MODEL 04101
WIND MONITOR -JR

CE

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MANUAL PN 04101-90

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MODEL 04101
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WIND SPEED SPECIFICATION SUMMARY

Range	0 to 60 m/s (130 mph), gust survival 100 m/s (220 mph)
Sensor	13 cm diameter 4-blade helicoid propeller molded of polypropylene
Pitch	29.4 cm air passage per revolution
Distance Constant	2.0 m (6.6 ft.) for 63% recovery
Threshold Sensitivity	1.0 m/s (2.2 mph)
Transducer	Centrally mounted stationary coil, 2K Ohm nominal DC resistance
Transducer Output	AC sine wave signal induced by rotating magnet on propeller shaft. 40 mV p-p at 100 rpm. 4.0 V p-p at 10,000 rpm.
Output Frequency	3 cycles per propeller revolution (0.0980 m/s per Hz)

WIND DIRECTION (AZIMUTH) SPECIFICATION SUMMARY

Range	360° mechanical, 352° electrical (8° open)
Sensor	Balanced vane, 21 cm (8 in) turning radius.
Damping Ratio	0.3
Delay Distance	0.8 m (2.6 ft) for 50% recovery
Threshold Sensitivity	1.7 m/s (3.8 mph) at 10° displacement
Transducer	Precision conductive plastic potentiometer, 10K ohm resistance (±20%), 1% 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 azimuth angle with regulated excitation voltage applied across potentiometer.

GENERAL

Operating Temperature	-50 to 50°C (-58 to 122 °F)

INTRODUCTION

The Wind Monitor measures horizontal wind speed and direction. Originally developed for ocean data buoy use, it is rugged and corrosion resistant yet accurate and light weight. The main housing, nose cone, propeller, and other internal parts are injection molded U.V. stabilized plastic. Both the propeller and vertical shafts use stainless steel precision grade ball bearings. Bearings have light contacting teflon seals and are filled with a low torque wide temperature range grease to help exclude contamination and moisture.

Propeller rotation produces an AC sine wave signal with frequency proportional to wind speed. This AC signal is induced in a stationary coil by a six pole magnet mounted on the propeller shaft. Three complete sine wave cycles are produced for each propeller revolution.

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 wind direction angle.

The instrument mounts on standard one inch pipe, outside diameter 34 mm (1.34"). An orientation ring is provided so the instrument can be removed for maintenance and reinstalled without loss of wind direction reference. Both mounting post assembly and orientation ring are secured to the mounting pipe by stainless steel band clamps. Electrical connections are made in a junction box at the base. A variety of devices are available for signal conditioning, display, and recording of wind speed and direction.

INITIAL CHECKOUT

When the Wind Monitor is unpacked it should be checked carefully for any signs of shipping damage. The instrument is aligned, balanced and fully calibrated before shipment, however it should be checked both mechanically and electrically before installation. The vane and propeller should easily rotate 360° without friction. Check vane balance by holding the instrument base 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.

The potentiometer requires a stable DC excitation voltage. Do not exceed 15 volts. When the potentiometer wiper is in the deadband region, the output signal is “floating” and may show varying or unpredictable values. To prevent false readings, signal conditioning electronics should clamp the signal to excitation or reference level when this occurs. **Note: Young signal conditioning devices clamp the signal to excitation level.** Avoid a short circuit between the wind direction signal line and either the excitation or reference lines. Damage to the potentiometer may occur if a short circuit condition exists.

Before installation, connect the instrument to an indicator as shown in the wiring diagram and check for proper wind speed and wind direction values. Position the vane over a sheet of paper with 30° or 45° crossmarkings to check vane alignment.

INSTALLATION

Proper placement of the instrument is very important. Eddies from trees, buildings, or other structures can greatly influence wind speed and wind direction observations. To get meaningful data for most applications locate the instrument well above or upwind from 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 up to twice the height of the structure above ground. For some applications it may not be practical or necessary to meet these requirements.

FAILURE TO PROPERLY GROUND THE WIND MONITOR MAY RESULT IN ERRONEOUS SIGNALS OR TRANSDUCER DAMAGE.

Grounding the Wind Monitor is vitally important. Without proper grounding, static electrical charge can build up during certain atmospheric conditions and discharge through the transducers. This discharge can cause erroneous signals or transducer failure. To direct the discharge away from the transducers, the mounting post assembly is made with a special antistatic plastic. It is very important that the mounting post be connected to a good earth ground. There are two ways this may be accomplished. First, the Wind Monitor may be mounted on a metal pipe which is connected to earth ground. The mounting pipe should not be painted where the Wind Monitor 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 terminal labeled EARTH GROUND is internally connected to the antistatic mounting post. This terminal should be connected to an earth ground (refer to wiring diagram).

Initial installation is most easily done with two people; one to adjust the instrument position and the other to observe the indicating device. After initial installation, the instrument can be removed and returned to its mounting without realigning the vane since the orientation ring preserves the wind direction reference. Install the Wind Monitor following these steps:

1. MOUNT WIND MONITOR
   a) Place orientation ring on mounting post. Do Not tighten band clamp yet.
   b) Place Wind Monitor 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 instrument to an indicator.
   b) Choose a known wind direction reference point on the horizon.
   c) Sighting down instrument centerline, point nose cone at reference point on horizon.
   d) While holding vane in position, slowly turn base until indicator shows proper value.
   e) Tighten mounting post band clamp.
   f) Engage orientation ring indexing pin in notch at instrument base.
   g) Tighten orientation ring band clamp.

CALIBRATION

The Wind Monitor 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.

To calibrate for wind direction, the following method can yield vane calibration accuracies of ±5° or better if carefully done. Begin by connecting the instrument to a signal conditioning circuit which has some method of indicating wind direction value. This may be a display which shows wind direction values in angular degrees or simply a voltmeter monitoring the output. On a large sheet of paper or cardboard, carefully draw lines, pie fashion, at 45° increments. Mark these points with degree values; 0°, 45°, 90°.... Center the instrument mounting base at the centerpoint of the markings with the junction box facing South (180°). Visually align the vane with each crossmarking and observe the indicator output. If the vane position and indicator do not agree within 5°, it may be necessary to adjust the potentiometer coupling inside the main housing. Details for making this adjustment appear in the MAINTENANCE, POTENTIOMETER REPLACEMENT outline, step 7.

It is important to note that while the sensor mechanically rotates through 360°, the wind direction signal from the signal conditioning occurs at 352°. The signal conditioning electronics must be adjusted accordingly. For example, in a circuit where 0 to 1.000 VDC represents 0° to 360°, the output must be adjusted for 0.978 VDC when the instrument is at 352°. (352°/360° X 1.000 volts = 0.978 volts)

Wind speed calibration is determined by propeller pitch and the output characteristics of the transducer. Calibration formulas showing propeller rpm and frequency output vs. wind speed are included below. Standard accuracy is +/- 0.5m/sec. For greater accuracy, the device 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.

Details on checking bearing torque, which affects wind speed and direction threshold, appear in the following section.

CALIBRATION FORMULAS

Model 04101 Wind Monitor-JR

WIND SPEED vs PROPELLER RPM

m/s	=	0.00490 x rpm
knots	=	0.00952 x rpm
mph	=	0.01096 x rpm
km/h	=	0.01764 x rpm

WIND SPEED vs OUTPUT FREQUENCY

m/s	=	0.0980 x Hz
knots	=	0.1904 x Hz
mph	=	0.2192 x Hz
km/h	=	0.3528 x Hz

MAINTENANCE

Given proper care, the Wind Monitor should provide years of service. The only components likely to need replacement due to normal wear are the precision ball bearings and the wind direction potentiometer. Only a qualified instrument technician should perform the replacement. If service facilities are not available, return the instrument to the company. Refer to the 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 nonlinear. When signal noise or nonlinearity becomes unacceptable, replace the potentiometer. Refer to exploded view drawing and proceed as follows:

1. REMOVE MAIN HOUSING
   a) Unscrew nose cone from main housing.
   b) Gently push main housing latch, visible inside front housing.
   c) While pushing latch, lift main housing up and remove it from vertical shaft bearing rotor.

2. UNSOLDER TRANSDUCER WIRE
   a) Slide junction box cover up, exposing circuit board.
   b) Remove screws holding circuit board.
   c) Unsolder three potentiometer wires (white, green, black), two wind speed coil wires (red, black) and earth ground wire (gray) from board.

3. REMOVE POTENTIOMETER
   a) Loosen set screw on potentiometer coupling and remove it from potentiometer adjust thumbwheel.
   b) Loosen set screw on potentiometer adjust thumbwheel and remove it from potentiometer shaft extension.
   c) Loosen two set screws at base of transducer assembly and remove assembly from vertical shaft.
   d) Unscrew potentiometer housing from potentiometer mounting & coil assembly.
   e) Push potentiometer out of potentiometer mounting & coil assembly by applying firm but gentle pressure on potentiometer shaft extension. Set o-ring aside for later use.
   f) Loosen set screw on potentiometer shaft extension and remove it from potentiometer shaft.

4. INSTALL NEW POTENTIOMETER
   a) Place potentiometer shaft extension with o-ring on new potentiometer (Gap 0.040") and tighten set screw*. Regrease o-ring if necessary.
   b) Push new potentiometer into potentiometer mounting & coil assembly.
   c) Feed potentiometer and coil wires through hole in bottom of potentiometer housing.
   d) Screw potentiometer housing onto potentiometer mounting & coil assembly.
   e) Gently pull transducer wires through bottom of potentiometer housing to take up any slack. Apply a small amount of silicone sealant around hole.
   f) Install transducer assembly on vertical shaft allowing 0.5 mm (0.020") clearance from vertical bearing. Tighten set screws* at bottom of transducer assembly.
   g) Place potentiometer adjust thumbwheel on potentiometer shaft extension and tighten set screw*.
   h) Place potentiometer coupling on potentiometer adjust thumbwheel. Do not tighten set screw yet.

5. RECONNECT TRANSDUCER WIRES
   a) Using needle-nose pliers or a paper clip bent to form a small hook, gently pull transducer wires through hole in junction box.
   b) Solder wires to circuit board according to wiring diagram. Observe color code.
   c) Secure circuit board in junction box using two screws removed in step 2b. Do not overtighten.

6. REPLACE MAIN HOUSING
   a) Place main housing over vertical shaft bearing rotor. Be careful to align indexing key and channel in these two assemblies.
   b) Place main housing over vertical shaft bearing rotor until potentiometer coupling is near top of main housing.
   c) Turn potentiometer adjust thumbwheel until potentiometer coupling is oriented to engage ridge in top of main housing. Set screw on potentiometer coupling should be facing the front opening.
   d) With potentiometer coupling properly oriented, continue pushing main housing onto vertical shaft bearing rotor until main housing latch locks into position with a “click”.

7. ALIGN VANE
   a) Connect excitation voltage and signal conditioning electronics to terminal strip according to wiring diagram.
   b) With mounting post held in position so junction box is facing due south, orient vane to a known angular reference. Details appear in CALIBRATION section.
   c) Reach in through front of main housing and turn potentiometer adjust thumbwheel until signal conditioning system indicates proper value.
   d) Tighten set screw* on potentiometer coupling.

8. REPLACE NOSE CONE
   a) Screw nose cone into main housing firmly, using only hand pressure. Be certain threads are properly engaged to avoid cross-threading.

FLANGE BEARING REPLACEMENT

If anemometer bearings become noisy or wind speed threshold increases above an acceptable level, bearings may need replacement. A rough check of anemometer bearing condition can be performed by adding an ordinary paper clip (0.5 gm) to the tip of a propeller blade. Turn the blade with the paper clip to the "three o'clock" or "nine o'clock" position and gently release it. 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. If needed, bearings are replaced as follows.

1. REMOVE OLD BEARINGS
   a) Unscrew nose cone.
   b) Loosen set screw on magnet shaft collar and remove magnet.
   c) Slide propeller shaft out of nose cone assembly.
   d) Remove both front and rear bearings from nose cone assembly. Insert edge of a pocket knife under bearing flange and lift it out.

2. INSTALL NEW BEARINGS
   a) Insert new front and rear bearings into nose cone.
   b) Carefully slide propeller shaft thru bearings.
   c) Replace magnet on propeller shaft allowing 0.5 mm (0.020") clearance from rear bearing.
   d) Tighten set screw* on magnet shaft collar.
   e) Screw nose cone into main housing until seated. Be certain threads are properly engaged to avoid cross-threading.

*Max set screw torque 80 oz-in

VERTICAL SHAFT BEARING REPLACEMENT

Vertical shaft bearings are much larger than the anemometer bearings. Ordinarily, these bearings will last about twice as long as the anemometer bearings. Check bearing condition holding the instrument with the vane horizontal and placing a 3 gm weight near the aft edge of the fin. A U.S. penny weighs about 3 gm and is convenient for this check. Failure to rotate downward indicates the vertical bearings need replacement. Repeat this test at different positions to check full bearing rotation.

Since this procedure is similar to POTENTIOMETER REPLACEMENT, only the major steps are listed here.

1. REMOVE MAIN HOUSING
2. UNSOLDER TRANSDUCER WIRES AND REMOVE TRANSDUCER ASSEMBLY
   Loosen set screws at base of transducer assembly and remove entire assembly from vertical shaft.
3. REMOVE VERTICAL SHAFT BEARING ROTOR by sliding it upward off vertical shaft.
4. REMOVE OLD VERTICAL BEARINGS AND INSTALL NEW BEARINGS. When inserting new bearings, be careful not to apply pressure to bearing shields.
5. REPLACE VERTICAL SHAFT BEARING ROTOR.
6. REPLACE TRANSDUCER & RECONNECT WIRES
7. REPLACE MAIN HOUSING
8. ALIGN VANE
9. REPLACE NOSE CONE

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

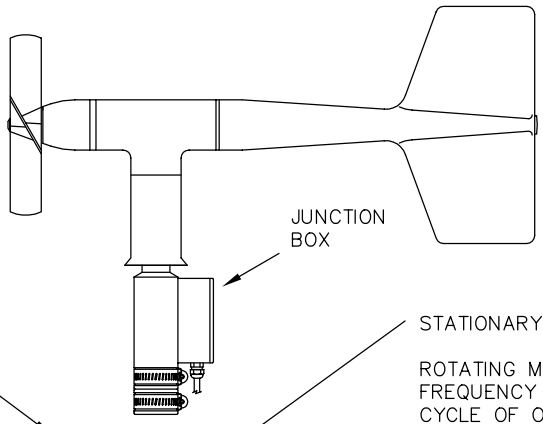
Type of Equipment:
Meteorological Instruments

Model Number / Year of Manufacture:
04101/1996

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 04101 WIND MONITOR–JR

JUNCTION BOX

SIX POLE PERMANENT MAGNET MOUNTED ON PROPELLER SHAFT

STATIONARY WIND SPEED TRANSDUCER COIL:

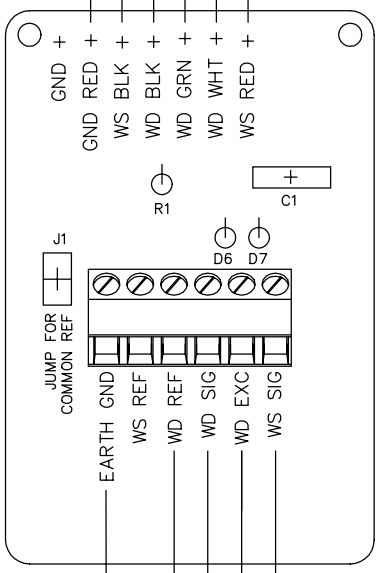
ROTATING MAGNET ON PROPELLER SHAFT INDUCES AC SIGNAL WITH FREQUENCY DIRECTLY PROPORTIONAL TO WIND SPEED. EACH FULL CYCLE OF OUTPUT REPRESENTS 10cm OF WIND PASSAGE (3 CYCLES PER REVOLUTION)

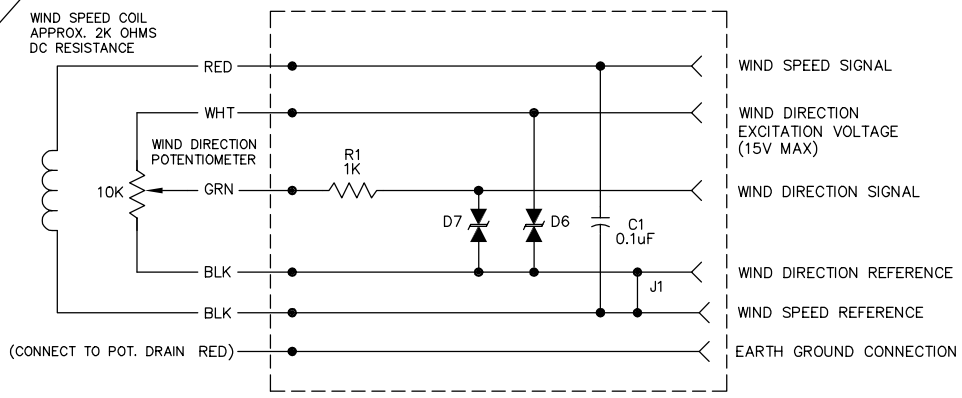
WIND DIRECTION POTENTIOMETER WITH ANTISTATIC DRAIN PAD

10K OHMS, 1% LINEARITY, 352° FUNCTION ANGLE, 1 WATT @ 40°C, DERATED TO 0 WATTS @ 125° C

NOTE:
POTENTIOMETER WIRES ARE 28 AWG.
WIND SPEED COIL WIRES ARE 22 AWG

P.C. BOARD MOUNTED IN JUNCTION BOX

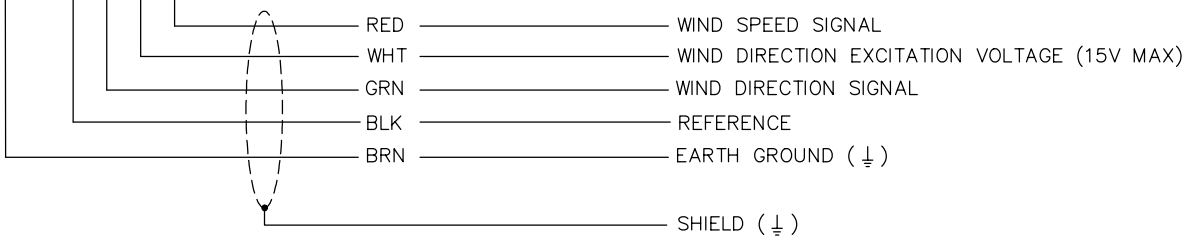




JUMPER J1 CONNECTS THE WIND DIRECTION AND WIND SPEED REFERENCES. IN APPLICATIONS WHERE THE TWO REFERENCES NEED TO REMAIN SEPARATE, JUMPER J1 MUST BE OMITTED OR CUT.

D6 AND D7 ARE TRANSZORB TRANSIENT PROTECTION DEVICES.

MULTI–CONDUCTOR CABLE



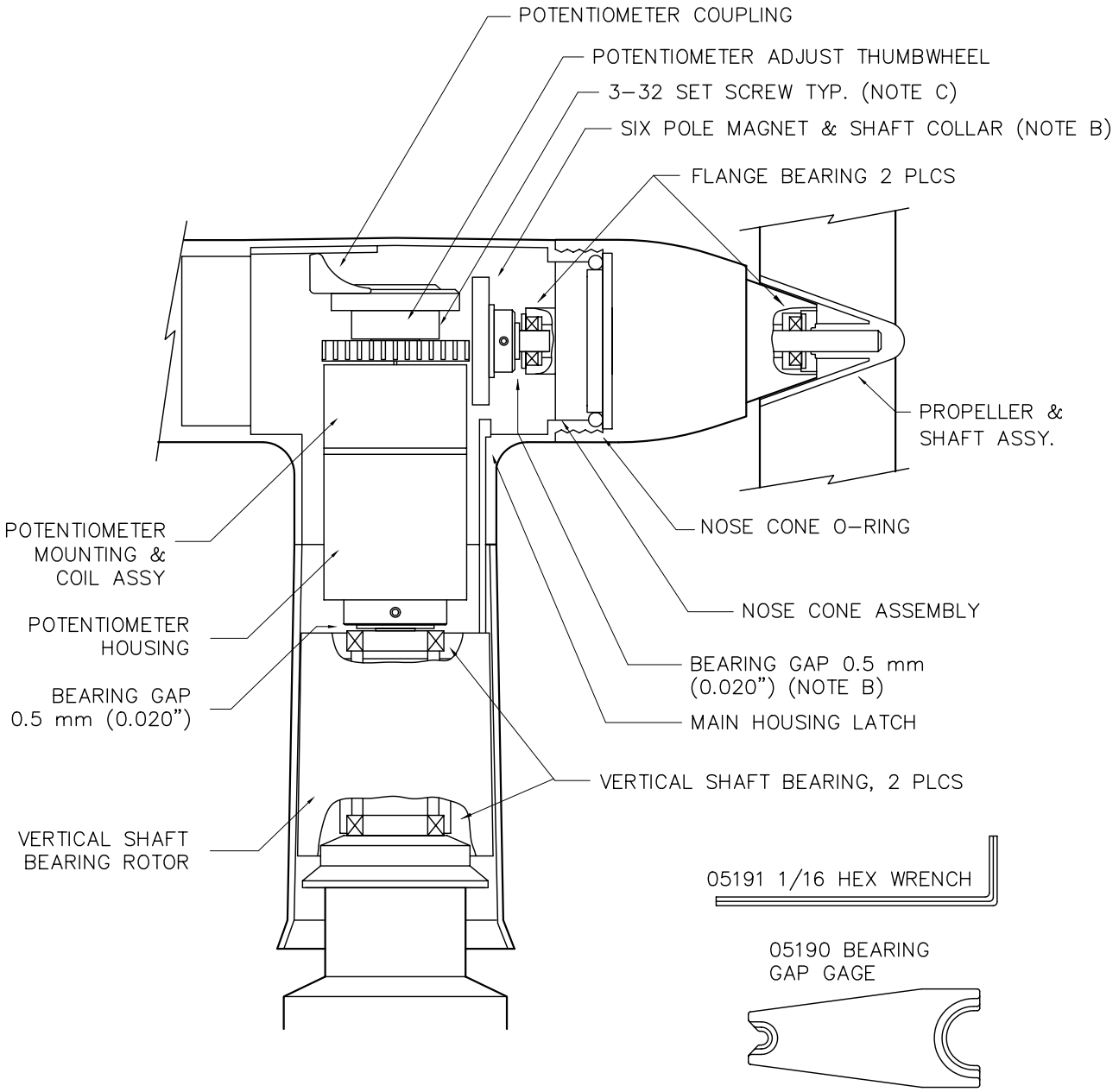
NOTE:

THE EARTH GROUND TERMINAL MUST BE CONNECTED TO EARTH GROUND TO PROVIDE A STATIC DISCHARGE PATH.

MODEL 04101	DWG A	PRD 07–93
WIND MONITOR–JR	DWN KL	DWG 01–98
CABLE & WIRING DIAGRAM	CHK Y.C.	W04101
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 616–946–3980		

WIND MONITOR SECTION VIEW

BEARING REPLACEMENT/POTENTIOMETER ADJUSTMENT



NOTES:

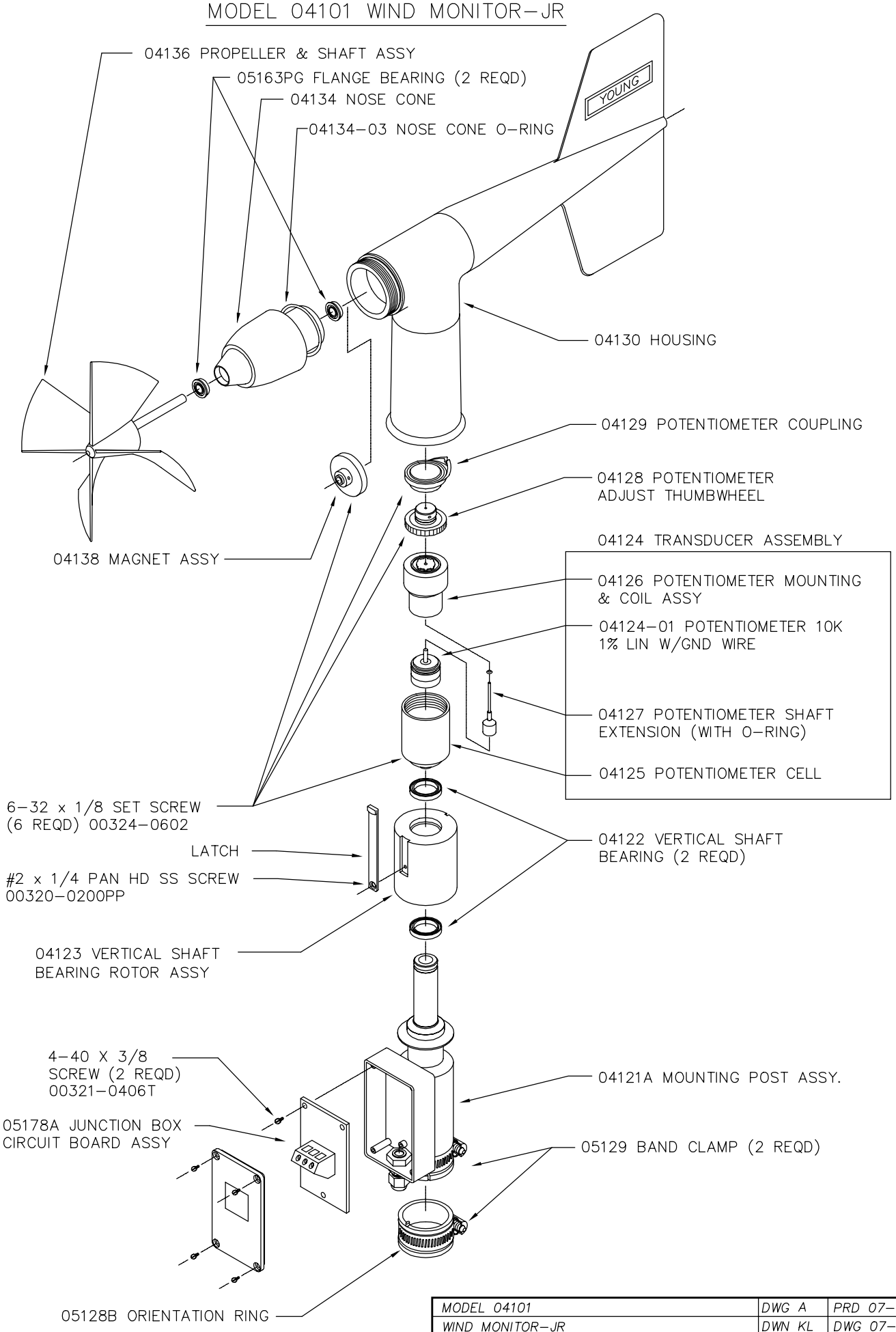
A. TO REMOVE MAIN HOUSING – UNTHREAD NOSE CONE ASSEMBLY, PUSH MAIN HOUSING LATCH, LIFT UPWARD.

B. TO REPLACE ANEMOMETER FLANGE BEARINGS – UNTHREAD NOSE CONE, REMOVE SIX POLE MAGNET USING 1/16 HEX WRENCH. SLIDE PROPELLER & SHAFT ASSEMBLY FORWARD. REMOVE FLANGE BEARINGS. AFTER BEARING REPLACEMENT, SET BEARING GAP TO 0.5mm (0.020") WITH BEARING GAP GAGE. RE–TIGHTEN SET SCREW.

C. TO ADJUST POTENTIOMETER OUTPUT SIGNAL – REMOVE NOSE CONE, LOOSEN SET SCREW IN POTENTIOMETER COUPLING, ADJUST OUTPUT SIGNAL BY MEANS OF POTENTIOMETER ADJUSTMENT THUMBWHEEL, RE–TIGHTEN SET SCREW.

WIND MONITOR–JR SECTION VIEW	DWG A	PRD 07–93
BEARING REPLACEMENT/	DWN KL	DWG 01–99
POTENTIOMETER ADJUSTMENT	CHK mdf	S04101
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231–946–3980		

MODEL 04101 WIND MONITOR–JR



MODEL 04101	DWG A	PRD 07–93
WIND MONITOR–JR	DWN KL	DWG 07–99
	CHK Y.C.	E04101
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