An All Weather Inc. Company

PORTABLE AUTOMATED SURFACE OBSERVING SYSTEM

Installation and Maintenance

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TM 58965-10000-903

Table 7-1. Pressure Sensor Specifications

Characteristic		Specifications
Pressure Media		Clean dry nonconductive noncorrosive gas
Output		Bidirectional EIA-232 interface
Power		5V dc ±1%, 90 ma
Pressure Range		+16.9 to -31.5 inHg
Resolution		<0.005 inHg
Altitude Range	High	Atmospheric pressure at -100 ft plus 1.5 inHg
	Low	Atmospheric pressure at 10,000 ft minus 3.0 inHg
Accuracy	Accuracy	±0.01 inHg (0.00338 hPa) RMSE full scale
	Nonlinearity	±0.012% full scale
	Hysteresis	0.010% full scale
	Nonrepeatability	±0.010% full scale
	Thermal Zero Shift	±0.002% full scale per degree
	Thermal Span Shift	±0.001% full scale per degree
	Stability, 24 hours	±0.005% full scale
	Stability, 30 days	±0.02% full scale
	Stability, 1 year	±0.05% full scale
Physical	Pressure Fitting	1/8" barbed male fitting
	Pressure Port	10-32 internal thread
	Height	4.0 in
	Width	3.5 in
	Depth	5.35 in
	Weight	2.4 lb

7.3.1 PASOS uses two pressure sensors as the basic pressure sensor. The system data quality program checks the computed 1-minute average of each sensor to verify that the readings are within 0.04 inHg of each other. When the two sensors pass the data quality check, the sensor issuing the lowest reading is used in the pressure algorithm. When the pressure difference between the two sensors exceeds 0.04 inHg, the pressure is reported as "Missing". Once the pressure is reported "missing" because of the 0.04 inHg difference, the pressure will remain missing. Technician intervention is required to return the pressure to operational.

CHAPTER 9

R. M. YOUNG WIND SENSOR

MODEL 05103 WIND SENSOR

9.1 INTRODUCTION

The Wind Sensor measures horizontal wind speed and direction. Originally developed for ocean data buoy use, it is rugged and corrosion resistant yet accurate and lightweight. 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 that 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 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 the mounting post assembly and the 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.

9.2 WIND SPEED SPECIFICATION SUMMARY

Range	0 to 60 m/s (130 mph), gust survival 100 m/s (220 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	1.0 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. 125 mV p-p at 100 rpm. 12.5 V p-p at 10,000 rpm.
Output Frequency	3 cycles per propeller revolution (0.098 m/s per Hz)

9.3 WIND DIRECTION (AZIMUTH) SPECIFICATION SUMMARY

Range	360° mechanical, 355° electrical (5° open)
Sensor	Balanced vane, 38 cm (15 in) turning radius.
Damping Ratio	0.25
Delay Distance	1.3 m (4.3 ft) for 50% recovery
Threshold Sensitivity	1.0 m/s (2.2 mph) at 10° displacement 1.5 m/s (3.4 mph) at 5° displacement
Damped Natural Wavelength	7.4 m (24.3 feet)
Undamped Natural Wavelength	7.2 m (23.6 feet)
Transducer	Precision conductive plastic potentiometer, 10K ohm resistance (+20%), 0.25% linearity, life expectancy 60 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.

9.4 INITIAL CHECKOUT

When the Wind Sensor is unpacked it should be checked carefully for any signs of shipping damage. Remove the plastic nut on the propeller shaft. Install the propeller on the shaft so the letter markings on the propeller face forward (into the wind). Engage the propeller into the molded ribs on the propeller shaft 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 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 5° dead band 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. Avoid a short circuit between the azimuth signal line and either the excitation or reference lines. Although there is a 1K-ohm current limiting resistor in series with the wiper for protection, damage to the potentiometer may occur if a short circuit condition exists.

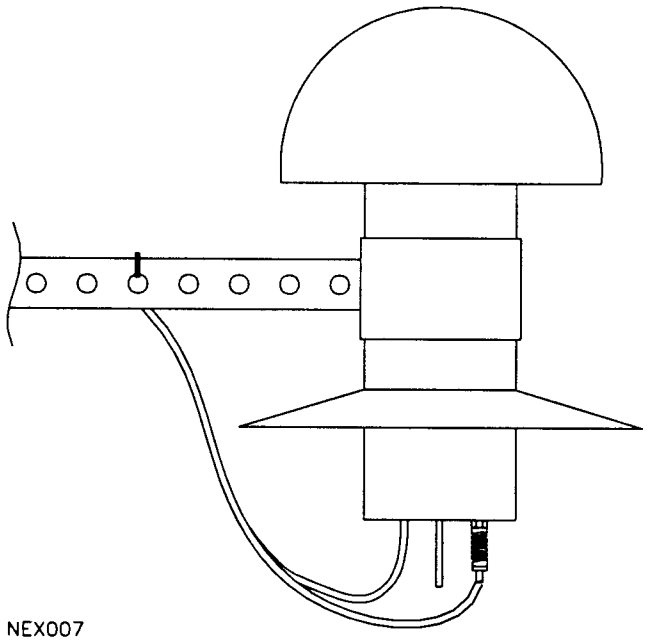

Figure 12-1. Temperature/Relative Humidity Sensor (Mounted Inside Aspirator)

Table 12-1. Temperature/Relative Humidity Sensor Specifications

Characteristic		Specification
Temperature/Humidity Sensor		Rotronics MP 101A-C4
Humidity and Temperature Response Time Constant (without filter)		<10 seconds
Humidity Resolution (when converted to dewpoint temperature)		1.0°F (0.55°C)
Temperature Resolution		1.0°F (0.55°C)
Humidity Operating Range		0% to 100% RH
Temperature Operating Range		-65°F to 140°F (-54°C to 60°C)
Humidity Output Signal (Linear)		0 to 1.0V dc = 0 to 100% RH
Temperature Output Signal (Linear)		0 to 1.2V dc = -65 to 140°F (-54°C to 60°C)
Humidity Accuracy	80% to 100% RH, 30° to 90°F	2°F (1.1°C)
	15% to 75% RH, 30° to 120°F	3°F (1.65°C)
	25% to 95% RH, -20° to 20°F	4°F (2.2°C)
Temperature Accuracy		±1.0°F (±0.55°C)
Humidity Repeatability		±0.3% RH
Temperature Repeatability		±0.18°F (0.1°C)
Humidity Sensor Stability		Better than 1% RH over a year
Supply Voltage		4.8V to 26.5V dc
Maximum Current Consumption		10 mA
Weight (without aspirator)		1.50 lb.