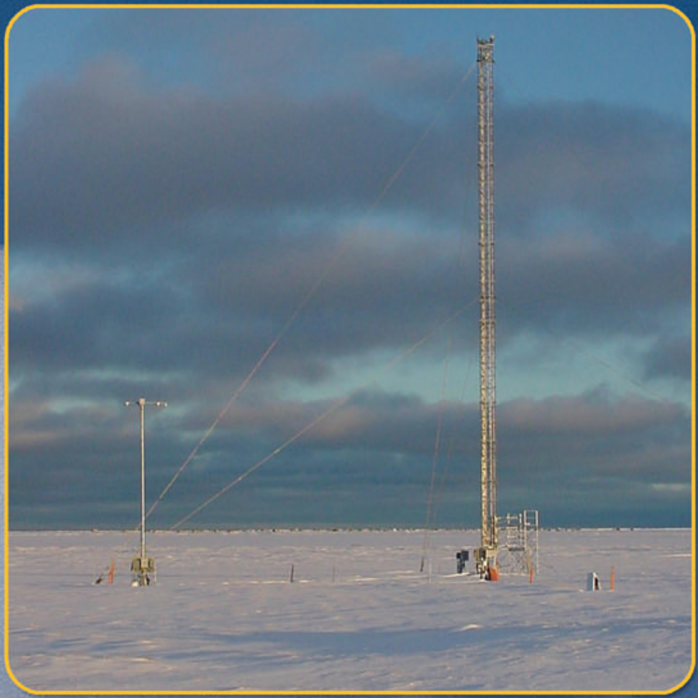
ARM TR-034

Barrow Meteorology Station
Handbook



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Barrow Meteorology Station Handbook

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1. General Overview

The Barrow meteorology station (BMET) uses mainly conventional *in situ* sensors mounted at four different heights on a 40 m tower to obtain profiles of wind speed, wind direction, air temperature, and humidity. It also obtains barometric pressure, visibility, and precipitation data.

2. Contacts

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3. Deployment Locations and History

This one-of-a-kind system was installed at the NSA Barrow Alaska site in March 1998. In October 2003 the collection system and various sensors were replaced. See the Surface and Tower Meteorological Instrumentation at Barrow (METTWR4H) for the current data, sensors and measurement methods.

Table 1.

Location	Date installed	Date Removed	Status
NSA C2	03/1998	N/A-changed	changed

4. Near-Real-Time Data Plots

This section is not applicable to this instrument.

5. Data Description and Examples

This section is not applicable to this instrument.

5.1 Data File Contents

5.1.1 Primary Variables and Expected Uncertainty

The BMET station directly measures wind speed, wind direction, air temperature, and relative humidity at 2 m, 10 m, 20 m, and 40 m. Vector-averaged wind speeds, vector-averaged wind directions, dew points, and vapor pressures are computed from these primary measurements.

Periodically, 2 m air and dew point temperatures are measured using a chilled-mirror hygrometer.

Barometric pressure, visibility, and precipitation at the surface are also directly measured.

Table 2. NSA Met Tower

Quantity	Variable	Unit	Measurement Level	Measurement Interval	Resolution
Barometric Pressure	atmos_pressure	hPa	4m	1 min	0.01
Mean Wind Speed	wind_spd_mean	m/s	2m, 10m, 20m, 40m	1 min	0.001
Maximum Wind Speed	wind_spd_max	m/s	2m, 10m, 20m, 40m	1 min	0.001
Minimum Wind Speed	wind_spd_min	m/s	2m, 10m, 20m, 40m	1 min	0.001
Vector-averaged Wind Speed	wind_spd_vec_avg	m/s	2m, 10m, 20m, 40m	1 min	0.001
Vector-averaged Wind Direction	wind_dir_vec_avg	deg	2m, 10m, 20m, 40m	1 min	0.001
Std Dev of Wind Direction	wind_dir_sd	deg	2m, 10m, 20m, 40m	1 min	
Maximum Wind Direction	wind_dir_max	deg	2m, 10m, 20m, 40m	1 min	0.001
Minimum Wind Direction	wind_dir_min	deg	2m, 10m, 20m, 40m	1 min	0.001
Mean Air Temperature or Hardware Error	temp_mean	C	2m, 10m, 20m, 40m	1 min	0.001
Maximum Air Temperature	temp_max	C	2m, 10m, 20m, 40m	1 min	0.001
Minimum Air Temperature	temp_mean	C	2m, 10m, 20m, 40m	1 min	0.001

Table 2. (cont'd)

Quantity	Variable	Unit	Measurement Level	Measurement Interval	Resolution
Mean Relative Humidity	relh_mean	%	2m, 10m, 20m, 40m	1 min	0.01
Maximum Relative Humidity	relh_max	%	2m, 10m, 20m, 40m	1 min	0.01
Minimum Relative Humidity	relh_min	%	2m, 10m, 20m, 40m	1 min	0.01
Mean Dew Point Temperature	dew_pt_temp_mean	C	2m, 10m, 20m, 40m	1 min	0.001
Maximum Dew Point Temperature	dew_pt_temp_max	C	2m, 10m, 20m, 40m	1 min	0.001
Minimum Dew Point Temperature	dew_pt_temp_min	C	2m, 10m, 20m, 40m	1 min	0.001
Mean Vapor Pressure	vap_pres_mean	hPa	2m, 10m, 20m, 40m	1 min	0.001
Maximum Vapor Pressure	vap_pres_max	hPa	2m, 10m, 20m, 40m	1 min	0.001
Minimum Vapor Pressure	vap_pres_min	hPa	2m, 10m, 20m, 40m	1 min	0.001

Table 3. Present Weather Sensor

Quantity	Variable	Unit	Measurement Level	Measurement Interval	Resolution
NWS Code	present_weather_sensor_NWS_code	N/A	3m	1 min	N/A
One Minute Visibility	one_minute_visibility	m	3m	1 min	1
Ten Minute Visibility	ten_minute_visibility	m	3m	1 min	1
One Minute PW code	one_minute_PW_code	N/A	3m	1 min	N/A
Ten Minute PW Code	ten_minute_PW_code	N/A	3m	1 min	N/A
One Hour PW code	one_hour_PW_code	N/A	3m	1 min	N/A
Precipitation Rate	precip_rate	mm/hr	3m	1 min	0.01
Cumulative Liquid Water Equivalent	cumul_liq_water_equiv	mm/hr	3m	1 min	0.01
Cumulative Snow	cumul_snow	mm/hr	3m	1 min	0.01

Table 4. Chilled Mirror Hygrometer

Quantity	Variable	Unit	Measurement Level	Measurement Interval	Resolution
Air temperature	air_temp	C	2m	10 min	0.1
Dew point temperature	dew_pt_temp	C	2m	10 min	0.01
Relative humidity	relh	%	2m	10 min	0.1

Table 5. Optical Rain Gauge

Quantity	Variable	Unit	Measurement Level	Measurement Interval	Resolution	Uncertainty
NWS Code	precip_NWS_code	N/A	1 m	1 min	N/A	N/A
ORG Precipitation Rate	precip_rate	mm/hr	1 m	1 min	0.001	5%
Daily Accumulation	precip_daily_accum	mm	1 m	1440 min	0.001	10%

5.1.1.1 Definition of Uncertainty

When the wind speed drops below the starting threshold for the cup anemometers or the wind vanes, the sensors will not respond properly. If the wind speed stays below the starting threshold, the sensors will not respond at all.

During periods of rime ice, the air flow through the aspirated radiation shields will be modified. The air flow may be reduced and the temperature in the shield may be closer to that of the rime ice than that of the air. The humidity in the shield may also be affected.

5.1.2 Secondary/Underlying Variables

This section is not applicable to this instrument.

5.1.3 Diagnostic Variables

Table 6. NSA Met Tower

Variable	Measurement Interval	Measurement Level	Min	Max
Barometric Pressure out of range error	atmos_pressure_out_of_range_error	4m	800	1100
Barometric Pressure read timeout error	atmos_pressure_read_timeout_error	4m		
PTB Serial Error	atmos_pressure_PTB_Serial_Error	4m		

Table 6. (cont'd)

Variable	Measurement Interval	Measurement Level	Min	Max
Std Dev of Wind Speed	wind_spd_sd	2m, 10m, 20m, 40m		
Std Dev of Air Temperature	temp_sd	2m, 10m, 20m, 40m		
Std Dev of Relative Humidity or Hardware Error Code	relh_sd	2m, 10m, 20m, 40m		
Std Dev of Dew Point Temperature	dew_pt_temp_sd	2m, 10m, 20m, 40m		
Std Dev of Vapor Pressure	vap_pres_sd	2m, 10m, 20m, 40m		
Wind Speed out of range error	wind_spd_out_of_range_error	2m, 10m, 20m, 40m	0	100
Wind Direction out of range error	wind_dir_out_of_range_error	2m, 10m, 20m, 40m	0	360
Air Temperature out of range error	temp_out_of_range_error	2m, 10m, 20m, 40m	-50	30
Relative Humidity out of range error	relh_out_of_range_error	2m, 10m, 20m, 40m	-2	104
Dew Point Temperature out of range error	dew_pt_temp_out_of_range_error	2m, 10m, 20m, 40m	-60	30
Vapor Pressure out of range error	vap_press_out_of_range_error	2m, 10m, 20m, 40m	0.002	43
Internal Voltage out of range error	internal_voltage_out_of_range	2m, 10m, 20m, 40m	21.5	28.5
Internal Temperature out of range error	internal_temp_out_of_range_error	2m, 10m, 20m, 40m	-50	100
Air Temperature Hardware Error	temp_hardware_error	2m, 10m, 20m, 40m	N/A	N/A
Dew Point Temperature Hardware Error	dew_pt_hardware_error	2m, 10m, 20m, 40m	N/A	N/A
Number of timeout readings of the met tower data by QLI	read_timeout_count	2m, 10m, 20m, 40m	N/A	N/A

Table 7. Present Weather Sensor

Variable	Measurement Interval	Min	Max
One Minute Visibility out of range error	one_minute_vis_out_of_range_error	0	50000
Ten Minute Visibility out of range error	ten_minute_vis_out_of_range_error	0	50000
One Minute PW code out of range error	one_min_pw_code_out_of_range_error	0	99
Ten Minute PW code out of range error	ten_min_pw_code_out_of_range_error	0	99
One Hour PW code out of range error	one_hour_pw_code_out_of_range_error	0	99
PWS Precipitation Rate out of range error	precip_rate_out_of_range_error_	0	999
Liquid Water Equivalent out of range error	cumul_liq_water_equiv_out_of_range_error	0	999
Cumulative Snow out of range error	cumul_snow_out_of_range_error	0	999
Present Weather Sensor Serial Error	pws_serial_error	N/A	N/A
Present Weather Sensor Read Timeout Error	pws_read_timeout_error	N/A	N/A

Table 8. Chilled Mirror Hygrometer

Quantity	Variable	Measurement Interval	Min	Max
Air temperature out of range error	air_temp_out_of_range_error	10 min	unk	unk
Dew point temperature out of range error	dew_pt_temp_out_of_range_error	10 min	unk	unk
Relative Humidity out of range error	relh_out_of_range_error	10 min	unk	unk
Read timeout error	read_timeout_error	10 min	unk	unk
Serial port read error	serial_read_error	10 min	unk	unk

Table 9. Optical Rain Gauge

Quantity	Variable	Measurement Interval	Min	Max
Daily Accumulation out of range error	precip_out_of_range_error	1 min	0	700
ORG No Data Error	precip_no_data_error	1 min	N/A	N/A
ORG Read Timeout Error	precip_read_timeout_error	1 min	N/A	N/A
ORG Serial Error	precip_serial_error	1 min	N/A	N/A

5.1.4 Data Quality Flags

Data Quality flags were contained in the MetTWR, Mettiptwr, Optical Rain Gauge (ORG), Present Weather Sensor (PWS), and Snow Depth Sensor Data Object Design Changes for ARM netCDF file header descriptions. Contact the mentor if you need a copy.

Table 10. NSA Met Tower

Quantity	Variable	Measurement Level	Measurement Interval	Min	Max	Delta
Barometric Pressure	qc_atmos_pressure	4m	1 min	800	1100	10
Mean Wind Speed	qc_wind_spd_mean	2m, 10m, 20m, 40m	1 min	0	100	20
Vector-averaged Wind Direction	qc_wind_dir_vec_avg	2m, 10m, 20m, 40m	1 min	0	360	90
Mean Air Temperature or Hardware Error	qc_temp_mean	2m, 10m, 20m, 40m	1 min	-60	30	10
Mean Relative Humidity	qc_relh_mean	2m, 10m, 20m, 40m	1 min	-2	104	30
Mean Dew Point Temperature	qc_dew_pt_temp	2m, 10m, 20m, 40m	1 min	-60	30	10
Mean Vapor Pressure	qc_vap_pres_mean	2m, 10m, 20m, 40m	1 min	0.002	43	10

Table 11. Present Weather Sensor

Quantity	Variable	Measurement Interval	Min	Max	Delta
One Minute Visibility	qc_one_minute_visibility	1 min	0	50000	5000
Ten Minute Visibility	qc_ten_minute_visibility	1 min	0	50000	5000
One Minute PW Code	qc_one_minute_PW_code	1 min	0	99	N/A
Ten Minute PW Code	qc_ten_minute_PW_code	1 min	0	99	N/A
One Hour PW Code	qc_one_hour_PW_code	1 min	0	99	N/A
Precipitation Rate	qc_precip_rate	1 min	0	999	100
Cumulative Liquid Water Equivalent	qc_cumul_liq_water_equiv	1 min	0	999	100
Cumulative Snow	qc_cumulative_snow	1 min	0	999	100

Table 12. Optical Rain Gauge

Quantity	Variable	Measurement Interval	Min	Max	Delta
ORG Precipitation Rate	qc_precip_rate	1 min	0	700	100

5.1.5 Dimension Variables

Table 13. NSA Met Tower

Variable	Measurement Interval	Unit
base_time	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
time_offset	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
lat	1 min	degrees
lon	1 min	degrees
alt	1 min	meters above sea level

Table 14. Present Weather Sensor

Variable	Measurement Interval	Unit
base_time	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
time_offset	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
Lat	1 min	degrees
Lon	1 min	degrees
Alt	1 min	meters above sea level

Table 15. Chilled Mirror Hygrometer

Variable	Measurement Interval	Unit
base_time	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
time_offset	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
lat	1 min	degrees
lon	1 min	degrees
alt	1 min	meters above sea level

Table 16. Optical Rain Gauge

Variable	Measurement Interval	Unit
base_time	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
time_offset	1 min	seconds since YYYY-mm-dd XX:XX:XX X:XX
lat	1 min	degrees
lon	1 min	degrees
alt	1 min	meters above sea level

5.2 Annotated Examples

This section is not applicable to this instrument.

5.3 User Notes and Known Problems

This section is not applicable to this instrument.

5.4 Frequently Asked Questions

This section is not applicable to this instrument.

6. Data Quality

6.1 Data Quality Health and Status

This section is not applicable to this instrument.

6.2 Data Reviews by Instrument Mentor

Each data measurement value was compared to upper and lower limits by the data acquisition and processing program. If a single value obtained during the one-minute processing interval was outside of these limits, a flag was set and included in the data record for that minute.

6.3 Data Assessments by Site Scientist/Data Quality Office

This section is not applicable to this instrument.

6.4 Value-Added Procedures and Quality Measurement Experiments

Many of the scientific needs of the ARM Program are met through the analysis and processing of existing data products into "value-added" products or VAPs. Despite extensive instrumentation deployed at the ARM CART sites, there will always be quantities of interest that are either impractical or impossible to measure directly or routinely. Physical models using ARM instrument data as inputs are implemented as VAPs and can help fill some of the unmet measurement needs of the program. Conversely, ARM produces some VAPs not in order to fill unmet measurement needs, but instead to improve the quality of existing measurements. In addition, when more than one measurement is available, ARM also produces "best estimate" VAPs. A special class of VAP called a Quality Measurement Experiment (QME) does not output geophysical parameters of scientific interest. Rather, a QME adds value to the input datastreams by providing for continuous assessment of the quality of the input data based on internal consistency checks, comparisons between independent similar measurements, or comparisons between measurement with modeled results, and so forth. For more information, see the VAPs and QMEs web page.

7. Instrument Details

7.1 Detailed Description

7.1.1 List of Components

Wind speed sensors: Vaisala WAA251 cup anemometers with heated cups and shafts are used to measure wind speed at each height. Vaisala quotes a starting threshold of about 0.5 m, a distance constant of 2.7 m, and a linear output with an accuracy of +/-0.17 m/s between 0.4 to 75 m/s.

Wind direction sensors: Vaisala WAV251 wind vanes with heated shafts are used to measure wind direction at each height. Vaisala quotes a starting threshold of 0.4 m/s, a damping ratio of 0.14, an overshoot ratio of 0.65, and a delay distance of 0.4 m.

Temperature and relative humidity sensors: Vaisala HMP35D or HMP45D Relative Humidity and Temperature Probes are used to measure air temperature and relative humidity at each height. They are mounted in R. M. Young 43408-2 Aspirated Radiation Shields. Vaisala quotes an accuracy of +/-2%RH (0% to 90%RH) and +/-3%RH (90% to 100% RH).

Data converters: Vaisala QLI50 Sensor Collectors are used at each height to convert the wind speed, wind direction, temperature, and relative humidity sensor signals to digital data.

DC power supplies: Vaisala WHP25 power supplies at each tower level power the instrumentation at that level.

Chilled-mirror hygrometer: A Meteolabor AG VTP6 Ventilated Thermohygrometer is used to measure air and dew point temperatures at 2 m. It runs on a 10 minute cycle. Meteolabor AG quotes a resolution of 0.1 deg C resolution and an accuracy of +/- 0.15 deg C between -20 deg C and +50 deg C and +/-0.25 deg C between -65 deg C and -20 deg C.

Precipitation sensor: A Scientific Technology, Inc. ORG-815-DR optical precipitation sensor is used to obtain the accumulation of liquid or frozen precipitation. ScTi quotes a resolution of 0.001 mm and an accuracy of +/-5% for rain and +/-10% for snow.

Present weather sensor: A Vaisala FD12P Present Weather Sensor produces visibility and precipitation data. It also produces NWS and WMO weather codes. Vaisala quotes the visibility accuracy to be +/-10% between 10 and 10,000 meters and +/-20% for 10,000 to 50,000 meters and a precipitation accuracy of +/-30%.

Barometric pressure sensor: A Vaisala PTB201A Digital Barometer is used to measure the station barometric pressure. The barometer has a resolution of 0.1 hPa and an accuracy of 0.25 hPa.

Data acquisition and processing system: A Gateway2000 G6-300 computer is used to acquire and process the data.

7.1.2 System Configuration and Measurement Methods

A set of sensors for measuring wind speed, wind direction, air temperature, and relative humidity and a Sensor Collector which converts the signals from the sensors into digital data are deployed on each of 4 booms mounted on the 40 m tower. A chilled-mirror hygrometer is mounted at 2 m near the 2 m boom. An optical precipitation sensor is mounted on an arm at the base of the tower. A Present Weather Sensor and a digital barometer are located nearby.

Wind speed at 2, 10, 20 and 40 m

The cup anemometers use a photo-chopper to produce a 10 Hz per m/s signal. The Sensor Collectors determine the frequency by obtaining the average period between pulses and convert them to wind speeds. Both the cups and the shafts of these sensors are heated in order to prevent ice buildup from affecting the accuracies of the measurements. One minute means, vector-averages, and standard deviations are reported with a precision of 0.001 m/s but have a resolution of only 0.02 m/s. Minima and maxima are reported with a precision of 0.1 m/s

Wind direction at 2, 10, 20 and 40 m

The wind vanes use an optically detected GRAY code disk with a 5.6 deg resolution. The Sensor Collectors convert the GRAY code into a binary value. The shafts of these sensors are heated in order to prevent ice buildup from affecting the accuracies of the measurements. Vector-averages and standard deviations are reported with a precision of 0.001 deg but have a resolution of only 0.1 deg. Minima and maxima are reported with 1 deg precision.

Air temperature at 2, 10, 20 and 40 m

The air temperature sensors, 4-wire 100 ohm platinum resistance thermometers, are included in the same probe as the relative humidity sensors. The probes are mounted in aspirated radiation shields to minimize radiation and self-heating errors. The Sensor Collectors supply a 1.2 mA constant-current excitation and measure the voltages across the sensors. They then compute the temperatures from the voltages. Means and standard deviations are reported with a precision of 0.001 C. Minima and maxima are reported with a precision of 0.01 C.

Relative humidity at 2, 10, 20 and 40 m

The relative humidity probes use Vaisala HUMICAP sensors and associated electronics to produce a 0 to 1 V output corresponding to an RH of 0 to 100%. The Sensor Collectors use A/D converters to measure the voltages and convert them to % RH. They also compute the Dew Points from the air temperatures and relative humidities. Means and standard deviations of relative humidity are reported with a precision of 0.001% RH but have resolution of only 0.1% RH. Minima and maxima are reported with a precision of 0.1% RH.

Air and dew point temperatures at 2 m

The Meteolabor AG VTP6 Ventilated Thermohygrometer uses a chilled-mirror hygrometer to measure the dew point temperature and a thermocouple to measure the air temperature. The hygrometer cycle incorporates a heater, a mirror cleaning feature, and automatic differentiation between ice and water films on the mirror. It makes 10 measurements within a 40 second period every 10 minutes and transmits averaged values. The data acquisition system obtains the past hour's readings a few minutes after the hour and writes the data to a separate file.

Optical precipitation at the base of the tower

The optical precipitation sensor measures rain or snow by detecting scintillation of a coherent infrared light beam. The sensor uses automatic gain control to eliminate the effects of source power drift or dirty optics. It reports precipitation as a digital (RS-232) output with a 0.001 mm precision.

Visibility and Present Weather

The Present Weather Sensor is a microprocessor controlled, intelligent sensor that uses a forward scatter visibility meter, a capacitive rain detector, and a platinum resistance thermometer to measure visibility and amount and type of precipitation. By monitoring the LED transmitted light intensity, the sensor compensates for temperature and aging effects. It has a digital (RS-232) output. Visibilities are reported in meters, precipitation in mm/hr, liquid water equivalence in mm, and total snow in mm.

Barometric pressure

The barometer produces a digital output from measurements of a silcon capacitive absolute pressure sensor. The sensor is located next to the computer in the shelter but has a port to the outside. It reports atmospheric pressure with a 0.1 hPa resolution.

Data acquisition and processing

National Instruments' BridgeVIEW, a superset of LabVIEW, is used on a Pentium II computer operating under WindowsNT4.0 to acquire and process the data. The Sensor Collectors, the optical precipitation sensor, the barometer, and the Present Weather Sensor are all digital output devices. The computer polls the Sensor Collectors every 2 seconds and computes means, standard deviations, minima, and maxima over periods of 1-minute duration. It also computes vapor pressures and vector-averaged winds. Once a minute it polls the barometer, the precipitation sensor, and the Present Weather Sensor. Once an hour it polls the chilled-mirror hygrometer. All incoming data are compared to limits and flags are set if any are outside those limits.

7.1.3 Specifications

The specifications are given under List of Components, Section 7.1.1., and are further discussed under System Configuration and Measurement Methods, Section 7.1.2., above.

7.2 Theory of Operation

Each of the primary measurements of wind speed, wind direction, air temperature, relative humidity, barometric pressure, and rate of rainfall are intended to represent self-standing data streams that can be used independently or in combinations. The theory of operation of each of these sensors is similar to that for sensors typically used in other conventional surface meteorological stations. Some details can be found under Description of System Configuration and Measurement Methods but further, greatly detailed description of theory of operation is not considered necessary for effective use of the data for these rather common types of measurements. The instrument mentor or the manufacturers can be contacted for further information.

7.3 Calibration

7.3.1 Theory

The BMET is not calibrated as a system. The sensors along with the Sensor Collectors and the instruments are calibrated separately. The system was installed using components that had a current calibration. The sensor, Sensor Collector, and instrument calibrations are checked in the field by comparison to calibrated references. Any unit that fails a field check is returned to the manufacturer for recalibration.

Wind speed calibrations are checked by rotating the anemometer shafts at a series of fixed rpm's using an R. M. Young Model 18810 Anemometer Drive. The reported wind speeds are compared to a table of expected values and tolerances. If the reported wind speeds are outside the tolerances for any rate of rotation, the sensor is replaced by one with a current calibration.

Wind direction calibrations are checked by using a vane angle fixture, R. M. Young Model 18212, to position the vane at a series of angles. The reported wind directions are compared to the expected values. If any direction is in error by more than 5 degrees, the sensor is replaced by one with a current calibration.

Air temperature and relative humidity calibrations are checked by comparison with the Meteolabor AG Ventilated Thermohygrometer. If the reported temperature and relative humidity vary by more than the sensor uncertainty from the reference, the probe is replaced by one with a current calibration.

Barometric pressure calibration is checked by comparison with a reference Vaisala PA-11 Barometer. If the reported pressure varies by more than the sensor uncertainty from the reference, the sensor is replaced by one with a current calibration.

The Present Weather Sensor is check calibrated following the manufacturer's recommendation.

7.3.2 Procedures

This section is not applicable to this instrument.

7.3.3 History

All equipment were calibrated at the manufacturers prior to installation.

A field check calibration on the instruments was made on 18 SEP 1999. All were within tolerances.

All wind speed, wind direction, and temperature/humidity sensors were replaced and a field calibration check on the instruments were made on 9-13 OCT 2001. All were within tolerances.

On September 18, 2002, the 20m wind speed sensor was replaced. The heating mechanism had failed causing the sensor to accumulate ice.

7.4 Operation and Maintenance

7.4.1 User Manual

This section is not applicable to this instrument.

7.4.2 Routine and Corrective Maintenance Documentation

This section is not applicable to this instrument.

7.4.3 Software Documentation

ARM netCDF file header descriptions were found in the MetTWR, Mettiptwr, Optical Rain Gage (ORG), Present Weather Sensor (PWS), and Snow Depth Sensor Data Object Design files. Contact the mentor to request a copy.

7.4.4 Additional Documentation

This section is not applicable to this instrument.

7.5 Glossary

See the ARM Glossary.

7.6 Acronyms

See the ARM Acronyms and Abbreviations.

7.7 Citable References

None