Alaska Meteorological Monitoring Procedures

Air Quality Division

Department of Environmental Conservation

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State of Alaska
Department of Environmental Conservation
Air Quality Division – Air Monitoring & Quality Assurance

Alaska Meteorological Monitoring Procedures

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1. Introduction

The use of on-site meteorological data to support air quality impact analysis has grown rapidly over the past decades. It is generally recognized that valid on-site data provide a more accurate characterization of the meteorological conditions affecting the transport and dispersion of pollutants emitted by a source, than data from a distant location. As a result of the shift toward on-site data it is essential that such data be representative of atmospheric dispersion conditions in the area of interest.

This document describes the guidelines for installing and operating meteorological monitoring sites in accordance with the EPA guidance documents, Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD) and Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV, Meteorological Measurements, Version 2.0 USEPA, March 2008, and the ADEC Ambient Air and/or Meteorological Monitoring Quality Assurance Project Plan (QAPP) Review Checklist, Revision 2.0. Links to all the documents are provided in the back of the document under Section 9 References. Topics covered include site selection, site installation, calibration standards, calibration, quality control, maintenance, quality assurance, data recording and data quality assessment. The purpose of this document is to provide information and guidance to the meteorologist as well as the non-meteorologist as to the proper operational aspects of a quality run meteorological station. In addition, this document will provide the minimum requirements for meteorological data collection to support air quality impact analysis performed for programs administered by the Alaska Department of Environmental Conservation Air Quality Division (DEC). All heights referenced in this document are measured from the tower base.

2. Site Selection

The primary objective when siting a meteorological monitoring station is to site the instruments away from the influence of obstructions such as buildings and trees, and in a location that is representative of the atmosphere in the area of interest. A secondary consideration is accessibility and security; however, these considerations should not be allowed to compromise the quality of the data. Refer to Alaska Department of Environmental Conservation's Meteorological Site Approval Plan Checklist for a detailed guide, attached in this document, Appendix B and also located on the Departments Air Quality website.

2.1 Wind Measurements

Wind measurements are typically taken over open, level terrain at a height of 10 meters. This height can change however, depending on the requirements of the monitoring program and/or the height of the source emission point. In some cases, DEC has required 2m and 10m wind sensors placed on an ambient air quality monitoring tower to help identify the micrometeorology during the Air Quality modeling process. Open terrain is defined as an area where any obstructions, man-made or natural, are 10 times the height of the obstruction away from the monitoring tower.

In general, the siting of meteorological towers on top of buildings should be avoided. However, if the wind instruments are to be mounted on the roof of a building, due to the lack of open space, the measurements should be taken high enough to ensure that no adverse effects are created by the building wake. In general, this height above the roof is 1.5 times the height or width of the building (whichever is less). Additional information on siting monitoring stations near major structures can be obtained in the Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) - Revised EPA 450/4-80-023R. All site characteristics, including photos, must be documented in the DEC Meteorological Site Approval Plan Checklist and/or in the associated QAPP.

2.2 Temperature Measurements

Temperature measurements should be taken at a height of approximately 2 meters, and vertical temperature difference measured between 2 meters and 10 meters. The sensor(s) should be located over on open, level area at least 10 meters in diameter. The temperature sensors must be protected from thermal radiation by mounting the sensors in aspirated radiation shields. Ground cover should be short grass, preferably non-irrigated, or natural earth.

Temperature sensors should be mounted at least 4 times the height of any obstructions away from that obstruction, and at least 30 meters away from large, paved areas. Other siting situations to be avoided include large industrial heat sources, rooftops, sheltered hollows, high vegetation, shaded areas, swamps, and areas where standing water can accumulate. Measurements should also not be made near ridges, steep slopes or valleys unless those areas are of specific interest. Measurements taken close to bodies of water should also be avoided due to the large temperature variations.

2.3 Meteorological Towers

Towers should be located over an open level area. Attention should be taken when choosing a site to ensure that the site is representative of the area under study, while at the same time is free from obstructions that might affect the measurements.

Towers should preferably be of the open lattice variety. Regardless of the type, the tower should be rugged enough to withstand substantial wind and adverse weather conditions. Folding and collapsible towers are preferable provided that they are rugged enough to keep the instrumentation properly oriented.

Wind instruments should be mounted above the top of the tower on a boom or mast. If a crossarm is employed in the mounting of the wind instruments, the crossarm should be mounted perpendicular to the prevailing wind flow and at least one tower diameter above the top of the tower structure. This will ensure that the measurements taken are not affected by the wind sensor bodies or the tower itself.

2.4 Station Siting

When choosing a meteorological monitoring site, it is important to have the monitoring purpose clearly defined. This will enable the personnel performing the station siting to evaluate and choose the site that best defines the purpose. In most cases the purpose of the monitoring is to provide PSD quality meteorological data to be used for computer modeling in support of an existing air quality concern and/or as part of an air quality permit application requirement. Prior to the selection of a site, a written proposal to the DEC AQ Monitoring is suggested.

Once a site is selected, the site must be completely documented in the project QAPP. Photographs of the site must also be included. Refer to the DEC Ambient Air and/or Meteorological Monitoring Quality Assurance Project Plan (QAPP) Review Checklist for placement.

3. Site Installation

Upon procurement and receipt of the meteorological instrumentation, but prior to installation, a complete acceptance test should be conducted on all sensors. This acceptance test should include but is not limited to physical examination of all sensors, cables, and connectors, a wind speed sensor calibration, a wind direction sensor calibration, and a temperature sensor calibration. Document the acceptance test in the logbook that will be used at the station. Bring any problems encountered during the acceptance test to the attention of the vendor as soon as possible to avoid delays in the monitoring project. Additional information on acceptance testing can be found in the EPA document On-Site Meteorological Program Guidance for Regulatory Modeling Applications EPA-450/4-87-013 as well as the EPA Quality Assurance Handbook for Air Pollution Measurement Systems EPA-600/4-82-060. Revised August 1989.

Once the site has been selected and the station has been established, equipment and supplies are required for the measurement of the meteorological parameters. The station must contain at a minimum the following.

- meteorological sensors, cables, and manuals
- tower with mounting mast
- power supply (11-24 VDC)
- data acquisition system
- data logger
- room temperature sensor (sheltered site)
- station logbook
- spare parts, and
- supplies and consumables

Install the meteorological monitoring instruments according to the manufacturers' instruction manual. The information contained in the manual includes instructions on:

- installation of the equipment
- calibration
- operation
- preventative maintenance
- troubleshooting

4. Calibration/Audit

The calibration procedures described in this section will be used to assess the performance and validate the data from meteorological networks.

The procedures written in this document have been developed for the R.M. Young meteorological monitoring system. However, many of the procedures that are used are also applicable to other instrument systems. It is recommended that the reader refer to the instrument manual for specific instructions on calibration. In the event a sonic wind sensor is installed on a meteorological monitoring site, a heater and annual factory recertification are mandatory.

The calibration/audit procedures will be performed immediately upon installation of the system, on a quarterly basis thereafter, and at the end of the monitoring project (no earlier than 30 days prior to the end of the monitoring period).

Use the blank Calibration/Audit worksheets located in Appendix A to document the results and identify corrective actions taken. Once the calibration has been performed, ensure that the worksheet is complete and submit a copy to the Quality Assurance Unit.

4.1 Wind Direction Orientation

During the station installation the sensor will be aligned to true north (magnetic north ± declination) using the solar azimuth observation procedure in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV, Meteorological Measurements, Section 4.2.4.3.2.2. Once the vane alignment rod has been aligned using the solar noon observation procedure:

1. Identify a distant landmark and bearing using a transit or from the site diagram. Set up the transit in line with the sensor's vane alignment rod, at a location where the distant landmark can be seen and at least 60 feet from the tower.

2. Sight the distant landmark with the transit telescope and lock in the known bearing on the transit horizontal circle. Without moving the transit tripod or horizontal circle, turn the transit telescope, sight down the sensor's vane alignment rod and read the bearing from the horizontal circle. This is the sensors actual bearing. Record this value on the QC worksheet.

3. If the difference between the sensor's actual bearing and true north (360°) is greater than 3° find true north with a compass or transit and reset the sensor's orientation ring. Record this remedial action on the QC Worksheet and in the station logbook.

4.2 Wind Speed Threshold Check

1. Disable the data logger, lower the tower, and disconnect the wiring from the wind sensor. Verify that the orientation ring is tight. This will ensure that the wind sensor will be reinstalled in the proper orientation. Remove the wind sensor from the tower and mount it on the vane angle bench stand (Figure 4-1). Verify that the vane angle bench stand is level and is not binding when rotated.

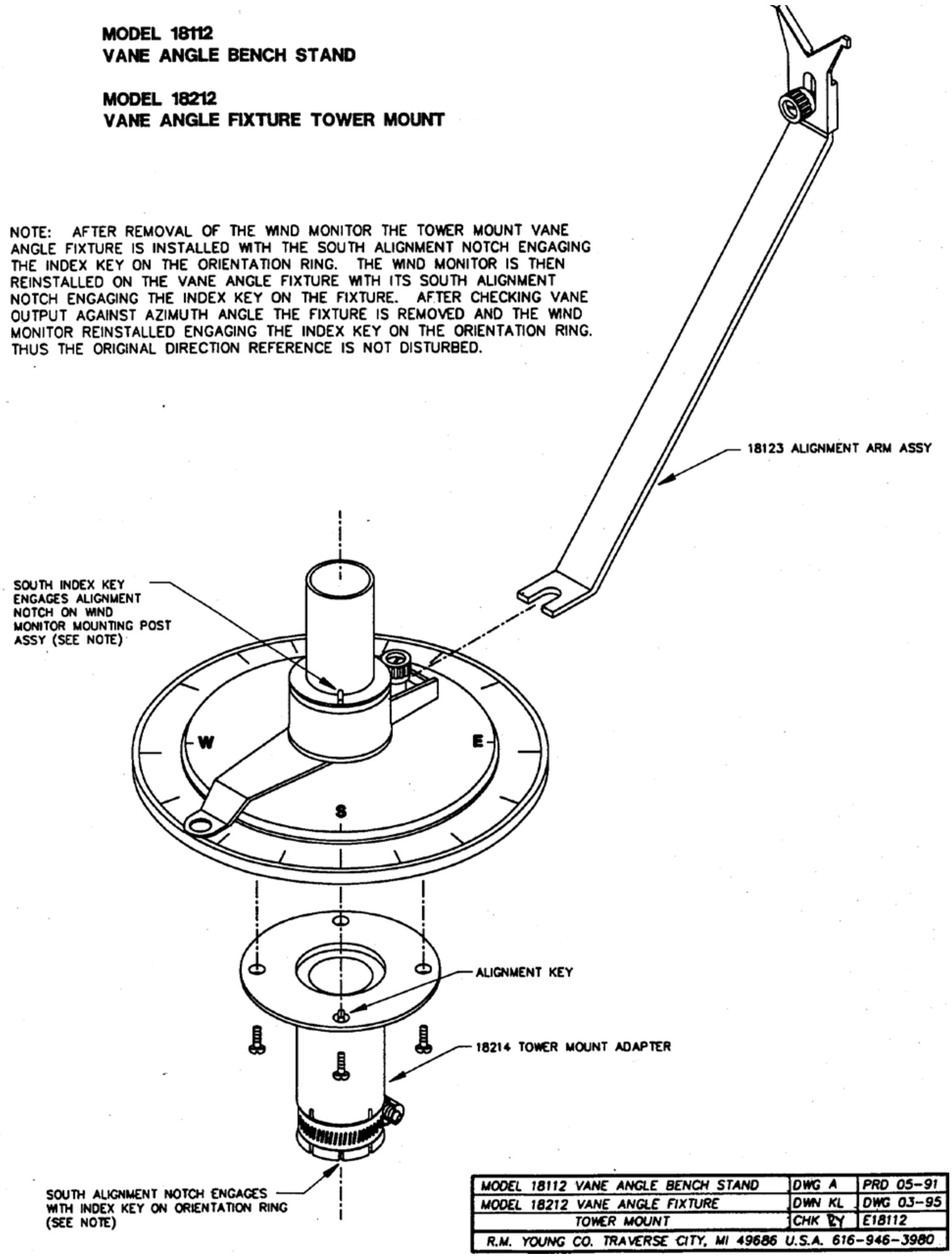
2. Remove the propeller and install the propeller torque disk. Verify that the disk is in balance with the anemometer assembly. Set the orientation of the screw holes to a variety of positions (at least six) and verify that the disk does not turn when released. Add balancing weight (tape or rotate the disk on the shaft to achieve equilibrium).

3. Install the 0.1-gram black nylon screw weight on the left side of the anemometer torque disk 1 centimeter from the center as seen looking at the disk from the front. Set the line of screw holes horizontal. This imposes a 0.1 gram-centimeter torque in the direction the wind would turn the

propeller.

If the disk moves five degrees or more this is the starting torque. If it does not, increase the torque by moving the weight further from the center or adding more weight to the anemometer torque disk

Figure 4-1


MODEL 18112
VANE ANGLE BENCH STAND
MODEL 18212
VANE ANGLE FIXTURE TOWER MOUNT
NOTE: AFTER REMOVAL OF THE WIND MONITOR THE TOWER MOUNT VANE ANGLE FIXTURE IS INSTALLED WITH THE SOUTH ALIGNMENT NOTCH ENGAGING THE INDEX KEY ON THE ORIENTATION RING. THE WIND MONITOR IS THEN REINSTALLED ON THE VANE ANGLE FIXTURE WITH ITS SOUTH ALIGNMENT NOTCH ENGAGING THE INDEX KEY ON THE FIXTURE. AFTER CHECKING VANE OUTPUT AGAINST AZIMUTH ANGLE THE FIXTURE IS REMOVED AND THE WIND MONITOR REINSTALLED ENGAGING THE INDEX KEY ON THE ORIENTATION RING. THUS THE ORIGINAL DIRECTION REFERENCE IS NOT DISTURBED.
18123 ALIGNMENT ARM ASSY
SOUTH INDEX KEY ENGAGES ALIGNMENT NOTCH ON WIND MONITOR MOUNTING POST ASSY (SEE NOTE)
W
E
S
ALIGNMENT KEY
18214 TOWER MOUNT ADAPTER
SOUTH ALIGNMENT NOTCH ENGAGES WITH INDEX KEY ON ORIENTATION RING (SEE NOTE)
MODEL 18112 VANE ANGLE BENCH STAND
DWG A
PRD 05-91
MODEL 18212 VANE ANGLE FIXTURE
DWN KL
DWG 03-95
TOWER MOUNT
CHK RY
E18112
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 616-946-3980

until the torque is found. During the test, rotate the sensor and check the torque both to the left and right of center. During the test, rotate the disk both to the left and right of center. This tests the torque on both sides of the centerline. If necessary, use the 1.0 gram stainless steel screw weight. Record the gram-centimeter starting torque on the QC Worksheet and in the logbook.

To calculate the threshold speed (meters/sec) divide the gram centimeter starting torque by the propeller k constant (3.8 for R.M. Young carbon filter propeller) and take the square root of the result.

4. If the starting threshold is greater than 1 gram-centimeter (0.5 meters/sec) take corrective action by replacing the anemometer bearing assembly. Record this remedial action on the QC Worksheet and in the logbook.

4.3 Wind Direction Threshold Check

1. With the wind sensor still mounted on the level vane angle bench stand, but prior to the torque test, ensure that there is no air movement in the room by moving the vane to a variety of positions and noting any movement. Adjust the vane location if necessary.

2. Mount the vane torque gauge as shown in Figure 4-3.

3. Slowly apply steady force at the end of the leaf spring until the vane begins to move in a clockwise direction. Test the vane through 360^{o} and note the maximum reading in grams. Repeat the test in the counterclockwise direction.

   To calculate the threshold speed (meters/sec) divide the gram-centimeter starting torque by the wind vane constant K (37 for the R.M. Young wind monitor) and take the square root of the result.

   Select Torque value for type of instrument to be checked and desired maximum threshold from table. Preset stop on leaf spring to this torque value (force in grams x 10 cm distance from center of rotation). Install gauge on mounting bracket with tip of leaf spring 10 cm from centerline (CL) of instrument as shown. With instrument mounted on level surface with no air movement apply steady pressure at end of leaf spring. Vane should rotate through 360 degrees without exceeding preset torque value. Free rotation indicates good bearing/transducer condition. Excess torque indicates need for service.

4. If the starting torque is greater than 12 gram-centimeters (0.57 meters per second) take corrective action by replacing both sets of bearings in the direction vane assembly. Record this remedial action on the QC Worksheet and in the station logbook.

4.4 Wind Speed Accuracy Test

1. Connect an alternate cable from the wind monitor to the data logger. Refer to Figure 4-4 for wiring connections.

2. Mount the selectable speed calibration unit to the wind monitor and attach the coupling to the anemometer shaft.
3. Through the data logger menu, switch the display to “raw voltages”. Speed in miles per hour is equal to the displayed voltage reading for wind speed divided by 2.237 and multiplied by 100. Record this value for zero revolutions.

4. Set the calibration unit speed to 600 revolutions per minute counterclockwise (06 on the digital switch). To calculate the simulated wind speed in meters/second divide the revolutions per minute by 60 seconds per minute and multiply by the propeller pitch of 0.294 meters per second.

   To convert meters per second to miles per hour, multiply by 2.237.

   Six hundred revolutions per minute results in a simulated wind speed of 3.07 meters per second or 6.87 miles per hour. Allow the wind speed calibrator to run until the reading becomes stable. Record this simulated wind speed and the indicated wind speed from the voltmeter on the QC worksheet.

5. Set the calibration unit speed to 1200 revolutions per minute counterclockwise (12 on the digital switch). This simulates a wind speed of 6.14 meters per second or 13.74 miles per hour. Record this simulated wind speed and the indicated wind speed from the voltmeter on the QC Worksheet.

6. Set the calibration unit speed to 2400 revolutions per minute counterclockwise (24 on the digital switch). This simulates a wind speed of 12.28 meters per second or 27.48 miles per hour. Record this simulated wind speed and indicated speed from the voltmeter on the QC Worksheet.

7. Take corrective action if the indicated readings are not within 0.2 meters per second (0.50 miles per hour) of the simulated wind speed. The corrective action may include sending the sensor to back to the Repair and Calibration Unit. Record this remedial action on the QC Worksheet and in the station logbook.

8. Remove the calibration unit and reinstall the propeller with the smooth side and letter markings facing forward (into the wind).

4.5 Wind Direction Accuracy Check

1. Install the vane holding arm on the vane angle bench stand. Tighten the V-shaped holder in a two-point contact position with the vane boom. Do **not** over tighten the V-shaped holder or the boom will bind when rotated.

2. Through the data logger menu, switch the display to “raw voltages”. To calculate a bearing from the voltmeter reading, divide the voltage reading by 5 and multiply by 540º.

3. Move the indicator to the following positions in sequence and record the output readings, from the data logger, for each position on the QC Worksheet and in the logbook.

005°	030°	060°	090°	120°	150°	180°	210°	240°
270°	300°	330°	350°	370°	390°	420°	450°	480°
510°	538°	450°	370°	270°	180°	090°	005°	

4. Subtract the azimuth reading, calculated from the data output, from the indicated position and record the value for each of the 26 positions.

5. A difference between the actual and indicated direction equal to or greater than 3° requires corrective action. Find true north with a compass or transit and reset the sensor's orientation ring Record any remedial action taken in the QC Worksheet and in the station logbook.

6. Remove the sensor from the vane angle bench stand and install on the tower mast.

Figure 4-2

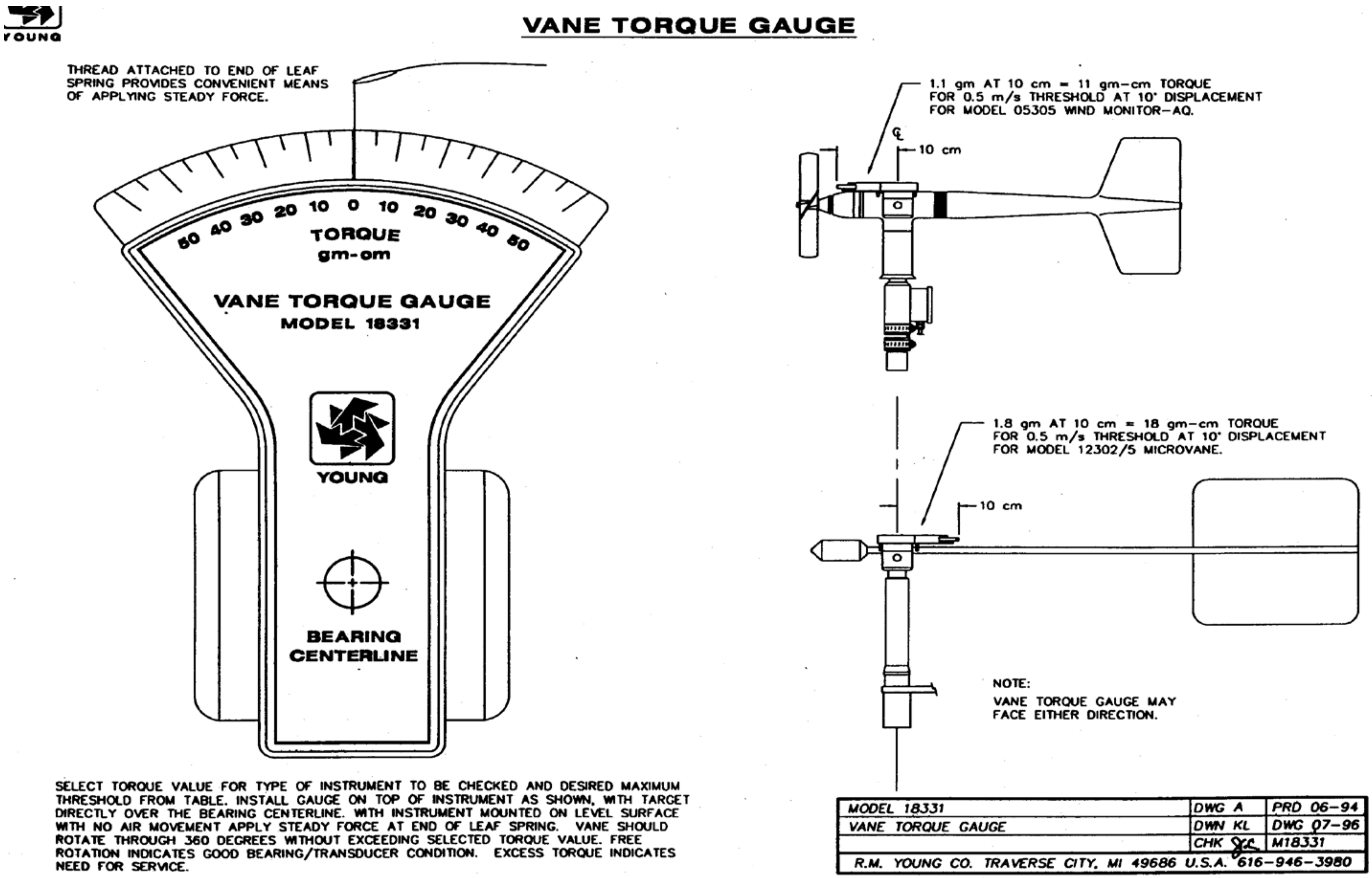
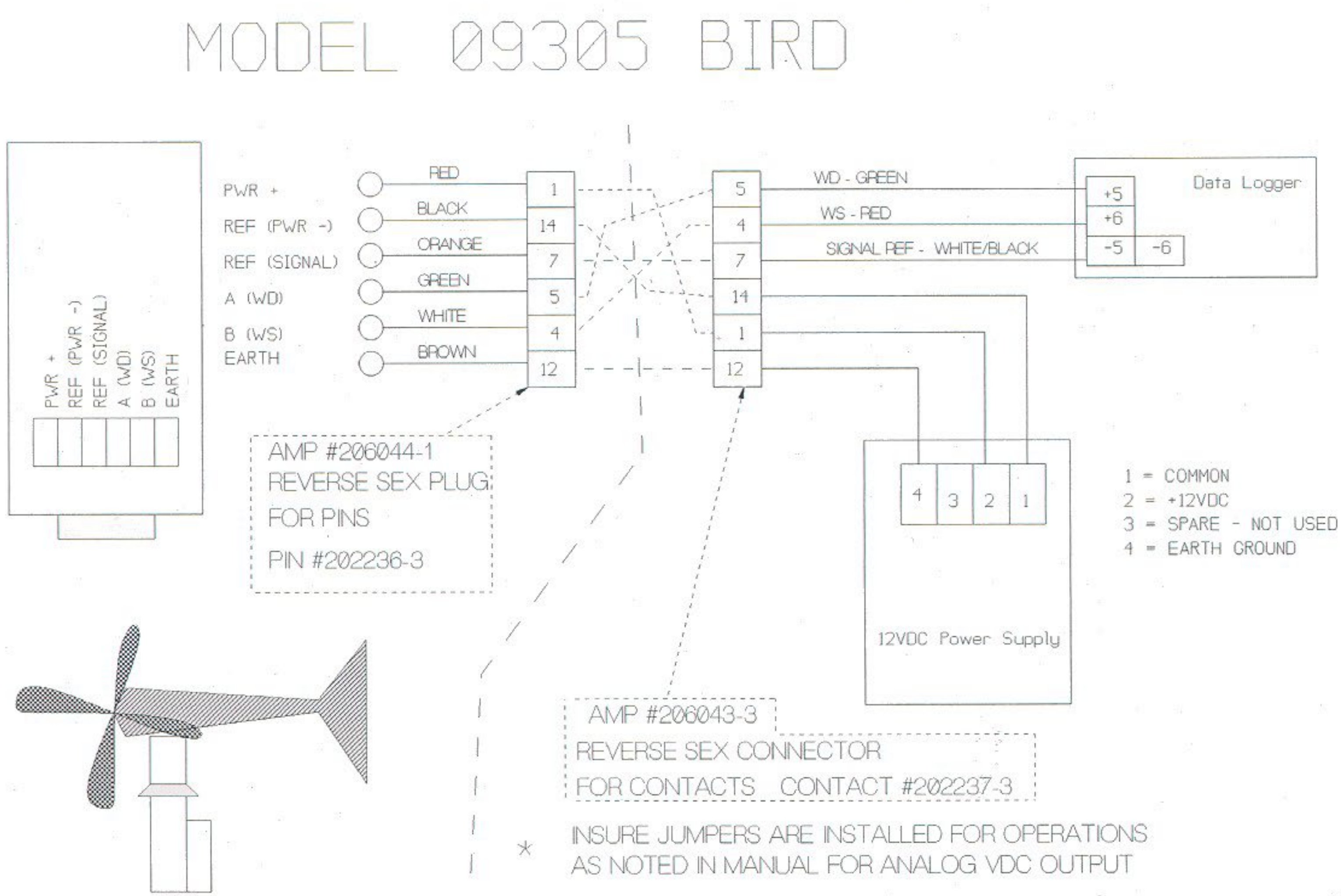

YOUNG
VANE TORQUE GAUGE
THREAD ATTACHED TO END OF LEAF SPRING PROVIDES CONVENIENT MEANS OF APPLYING STEADY FORCE.
50 40 30 20 10 0 10 20 30 40 50
TORQUE gm-cm
VANE TORQUE GAUGE
MODEL 18331
YOUNG
BEARING CENTERLINE
1.1 gm AT 10 cm = 11 gm-cm TORQUE FOR 0.5 m/s THRESHOLD AT 10° DISPLACEMENT FOR MODEL 05305 WIND MONITOR-AQ.
10 cm
1.8 gm AT 10 cm = 18 gm-cm TORQUE FOR 0.5 m/s THRESHOLD AT 10° DISPLACEMENT FOR MODEL 12302/5 MICROVANE.
10 cm
NOTE:
VANE TORQUE GAUGE MAY FACE EITHER DIRECTION.
SELECT TORQUE VALUE FOR TYPE OF INSTRUMENT TO BE CHECKED AND DESIRED MAXIMUM THRESHOLD FROM TABLE. INSTALL GAUGE ON TOP OF INSTRUMENT AS SHOWN, WITH TARGET DIRECTLY OVER THE BEARING CENTERLINE. WITH INSTRUMENT MOUNTED ON LEVEL SURFACE WITH NO AIR MOVEMENT APPLY STEADY FORCE AT END OF LEAF SPRING. VANE SHOULD ROTATE THROUGH 360 DEGREES WITHOUT EXCEEDING SELECTED TORQUE VALUE. FREE ROTATION INDICATES GOOD BEARING/TRANSDUCER CONDITION. EXCESS TORQUE INDICATES NEED FOR SERVICE.
MODEL 18331
VANE TORQUE GAUGE
DWG A
DWN KL
CHK
PRD 06-94
DWG 07-96
M18331
R.M. YOUNG CO. TRAVERSE CITY, MI 49686 U.S.A. 616-946-3980

Figure 4-3


MODEL 09305 BIRD
PWR +
REF (PWR -)
REF (SIGNAL)
A (WD)
B (WS)
EARTH
RED
BLACK
ORANGE
GREEN
WHITE
BROWN
1
14
7
5
4
12
WD - GREEN
WS - RED
SIGNAL REF - WHITE/BLACK
Data Logger
+5
+6
-5
-6
AMP #206044-1
REVERSE SEX PLUG
FOR PINS
PIN #202236-3
4 3 2 1
12VDC Power Supply
1 = COMMON
2 = +12VDC
3 = SPARE - NOT USED
4 = EARTH GROUND
AMP #206043-3
REVERSE SEX CONNECTOR
FOR CONTACTS CONTACT #202237-3
* INSURE JUMPERS ARE INSTALLED FOR OPERATIONS
AS NOTED IN MANUAL FOR ANALOG VDC OUTPUT

4.6 Temperature Accuracy Calibration/Audit

Temperature calibrations/audits require a minimum of three comparison points.

Using an Ice Bath

1. Ideal conditions for a temperature check are those that have a minimum solar impact (i.e., nighttime, overcast, moderate wind etc.). Through the data logger menu, switch the display to instantaneous readings (°C), record the temperature from the data logger once it stabilized.

2. Disconnect the temperature probe from the radiation shield and place both the probe and the appropriate NIST traceable thermometer in a bath of crushed ice or dry ice and stir. While stirring continuously at a steady pace, ensure that both the temperature sensor and the thermometer are at the same level in the bath. The low temperature calibration/audit will be in the lower temperature range typically experienced at the site.

3. When the readings from both the instrument and the thermometer are steady, record both readings on the QC Worksheet and in the station logbook.

4. Verify that the reading matches with that of the strip chart and the data logger. Note the reading on the strip chart.

5. Place both the probe and the appropriate thermometer in a bath of lukewarm water and stir. The upper temperature calibration/audit will be in the upper temperature range typically experienced at the site.

6. When the readings from both the instrument and the thermometer are steady, record both readings.

7. For both tests subtract the thermometer reading from the sensor reading. If the difference exceeds +/- 0.5° Celsius, take corrective action. Replace temperature sensors or remove and send back to manufacture for recalibration. Record any corrective action taken on the QC Worksheet and in the station logbook.

8. Return the temperature probe to the radiation shield.

9. For Delta Temperature Checks follow the same steps as above. Both temperature probes/thermocouples must be submerged with the reference probe into the water bath at the same time. If the delta T value is greater than +/- 0.10° Celsius, take corrective action. Replace temperature sensors with factory calibrated sensors and complete another check or remove and send back to manufacture for recalibration. Record any corrective action on the QC Worksheet and in the station logbook.

Using a Dry Well Calibrator

1. Ideal conditions for a temperature check are those that have a minimum solar impact (i.e., nighttime, overcast, moderate wind etc.). Use the data logger's instantaneous readings to record

temperature readings.

2. Disconnect the temperature probe from the radiation shield and place both the probe and the appropriate NIST traceable temperature probe in the Dry Well. The low temperature calibration/audit will be in the lower temperature range typically experienced at the site.

3. Set the dry well to -35° C for the low range. The dry well calibrator will be given time to thermally stabilize and provide a uniform low temperature. Complete a reading of both the 2m and 10m temperature probes and NIST temperature probe.

4. Set the dry well to -0° C for the low range. The dry well calibrator will be given time to thermally stabilize and provide a uniform low temperature. Complete a reading of both the 2m and 10m temperature probes and NIST temperature probe.

5. Set the dry well to -25° C for the low range. The dry well calibrator will be given time to thermally stabilize and provide a uniform low temperature. Complete a reading of both the 2m and 10m temperature probes and NIST temperature probe.

6. Replace the 2m and 10m temperature probes into their respective radiation shields.

7. For all ranges take the difference between the audit/calibration thermocouple probe and the temperature sensor reading. If the difference exceeds +/- 0.5º Celsius, take corrective action. Replace temperature sensors with factory calibrated sensors and complete another check or remove and send back to manufacture for recalibration. Record any corrective action taken on the QC Worksheet and in the station logbook.

8. Return the temperature probe to the radiation shield.

9. For Delta Temperature Checks follow the same steps as above. Both temperature probes/ thermocouples must be compared with the reference probe in the dry well at the same temperature setting. If the delta T value is greater than +/- 0.10º Celsius, take corrective action. Replace temperature sensors with factory calibrated sensors and complete another check or remove and send back to manufacture for recalibration. Record any corrective action on the QC Worksheet and in the station logbook.

4.7 Solar Radiation Accuracy Calibration/Audit

The calibration schedule for a pyranometer requires an initial calibration check, and calibrations every 6 months. Calibrations are also required immediately after any repair, rewiring, adjustment, or replacement of the sensor or any sensor components. Calibrations/audits, when possible, should last 2 full diurnal cycles. However, since this is rarely possible in remote Alaska sites, calibration checks will be performed with a minimum of 4 hours before and after solar max. A field calibration/audit check is comprised of the comparison of the pre-adjustment responses to the responses obtained from a collocated, calibrated NIST traceable pyranometer, adjusting or performing needed maintenance on the pyranometer, and documentation of all collected data and adjustments made.

1. First check consists of totally covering the sensor to exclude all light. Observe and record the output from the datalogger (which should be approximately zero) in the Solar Radiation Sensor Calibration/Audit Form.

2. Next check the ambient light condition output for the sensor and calibration sensor. Record these values in the Solar Radiation Sensor Calibration/Audit Form.

3. Set-up and level the Collocated Transfer Standard (CTS) as near as practical to the site pyranometer. Special care should be taken to ensure the CTS is setup comparably to the station pyranometer or differences in reflection from snow, shadows, or other light variations can have a significant impact on the measurements. If the station Pyranometer has a ventilator or heater, it may be best to turn these off during the calibration. Record the concurrent values for the site and CTS pyranometer. Ideally, the CTS should be collecting data for the entire time the technician is on-site.

4. Record the solar radiation data, averaging interval, and all other pertinent information in the Solar Radiation Sensor Calibration/Audit Form. PSD limits have been interpreted as ± 5% of the calibration value when the average sample value is greater than or equal to 200W/m^2 or, ±10W/m^2 of the calibration value when the average sample value is less than 200W/m^2.

4.8 Relative Humidity Accuracy Calibration/Audit

The audit procedure tests the monitoring station's RH measurement system in two test environments: (1) ambient humidity, and (2) high humidity. The two tests are accomplished by first placing the station and audit meter RH sensing elements (probes) in a sealed test chamber under ambient conditions and allowing ample time (30 to 60 minutes) for both RH probes to stabilize. It is important that the RH chamber be shielded from direct sunlight or other conditions that could vary the chamber's internal temperature during the test period. Comparison between the audit meter's RH values and the observed station-reported RH values under ambient and high humidity conditions provides an assessment of the station's RH measurement system. Follow the steps below.

1. Remove the station RH probe from its housing and insert it into the test chamber immediately adjacent to the audit RH test probe.

2. Close the test chamber and shield it from exposure to direct sunlight or other conditions that would cause the RH chamber's temperature to vary during the test period.

3. Allow 30 to 60 minutes for the probes and test chamber to stabilize under the ambient test conditions.

4. Record the ambient relative humidity values for the audit RH meter and station RH system on the Relative Humidity Probe Audit Report form.

5. Open the RH chamber and carefully place a wetted wick in the chamber next to the two RH probes. Be careful not to allow water from the wick to drip onto one or both of the RH probes.

6. Allow 30 to 60 minutes for the probes and test chamber to stabilize under the high humidity test conditions. As before, shield the RH chamber from conditions that could affect temperatures within the chamber.

7. Record the high relative humidity values for the audit RH meter and station RH system on the Relative Humidity Probe Audit Report form. If the difference between the two probes is greater than 7% take corrective action. Replace the RH sensor a with factory calibrated sensor and complete another check or remove and send back to manufacture for recalibration.

4.9 Barometric Pressure Accuracy Calibration/Audit

The procedure involves collocation of an audit barometer transfer standard as close as possible to the station's barometric pressure sensor and allowing both instruments ample time (5 to 10 minutes) to measure and report barometric pressure values. The test should be conducted during a period of calm weather when no storms are moving through the test location. Comparison between the barometric pressure value reported by the audit transfer standard and the observed station-reported values provides an assessment of the station's accuracy.

1. Position the audit barometer as close as possible to the station's barometric pressure sensor.

2. Turn on the audit barometer and allow 5 to 10 minutes for the barometer to stabilize.

3. Record the barometric pressure values for the audit barometer and station barometric pressure sensor on the Barometric Pressure Sensor Audit Report form.

4. Repeat the procedure three to five times throughout the day to confirm the test results. Record the barometric pressure values for the audit sensor and station barometric sensor on the Barometric Pressure Audit/Calibration Report form. If the difference between the two probes is greater than 3mb take corrective action. Replace the sensor a with factory calibrated sensor and complete another check or remove and send back to manufacture for recalibration.

5. Maintenance

With the advent of sealed bearings and instrument housings that are impervious to corrosion, instrument failure has declined dramatically. These improvements, however, should be combined with a routine Quality Control and maintenance program to properly protect the system from failure.

With a properly administered Quality Control program, the only component likely to need replacement due to normal wear is the precision bearings in the wind sensors. It is recommended that the wind speed bearings be replaced on a semi-annual basis. Refer to your instrument specific manual for proper instructions on the replacement of these parts as well as any other maintenance activities.

6. Quality Assurance

6.1 Performance Audits

During each calendar year, utilizing the procedures in section 4.0, 100% of the operating meteorological monitoring stations will be audited on a semiannual basis for PSD projects and annually for SLAMS sites and generate an audit report that will be incorporated into the Annual Data Review report.

6.2 Technical System Audits

The Technical Systems audit is an on-site review and inspection of the entire meteorological monitoring program to assess its compliance with established regulations governing the collection, analysis, validation, and reporting of meteorological data. A technical systems audit will be performed annually for PSD monitoring sites and every 3 years for SLAMS sites.

7. Data Recording, Validating and Reporting

Refer to DEC Ambient Air and/or Meteorological Monitoring Quality Assurance Project Plan (QAPP) Review Checklist, Revision 2.0. This document describes the procedures for handling, recording and validating air monitoring data. All data will be reviewed and certified by the Quality Assurance Coordinator prior to being reported or used to make decisions concerning air quality, air pollution abatement or control.

8. Data Quality Assessment

For each calendar quarter and year, the Quality Assurance unit will prepare data completeness reports. The completeness of the data will be determined for each meteorological parameter and expressed as a percentage. Percent valid data will be a gauge of the amount of valid data obtained compared to the amount expected under ideal conditions (24 hours per day, 365 days per year).

9. References

1. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD) EPA-450/4-87-007. May 1987.
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