendix A for wiring the 200-WS-23 Wind Speed and Direction transmitter
- Refer to Appendix B for wiring the 200-WS-23S Wind Speed Only transmitter

1. Remove the cover of the transmitter unit and set it aside.
2. Insert the wind speed sensor cable into the same gland as the green earth grounding wire. Provide some slack so that the wires can be connected without putting strain on the cable. Tighten the gland nut.
3. Make sure there is a drip loop below the transmitter enclosure so that any moisture on the cable will not seep into the enclosure. This is particularly important since the seal around the grounding wire and cable will not be watertight. If a watertight seal is required, apply plumber's putty (not supplied) to the cable before tightening the gland nut.
4. Connect the anemometer wires as indicated in Appendix A or Appendix B.
5. Prepare the output cable by cutting back the outer jacket about 4 inches, and then strip the wire ends. Insert the output cable into the remaining gland until the jacket is visible inside the enclosure, then tighten the gland nut. Provide a drip loop for this cable also.
6. Wire the Wind Direction transmitter and record the wire colors
    a. Terminal 1 is the 8-30 Vdc input (+) Wire color _____
    b. Terminal 2 is the 4-20 mA Wind Direction signal Wire color _____
7. Wire the Wind Speed transmitter and record the wire colors
    a. Terminal 3 is the 8-30 Vdc input (+) Wire color _____
    b. Terminal 4 is the 4-20 mA Wind Speed signal Wire color _____
8. Disconnect power from your monitoring equipment before wiring the current loop transmitter(s). Ensure that the 4-20 mA channel(s) on the monitoring equipment are programmed appropriately. Connect and verify all wiring before restoring power to the monitoring equipment.
9. Secure the cables with cable ties as required to complete the installation.

6 TROUBLESHOOTING

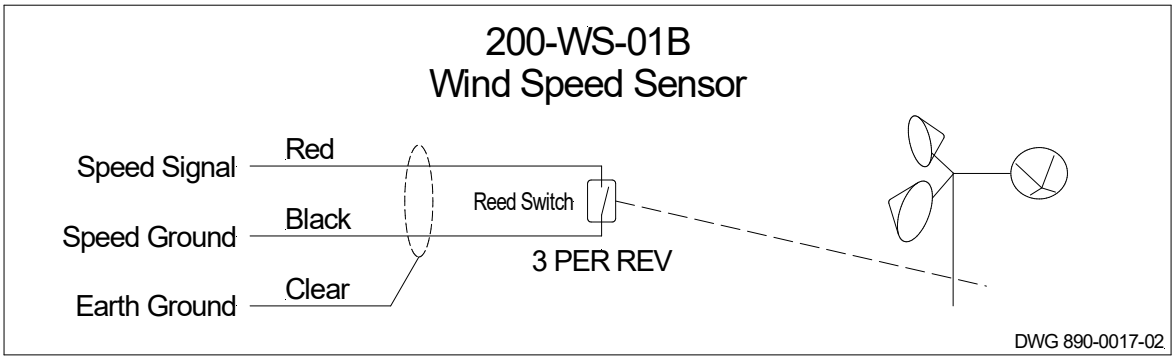
The current loop wind monitoring system consists of three parts: the sensor, the driver board, and the monitoring system (which may be a logger or display meter). If the system isn't working the problem may be one or more components of the system or the connections between them. Check the connections first, making sure each wire is in the correct location, is making good contact, and the system is powered correctly.

6.1 Wind Sensor Tests

The wind speed sensor utilizes a dry contact reed switch which opens and closes under the influence of magnets that spin with the rotation of the cups. The wind sensor must be disconnected from the driver board to test the reed switch.

200-WS-01B Sensor:

1. Set the multimeter to read ohms (200 ohm scale) and test the meter:
   a. Read zero ohms when the leads are touched together.
   b. Read infinite (over-range) when the leads are apart.
2. Connect the black meter lead to the black sensor wire.
3. Connect the red meter lead to the red sensor wire.
4. Turn the cup assembly slowly. **The meter should show zero ohms three times per one revolution.**



200-WS-02FA Wind Speed Sensor:

1. Set the multimeter to read ohms (200 ohm scale). Test the meter (zero ohms when the leads are touched together, infinite (over-range) when the leads are apart).
2. Connect the black meter lead to the brown sensor wire.
3. Connect the red meter lead to the white sensor wire.
4. Turn the cup assembly slowly. **The meter should show zero ohms three times per one revolution.**

200-WS-02FA Wind Direction Sensor:

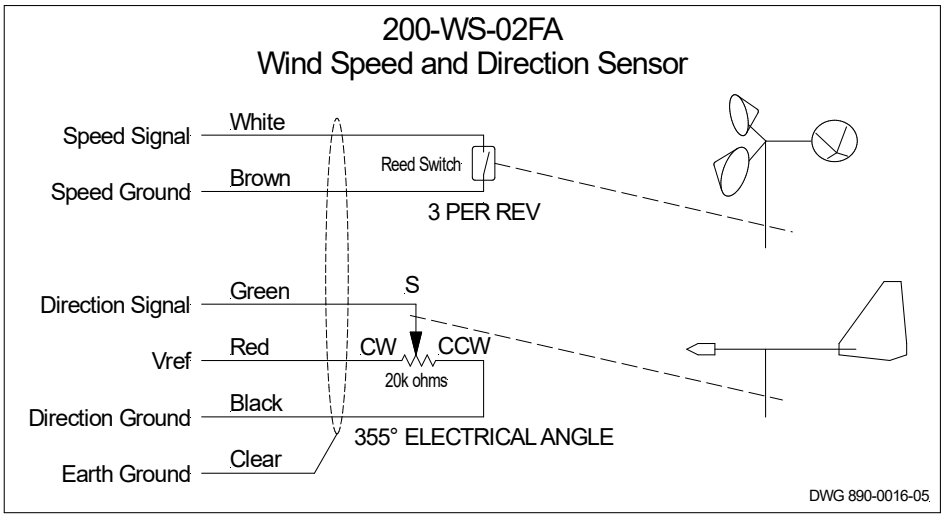
The wind direction sensor is a 20k ohm potentiometer with three wires connected to it. The resistance between the excitation (Vref) and ground connection should be constant, but the resistance from the signal wire to ground should vary as the wind vane turns. The wind sensor must be disconnected from the driver board to test the potentiometer.

Test the resistance from Vref to ground:

1. Set the multimeter to the 20k ohm scale.
2. Connect the black meter lead to the black sensor wire.
3. Connect the red meter lead to the red sensor wire.
4. **The meter should indicate approximately 20k ohms.** (If the meter over-ranges then switch to a higher scale, usually megohms).
5. Verify the meter reading does not change significantly as the wind vane is rotated.

Test the varying resistance from signal to ground:

1. Disconnect the red meter lead and connect it to the green sensor wire.
2. Rotate the vane slowly clockwise. **The meter should indicate a gradually increasing resistance** until the dead band is reached (when the vane is pointing north). Continue rotating one full turn to verify the resistance changes smoothly from zero to approximately 20k ohms.

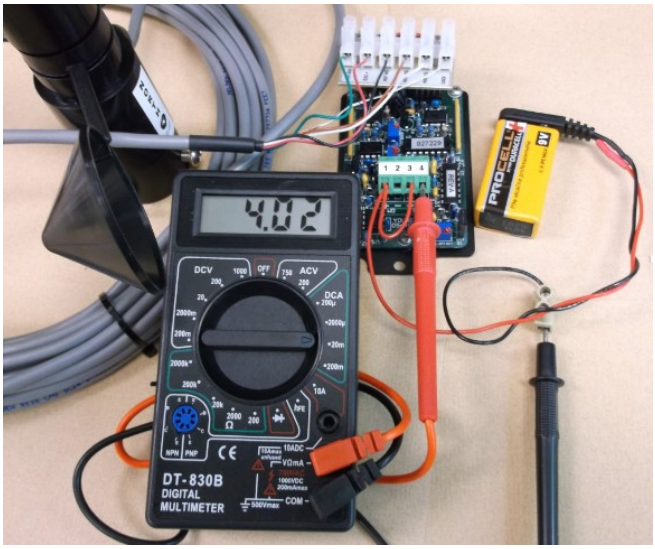


6.2 Driver Board Test

A working wind sensor is needed in order to provide signals to the driver board. In addition, a power source is needed to drive the current loop circuit. The driver board requires from 8 to30 Vdc, so a 9 volt battery is a handy source. You will need a multimeter capable of reading up to 20 mA. Please note that often the mA input of a meter has a fuse. If your tests indicate no current is flowing, please check the fuse.

Test the wind speed current loop:

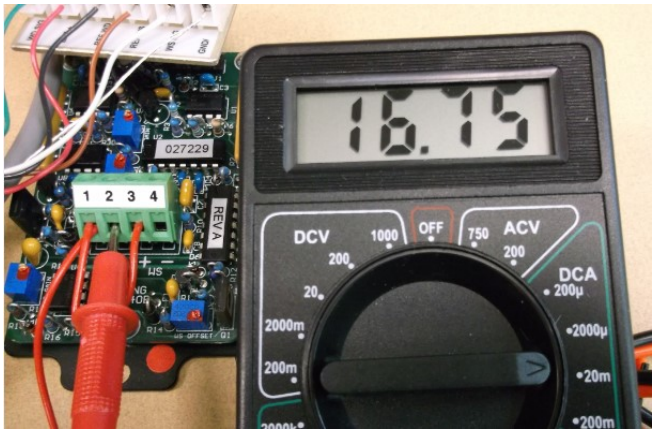
1. Connect the wind sensor according to **Appendix A** or **B** depending on the model of your sensor.
2. Set your meter to the 20 mA scale.
3. Connect the positive output of your power supply (+ terminal of a 9 volt battery) to Terminal 1 and Terminal 3 on the driver board (photo).
4. Connect the black meter lead to the power supply ground (- terminal of your battery).
5. Insert the red meter lead in Terminal 4. **The meter should read 4 mA, which represents zero wind speed. If the reading is zero milliamps, then the driver circuit board is defective.**
   Spin the wind cups on the anemometer. **The meter reading should increase to 5 or 6 milliamps.**



Meter connected to the wind speed output.

Test the wind direction current loop (200-WS-02FA)**:**

1. Leave the black meter lead connected to the ground on your power supply (- terminal of your battery).
2. Move the red meter lead to Terminal 2 on the driver board. The meter should read between 4 and 20 milliamps, depending on the direction the wind vane is pointing.
3. **Rotate the vane slowly one full turn to see that the meter reading varies the full range from 4 to 20 mA.** Refer to the calibration table in Section 6.3 for expected output at different degrees of rotation relative to the North indicator label on the sensor.



Meter connected to the wind direction output.

6.3 Monitoring Device Test

The following table can be used as a guide if it becomes necessary to check the functionality or calibration of the monitoring equipment. Disconnect the 200-WS-23 or 200-WS-23S from the device before doing these tests.

1. Use a 4-20 mA signal generator to feed 6 mA into the selected channel on your monitoring device.
2. Compare the output of the monitoring equipment to the values in the table.
3. Switch the signal generator to output 18 mA. Compare the output to the table.
4. If both readings are higher or lower than in the table by the same amount, the zero offset parameter in the monitoring equipment needs to be adjusted.
5. If the readings are off by different amounts, then the slope parameter needs to be adjusted, and after that it may be necessary to adjust the zero offset also.

Calibration Table

Loop Current	Wind Speed			Wind Direction	
	mph	m/s	kph	degrees	compass
4.0	0.00	0.00	0.00	0	N
6.0	12.50	6.25	25.00	45	NE
8.0	25.00	12.50	50.00	90	E
10.0	37.50	18.75	75.00	135	SE
12.0	50.00	25.00	100.00	180	S
14.0	62.50	31.25	125.00	225	SW
16.0	75.00	37.50	150.00	270	W
18.0	87.50	43.75	175.00	315	NW
20.0	100.00	50.00	200.00	360	N

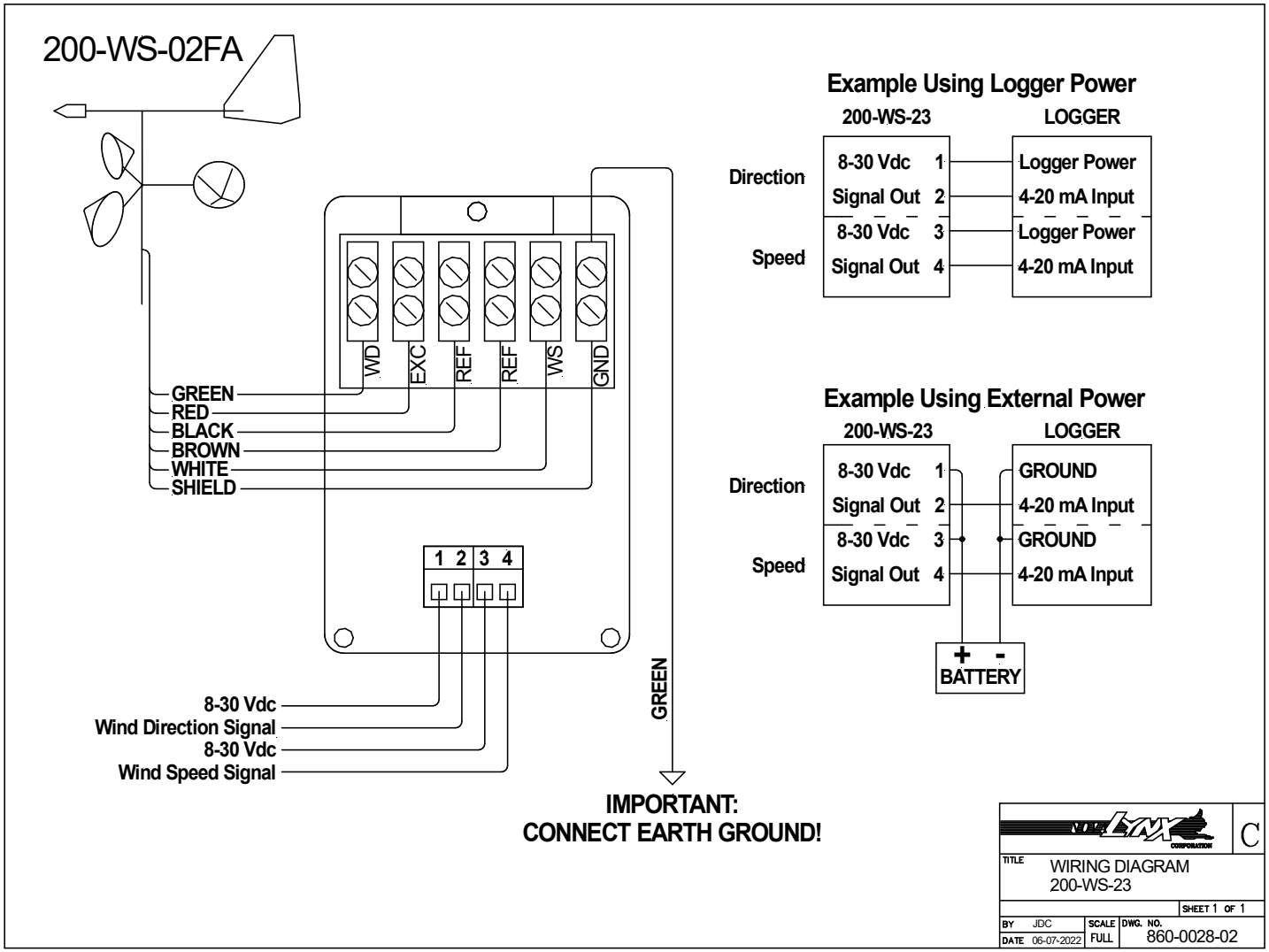
7 CALIBRATION

The **200-WS-23 and 200-WS-23S Current Loop Wind Sensors** are pre-calibrated and should require no adjustment over their lifetime. However, if the cable between the anemometer and the transmitter is extended beyond 250 feet (75 m), then resistance losses may introduce errors in the wind direction readings.

A calibration procedure is beyond the scope of this manual. However, for those with the technical expertise, the board can be adjusted by means of multi-turn potentiometers located on the 4-20 mA driver circuit board.

	Offset	Span
Wind Speed	R-33	R-17
Wind Direction	R-26	R-28

APPENDIX A WIND SPEED AND DIRECTION WIRE DIAGRAM



APPENDIX B WIND SPEED ONLY WIRE DIAGRAM