

**MODEL 03001  
WIND SENTRY**



**JULY 1995**

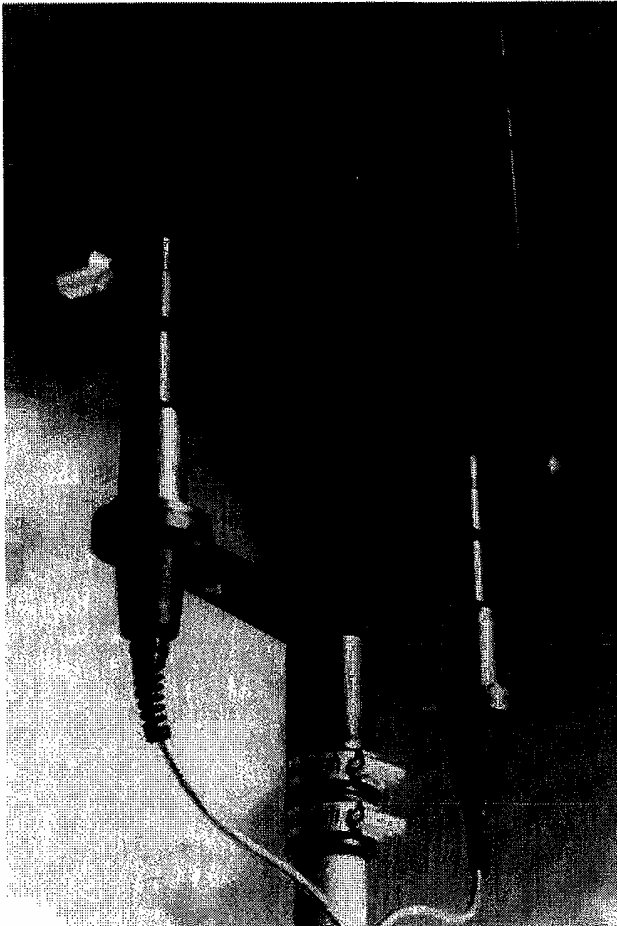
**MANUAL PN 03001-90**

**R. M. YOUNG COMPANY**

**2801 AERO PARK DRIVE, TRAVERSE CITY, MICHIGAN 49686, USA  
TEL: (231) 946-3980 FAX: (231) 946-4772**



**MODEL 03001**  
**WIND SENTRY**  
INCLUDES MODELS 03101 & 03301



**WIND SPEED SPECIFICATION SUMMARY:**

Range	0 to 50 m/s (112 mph), gust survival 60 m/s (134 mph)
Sensor	12 cm diameter cup wheel assembly, 40 mm diameter hemispherical cups
Turning Factor	75 cm (2.46 ft)
Distance Constant (63% recovery)	2.3 m (7.5 ft)
Threshold	1.1 m/s (2.5 mph)
Transducer	Stationary coil, 1300 ohm nominal resistance
Transducer Output	AC sine wave signal induced by rotating magnet on cup wheel shaft 100 mV p-p at 60 rpm. 6V p-p at 3600 rpm.
Output Frequency	1 cycle per cup wheel revolution. 0.75 m/s per Hz

**WIND DIRECTION (AZIMUTH) SPECIFICATION SUMMARY:**

Range open)	360° mechanical, 352° electrical (8°
Sensor	Balanced vane, 16 cm turning radius.
Damping Ratio	0.2
Delay Distance (50% recovery)	0.5 m (1.6 ft)
Threshold	1.3 m/s (2.9 mph) at 10° displacement 1.9 m/s (4.2 mph) at 5° displacement
Transducer	Precision conductive plastic potentiome- ter, 10K ohm $\pm 20\%$ resistance 1.0% linearity, life expectancy 50 million revolutions Rated 1 watt at 40°C, 0 watts at 125°C
Transducer Excitation Requirement	Regulated DC voltage, 15 VDC max
Transducer Output	Analog DC voltage proportional to wind direction angle with regulated excitation voltage applied across potentiometer

**INTRODUCTION**

The Wind Sentry Anemometer and Vane measure horizontal wind speed and wind direction. The small size, simplicity, and corrosion resistant construction provide a professional quality instrument at a modest cost. The cup wheel and vane shafts use stainless steel precision instrument grade ball bearings which are lubricated with a wide temperature range high quality instrument oil. Standard bearings have light contacting seals to exclude contamination and help retain lubricant for longer service life.

Cup wheel rotation produces an AC sine wave voltage signal with frequency directly proportional to wind speed. This AC signal is induced in a stationary coil by a two pole ring magnet mounted on the cup wheel shaft. One complete sine wave cycle is produced for each cup wheel revolution.

Wind vane position is transmitted by a 10K ohm precision conductive plastic potentiometer which requires a regulated excitation voltage. With a constant voltage applied to the potentiometer, the output signal is an analog voltage directly proportional to azimuth angle.

The sensor mounts on standard one inch pipe, outside diameter 34mm (1.34"). Separately supplied Wind Sentry anemometers or vanes mount on vertical 3/4" threaded pipe.

**INITIAL CHECK-OUT**

When the Wind Sentry is unpacked, check it carefully for any signs of shipping damage. Place the cup wheel on the anemometer shaft and secure it by tightening the set screw in the side of the hub. The instrument is aligned, balanced, and fully calibrated before shipment; however, it should be checked both mechanically and electrically before installation. The vane and cup wheel should easily rotate 360° without friction. Check vane balance by holding the instrument so the vane surface is horizontal. It should have near-neutral torque without any particular tendency to rotate, however a slight imbalance will not degrade performance.

The wind direction potentiometer requires a stable DC excitation voltage. Do not exceed 15 volts. When the potentiometer wiper is in the 5° deadband region, the output signal is "floating" and may show varying or unpredictable values. Azimuth signal conditioning electronics should properly process this condition. (All YOUNG signal conditioning electronics meet these requirements.) Avoid a short circuit between the azimuth signal line and either the excitation or ground reference lines. Although there is a 1K ohm current limiting resistor in series with the wiper for protection, damage to the potentiometer may occur if a short circuit condition exists.

Before installation, connect the Wind Sentry to a signal conditioning device and check for proper wind speed and direction values. Make electrical connections to the sensor cables as shown in the wiring diagram. Positioning the vane over the center of a sheet of paper with 35° or 45° cross markings allows easy visual alignment of the vane. To check wind speed, temporarily remove the cup wheel and connect its shaft to a Model 18810 Anemometer Drive. Details appear in the CALIBRATION section.

## INSTALLATION

Proper placement of the instrument is very important. Eddies from trees, buildings, or other structures can greatly influence wind speed and direction observations. To get meaningful data for most applications, locate the instrument well above or upwind of such obstructions. As a general rule, the air flow around a structure is disturbed to twice the height of the structure upwind, six times the height downwind, and twice the height of the structure above ground. For some observations it may not be practical or necessary to meet these guidelines.

Vane alignment is most easily done with two people; one to adjust the instrument position and the other to observe the indicating device. When anemometer and vane are mounted on the same crossarm (Model 03001), the azimuth potentiometer has been aligned at the factory such that the mounting crossarm should be oriented North-South with the vane on the North end.

The standard Wind Sentry includes a 3 meter (10 ft.) length of cable. Additional cable may be connected by splicing or termination in a user-supplied junction box. Make sure the connection is waterproof.

To install the Wind Sentry, follow these steps:

1. MOUNT WIND SENTRY
  - a) Place Wind Sentry on mounting post. Do Not tighten band clamp yet.
  - b) Connect sensor cable to indicator.
2. ALIGN VANE
  - a) Select a known azimuth reference point on the horizon.
  - b) Sighting down vane centerline, point counterweight toward azimuth reference on horizon.
  - c) While holding vane in position, slowly turn base until indicator displays proper value.
  - d) Tighten mounting post band clamp.

## CALIBRATION

The Wind Sentry is fully calibrated before shipment and should require no adjustments. Recalibration may be necessary after some maintenance operations. Periodic calibration checks are desirable and may be necessary where the instrument is used in programs which require auditing of sensor performance.

For wind direction calibration, the following method can yield an accuracy of ±5° or better if carefully done. Begin by connecting the instrument to a signal conditioning circuit which indicates azimuth value. This may be an indicator which displays azimuth values in angular degrees or simply a voltmeter monitoring the output. Hold or mount the instrument so the vane center of rotation is over the center of a sheet of paper which has 30° or 45° crossmarkings. Position the instrument so the mounting crossarm is oriented north-south with the vane on the north and the anemometer on the south. With the counterweight pointing directly at the anemometer the

azimuth signal should correspond to 180° or due south. Looking from above, visually align the vane with each of the crossmarkings and observe the indicator display. It should correspond to vane position within 5°. If not, it may be necessary to adjust the relative position of the vane skirt and shaft. See step 3 in the MAINTENANCE section under potentiometer replacement.

It is important to note that while full scale azimuth on signal conditioning electronics may be 360°, full scale azimuth signal from the instrument is 352°. The signal conditioning electronics must be adjusted accordingly. For example, in a circuit where 0 to 1.00 VDC represents 0° to 360°, the output must be adjusted for 0.978 VDC when the instrument is at 352° full scale. ( $352° / 360° \times 1.00 \text{ volts} = 0.978 \text{ volts}$ )

Wind speed calibration is determined by the cup wheel turning factor and the output characteristics of the transducer. Calibration formulas showing cup wheel rpm and frequency output vs. wind speed are included in this manual. These formulas are accurate to within 2 percent.

To calibrate wind system electronics using an actual signal from the instrument, temporarily remove the cup wheel and connect a Model 18801 Anemometer Drive to the cup wheel shaft. Calculate wind speed by applying the appropriate calibration formula to the motor rpm and adjust the signal conditioning electronics for proper value. For example, with the cup wheel shaft turning at 1800 rpm adjust the indicator to display 22.7 meters per second. ( $0.01250 \times 1800 + 0.2 = 22.7$ )

## MAINTENANCE

Given proper care, the Wind Sentry should provide years of service. Constructed entirely of non-corrosive materials and using components which are conservatively rated, the instrument requires little maintenance. The only components likely to require replacement due to normal wear are the precision ball bearings and the azimuth potentiometer. Replacement of these components should only be performed by a qualified instrument technician. If service facilities are not available, return the instrument to the factory. Refer to the accompanying drawings to become familiar with part names and locations. The asterisk \* which appears in the following outlines is a reminder that maximum torque on all set screws is 80 oz-in.

### POTENTIOMETER REPLACEMENT:

The potentiometer has a life expectancy of fifty million revolutions. As it becomes worn, the element may begin to produce noisy signals or become non-linear. When the signal noise or non-linearity become unacceptable, replace the potentiometer as follows:

1. REMOVE POTENTIOMETER
  - a) Remove three screws which secure upper and lower sections of main housing.
  - b) Carefully remove upper housing exposing wiring connections to circuit board.
  - c) Unsolder potentiometer wires from circuit board. Note color coding.
  - d) Using a knife blade or similar instrument, loosen potentiometer assembly from upper housing and slide it out.
2. INSTALL NEW POTENTIOMETER
  - a) Slide new potentiometer cell into upper housing. Be sure to engage cell key into housing notch.
  - b) Solder potentiometer wires to circuit board. Observe color code.
  - c) Join two sections of main housing. Secure with screws removed in step 1a.

### 3. ALIGN VANE

- a) Connect excitation voltage and signal conditioning electronics to instrument according to wiring diagram.
- b) Loosen set screw in side of vane hub.
- c) Position instrument so crossarm is oriented north-south with vane on north side. Orient vane to a known angular reference. (See CALIBRATION section.)
- d) While holding vane in reference position, slowly turn vane skirt until signal conditioning system indicates proper value.
- e) Tighten set screw\* in side of vane hub.

### ANEMOMETER FLANGE BEARING REPLACEMENT:

If anemometer bearings become noisy or wind speed threshold increases above an acceptable level, replace the bearings. Check bearing condition by hanging an ordinary paper clip (0.5 gm) on the outside edge of one cup while the instrument is held in a horizontal position. The cup should rotate downward. Failure to rotate due to the weight of the paper clip indicates anemometer bearings need replacement. Repeat this test at different positions to check full bearing rotation. Replace bearings as follows:

#### 1. REMOVE BEARINGS

- a) Loosen set screw on side of cup wheel hub. Remove cup wheel.
- b) Remove three screws which hold two sections of main housing.
- c) Carefully separate upper and lower housing. Remove coil transducer assembly from upper housing. Do not disconnect from circuit board.
- d) Loosen screw and remove ring magnet on end of shaft inside upper housing.
- e) Slide shaft and skirt assembly out of both upper and lower bearings.
- f) Using knife blade under bearing flange, carefully remove upper bearing.
- g) Using a pencil, gently push out lower bearing from above.

#### 2. INSTALL NEW BEARINGS

- a) Insert new upper bearing. Use care not to apply excessive pressure.
- b) Slide cup wheel shaft through upper bearing.
- c) Slide lower bearing on shaft inside upper housing.
- d) Using ring magnet assembly, push lower bearing into its seat in upper housing.
- e) Secure ring magnet to shaft using screw removed in step 1d. Use a small amount of sealant on screw to prevent it from

loosening.

- f) Join two housing sections. Secure using three screws removed in step 1b.
- g) Place cup wheel on shaft. Tighten set screw\* on side of hub.

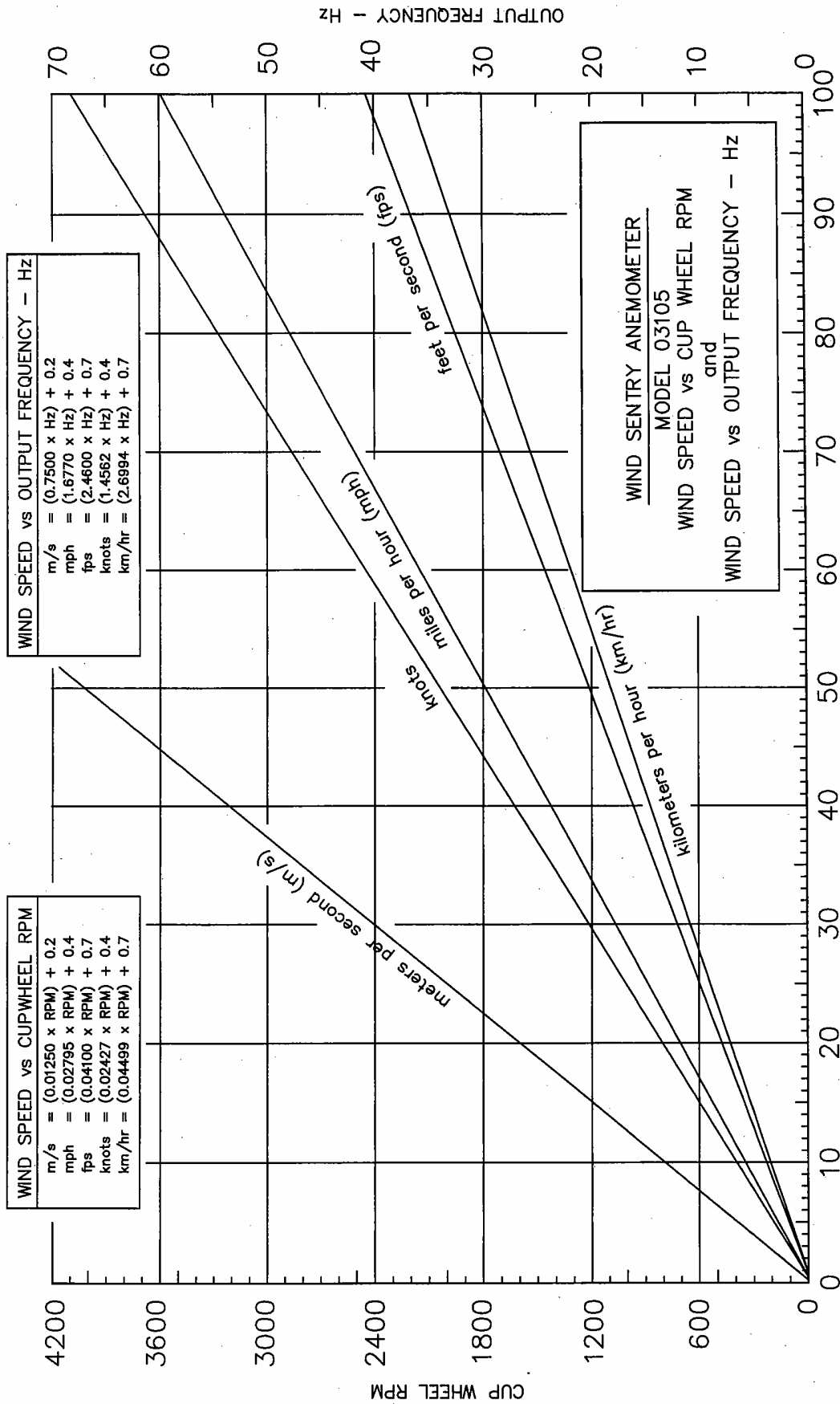
### VANE FLANGE BEARING REPLACEMENT:

If vane bearings become noisy or if wind direction threshold increases above an acceptable level, replace the bearings. Check bearing condition by adding two ordinary paper clips (0.5 gm each) to the back edge of the vane fin while the instrument and vane are held in a horizontal position. Gently release the vane. It should rotate downward. Failure to do so indicates the bearings need replacement. Repeat this test at various positions to check full bearing rotation.

Since this procedure is similar to anemometer bearing replacement, only the major steps are shown here:

1. REMOVE BEARINGS (Remove coupling disc - same as ring magnet)
2. INSTALL NEW BEARINGS
3. ALIGN VANE (See CALIBRATION section)

\*Max set screw torque 80 oz-in

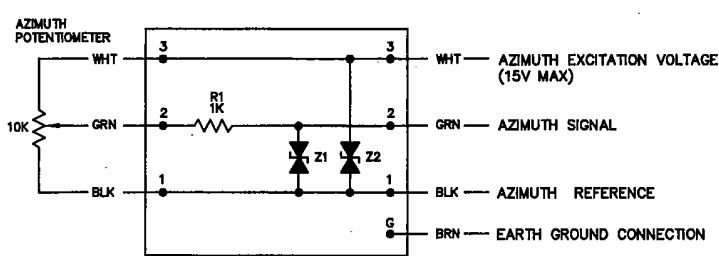
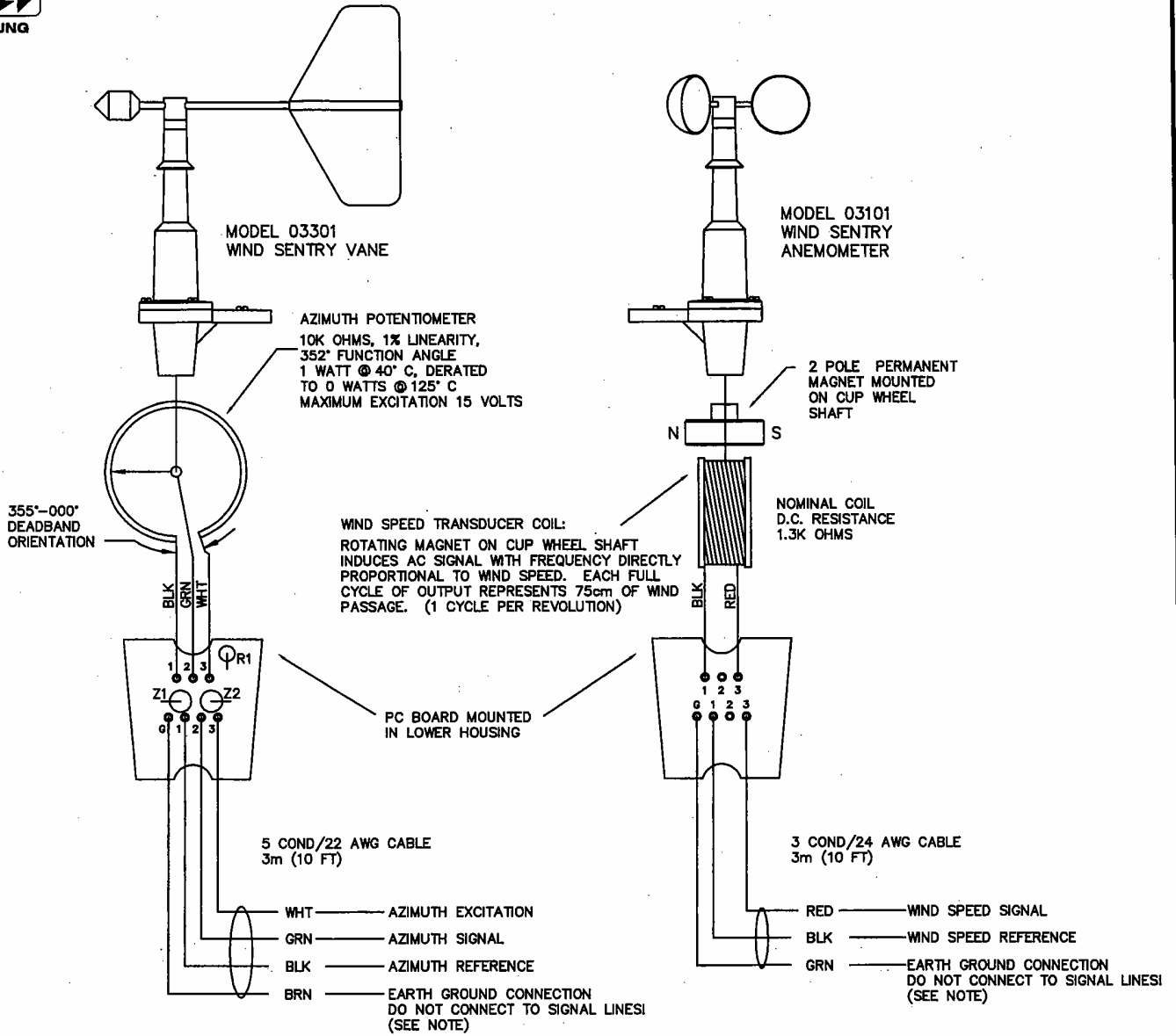


D03110.DWG  
MAR 97

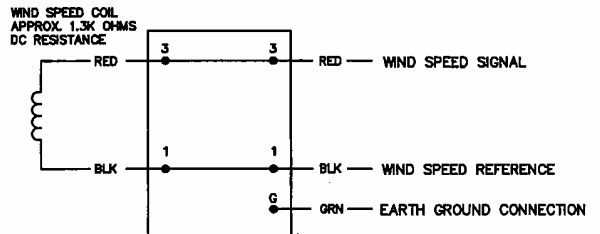
WIND SPEED: meters per second, miles per hour, feet per second, knots, kilometers per hour



MODEL 03001 WIND SENTRY ANEMOMETER AND VANE



Z1 AND Z2 ARE TRANSIENT PROTECTION DEVICES



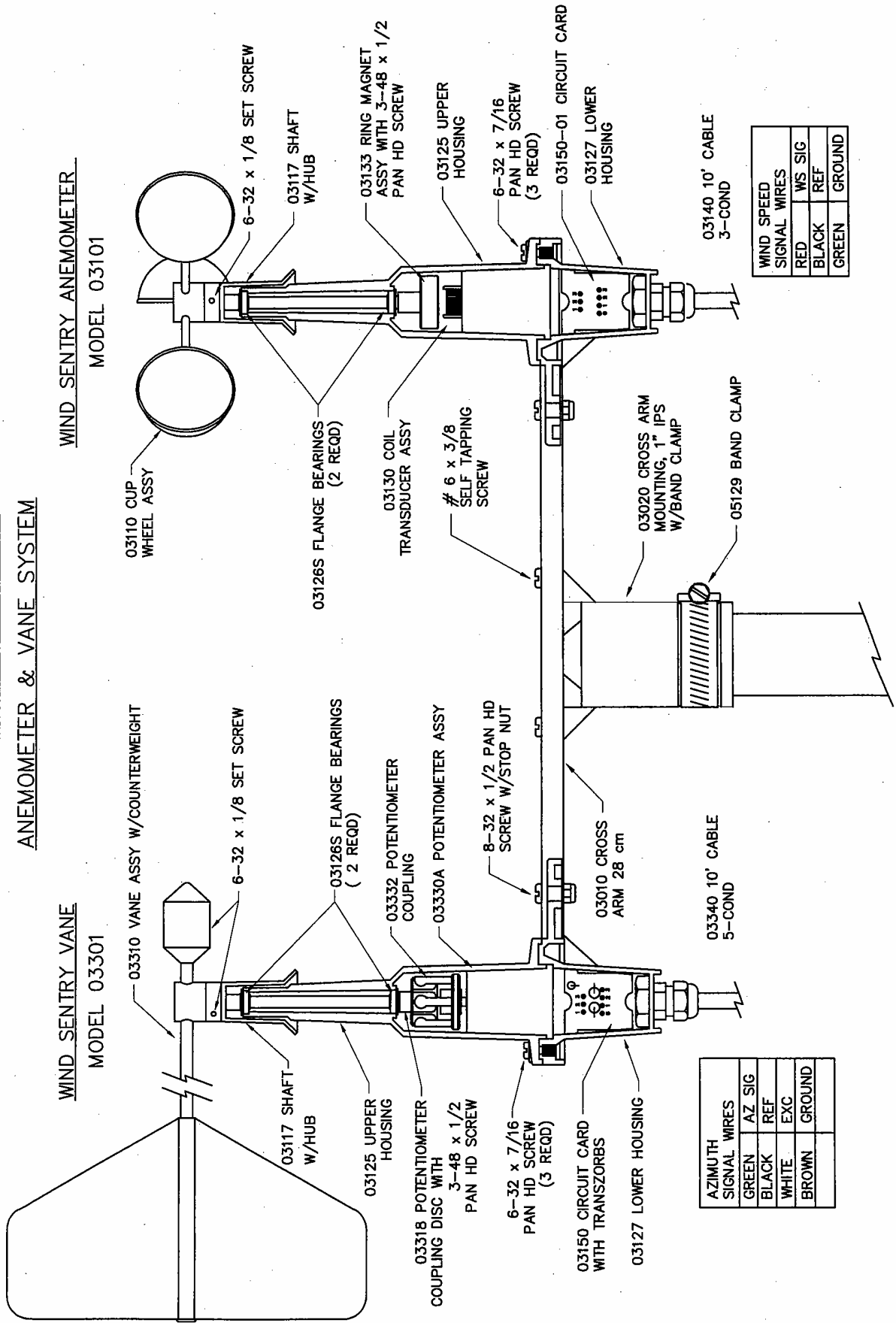
NOTE:

THE EARTH GROUND CONNECTIONS MUST BE CONNECTED TO EARTH GROUND TO PROVIDE A STATIC DISCHARGE PATH. CONNECT THESE WIRES TO AN EARTH GROUND IN THE PROXIMITY OF THE SENSOR.

MODEL 03001-60	DWG A	PRD 08-90
WIND SENTRY CABLE & WIRING DIAGRAM	DWN KL	DWG 06-93
CAMPBELL SCIENTIFIC CANADA CORP.	CHK X.C.	W03001
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231-946-3980		



**MODEL 03001 WIND SENTRY  
ANEMOMETER & VANE SYSTEM**



**WIND SENTRY ANEMOMETER  
MODEL 03101**

**WIND SENTRY VANE  
MODEL 03301**

WIND SPEED SIGNAL WIRES	
RED	WS SIG
BLACK	REF
GREEN	GROUND

AZIMUTH SIGNAL WIRES	
GREEN	AZ SIG
BLACK	REF
WHITE	EXC
BROWN	GROUND

MODEL 03001 WIND SENTRY	DWG A	PRD 05-88
ANEMOMETER & VANE	DWN KL	DWG 05-00
REPLACEMENT PARTS	CHK X.C.	MO3001
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231-946-3980		

