METEOROLOGICAL INSTRUMENTS

INSTRUCTIONS

WIND MONITOR

MODEL 05103-SDI

CE

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PN: 05103-SDI-90
REV: A060126

MODEL 05103-SDI
WIND MONITOR

WIND SPEED SPECIFICATION SUMMARY

Range	0 to 100 m/s (224 mph)
Sensor	18 cm diameter 4-blade helicoid propeller molded of polypropylene
Pitch	29.4 cm air passage per revolution
Distance Constant	2.7 m (8.9 ft.) for 63% recovery
Threshold Sensitivity	1.1 m/s (2.4 mph)
Transducer	Centrally mounted stationary coil with a rotating magnet on the propeller shaft. Frequency is digitally measured

WIND DIRECTION (AZIMUTH) SPECIFICATION SUMMARY

Range	360° mechanical, 355° electrical (5° open)
Sensor	Balanced vane, 38 cm (15 in) turning radius.
Damping Ratio	0.3
Delay Distance	1.3 m (4.3 ft) for 50% recovery
Threshold Sensitivity	1.1 m/s (2.5 mph) at 10° displacement
Transducer	Precision conductive plastic potentiometer, 10K ohm resistance (±20%), 0.25% linearity
Life Expectancy	50 million revolutions
Transducer Excitation	Regulated DC voltage provided internally
Output	Digital SDI-12 representation of azimuth angle

GENERAL

Power Requirement	6 - 16 VDC (12 VDC typ.)	
	Active:	1.0 mA @ 12 VDC
	Sleep:	0.3 mA @ 12 VDC
Dimensions:	Overall Height:	39cm
	Overall Length:	55cm
	Mounting:	34mm (Ø 1.34 in) (std. 1 inch pipe)
Weight:	Sensor Weight:	1.0 kg (2.2 lb)
	Shipping weight:	2.3 kg (5.0 lb)
SDI-12 Output:	Compliant with SDI-12 Version 1.3	
Operating Temperature:	-40 to +50°C (-40 to +140°F)	

INTRODUCTION

The R.M. Young Model 05103-SDI Wind Monitor measures horizontal wind speed and direction and provides a digital SDI-12 output. This sensor combines the proven mechanical design of the standard Model 05103 Wind Monitor with a microcontroller-based SDI-12 interface for accurate, low-power digital communication.

Originally developed for ocean data buoy use, the Wind Monitor is rugged and corrosion resistant yet accurate and lightweight. The main housing, nose cone, propeller, and other internal parts are injection-molded UV-stabilized plastic.

Model 05103-SDI features an oversized propeller shaft and ceramic bearings with non-contact seals to minimize contamination and moisture ingress. Both the propeller and vertical shafts utilize corrosion-resistant ceramic bearings, providing extended service life and reliable performance in the most demanding environments, including those requiring compliance with WMO surface observation standards (WMO IOM N0.136).

Wind speed is sensed by a 4-blade helicoid propeller that rotates a magnet past a stationary coil. The microcontroller measures the induced frequency and converts it to wind speed. Wind direction is sensed by a precision 10 kΩ conductive plastic potentiometer. The SDI-12 interface provides digital measurement, configuration, and averaging options via simple ASCII commands.

The instrument mounts on standard one-inch pipe (outside diameter 34 mm). An orientation ring allows the instrument to be removed and reinstalled without loss of wind direction reference. Both the mounting post assembly and the orientation ring are secured to the mounting pipe by stainless steel band clamps. Electrical connection is made in a junction box at the base.

INITIAL CHECKOUT

When the Wind Monitor is unpacked, it should be checked carefully for any signs of shipping damage.

Remove the plastic nut on the propeller shaft. Install the propeller so the serial number faces forward (into the wind). Engage the propeller into the molded ribs on the shaft hub. The vane and propeller should rotate freely 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.

The instrument is factory calibrated and fully tested before shipment. Verify operation by connecting to an SDI-12 data logger or compatible interface and sending the address query command.

Address Querry Command: ?!
Response: 0 <CR><LF> (default address)

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 GND 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. Align Vane
   a) Connect the instrument to a data logger using the wiring diagram provided at the back of this manual. Power the instrument and use the data logger to send a measurement command (e.g., 0M!) to verify communication and confirm that wind direction data is being received.
   b) Choose a known wind direction reference point on the horizon.
   c) Sighting down the instrument centerline, point the nose cone toward the chosen reference point on the horizon.
   d) While holding the vane in position, trigger a measurement (OM!) and observe the reported wind direction. Repeat measurement cycles until the reported wind direction matches the known reference.
   e) Tighten the mounting post band clamp.
   f) Engage the orientation ring indexing pin in the notch at the instrument base.
   g) Tighten the orientation ring band clamp.

OPERATION

Model 05103-SDI uses the SDI-12 (v1.3) serial communication protocol to initiate wind measurements and configure sensor parameters. The default sensor address is 0 (zero) and can be changed to any valid single-character value. Additional details about the SDI-12 protocol may be found at www.sdi-12.org.

After initial power-up with 6–16 VDC, the sensor enters a low-power standby state with a quiescent current of 0.3 mA. A valid SDI-12 command wakes the sensor to initiate a measurement or set an operating parameter. After processing is complete, the sensor returns to low-power standby (Standard Mode) or continues background sampling (Continuous Mode).

OPERATING MODES

Model 05103-SDI supports two operating modes that determine how measurements are collected and averaged. The active mode is selected by jumper P1 on the 05178AS junction box circuit board (see Jumper Configuration below).

Standard Mode

In Standard Mode, the sensor follows traditional SDI-12 behavior. It remains in a low-power sleep state between commands and collects measurement data only when explicitly requested by the data logger.

Characteristics:

- Sensor sleeps between commands (lowest power consumption).
- Instantaneous measurements are taken on demand, collecting samples at 4 Hz.
- Averaged measurements (2-minute or 10-minute) are collected from scratch upon each M or C command request. The full averaging period must elapse before data is available.
- Quality flags report minimum sample availability only (see Quality Flags section).
- Use Standard Mode for general-purpose SDI-12 deployments where WMO compliance is not required and power conservation is a priority.

Continuous Mode (Default)

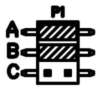
In Continuous Mode, the sensor runs continuously in the background, collecting wind samples at 1 Hz and maintaining rolling 2-minute and 10-minute averages at all times. The most recently completed average interval is always available and can be retrieved immediately.

Characteristics:

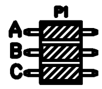
- Sensor continuously collects samples (higher average power consumption than Standard Mode).
- 2-minute and 10-minute averages are always current and available on demand with minimal latency (response time ≤ 1 second).
- Enables full quality flag evaluation, including rate-of-change checks, stuck-sensor detection, and minimum sample checks, as defined in WMO IOM No. 136.
- Required for WMO-compliant wind measurement (see WMO Compliance section).
- Use Continuous Mode when regulatory compliance, data quality assurance, or low-latency averaged data are required.

Jumper Configuration

Operating mode is set by jumper P1 on the 05178AS junction box circuit board, located inside the junction box. Refer to the Cable and Wiring Diagram (page 11) for board layout and jumper location.



Standard Mode



Continuous Mode

(Note: Jumper settings take effect on the next power cycle)

Mode Comparison

Feature	Standard Mode	Continuous Mode (default)
Power	0.3mA (sleep), 1.0 mA (measuring)	1.0 mA (continuous sampling)
Instantanteous Data	On demand (4 Hz sampling)	On demand (4 Hz sampling)
2-min / 10-min average	Computed on request; full wait period required	Always current; available within 1 second
Quality flags	Minimum sample check only	Full WMO quality flag set
WMO IOM 136 compliance	Not supported	Supported
Jumper Configuration	A + B Installed	A + B + C all installed

WMO COMPLIANCE

WMO Instruments and Observing Methods Report No. 136 (IOM-136) specifies that surface wind measurements shall be based on 2-minute and 10-minute vector averages, with continuous sampling, rolling quality checks, and at least 75% sample availability. Meeting these requirements demands that the sensor collect and evaluate samples continuously, this is not possible in Standard Mode, which samples only on demand. Select Continuous Mode (jumpers A, B, and C all installed) for any deployment requiring WMO IOM No. 136 compliance.

SDI-12 COMMANDS

All SDI-12 commands follow the format described in the SDI-12 v1.3 specification. In all command and response examples, the character a represents the single-character sensor address (default: 0).

Non-Measurement Commands

Name	Command	Response
Address Query	?!	a<CR><LF>
Acknowledge Active	a!	a<CR><LF>
Change Address	aAb! a = Sensor address b = New sensor address	b<CR><LF>
Send Identification	aI!	a13RMYOUNG 05103 1.0SN=0000012345<CR><LF>

Extended Commands

Extended Commands customize manufacturer settings and operating parameters. A successful command returns aS<CR><LF>; a failed command returns aF<CR><LF>. Only the aXP!, aXV!, and aXI! commands return a data response message.

Name	Command
Wind Speed Units	**aXUn!** (n = wind speed units code) 0 = m/s (default) 1 = knots 2 = mph 3 = kph
Wind Speed Multiplier	**aXMn!** (n = multiplier) n = 0.5000 - 1.5000 (default: 1.000)
Wind Direction Offset	**aXOn!** (n = offset) n = 0.0 - 360.0 (default: 0.0)
Parameter Report	**aXP!** (returns current configuration) *aU=msSP=05103M=1.0000O=0.0CM=0<CR><LF>* a = Sensor Address U = Wind Speed Units SP = Propeller Pitch M = Wind Speed Multiplier O = Wind Direction Offset CM = Continuous Mode
Reset to Factory Default	**aXFD!**
Input Voltage (v)	**aXV!** a+xx.xx<CR><LF>
Current Draw (mA)	**aXI!** a0011<CR><LF> **aD0!** a+x.xxx<CR><LF>

Measurement Commands

SDI-12 M and C commands initiate a wind measurement. The sensor response indicates the maximum wait time (ttt, in seconds) before data is ready, and the number of data values available. When the data logger receives an M-command service request, or after the full ttt wait for C commands, it sends a D command to retrieve the measurement.

Standard Mode Measurement Commands

In Standard Mode, measurement averaging starts when the M or C command is received. The sensor must collect the full sample set before data is available. Timing depends on the measurement type as shown below.

Name	Command	Response	Notes
Instantaneous Measurement (Polar)	aM!	a0012<CR><LF>	Returns the following parameters: WS, WD Collects samples at 4 Hz
	aMC!		
	aC!	a0012<CR><LF>	
	aCC!		
	aD0!	a+www.w+ddd<CR><LF>	
		a+www.w+ddd<CRC><CR><LF>	
Instantaneous Measurement (Cartesian)	aM1!	a0012<CR><LF>	
	aMC1!		
	aC1!	a0012<CR><LF>	
	aCC1!		
	aD0!	a±uu.u±vv.v<CR><LF>	
		a±uu.u±vv.v<CRC><CR><LF>	
2-Minute Average	aM2!	a1217<CR><LF>	Returns the following parameters: Vector Ave: WS & WD Std Dev: WS & WD Peak 3-sec Gust: WS & WD Quality Flag Collects samples at 1 Hz
	aMC2!		
	aC2!	a1217<CR><LF>	
	aCC2!		
	aD0!	a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CR><LF>	
		a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CRC><CR><LF>	
10-Minute Average	aM3!	a6017<CR><LF>	
	aMC3!		
	aC3!	a6017<CR><LF>	
	aCC3!		
	aD0!	a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CR><LF>	
		a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CRC><CR><LF>	

Note: For Standard Mode, ttt in the acknowledge response indicates the maximum wait time in seconds before data is ready. The data logger must wait the full ttt period before issuing the aD0! retrieval command. If the aD0! command is issued before the full ttt period has elapsed, the sensor will return valid data based on the samples collected up to that point; however, the minimum samples quality flag will be set to indicate that the full sample set was not collected for that averaging period (refer to Quality Flag section for details).

Acknowledge Response Format

The acknowledge response to M and C commands has the format: atttnn<CR><LF>

Where a = sensor address, ttt = maximum wait time in seconds, nn = number of data values returned by the subsequent aD0! command.

Continuous Mode Measurement Commands

In Continuous Mode, the sensor maintains rolling averages at all times. All measurement commands share the same command syntax as Standard Mode. The key difference is in the acknowledge response timing for averaged measurements: data is always current and available within 1 second.

Name	Command	Response	Notes
Instantaneous Measurement (Polar)	aM!	a0012<CR><LF>	Returns the following parameters: WS, WD Collects samples at 1 Hz
	aMC!		
	aC!	a0012<CR><LF>	
	aCC!		
	aD0!	a+www.w+ddd<CR><LF>	
		a+www.w+ddd<CRC><CR><LF>	
Instantaneous Measurement (Cartesian)	aM1!	a0012<CR><LF>	
	aMC1!		
	aC1!	a0012<CR><LF>	
	aCC1!		
	aD0!	a±uu.u±vv.v<CR><LF>	
		a±uu.u±vv.v<CRC><CR><LF>	
2-Minute Average	aM2!	a0017<CR><LF>	Returns the following parameters: Vector Ave: WS & WD Std Dev: WS & WD Peak 3-sec Gust: WS & WD Quality flag Collects samples at 1 Hz
	aMC2!		
	aC2!	a0017<CR><LF>	
	aCC2!		
	aD0!	a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CR><LF>	
		a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CRC><CR><LF>	
10-Minute Average (WMO)	aM3!	a0017<CR><LF>	
	aMC3!		
	aC3!	a0017<CR><LF>	
	aCC3!		
	aD0!	a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CR><LF>	
		a+www.w+ddd+www.w+ddd+www.w+ddd+QF<CRC><CR><LF>	

Note: In Continuous Mode, the ttt value of 001 in averaged measurement acknowledge responses indicates the data is immediately available from the rolling average buffer. The data logger need not wait for a new averaging cycle to complete.

Data Response Field Definitions (both modes)

Symbol	Field	Description
+www.w	Wind Speed	Vector-averaged wind speed in selected units.
+ddd	Wind Direction	Wind direction in degrees (0–360). 0° = North, clockwise positive.
±uu.u	East Component (u)	East–West wind speed component (Cartesian). Positive = East.
±vv.v	North Component (u)	North-South wind speed component (Cartesian). Positive = North.
+QF	Quality Flag	3-digit integer encoded as a binary bit field. Present in 2-minute and 10-minute average responses only. See Quality Flags section.

For 2-minute and 10-minute averages, the seven data fields returned are:

Position	Symbol	Description
1	+www.w	Vector-averaged wind speed
2	+ddd	Vector-averaged wind direction
3	+www.w	Standard deviation of wind speed
4	+ddd	Standard deviation of wind direction
5	+www.w	Peak 3-second gust wind speed
6	+ddd	Peak 3-second gust wind direction
7	+QF	Quality flag (see Quality Flags section)

Timing Comparison: Standard vs. Continuous Mode

Measurement Type	Standard Mode Wait Time	Continuous Mode Wait Time
Instantaneous (aM! / aC!)	~1 second (4 Hz sampling)	~1 second (1 Hz sampling)
2-Minute Average (aM2! / aC2!)	121 seconds	1 second (rolling average always current)
10-Minute Average (aM3! / aC3!)	601 seconds	1 second (rolling average always current)

QUALITY FLAGS

Quality Flags are included in the data response for 2-minute and 10-minute averaged measurements. The Quality Flag is returned as a 3-digit decimal integer representing an unsigned 8-bit integer value. Each bit position corresponds to a specific quality condition based on checks defined in WMO IOM No. 136.

Quality Flag Bit Definitions

The Quality Flag field (+QF) is a 3-digit integer (000–127). Each bit, when set to 1, indicates that the corresponding condition was detected for that averaging period.

Bit	Value	Flag Name	WMO Ref.	Description
0	1	Min WS Samples	WS.OS.5	Fewer than 75% of wind speed samples were available for the averaging period. The computed average may be unreliable
1	2	Min WD Samples	WD.OS.2	Fewer than 75% of wind direction samples were available for the averaging period. The computed average may be unreliable.
2	4	WS Rate-of-Change Error	WS.OS.6	A wind speed sample differed from the preceding sample by more than 20 m/s. The out-of-range sample was excluded from the average. (Continuous Mode only.)
3	8	WS Stuck Sensor	WS.OS.8	Wind speed values did not vary by more than 0.5 m/s over the preceding 60 minutes. Data is flagged as suspect. (Continuous Mode only.)
4	16	WD Stuck Sensor	WD.OS.3	Wind direction values did not vary by more than 10° over the preceding 60 minutes. Data is flagged as suspect. (Continuous Mode only.)
5	32	Jump Check Suspect	WS.OS.7	The difference between consecutive 2-minute wind speed averages exceeded 10 m/s. Data is flagged as suspect for further investigation. (Continuous Mode only.)
6	64	Jump Check Erroneous	WS.OS.7	The difference between consecutive 2-minute wind speed averages exceeded 20 m/s. Data is flagged as erroneous. (Continuous Mode only.)

Quality Flag Mode Applicability

Not all quality flags are evaluated in both operating modes. The table below summarizes which flags are active in each mode.

Flag	Standard Mode	Continuous Mode
Min WS Samples	Combined with Min WD Samples. QF = 001 when triggered; QF = 000 when not triggered. These are the only two possible values in Standard Mode.	Active
Min WD Samples	Combined with Min WS Samples. See above.	Active
WS Rate-of-Change Error	Not Evaluated	Active
WS Stuck Sensor	Not Evaluated	Active
WD Stuck Sensor	Not Evaluated	Active
Jump Check Suspect	Not Evaluated	Active
Jump Check Erroneous	Not Evaluated	Active

Note: In Standard Mode, Min WS Samples and Min WD Samples are evaluated together as a single combined check. The Quality Flag will be either +000 (sufficient samples collected) or +001 (minimum samples condition triggered). All other quality checks require the continuous sample history maintained only in Continuous Mode and are not evaluated in Standard Mode.

Interpreting Quality Flags

To decode a Continuous Mode Quality Flag value, convert the decimal integer to binary. Each bit position that is set to 1 indicates the corresponding condition was detected. Multiple conditions can be active simultaneously; the flag value equals the sum of the active bit values. In Standard Mode, only two Quality Flag values are possible: +000 or +001.

Example: Continuous Mode
Quality Flag value: +037
Binary representation: 0 1 0 0 1 0 1 (bits 6 through 0)

Bit	Set?	Flag	Interpretation
0	1(set)	Min WS Samples	Fewer than 75% of wind speed samples available
1	0	-	-
2	1(set)	WS Rate-of-Change Error	At least one WS sample exceeded 20 m/s change; excluded from average
3	0	-	-
4	0	-	-
5	1(set)	Jump Check Suspect	Consecutive 2-min average difference exceeded 10 m/s
6	0	-	-

A Quality Flag value of +000 indicates no quality conditions were detected for that averaging period.

Example: Standard Mode
In Standard Mode, the Quality Flag will always be one of two values:

QF Value	Interpretation
+000	Sufficient samples were collected for both wind speed and wind direction. No quality conditions detected. Data is clean.
+001	The minimum samples condition was triggered. Fewer than 75% of wind speed and wind direction samples were available for the averaging period. The aD0! command was likely issued before the full ttt period elapsed, or sampling was otherwise interrupted.

CALIBRATION

Periodic calibration checks are desirable and may be necessary where the instrument is used in programs that require auditing of sensor performance. Recalibration may also be necessary after some maintenance operations.

An accurate wind direction calibration requires a Vane Angle Fixture (YOUNG Model 18112 or equivalent). Details are listed under “POTENTIOMETER REPLACEMENT – STEP 7. ALIGN VANE.” The sensor nose cone must be removed if any adjustment is required.

Wind speed calibration is determined by the propeller pitch and the output characteristics of the transducer. Calibration formulas showing wind speed versus propeller RPM are listed below. Standard accuracy is ±0.3 m/s (±0.6 mph). For greater accuracy, the device must be individually calibrated in comparison with a wind speed standard. Contact the factory or your YOUNG supplier to schedule a NIST (National Institute of Standards & Technology) traceable wind tunnel calibration in our facility.

To check wind calibration using a signal from the instrument, temporarily remove the propeller and connect an Anemometer Drive to the propeller shaft. Apply the appropriate calibration formula to the calibrating motor RPM and check for proper SDI-12 data response.

For example, with the propeller shaft turning at 3600 rpm, the reported wind speed should be approximately 17.6 meters per second

(3600 rpm × 0.00490 m/s per rpm = 17.6 m/s).

Use the aM! command (see SDI-12 Data Commands section) to request wind data and confirm the reported wind speed value corresponds to the calculated value.

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

Calibration Formulas

Model 05103-SDI Wind Monitor w / 08234 Propeller

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

MAINTENANCE

Given proper care, the SDI-12 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 non-linearity 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. Set O-ring aside for later use.
   b) Gently push main housing latch.
   c) While pushing latch, lift main housing up and remove it from vertical shaft bearing rotor.

2. UNSOLDER TRANSDUCER WIRE
   a) Remove junction box cover, 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 (red) 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.
   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. Make sure that the shaft o-ring comes out with the potentiometer. If not, then gently push it out from the top of the coil assembly.

4. INSTALL NEW POTENTIOMETER
   a) Push new potentiometer into potentiometer mounting & coil assembly making sure o-ring is on shaft.
   b) Feed potentiometer and coil wires through hole in bottom of potentiometer housing.
   c) Screw potentiometer housing onto potentiometer mounting & coil assembly.
   d) Gently pull transducer wires through bottom of potentiometer housing to take up any slack. Apply a small amount of silicone sealant around hole.
   e) Install transducer assembly on vertical shaft allowing 0.5 mm (0.020") clearance from vertical bearing. Tighten set screws* at bottom of transducer assembly.
   f) Place potentiometer adjust thumbwheel on potentiometer shaft and tighten set screw*.
   g) 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.

*Max set screw torque 80 oz-in

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 the SDI-12 data/power lead to the data logger per the wiring diagram. The data logger provides power and SDI-12 communications.
   b) Install sensor on vane angle fixture (Young Model 18112 or equivalent) with junction box at 180° or South position, align vane to a known angular reference.
   c) From the data logger, issue an SDI-12 measurement command and record the reported wind direction (0M!). If the reported measurement is within tolerance, proceed to step (d). If the reported measurement is out of tolerance, reach through the front of the main housing and turn the potentiometer adjust thumbwheel. After each adjustment, issue the 0M! measurement command again and verify the reading. Repeat adjustment → aM! → verify until the measurement is within tolerance.
   d) Once the received measurement is correct and within tolerance, tighten set screw* on potentiometer coupling.

8. REPLACE NOSE CONE
   a) Screw nose cone into main housing until o-ring seal is seated. 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. Check anemometer bearing condition using a Model 18310 Propeller Torque Disc. If needed, bearings are replaced as follows.

1. REMOVE OLD BEARINGS
   a) Unscrew nose cone. Set o-ring aside for later use.
   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) Place 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 o-ring seal is seated. Be certain threads are properly engaged to avoid cross-threading.

VERTICAL SHAFT BEARING REPLACEMENT

Vertical shaft bearings are much larger than the anemometer bearings. Ordinarily, these bearings require replacement less frequently than anemometer bearings. Check bearing condition using a Model 18331 Vane Torque Gauge.

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

EMC COMPLIANCE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme à la norme NMB-001 du Canada.

EN55011/CISPR 11, Group 1, Class B device.
Class B equipment is suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

WARRANTY

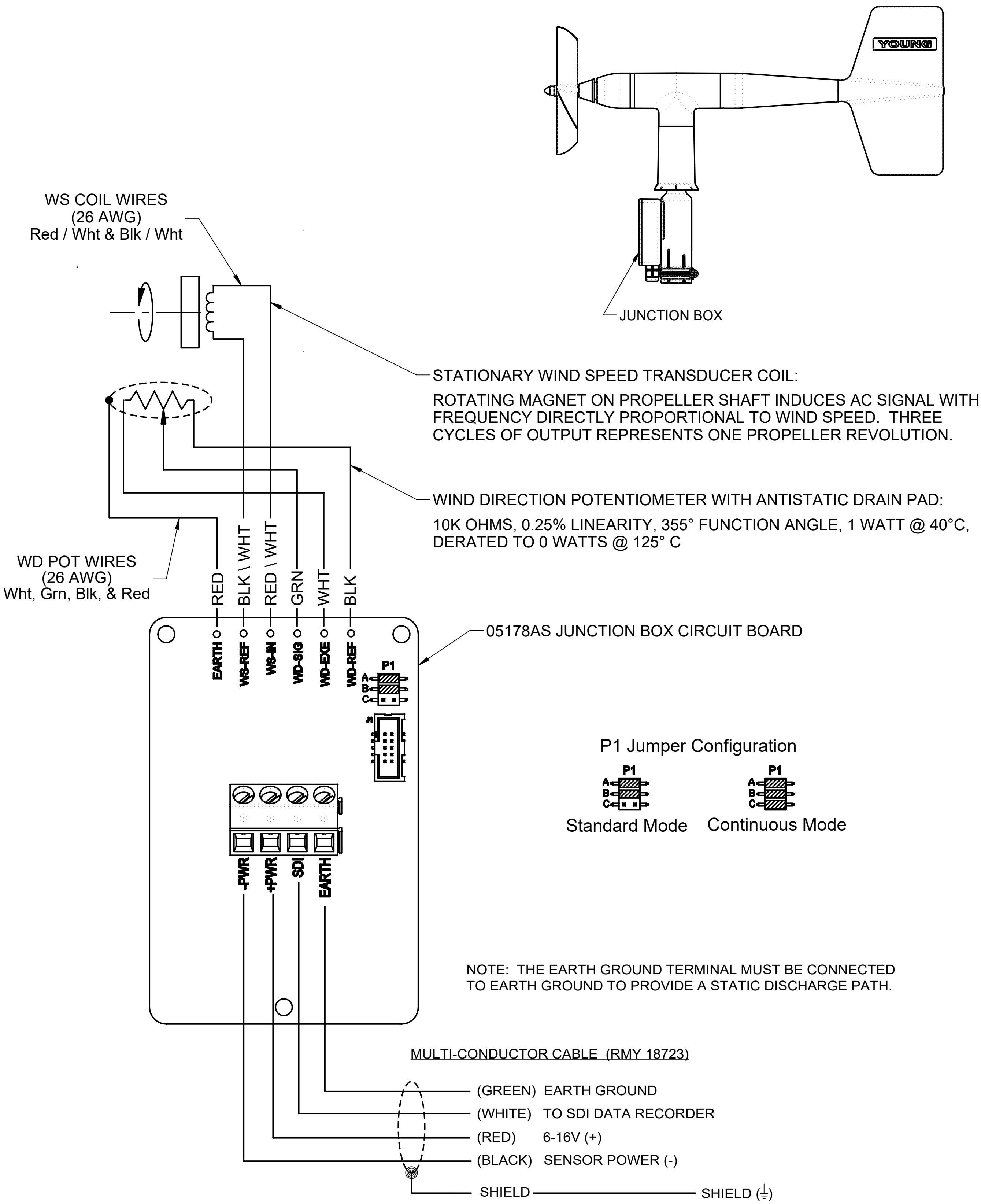
This product is warranted to be free of defects in materials and construction for a period of 12 months from date of initial purchase. Liability is limited to repair or replacement of defective item. A copy of the warranty policy may be obtained from R. M. Young Company.

CE COMPLIANCE

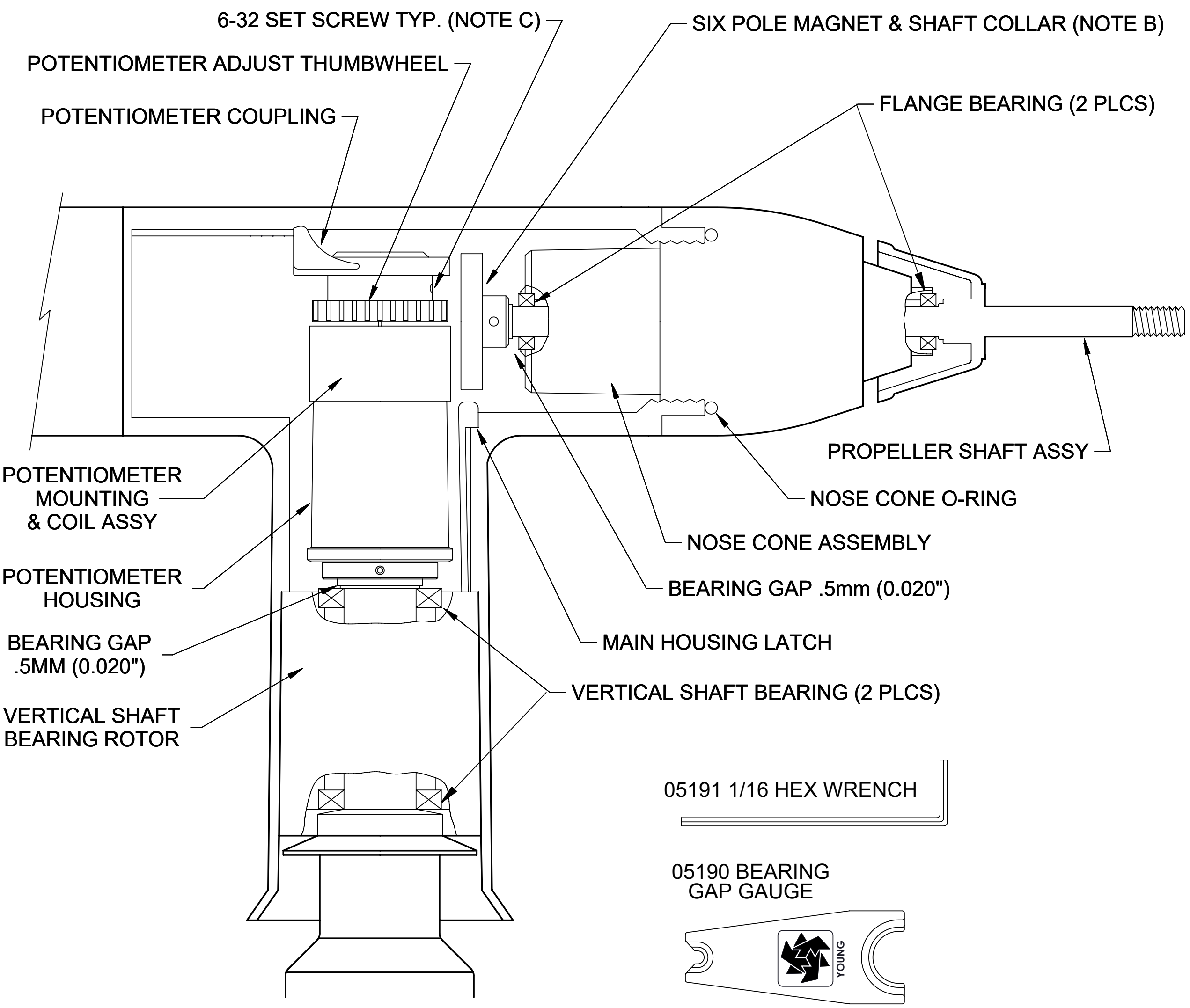
This product has been tested and complies with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

CABLE & WIRING DIAGRAM

MODEL 05103-SDI WIND MONITOR



BEARING REPLACEMENT & POTENTIOMETER ADJUSTMENT



NOTES:

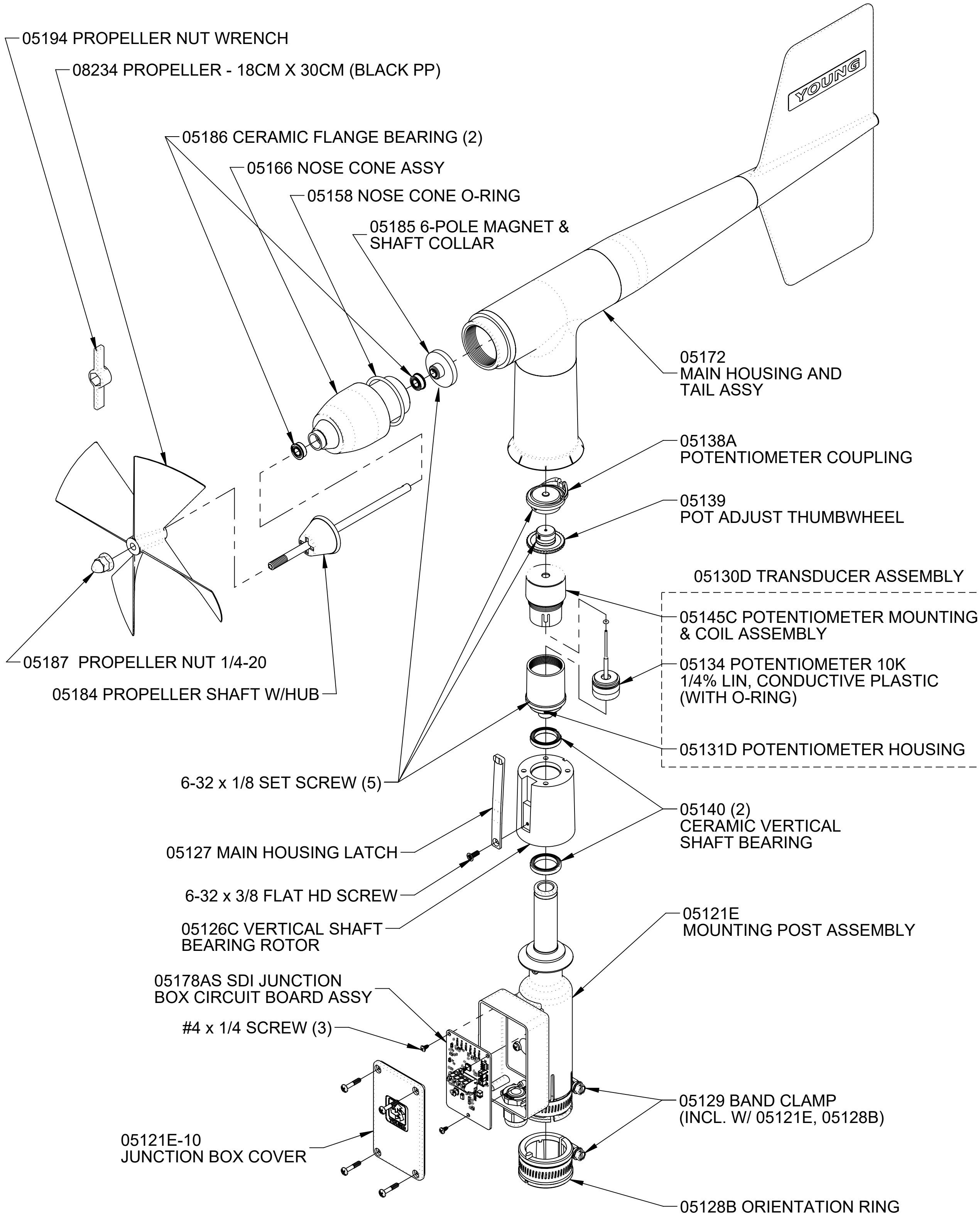
A. TO REMOVE HOUSING - UNTHREAD NOSE CONE ASSEMBLY, REMOVE HOUSING SCREWS, PUSH MAIN HOUSING LATCH, LIFT UPWARD.

B. TO REPLACE ANEMOMETER FLANGE BEARINGS - UNTHREAD NOSE CONE, REMOVE SIX POLE MAGNET, SLIDE PROPELLER SHAFT AND HUB ASSEMBLY FORWARD, REMOVE FLANGE BEARINGS. AFTER BEARING REPLACEMENT, SET BEARING GAP TO 0.5mm (0.020")

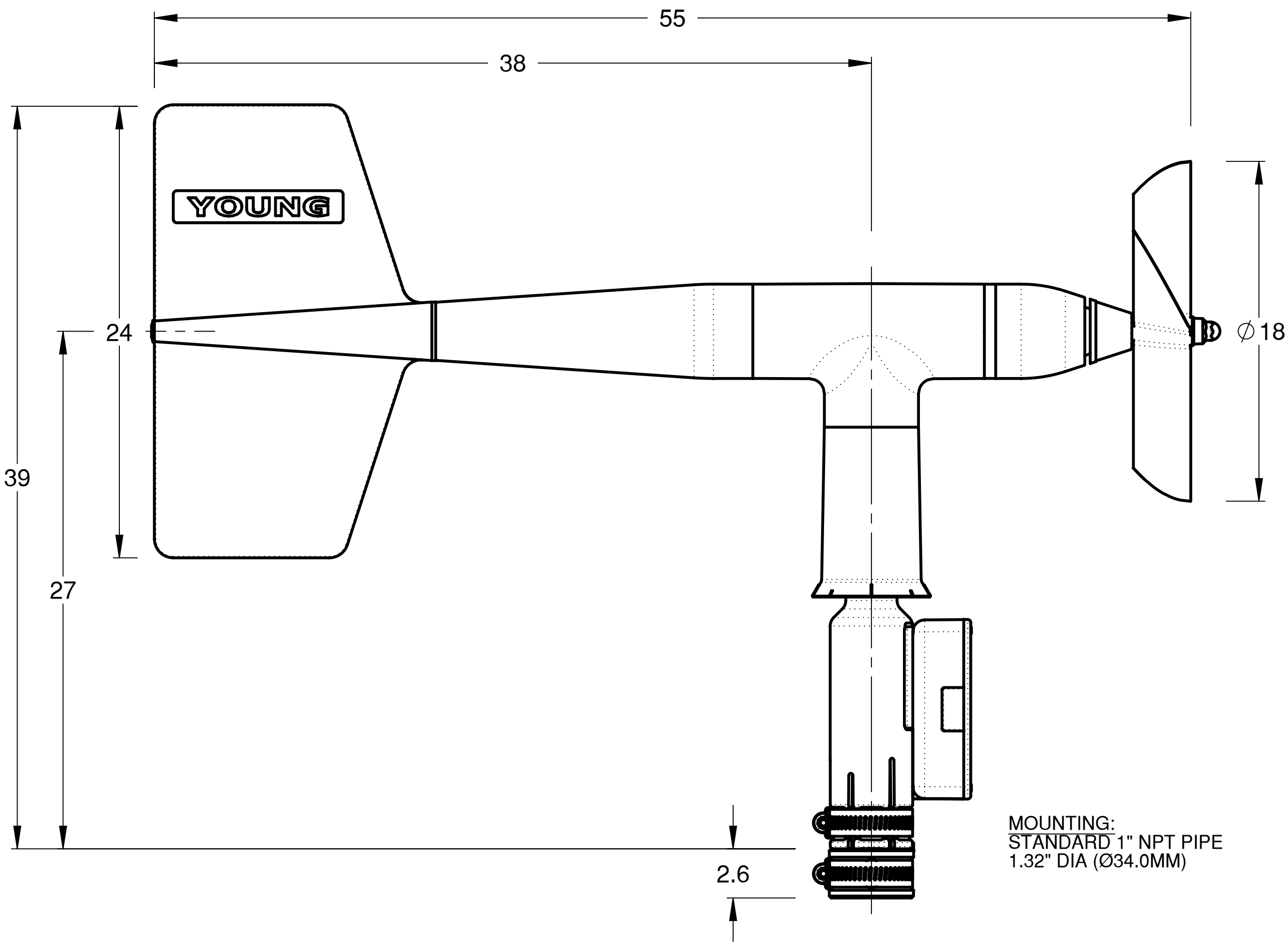
C. TO ADJUST POTENTIOMETER OUTPUT SIGNAL - REMOVE NOSE CONE, LOOSEN SET SCREW IN POTENTIOMETER COUPLING, ADJUST OUTPUT SIGNAL BY MEANS OF POTENTIOMETER ADJUSTMENT THUMBWHEEL, RE-TIGHTEN SET SCREW.

GENERAL ASSEMBLY & REPLACEMENT PARTS

MODEL 05103-SDI WIND MONITOR



OVERALL DIMENSIONS
MODEL 05103-SDI WIND MONITOR



NOT TO SCALE

ALL DIMENSIONS IN CENTIMETERS
UNLESS OTHERWISE SPECIFIED

Calibration Accessories

Model 18802
Anemometer Drive

Model 18112
Vane Angle Bench Stand

Model 18331 Vane Torque Gauge

Model 18212
Vane Angle Fixture-Tower Mount

Model 18310
Propeller Torque Disc

Model 18301
Vane Alignment Rod

YOUNG

Model 18802 Anemometer Drive provides a convenient and accurate way to rotate an anemometer shaft at a known rate. The motor may be set to rotate clockwise or counter-clockwise at any rate between 200 and 15,000 RPM in 100 RPM increments. The LCD display is referenced to an accurate and stable quartz timebase. For completely portable operation, the unit can be operated on internal batteries. For extended operation, an AC wall adapter is included.

Model 18811 Anemometer Drive is identical to Model 18802 except the drive motor incorporates a gear reducer for operation in the range of 20 to 990 RPM in 10 RPM increments. The lower range is recommended for cup anemometer calibration.

Model 18112 Vane Angle Bench Stand is used for benchtop wind direction calibration of the Wind Monitor family of sensors. The mounting post engages the direction orientation notch on the Wind Monitor. An easy to read pointer indicates 0 to 360 degrees with $^1/_2$ degree resolution.

Model 18212 Vane Angle Fixture - Tower Mount similar to the Model 18112, the tower mount feature allows use on the tower as well as the bench top. The fixture is temporarily placed on the tower between the Wind Monitor and its tower mounting. Index keys and notches are engaged to preserve direction reference.

Model 18310 Propeller Torque Disc checks anemometer bearing torque with 0.1 gm/cm resolution. The disc temporarily replaces the propeller for torque measurement or simple yet accurate pass/fail checks. Charts included with the unit relate torque to propeller threshold with limits for acceptable bearing performance.

Model 18312 Cup-Wheel Torque Disc checks cup anemometer bearing torque.

Model 18331 Vane Torque Gauge checks vane bearing torque of the Wind Monitor family sensors. Slip the fixture over the main housing and make simple yet accurate vane torque measurements. Charts relating vane torque to vane threshold provide limits for acceptable bearing performance.

Model 18301 Vane Alignment Rod helps align the vane of a wind sensor to a known direction reference during installation. The base of the device has an index key that engages the direction orientation notch in the sensor allowing the sensor to be removed without losing wind direction reference.

Ordering Information

Ordering Information	MODEL
ANEMOMETER DRIVE *200 to 15,000 RPM*	**18802**
ANEMOMETER DRIVE *20 TO 990 RPM*	**18811**
230V / 50-60 HZ INPUT POWER	***ADD SUFFIX "H"***
VANE ANGLE BENCH STAND	**18112**
VANE ANGLE FIXTURE - TOWER MOUNT	**18212**
PROPELLER TORQUE DISC	**18310**
CUP-WHEEL TORQUE DISC	**18312**
VANE TORQUE GAUGE	**18331**
VANE ALIGNMENT ROD	**18301**

Specifications

MODEL 18802 **ANEMOMETER DRIVE**
(Replaces 18801)

Range:
200 to 15,000 RPM in 100 RPM increments

Rotation:
Clockwise or Counter-Clockwise

Display Resolution:
1 RPM

Quartz Timebase Reference:
0.1 RPM

Power Requirement:
2x9 V (alkaline or lithium) batteries
115 VAC wall adapter included
(230 VAC – add suffix H)

MODEL 18811 **ANEMOMETER DRIVE**
(Replaces 18810)

Range:
20 to 990 RPM in 10 RPM increments

Display Resolution:
0.1 RPM

MODEL 18112, 18212 **VANE ANGLE CALIBRATION DEVICES**

Range:
0 to 360 degrees

Resolution:
0.5 degree

MODEL 18310, 18312 **TORQUE DISC DEVICES**

Range:
0 to 5.4 gm-cm

Resolution:
0.1 gm-cm

MODEL 18331 **VANE TORQUE GAUGE**

Range:
0 to 50 gm-cm

Resolution:
5 gm-cm

Specifications subject to change without notice.

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