MODEL 12002/12005
GILL MICROVANE & 3-CUP ANEMOMETER
MODEL 12102
GILL 3-CUP ANEMOMETER
MODEL 12302/12305
GILL MICROVANE

APRIL 1994

MANUAL PN 12002/12005-90

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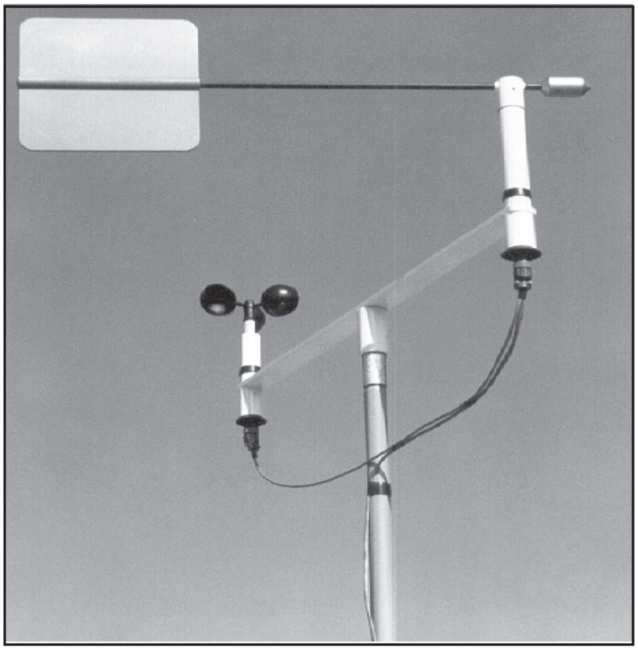
MODEL 12002/12005
GILL MICROVANE & 3-CUP ANEMOMETER

YOUNG



SPECIFICATIONS

3 - CUP ANEMOMETER:

Range:	0 to 50 m/s (100 mph) gust survival to 60 m/s (130 mph)
Dynamic Response:	2.3 m (7.5ft) cup wheel distance constant
Threshold Sensitivity:	0.5 m/s (1.0 mph) tach-generator, 0.3 m/s (0.7 mph) photochopper
Transducer Excitation Requirement:	Anemometer generator is self-powered. Optional photochopper requires 5 to 15 VDC/11 mA
Transducer Output:	Analog DC voltage from tach-generator. 1800 rpm (2400 mV) =28.6 m/s (63.9 mph). Optional photo chopper produces voltage pulse with frequency proportional to wind speed. 10 pulses per revolution.

GILL MICROVANE:

Range:	AZ 360° mech, 355° elec (5° open) **12002** 0 to 30 m/s (70 mph) gust survival to 35 m/s (80 mph) **12005** 0 to 50 m/s (100 mph), gust survival to 60 m/s (130 mph)
Damping Ratio:	**12002** 0.51; **12005** 0.34
Delay Distance:	**12002** 0.9 m (3.0 ft); **12005** 1.1 m (3.6 ft)
Threshold Sensitivity:	0.4 m/s (0.9 mph) at 10° displacement 0.7 m/s (1.6 mph) at 5° displacement
Damped Natural Wavelength:	**12002** 4.6 m (15.1 ft); **12005** 6.1 m (20.0 ft)
Undamped Natural Wavelength:	**12002** 4.0 m (13.1 ft); **12005** 5.7 m (18.7 ft)
Transducer Excitation Requirement:	15 VDC maximum
Transducer Output:	Analog DC voltage from conductive plastic potentiometer, resistance 10K, linearity 0.25%, life expectancy 50 million revolutions.

INTRODUCTION

The Gill MicroVane and 3-Cup Anemometer measure horizontal wind direction and speed. With specifications that are well matched for each other, these instruments are sufficiently sensitive for detailed wind studies yet rugged enough to remain exposed for extended periods with minimum maintenance.

The standard MicroVane employs a lightweight fin made from low density expanded polystyrene coated with UV resistant paint. Vane position is transmitted by a 10K ohm precision low torque 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 3-Cup Anemometer has light-weight hemispherical cups made from injection molded UV resistant polypropylene. The standard anemometer employs a DC tach-generator coupled to the cup wheel shaft. Cup wheel rotation produces a DC voltage which is directly proportional to wind speed. An optional photochopper version produces a pulse output with frequency proportional to wind speed. The photochopper version has a slightly lower starting threshold than the tach-generator version.

Both the anemometer and vane use low torque stainless steel precision grade ball bearings for low starting threshold.

The standard crossarm which supports the instruments mounts to unthreaded one inch standard pipe, outside diameter 34 mm (1.34"). The instruments are spaced 76 cm (30") apart on the standard crossarm to minimize wake effects. For portable field use an optional 28 cm (11") short crossarm may be used. When either the MicroVane or 3-Cup Anemometer is ordered separately, it is supplied with a single mounting bracket which threads onto 3/4" standard pipe. The vane base in both the crossarm and mounting bracket is keyed to the vane housing.

Electrical connections are made via a connector at the bottom of the instruments. A variety of devices are available for signal conditioning, display, and recording. YOUNG signal conditioning for the MicroVane may be ordered to produce signals with a 0-540° output range instead of the standard 0-360°.

INITIAL CHECK-OUT

These instruments are fully calibrated and inspected before shipment, however when unpacked they should be examined for any signs of shipping damage and checked for proper operation before installation. Refer to the accompanying exploded view drawings to identify parts.

Install the vane assembly on the vertical shaft and tighten* the set screw to secure it. The vane should freely rotate 360°. Check vane balance by holding the shaft housing so the fin surface is horizontal. The vane assembly should have near neutral torque without any particular tendency to rotate. A slight imbalance will not degrade performance.

Remove the plastic nut from the cup wheel shaft and install the cup wheel. Replace the nut and thumb-tighten. The cup wheel should easily rotate with little friction.

Before installation connect the instruments to an indicator or translator and check for proper wind speed and direction calibration. Position the vane over a piece of paper with 30° or 45° cross-markings to check vane alignment. To check wind speed remove the cup wheel and drive the shaft with a calibration motor. Additional details appear in the CALIBRATION section of this manual.

When connecting the MicroVane directly to data logging equipment be sure to observe appropriate signal conditioning requirements.

The potentiometer requires a stable DC excitation voltage not to 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. To prevent false readings signal conditioning electronics should clamp the signal to excitation or reference level when the wiper is in the deadband. Avoid a short circuit between the signal line and either the excitation or reference line. Although a 1K ohm current limiting resistor is wired in series with the wiper for protection, damage may occur if a short circuit condition exists.

INSTALLATION

Proper instrument placement is very important. Eddies from trees, buildings, or other structures can greatly influence wind speed and direction observations. To get meaningful data, locate the instrument well above or upwind from any obstructions. As a general rule, the 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.

Installation is most easily accomplished with two people particularly during the vane alignment step; one person to adjust the instrument position at the installation site and the other to observe the output signal.

Install the instruments as follows:

1. MOUNT THE INSTRUMENTS
   a) Install crossarm on vertical unthreaded 1" pipe. Orient crossarm north-south with 3-Cup Anemometer on north side.
   b) For separate installations of MicroVane or 3-Cup Anemometer install mounting brackets on vertical threaded 3/4" pipe.

2. ALIGN VANE
   a) Connect cable to MicroVane and monitor output.
   b) Slightly loosen set screw holding vane hub to vane hub skirt.
   c) Establish a known wind direction reference.
   d) Sighting down vane centerline, point vane toward wind direction reference.
   e) While holding vane in position, slowly turn vane hub skirt until output signal correctly represents direction reference.
   f) Tighten set screw securing vane hub to vane hub skirt.

3. CHECK ANEMOMETER
   a) Connect cable to 3-Cup Anemometer and monitor output.
   b) Rotate anemometer shaft. Check output for activity and proper polarity.

CALIBRATION

The MicroVane and 3-Cup Anemometer are 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 instruments are used in programs which require sensor performance audits.

The following method can yield vane calibration accuracies of ±5° or better if carefully done. Begin by connecting the instrument to a suitable signal conditioning circuit which indicates azimuth value. This may be a display which shows values in angular degrees or simply a voltmeter monitoring the potentiometer output. Mount the instrument so its center of rotation is over the center of a large sheet of paper which has 30° or 45° cross-markings. Orient the instrument so zero output coincides with one of the cross-markings. Rotate the vane, visually aligning it with each of the cross-markings and observe the indicated output. If the vane position and indicated output do not agree within 5°, the potentiometer may be worn or defective. Details for replacing the potentiometer appear in the MAINTENANCE section of this manual.

It is important to note that full scale azimuth output from the potentiometer is 355° and 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 0.986 VDC when the instrument is at 355°. (355°/360° x 1.000 volts = 0.986 volts)

Wind speed calibration is determined by the turning ratio of the cup wheel and the output characteristics of the transducer. A chart showing calibration formulas as well as cup wheel rpm vs. wind speed and transducer output is included in this manual. Formulas for various wind speed engineering units are also listed. The instrument is accurate to within 2 percent of values resulting from these formulas. For greater accuracy the cup wheel must be individually calibrated in comparison with a wind speed standard in a wind tunnel. Contact the factory or your supplier to schedule a wind tunnel calibration at our facility.

To check tach-generator and signal conditioning calibration, temporarily remove the cup wheel and connect a calibrating motor to the instrument shaft. Apply the appropriate calibration formula to the calibrating motor rpm and observe the signal output. If necessary, adjust the signal conditioning electronics for proper output. For example, with the cup wheel shaft turning at 1800 rpm the tach-generator output should be 2400mV ±10mV representing 28.6 m/s.

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

MAINTENANCE

Given proper care these instruments should provide many years of service. Well built and using components which are conservatively rated the instruments require little maintenance. The only components likely to need replacement due to normal wear are the precision ball bearings, potentiometer, and tach-generator.

Only a qualified instrument technician should perform the replacement. If service facilities are not available return the instrument to the company.

Before performing any maintenance operations 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 2800 gm-cm (40 oz-in).

POTENTIOMETER REPLACEMENT

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

1. REMOVE POTENTIOMETER ASSEMBLY
   a) Unthread shaft housing from potentiometer housing.
   b) Unthread cable receptacle from potentiometer housing.
   c) Unsolder potentiometer wires from cable receptacle. Note connections.
   d) Loosen set screw in side of potentiometer housing which secures potentiometer cell.
   e) Remove potentiometer cell assembly from housing.
   f) Remove potentiometer coupling which is friction fit on potentiometer shaft.

2. INSTALL NEW POTENTIAMETER ASSEMBLY
   a) Push potentiometer coupling ontonew potentiometer shaft.
   b) Push new potentiameter cell assembly into housing. Be sure it is properly seated.
   c) Tighten set screw* in side of housing to hold cell .
   d) Solder potentiometer wire to cable recepticle.
   e) Thread cable receptacle into potentiometer housing.
   f) Thread shaft housing with O-ring into potentiometer housing.

VERTICAL SHAFT BEARING REPLACEMENT

Check bearing condition with a Model 18331 Vane Torque Gauge. The data sheets supplied with the gauge list acceptable bearing torque for this instrument at different threshold values. If necessary replace the bearings as follows:

1. REMOVE OLD BEARINGS
   a) Loosen set screw in vane hub and remove vane assembly.
   b) Loosen set screw in vane hub skirt and remove from shaft.
   c) Remove plastic bearing cover.
   d) Unthread shaft housing from potentiometer housing.
   e) Remove screw holding coupling disc. Remove coupling disc.
   f) Loosen set screw in vertical shaft collar. Remove shaft collar.
   g) Remove vertical shaft from top of housing.
   h) Remove top and bottom bearings.

2. INSTALL NEW BEARINGS
   a) Insert new bearings into top and bottom of housing. Be careful not to apply pressure to bearing seals.
   b) Insert vertical shaft into bearings.
   c) Install vertical shaft collar onto vertical shaft allowing 0.25 mm (0.010") clearance from bearing.
   d) Tighten set screw* on shaft collar.
   e) Replace coupling disc on end of vertical shaft. Tighten screw.
   f) Thread shaft housing with O-ring into potentiometer housing.
   g) Replace plastic bearing cover.
   h) Place vane hub skirt on shaft and tighten set screw.
   i) Place vane assembly on vane hub skirt and tighten set screw.

TACH-GENERATOR REPLACEMENT

The tach-generator has a life expectancy of 750 million revolutions. When output voltage becomes erratic (usually due to brush failure) the entire generator assembly should be removed and replaced as follows:

1. REMOVE TACH-GENERATOR ASSEMBLY
   a) Unthread shaft housing from generator housing.
   b) Unthread cable receptacle from generator housing.
   c) Unsolder generator wires from cable receptacle. Note connections.
   d) Loosen set screw in generator housing which holds generator cell.
   e) Remove generator cell assembly from housing.

2. INSTALL NEW TACH-GENERATOR ASSEMBLY
   a) Insert new generator/cell assembly into generator housing. Be sure it is properly seated.
   b) Tighten set screw* holding cell in housing.
   c) Solder generator wires to cable receptacle.
   d) Thread cable receptacle into generator housing.
   e) Thread shaft housing with O-ring into generator housing.

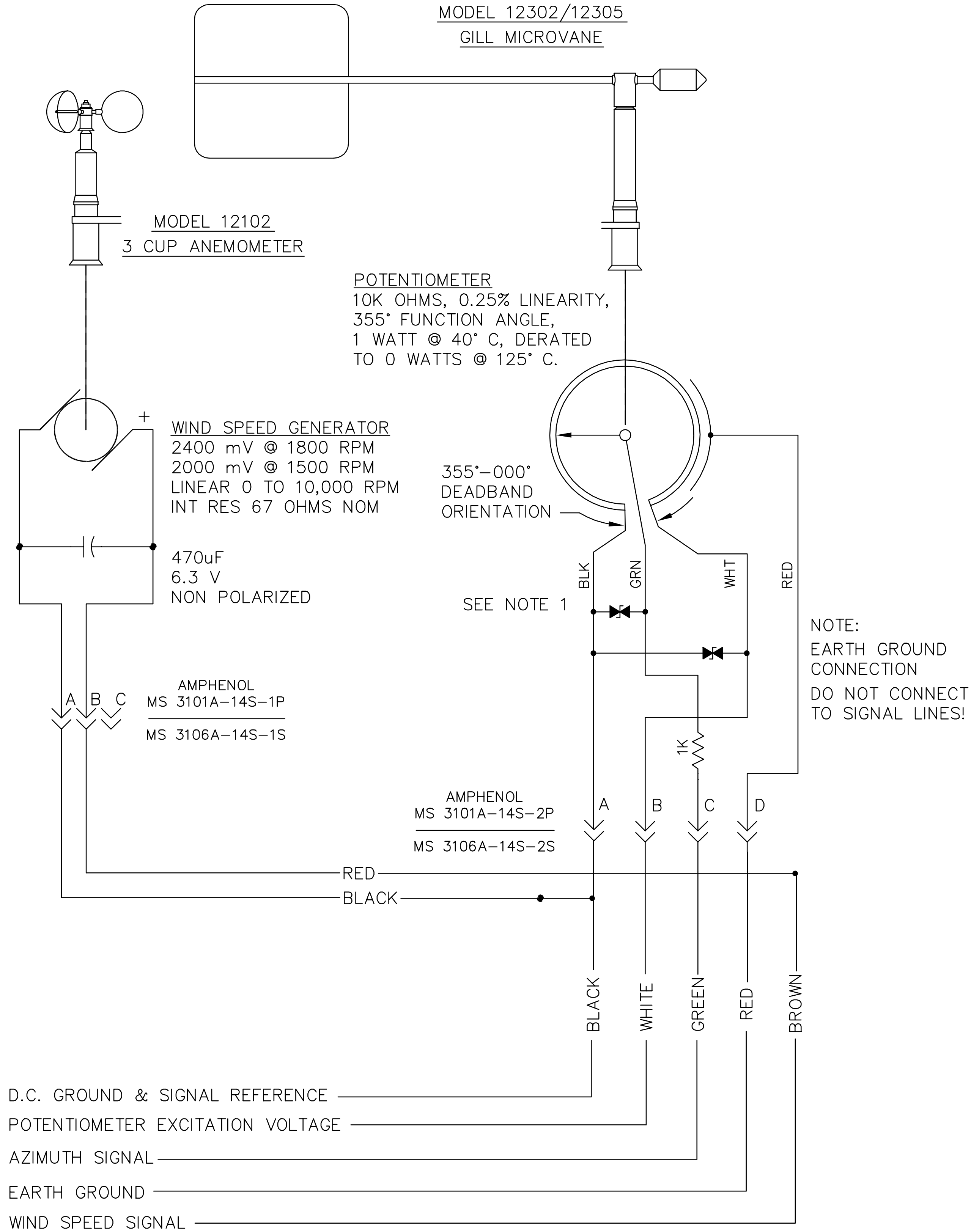
FLANGE BEARING REPLACEMENT

If anemometer bearings become noisy or wind speed threshold increases above an acceptable level, bearings may need replacement. Check anemometer bearing condition with a Model 18312 Cup Wheel Torque Disk. If necessary replace bearings as follows:

1. REMOVE FLANGE BEARINGS
   a) Remove cup wheel from cup wheel shaft.
   b) Unthread shaft housing from generator housing.
   c) Loosen set screw on shaft collar/coupling disc and remove from cup wheel shaft.
   d) Slide cup wheel shaft out top of housing.
   e) Remove dust shield.
   f) Remove bearings.

2. INSTALL NEW FLANGE BEARINGS
   a) Insert new flange bearings in shaft housing. Be careful not to apply pressure to bearing shields.
   b) Replace dust shield on shaft housing.
   c) Insert cup wheel shaft into bearings.
   d) Place shaft collar/coupling disc on cup wheel shaft allowing 0.25 mm (0.010") clearance from bearing.
   e) Tighten set screw* on shaft collar/coupling disc.
   f) Thread shaft housing with O-ring into generator housing.
   g) Replace cup wheel on cup wheel shaft.

** Max torque 2800 gm-cm (40 oz-in)*

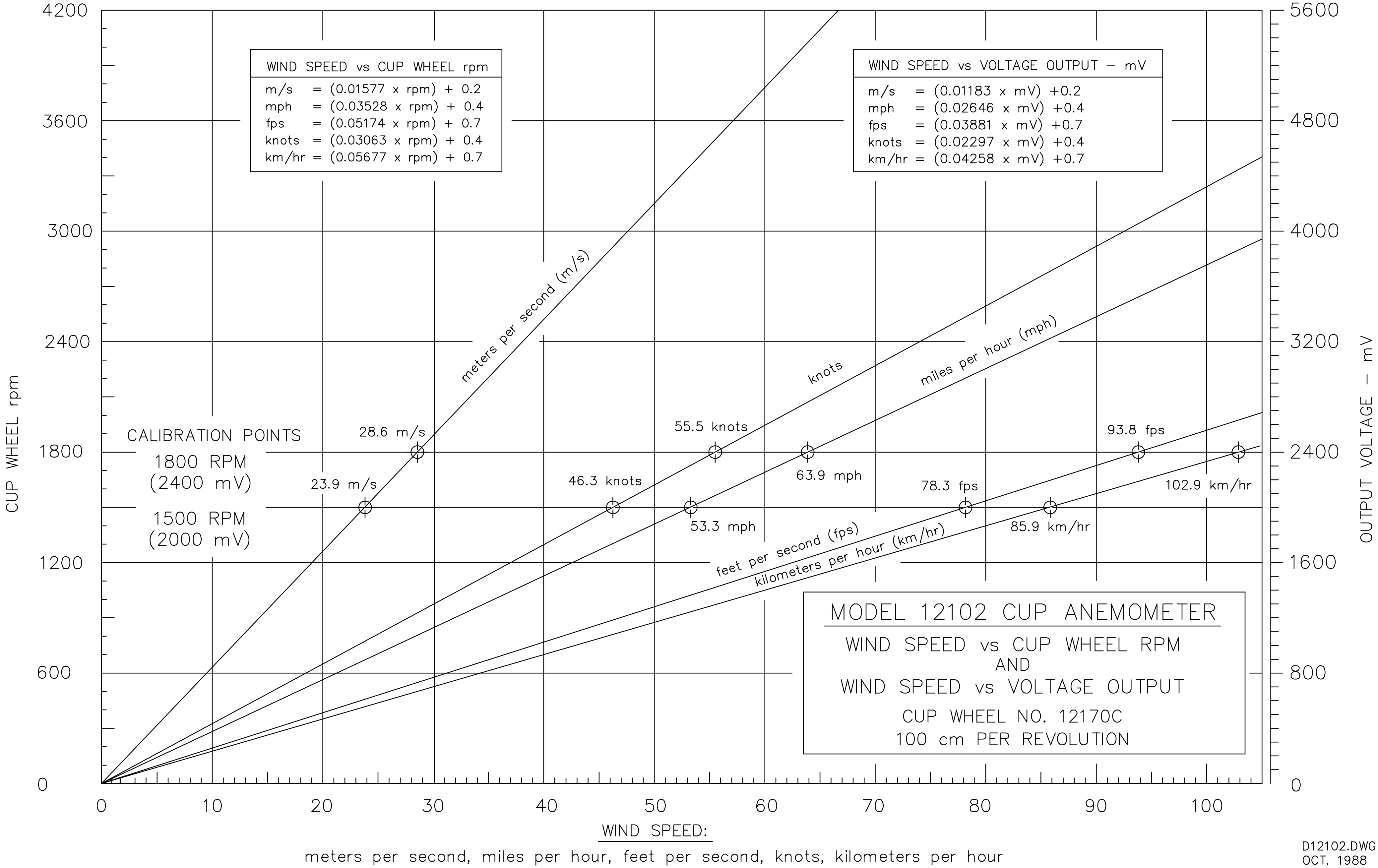


NOTES:

1. (⧓) TRANSZORBS INSTALLED ON POTENTIOMETER FOR TRANSIENT PROTECTION (22V NOMINAL)

2. EXCITATION VOLTAGE NOT TO EXCEED 15 VDC

MODEL 12102 3–CUP ANEMOMETER	*DWG A*	*PRD 10–86*
MODEL 12302/12305 GILL MICROVANE	*DWN KL*	*DWG 06–93*
CABLE AND WIRING DIAGRAM	*CHK*	*W12302*
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231–946–3980		



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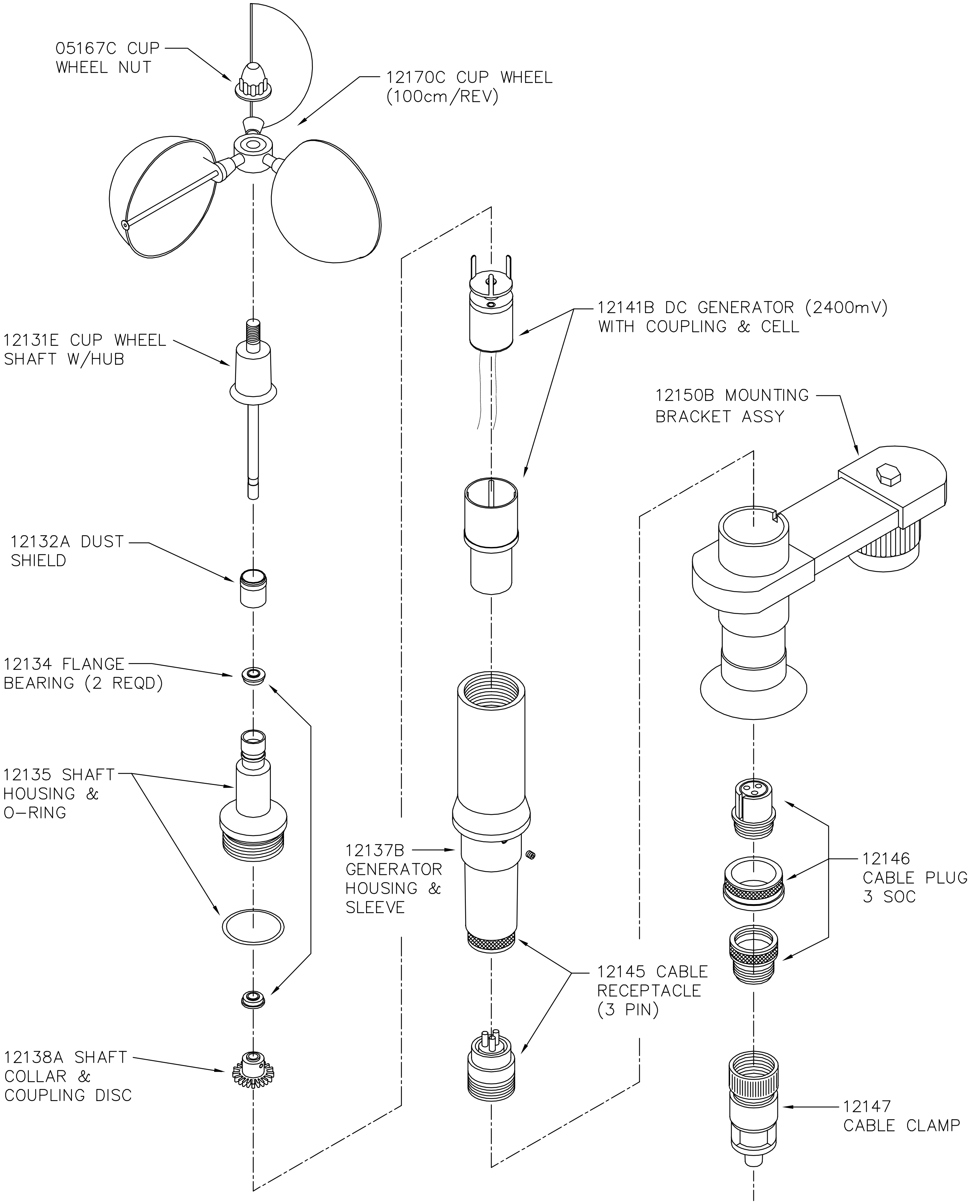
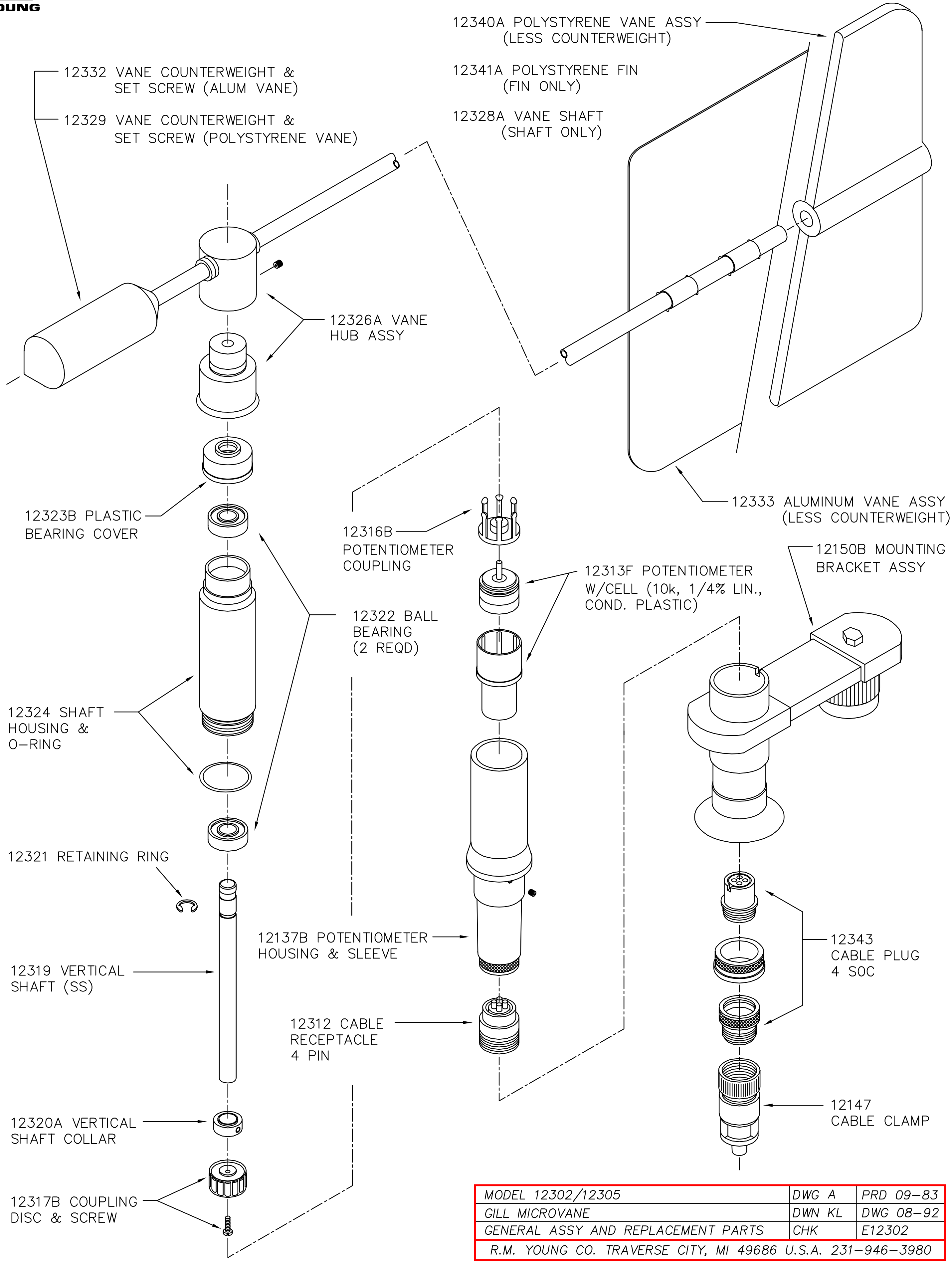
MODEL 12102 GILL 3 CUP ANEMOMETER



MODEL 12102	DWG A	PRD 09-83
GILL 3 CUP ANEMOMETER	DWN KL	DWG 10-94
GENERAL ASSY AND REPLACEMENT PARTS	CHK	E12102
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 231-946-3980		

MODEL 12302/12305 GILL MICROVANE



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GILL MICROVANE	DWN KL	DWG 08-92
GENERAL ASSY AND REPLACEMENT PARTS	CHK	E12302
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