

**MODEL 03002L**

**WIND SENTRY**

**WITH 4-20 mA OUTPUTS**



**JULY 2001**

**MANUAL PN 03002L-90**



**MODEL 03002L**  
**WIND SENTRY**  
**(WITH 4-20mA OUTPUTS)**  
**INCLUDES MODELS 03102L & 03302L**



**WIND SPEED SPECIFICATION SUMMARY**

|                                     |   |
|-------------------------------------|---|
| Range                               | 0 to 50 m/s (112 mph), gust survival<br>60 m/s (134 mph)                |
| Sensor                              | 12 cm diameter cup wheel assembly,<br>40 mm diameter hemispherical cups |
| Turning Factor                      | 75 cm (2.46 ft)   |
| Distance Constant<br>(63% recovery) | 2.3 m (7.5 ft)  |
| Threshold                           | 1.1 m/s (2.5 mph)   |
| Transducer                          | Stationary coil, 1300 ohm nominal DC<br>resistance                      |
| Output Signal                       | 4 to 20 mA over specified wind speed<br>range                           |

| Model No.<br>Suffix | Range                    |
|---------------------|--------------------------|
| M                   | 0 TO 50 M/S              |
| P                   | 0 to 100 MPH             |
| N                   | 0 to 100 KNOTS           |
| K                   | 0 TO 200 KILOMETERS/HOUR |

**WIND DIRECTION (AZIMUTH) SPECIFICATION SUMMARY**

|                                  |   |
|----------------------------------|---|
| Range                            | 360° mechanical, 352° electrical (8°<br>open)   |
| Sensor                           | Balanced vane, 16 cm turning radius.  |
| Damping Ratio                    | 0.2   |
| Delay Distance<br>(50% recovery) | 0.5 m (1.6 ft)  |
| Threshold                        | 1.3 m/s (2.9 mph) at 10° displacement<br>1.9 m/s (4.2 mph) at 5° displacement   |
| Transducer                       | Precision conductive plastic<br>potentiometer, 10K ohm ±20%<br>resistance 1.0% linearity, life expect-<br>ancy 50 million revolutions Rated 1<br>watt at 40°C, 0 watts at 125°C |
| Output Signal                    | 4 to 20 mA for 0 to 360°  |

**GENERAL**

|                       |                            |
|-----------------------|----------------------------|
| Power Requirement     | 8 - 30 VDC                 |
| Operating Temperature | -50 to 50°C (-58 to 122°F) |

**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 proportional to wind speed. Internal circuitry converts the raw signal to 4 to 20 mA current output over the specified wind speed range.

Vane position is sensed by a 10K ohm precision conductive plastic potentiometer. This signal is also converted to 4 to 20 mA current output.

The sensor mounts on standard 1 inch pipe, outside diameter 34mm (1.34") and is supplied with a crossarm and junction box for cable connections. Wind Sentry anemometers and windvanes are available separately with similar mounting and junction box.

**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 on 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. A slight imbalance will not degrade performance.

**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 applications it may not be practical or necessary to meet these requirements.

Grounding the Wind Sentry is vitally important. Without proper grounding, static electrical charge can build up during certain atmospheric conditions and discharge through the transducers. This discharge may cause erroneous signals or transducer failure. To direct the discharge away from the transducers, housings in which the transducers are mounted are made with a special anti-static plastic. It is important that the mounting post be connected to a good earth ground. There are two ways this may be accomplished. First, the Wind Sentry may be mounted on a metal pipe

which is connected to earth ground. The mounting pipe should not be painted where the Wind Sentry is mounted. Towers or masts set in concrete should be connected to one or more grounding rods. If it is difficult to ground the mounting post in this manner, the following method should be used. Inside the junction box the screw labeled EARTH GND is connected to the anti-static housings. This terminal should be connected to an earth ground (Refer to wiring diagram).

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 cross arm (Model 03002), the azimuth potentiometer has been aligned at the factory such that the mounting cross arm should be oriented North-South with the vane on the North end.

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.
2. CONNECT SENSOR CABLE
  - a) Refer to wiring diagram located at back of manual.
3. ALIGN VANE
  - a) Connect sensor cable to indicator.
  - a) Choose a known wind direction reference point on the horizon.
  - b) Sighting down vane centerline, point counterweight at reference point on horizon.
  - c) While holding vane in position, slowly turn base until indicator displays proper value.
  - d) Tighten mounting post band clamp.

## CALIBRATION

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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  $\pm 5^\circ$  or better if carefully done. Begin by connecting the instrument to a signal conditioning circuit which indicates wind direction value. This may be an indicator which displays wind direction 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  $30^\circ$  or  $45^\circ$  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  $180^\circ$  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  $5^\circ$ . 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 the sensor mechanically rotates through  $360^\circ$ , full scale wind direction signal from the signal conditioning occurs at  $352^\circ$ . The signal conditioning electronics must be adjusted accordingly. For example, in a circuit where 4 to 20 mA represents  $0^\circ$  to  $360^\circ$ , the output must be adjusted for 19.6 mA when the instrument is at  $352^\circ$  full scale.  $[(352^\circ/360^\circ \times 16 \text{ mA}) + 4 \text{ mA}]$

Wind speed calibration is determined by the cup wheel turning factor and the output characteristics of the transducer. The calibration formula relating cup wheel rpm to wind speed is shown below. Standard accuracy is  $\pm 0.5$  m/s (1.1 mph). For greater accuracy, the sensor must be individually calibrated in comparison with a wind speed standard. Contact the factory or your supplier to schedule a NIST (National Institute of Standards & Technology) traceable wind tunnel calibration in our facility.

To calibrate wind system electronics, temporarily remove the cup wheel and connect a Model 18801 Anemometer Drive to the cup wheel shaft. Apply the 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.  $(0.01250 \times 1800 + 0.2 = 22.7)$

## CALIBRATION FORMULAS

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### Model 03102L Wind Sentry Anemometer

WIND SPEED vs CUP WHEEL RPM  
03002LM m/s =  $(0.01250 \times \text{rpm}) + 0.2$   
03002LN knots =  $(0.02427 \times \text{rpm}) + 0.4$   
03002LP mph =  $(0.02795 \times \text{rpm}) + 0.4$   
03002LK km/hr =  $(0.04499 \times \text{rpm}) + 0.7$

WIND SPEED vs mA OUTPUT  
03002LM m/s =  $(3.1250 \times \text{mA}) - 12.5$   
03002LN knots =  $(6.2500 \times \text{mA}) - 25$   
03002LP mph =  $(6.2500 \times \text{mA}) - 25$   
03002LK km/hr =  $(12.500 \times \text{mA}) - 50$

WIND DIRECTION vs mA OUTPUT  
DEGREES =  $(22.5 \times \text{mA}) - 90$

## MAINTENANCE

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Given proper care, the Wind Sentry should provide years of service. Because of its durable, corrosion resistant construction, the instrument requires little maintenance. The only components likely to require replacement due to normal wear are the precision ball bearings and the wind direction 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. Maximum torque on all set screws is 80 oz-in.

### POTENTIOMETER REPLACEMENT

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The potentiometer has a life expectancy of fifty million revolutions. As it becomes worn, the element may 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 on side of vane hub. Do not exceed 80 oz-in torque.

## 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. Do not exceed 80 oz-in torque.

## 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)

## WARRANTY

This product is warranted to be free of defects in materials and construction for a period of 12 months from date of initial purchase. Liability is limited to repair or replacement of defective item. A copy of the warranty policy may be obtained from R. M. Young Company.

## CE COMPLIANCE

This product has been tested and shown to comply with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

### Declaration of Conformity

**Application of Council Directives:**  
89/336/EEC

**Standards to which Conformity is Declared:**  
EN 50082-1 (IEC 801-2, 3, 4)

**Manufacturer's Name and Address:**  
R. M. Young Company  
Traverse City, MI, 49686, USA

**Importer's Name and Address:**  
See Shipper or Invoice

**Type of Equipment:**  
Meteorological Instruments

**Model Number / Year of Manufacture:**  
03002/1996  
03102/1996  
03302/1996

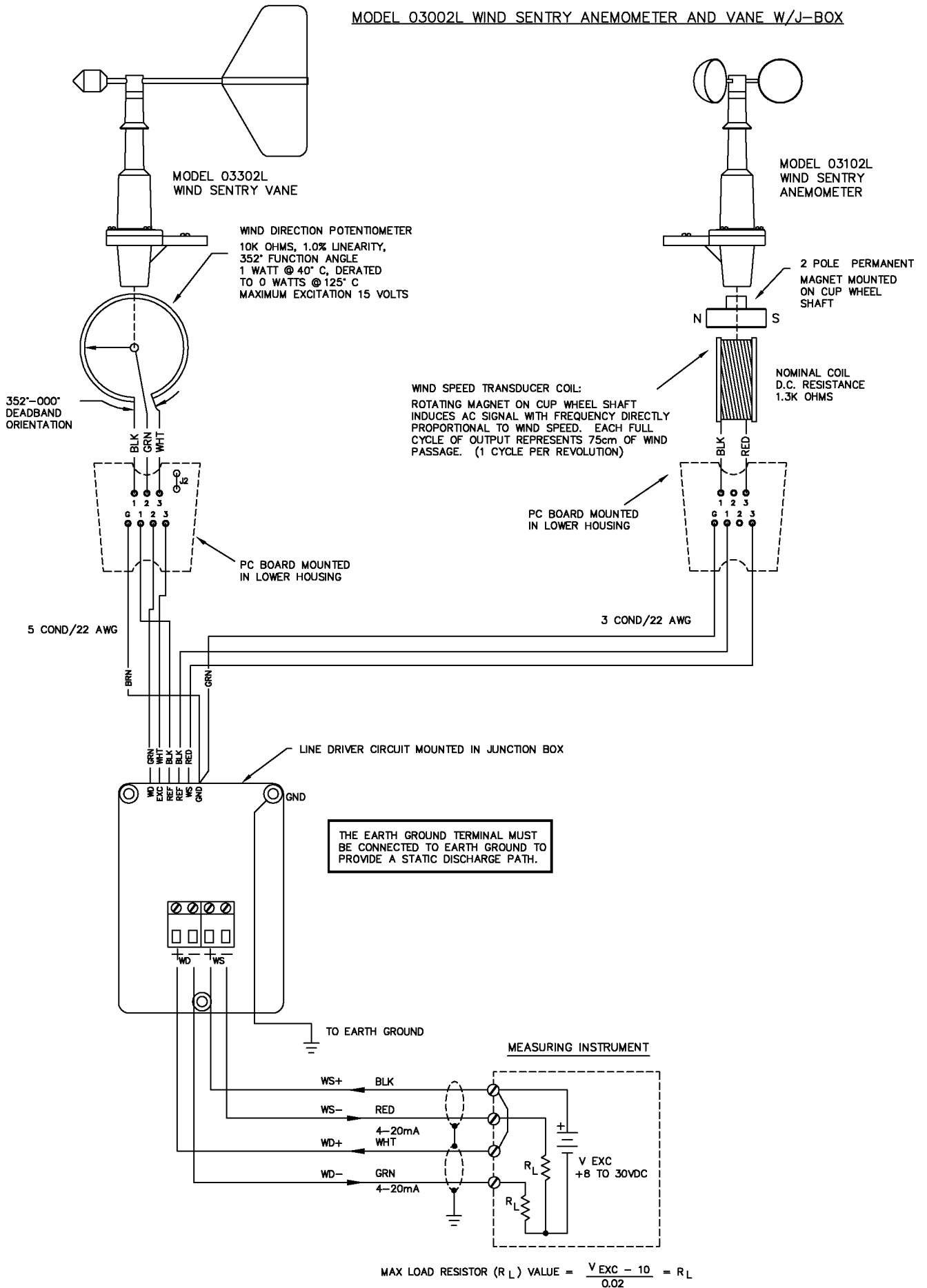
I, the undersigned, hereby declare that the equipment specified conforms to the above Directives and Standards.

**Date / Place:**  
Traverse City, Michigan, USA February 19, 1996



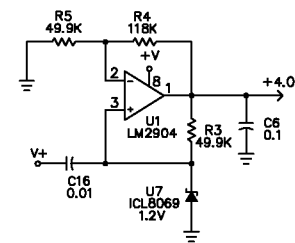
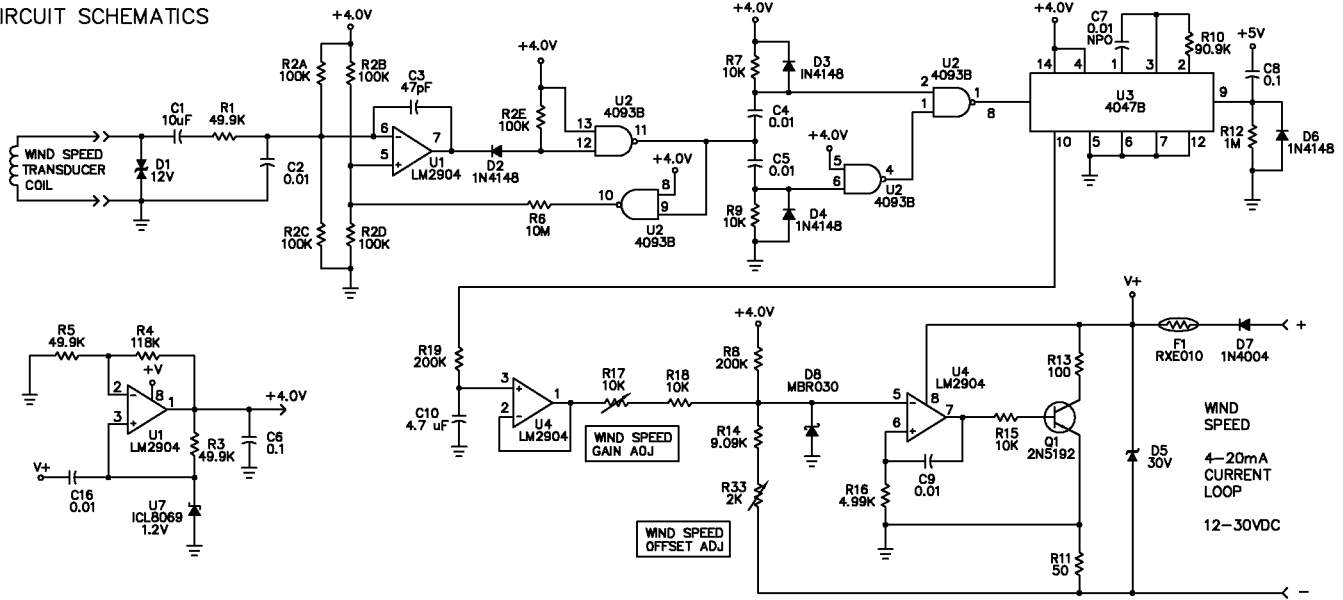
David Poinsett  
R & D Manager, R. M. Young Company

MODEL 03002L WIND SENTRY ANEMOMETER AND VANE W/J-BOX

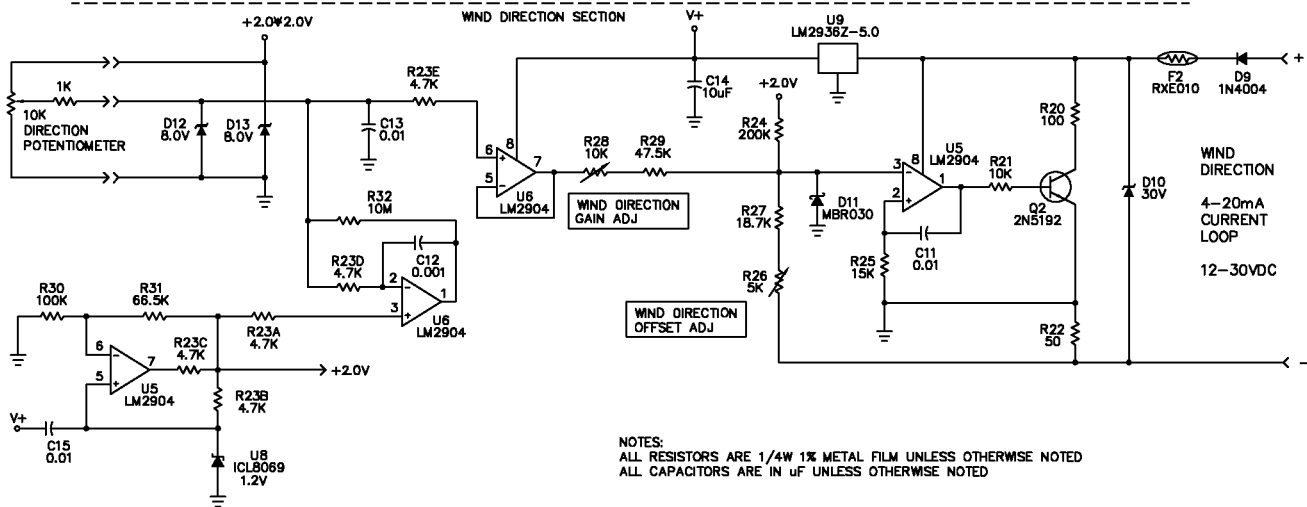


|  |          |           |
|--|----------|-----------|
| MODEL 03002L   | DWG A    | PRD 08-97 |
| WIND SENTRY 4-20 mA OUTPUTS                                | DWN KL   | DWG 08-97 |
| CABLE & WIRING DIAGRAM                                     | CHK S.C. | W03002L   |
| R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231-946-3980 |          |           |

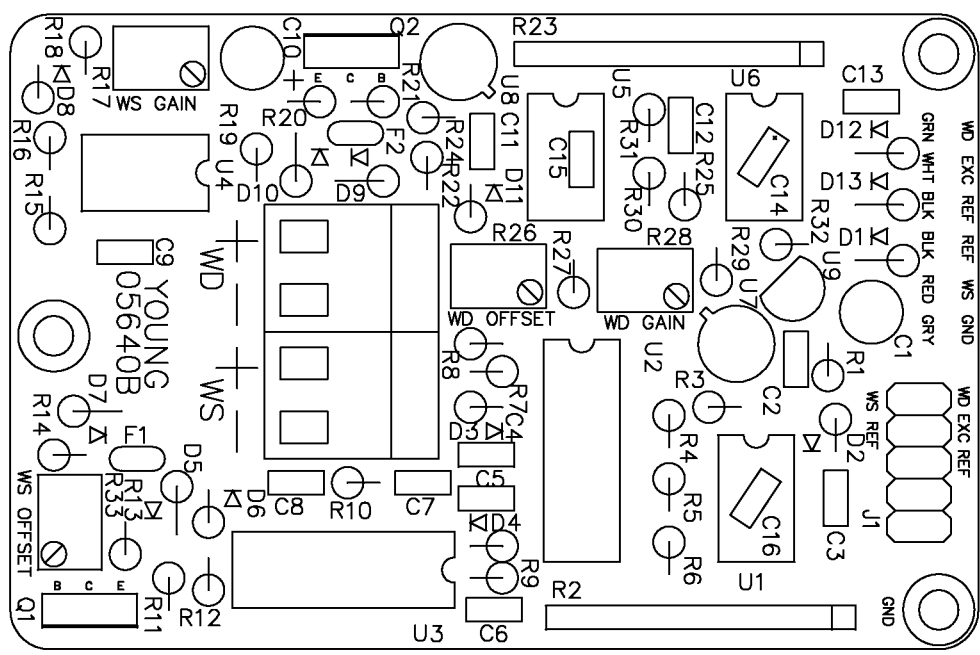
CIRCUIT SCHEMATICS



WIND SPEED SECTION



NOTES:  
ALL RESISTORS ARE 1/4W 1% METAL FILM UNLESS OTHERWISE NOTED  
ALL CAPACITORS ARE IN uF UNLESS OTHERWISE NOTED

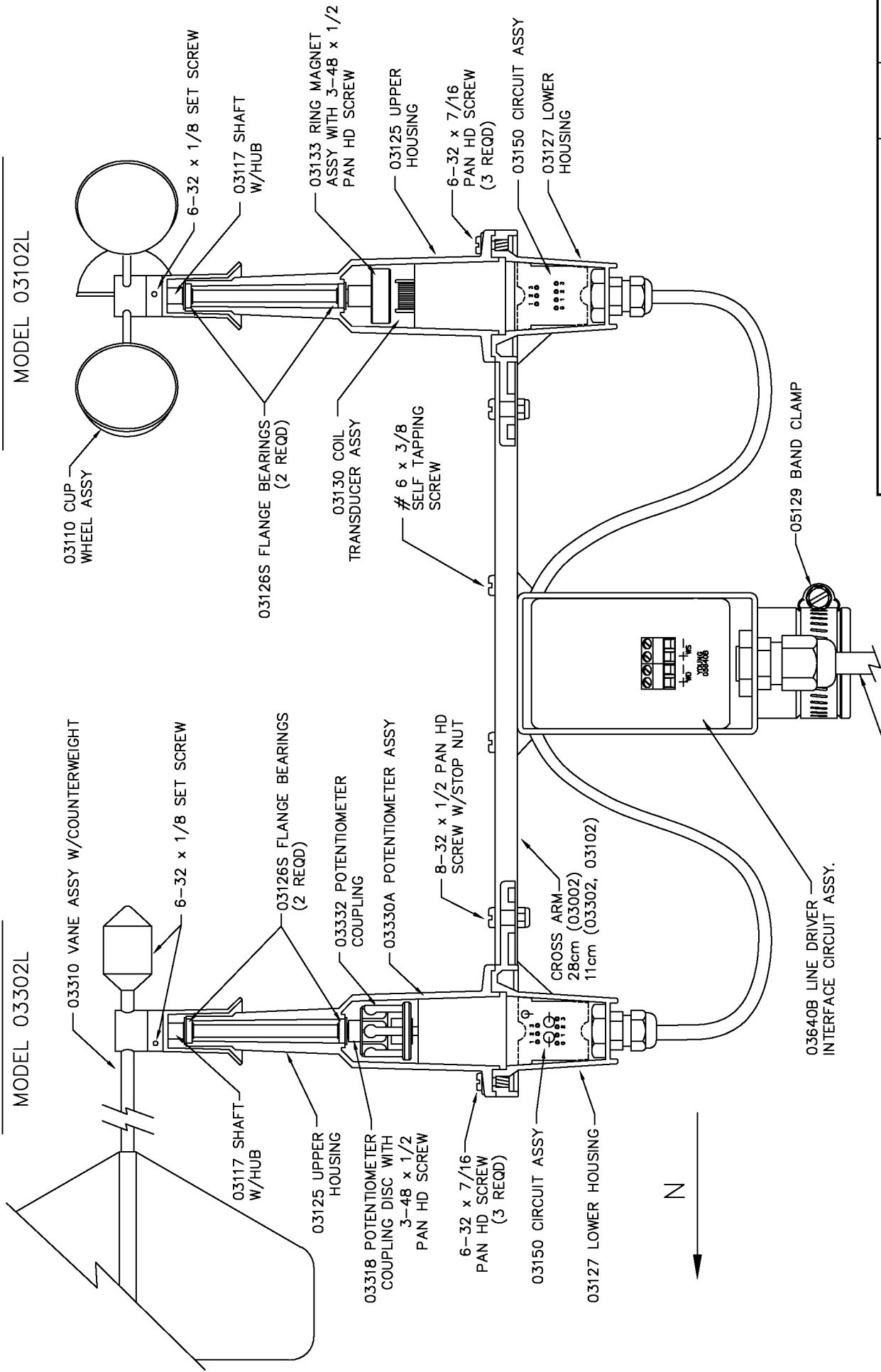


|  |                        |           |
|--|------------------------|-----------|
| MODEL 03640B WIND LINE DRIVER                              | DWG A                  | PRD 12-96 |
| CIRCUIT DIAGRAM AND COMPONENT LAYOUT                       | DWN JMT                | DWG 07-01 |
|  | CHK <i>[Signature]</i> | C03640B   |
| R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231-946-3980 |                        |           |

MODEL 03002L WIND SENTRY  
ANEMOMETER & VANE SYSTEM

WIND SENTRY VANE  
MODEL 03302L

WIND SENTRY ANEMOMETER  
MODEL 03102L



|  |          |           |
|--|----------|-----------|
| MODEL 03002L WIND SENTRY                                   | DWG A    | PRD 08-97 |
| 4-20 mA OUTPUTS  | DWN JMT  | DWG 07-01 |
| REPLACEMENT PARTS  | CHK X.C. | M03002L   |
| R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231-946-3980 |          |           |