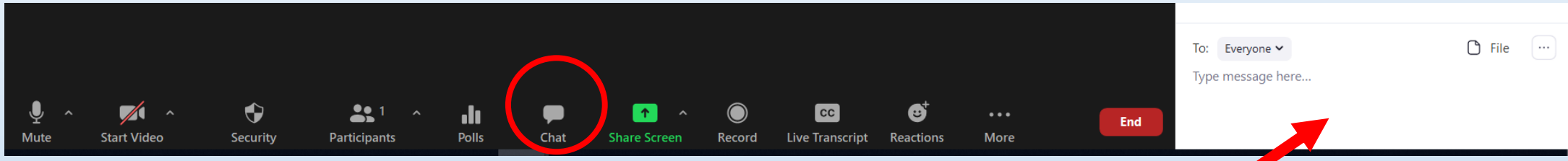
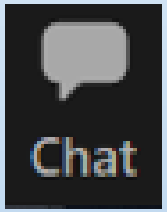
Introduction to Meteorological Monitoring

February 8 & 10 2022

Webinar Logistics





Click on the “Chat” icon to submit questions in the “Chat" pane

Click raise “Hand” icon if you would like to be unmuted

This webinar is being recorded – URL for the recording will be posted webinar email

Presented by the Institute for Tribal Environmental Professionals
American Indian Air Quality Training Program
Questions? Contact Christal.Black@nau.edu

Polling Questions

Poll Question 1

- Which of the following best describes your role?
  - Environmental Staff
  - Community or Tribal Leader
  - Federal or State Partner
  - Other

Poll Question 2

- Do you currently operate a meteorological monitoring station?
  - Yes
  - No
  - Maybe in the near future

Presenters

Michael King
NAU ITEP TAMS Center

Daniel Berc
National Weather Service, NOAA

Webinar Overview

WEBINAR 1

- Introduction to meteorology & NWS programs
- How to interpret a wind rose

WEBINAR 2

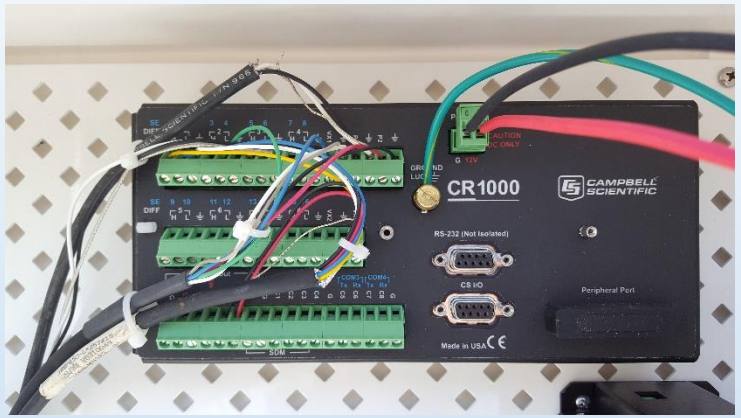
- Meteorological sensors, tower siting criteria & sensor exposure (placement)
- Maintenance of meteorological sensors
- Identifying uses of meteorological data

Meteorological Monitoring Site

AirVision Server

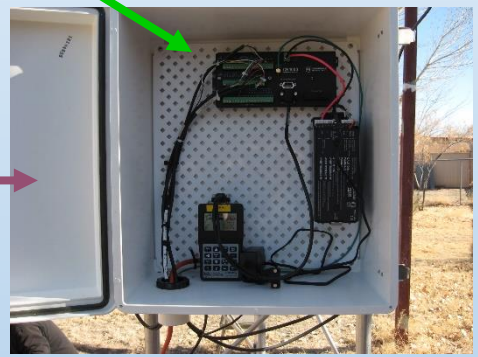
Wireless Link to Central

Wireless Modem/ Router



Switch

Analog I/O for Met



CR1000 Data Logger

Enclosure Box

Meteorological Monitoring Sensors

Analog I/O and RS-232 Network

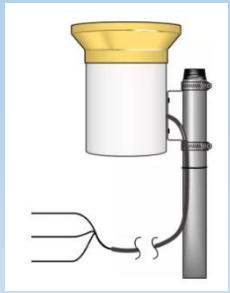
Wind Speed

Wind Direction

Temperature

Relative Humidity

Solar Radiation

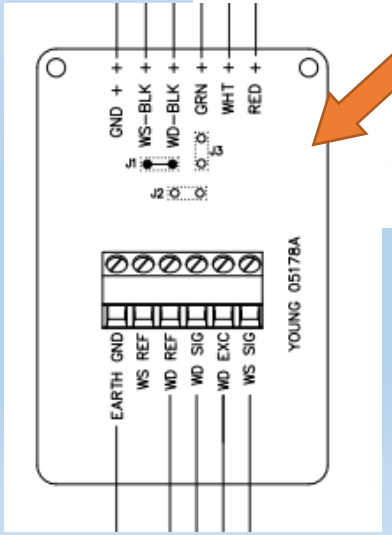


Tipping Bucket Rain Gauge

Barometric Pressure

Wind Speed Sensor

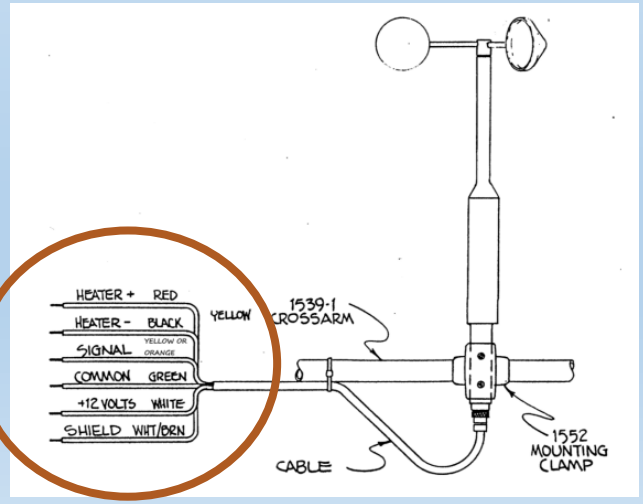
- Propeller, light weight thermoplastic material (polyurethane)
- Magnetically induced AC sine wave frequency directly proportional to wind speed
- Translator output is an analog voltage
- Voltage applied to Data Logger



RM Young Wind Monitor AQ 05305-L

Wind Speed Sensor

- 3-Cup anemometer assembly
- Rotation cup wheel produces a pulse frequency that is directly proportional to wind speed
- Translator output is an analog voltage
- Voltage applied to data logger

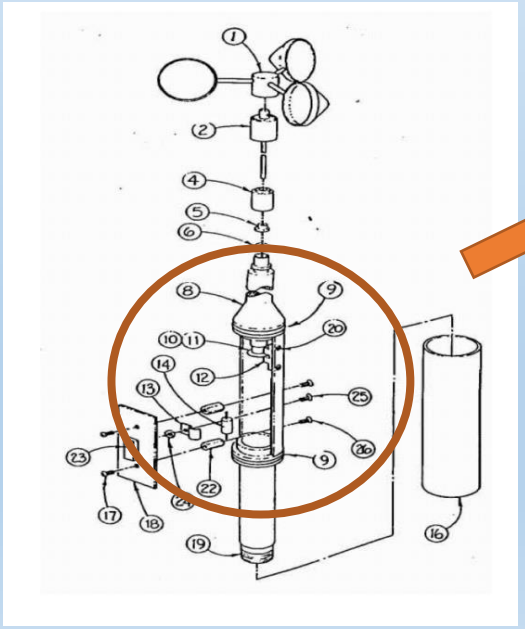


Met One Instruments, Inc. 014A 3-Cup Anemometer

Wind Speed Sensor

Met One 010C Wind Speed Sensor

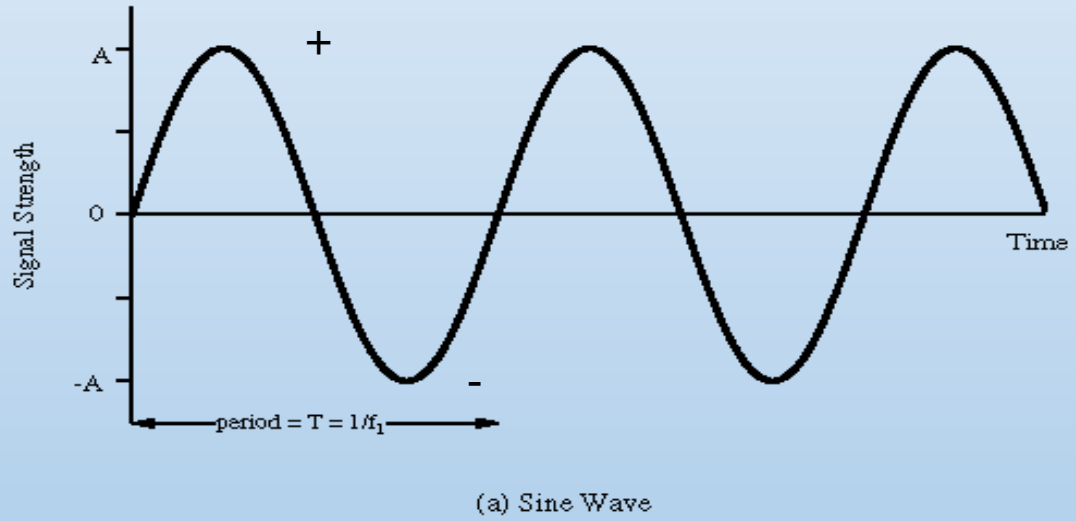
- Cover remove showing the light chopper disk that produces the pulse frequency
- Detector light assembly
- Electronic board



Wind Speed Sensor Frequencies

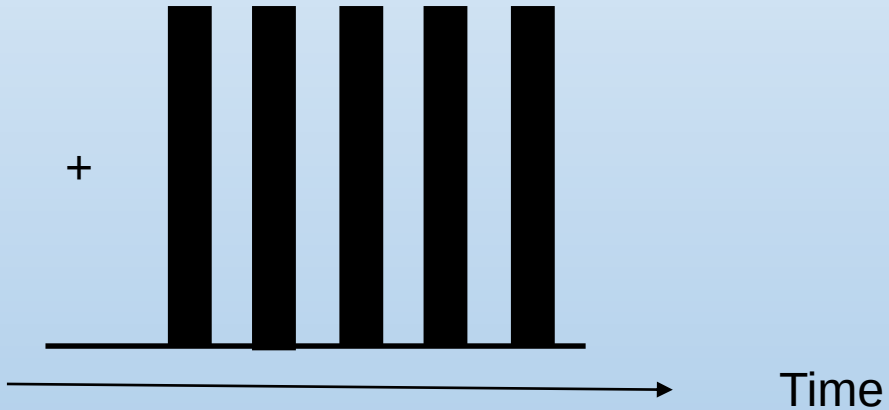
Sensor Frequencies

Sine Wave



(a) Sine Wave

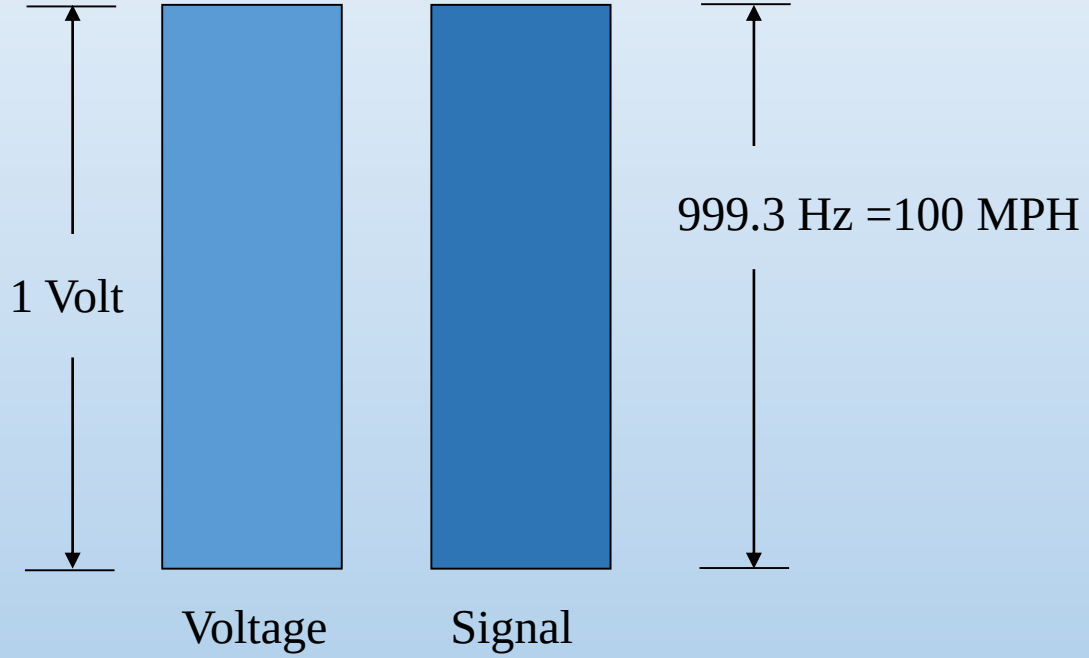
Pulsed frequency



Hz (Hertz) is cycles per second

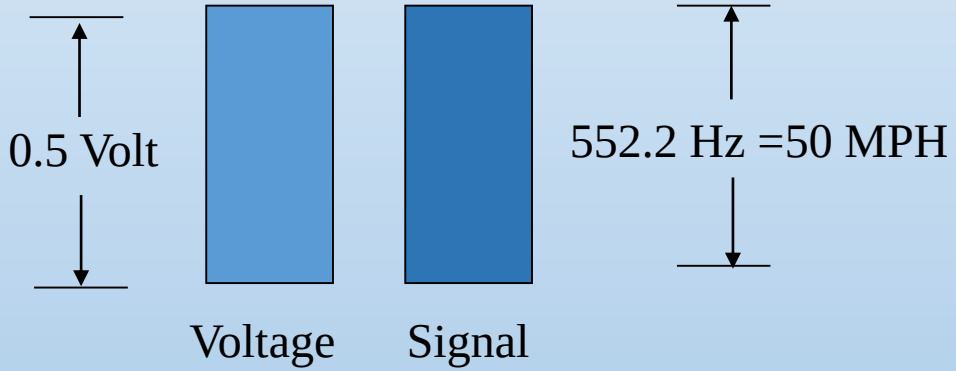
Use sensor unit specs for range

Wind Sensor Basic Signal Concept



Full Scale

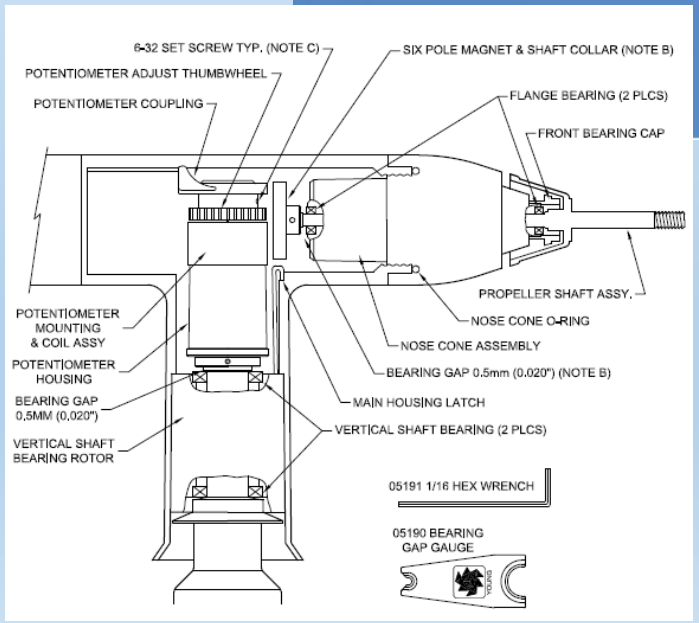
If 1.0 volt = 100 Mile per hour
then 0.5 volts = 50.0 MPH



Change is proportional

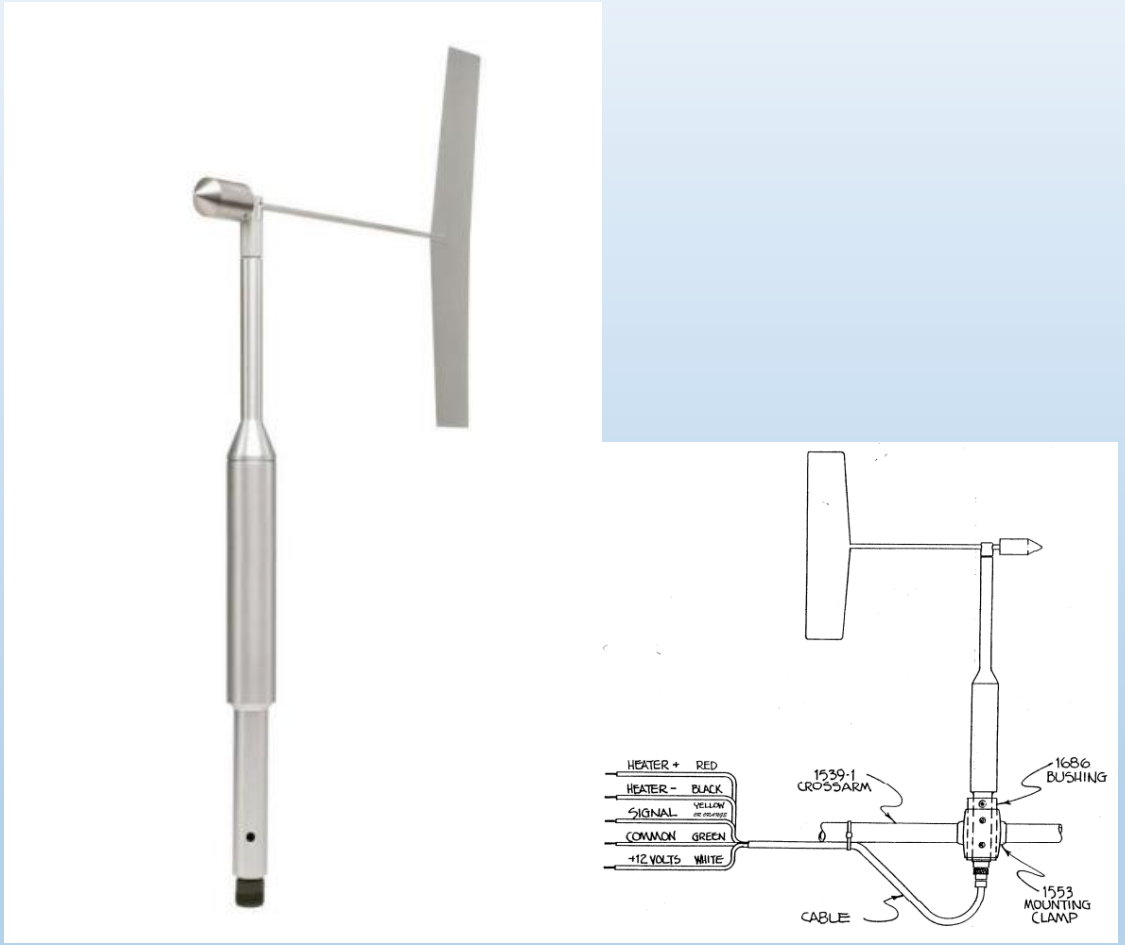
Wind Direction Sensor

- Lightweight plastic vane (tail)
- Tail allows the wind to spin the anemometer on its axis into a position parallel to the wind
- Wind vane directly coupled to potentiometer
- Potentiometer produce an analog output voltage
- Voltage is proportional to vane angle (wind direction)
- A mounting orientation ring assures correct alignment to wind direction reference (south)
- Voltage is applied to data logger



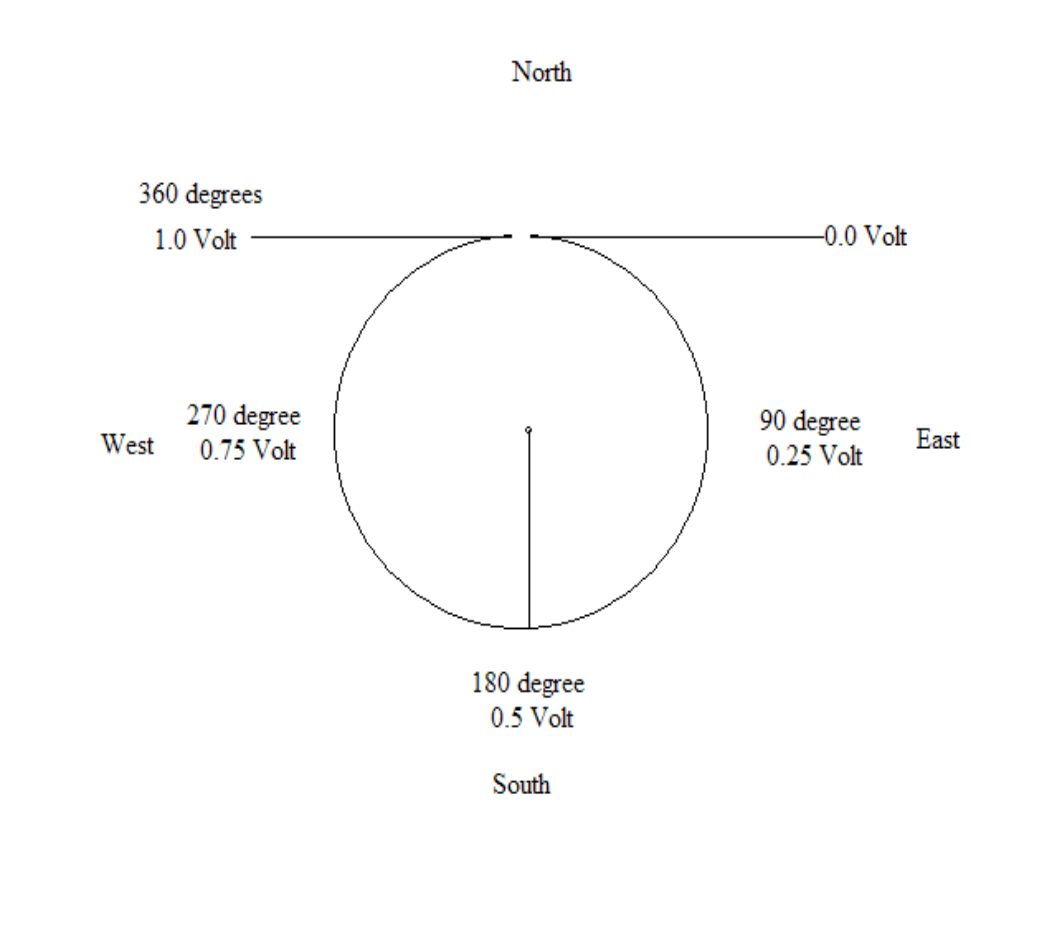
Wind Direction Sensor

- Lightweight plastic (polyurethane) material, airfoil shape
- Directly coupled to potentiometer
- Potentiometer produce an analog output voltage
- Voltage proportional to vane angle (wind direction)
- Orientation screw in the stem assures correct alignment to wind direction reference (south)
- Voltage is applied to translator or data logger

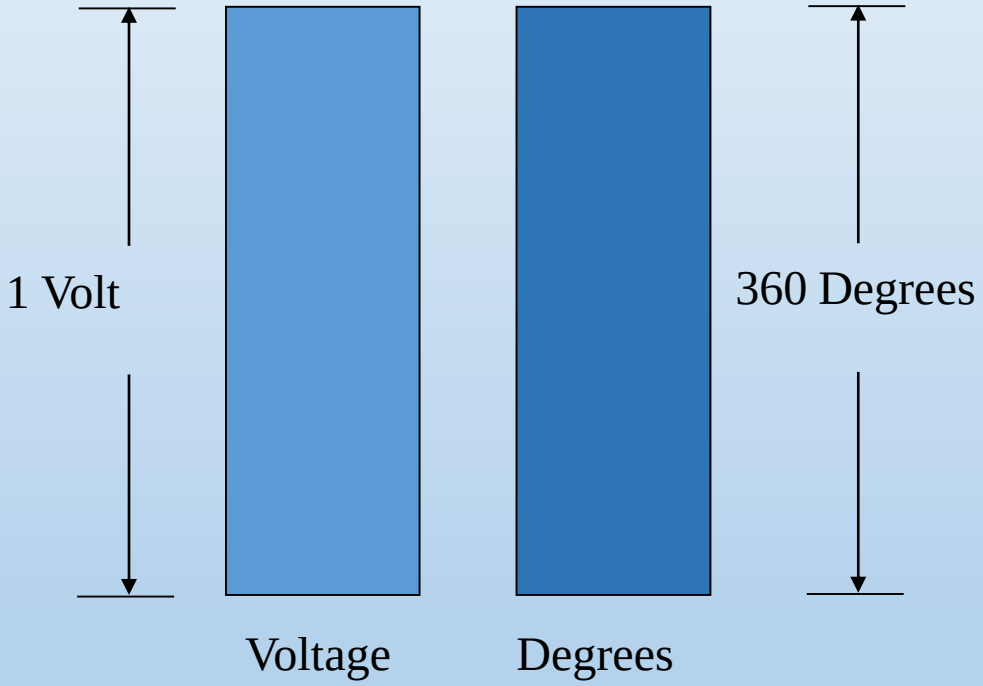


Met One Instruments, Inc. 020D Wind Direction Sensor

Wind Direction Sensor Voltage to Degree

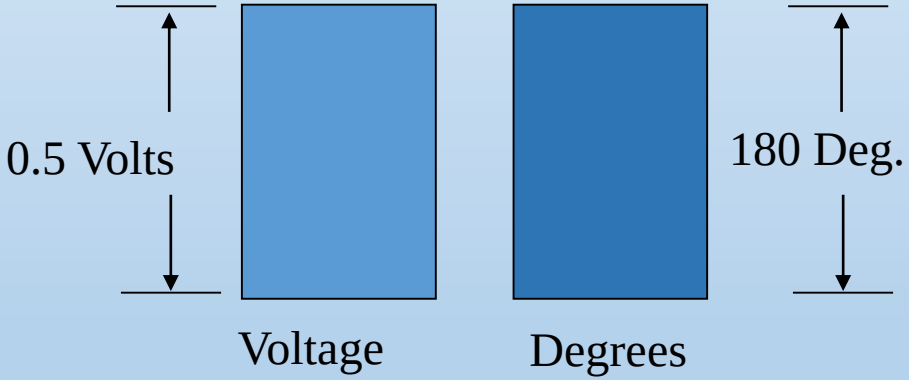


Wind Direction Basic Signal Concept



Full Scale

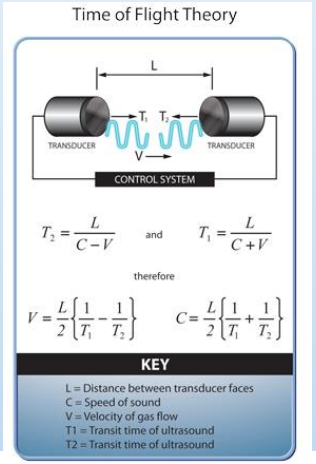
If 1.0 volt = 360 degrees
then 0.5 volts = 180 Degrees



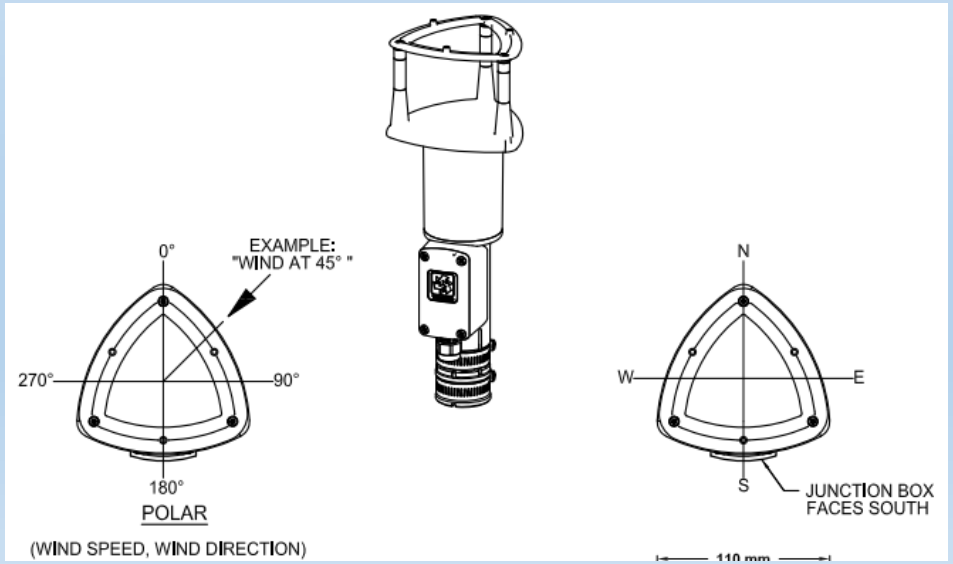
Change is proportional

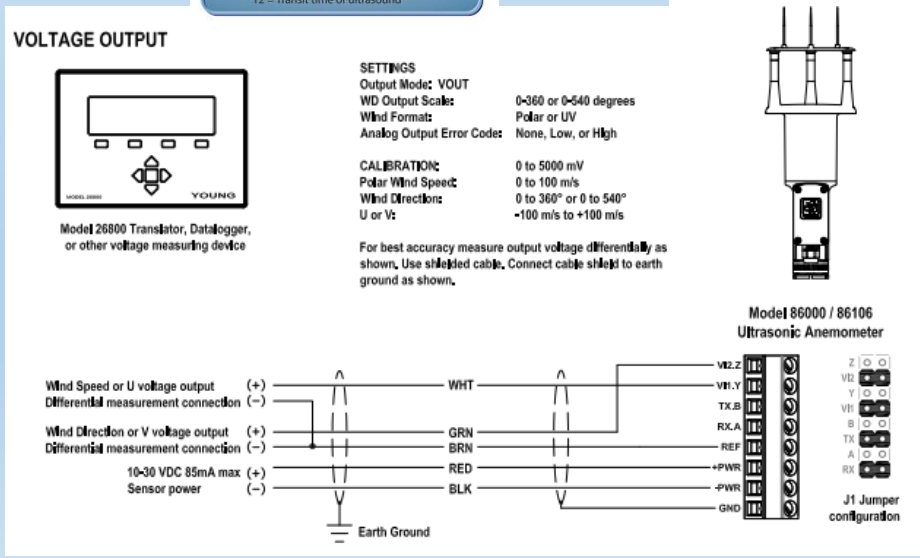
Ultrasonic Anemometer Wind Sensor

- Wind speed and direction sensor combined
  - Measures the time taken for an ultrasonic pulse of sound to travel between transducers
- Solid state (no moving parts)
- Analog and Digital output
- Less maintenance
- No calibration required (zero check)
- Junction box faces south



RM Young
Model 8600

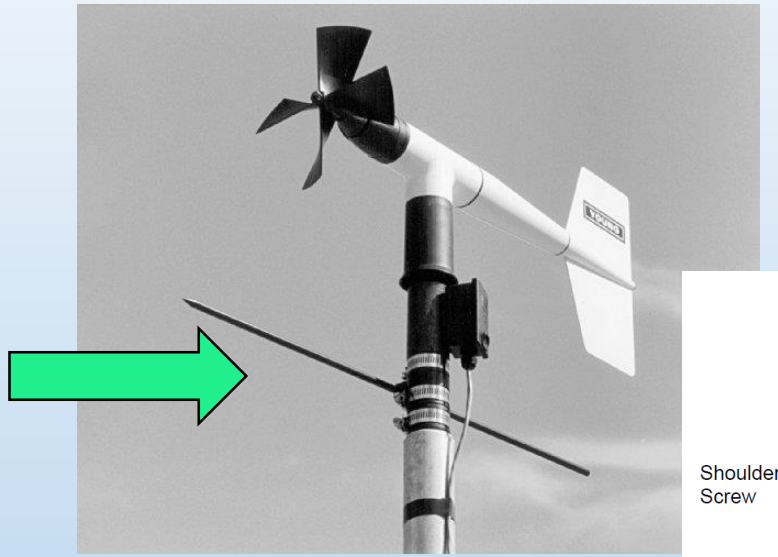


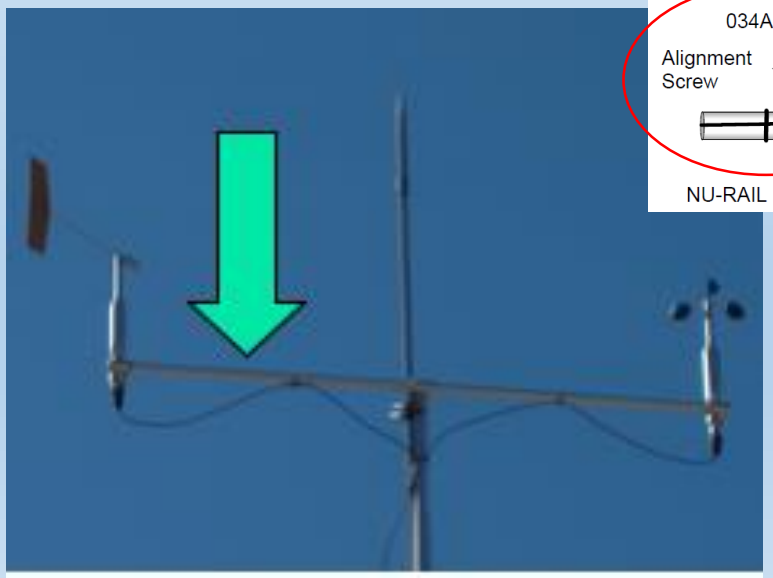


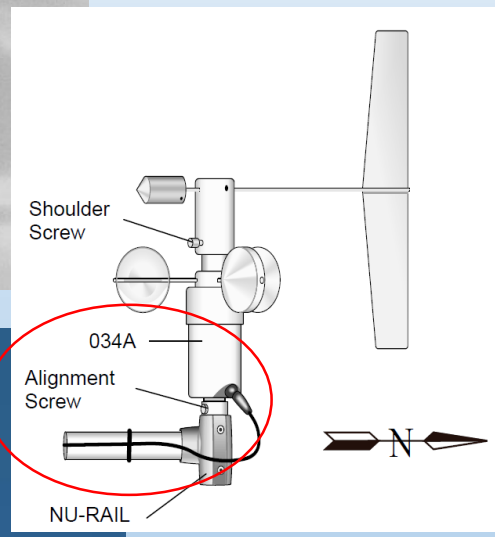
Wind Monitor Alignment

- RM Young
  - Vane Alignment Rod
    - Notch and box will always face true south with rod pointing to true north
- Met One
  - Cross-arm
    - Notch on direction sensor face south with cross arm pointing south / true north

What is True North???

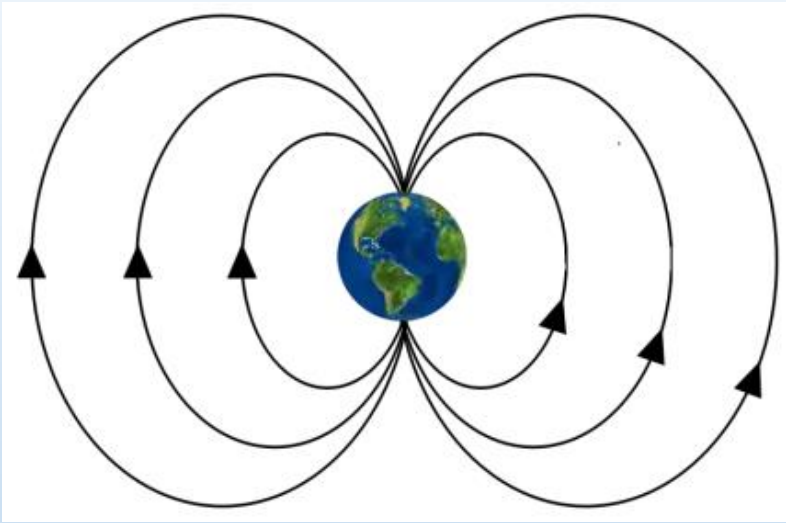






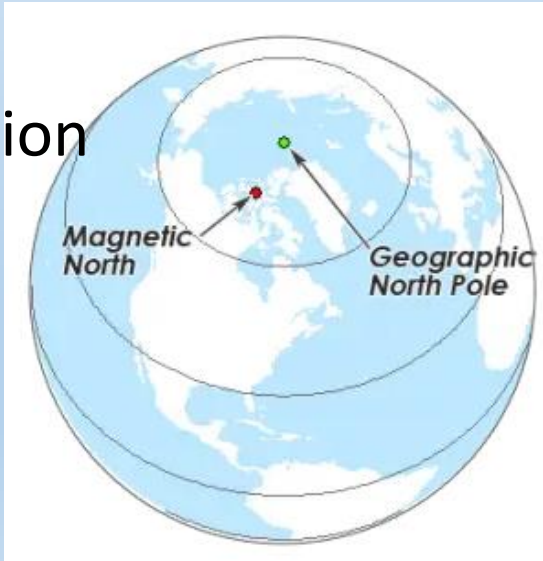
Magnetic North vs. True North

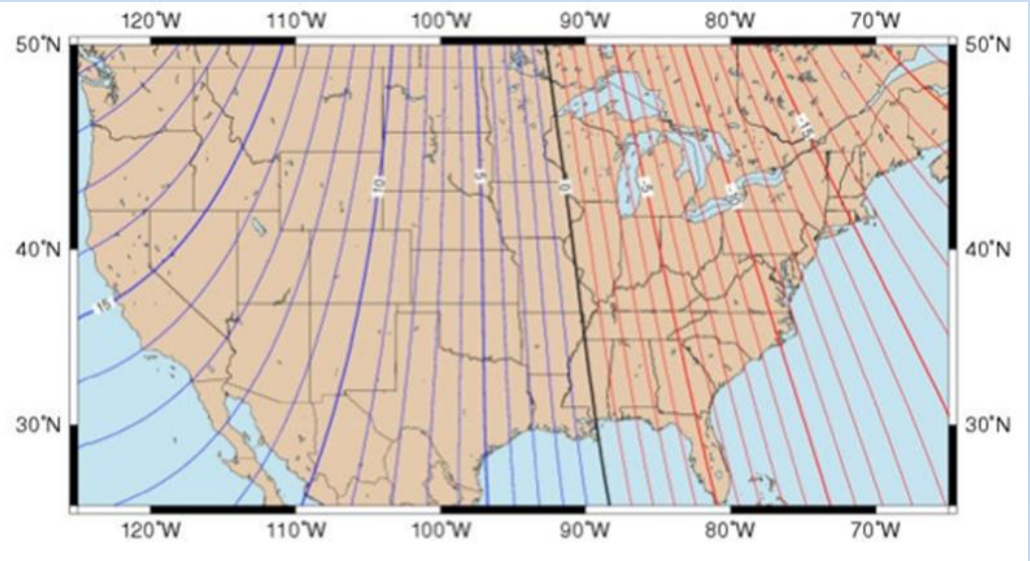
- Compass will show **magnetic north** which aligns with earth's magnetic field
- **True north** is where lines of longitude (meridians) converge in the north
- Angle Difference = magnetic declination (variation)
- Eastern part of U.S. declination is positive
- Western part of U.S. declination is negative



Magnetic North

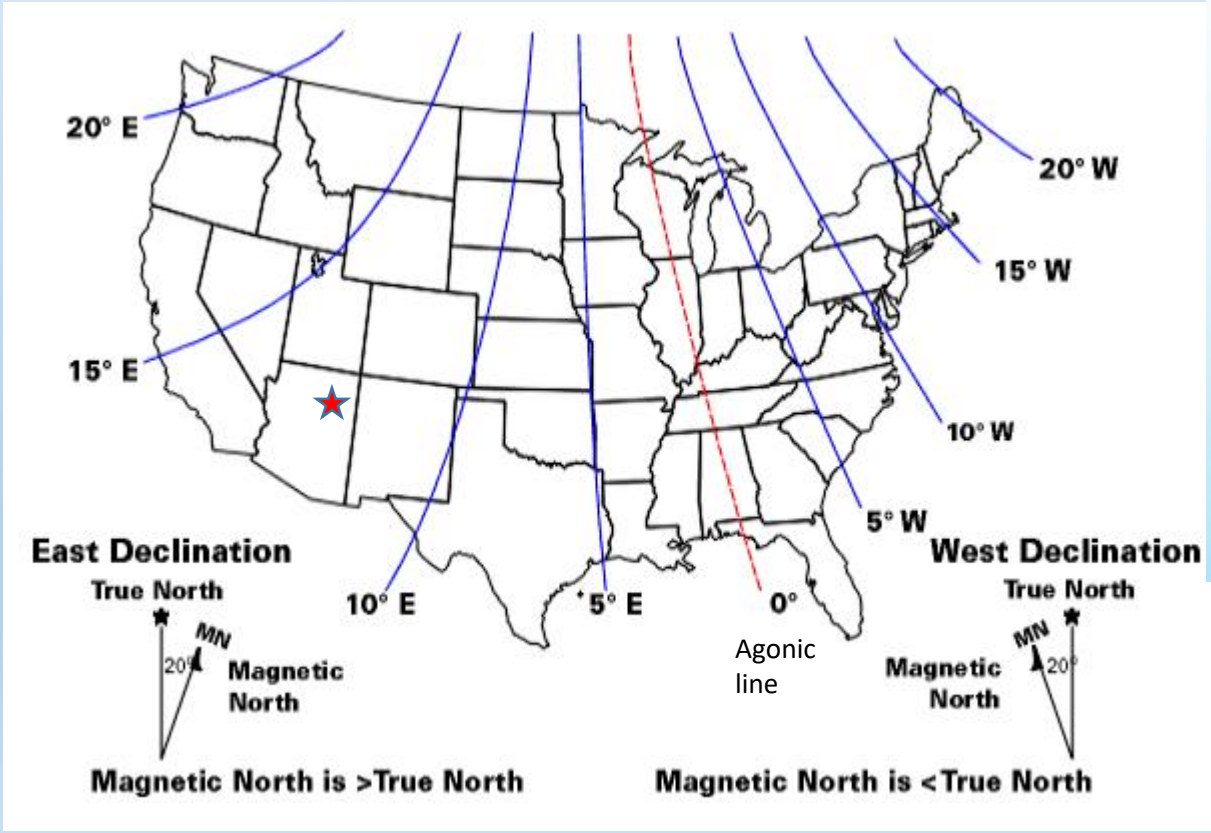
True (Geographic) North

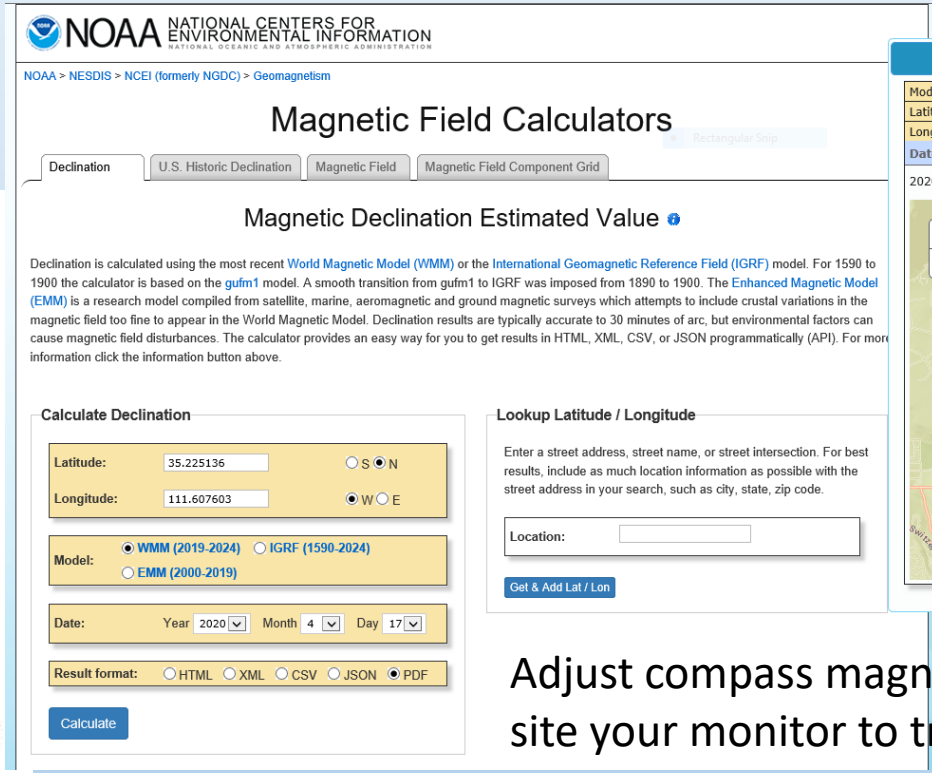


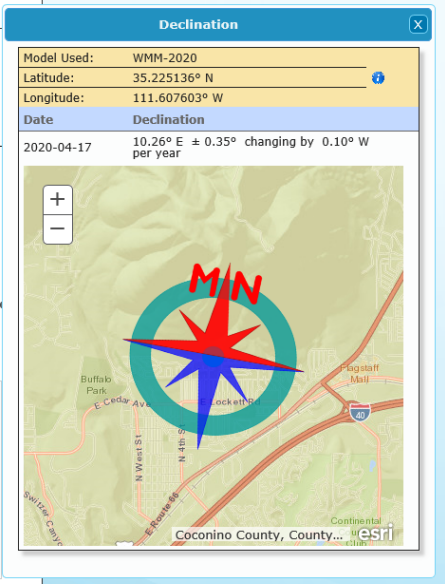


How to Find True North

- Your monitoring site will have a magnetic declination to use for correction to true north
- Example: Met Station in Flagstaff, AZ
  - 10.26° E is the magnetic declination
  - Subtract from 360° to get True North (360-10.26 = **349.74°**)





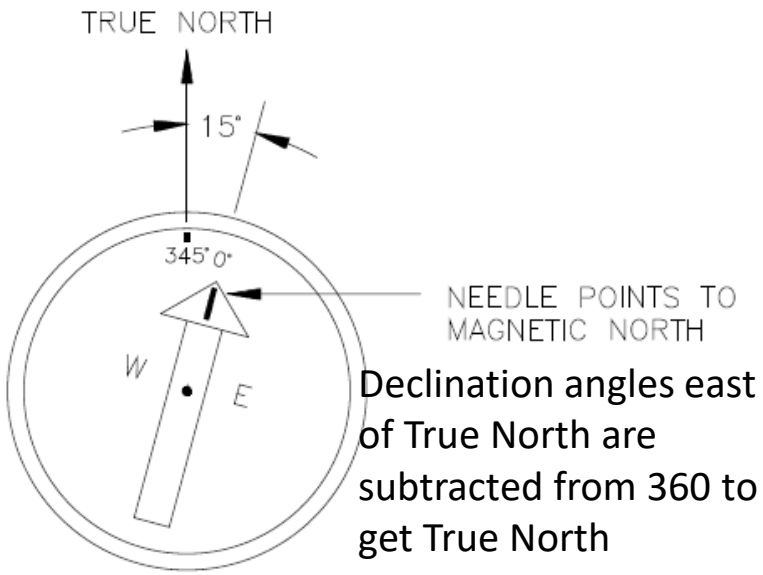


Adjust compass magnetic declination to site your monitor to true north

Website:
https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#declination

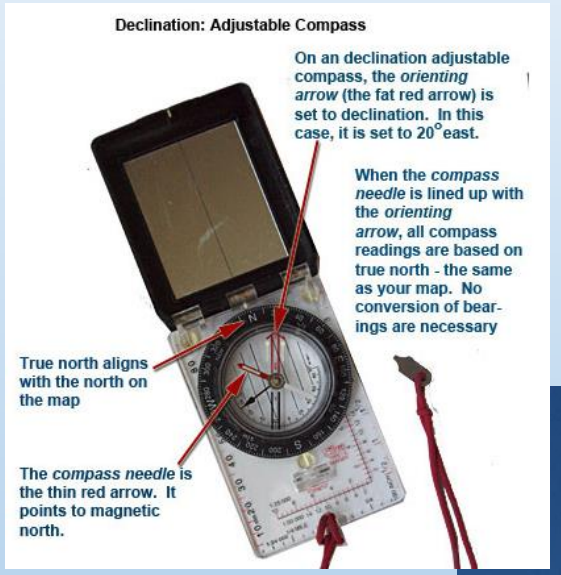
Meteorological Tower True North Alignment

1) Find True North



Declination angles east of True North are subtracted from 360 to get True North

2) Use a declination adjustable compass and establish a reference point on the horizon for True North



3) Use sighting mirror and sight a bearing back to tower crossarm and adjust cross arm (alignment rod) to True North

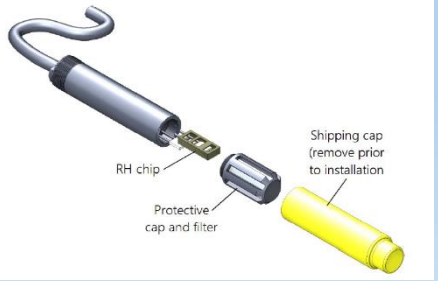
Ambient Temperature & Relative Humidity Sensor

- Ambient Temperature Sensor
  - High impedance thermistors, thermocouple or thermometer
    - Cold temperature will increase sensor resistance
    - Hot Temperature will decrease sensor resistance
      - Ex. 0°C is 100 ohms, resistance changes by approx. 0.4 ohms per °C
    - Temperature-dependent voltage
- Relative Humidity Sensor
  - Measure water vapor contents of atmosphere
    - Works based on capacitive change (electrical charge)
  - Integrated Sensor unit
    - Advantage
      - 2 sensors in one sensor (cost)
    - Disadvantage
      - If temperature or relative humidity component is damaged. Sensor must be replace sacrificing other sensor data

Vaisala HMP60 Temp/RH Probe

Wire color	Wire function	Data logger connection terminal
Black	Temperature signal	U configured for single-ended analog input[1], SE (single-ended, analog-voltage input)
White	Relative humidity signal	U configured for single-ended analog input, SE
Blue	Power ground and signal reference	G
Brown	Power	12V or SW12
Clear	EMF Shield	⏚ (analog ground)

[1]U terminals are automatically configured by the measurement instruction.



Temp/RH Radiation Shields

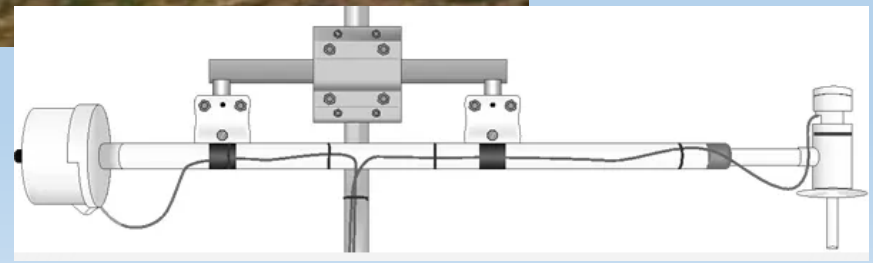
Multi-plate Radiation Shield

- White aluminum housing with disk plates
- Protect sensors from rain and from direct sun rays
- Allows air flow through plates to sensor located in center of shield

Fan Aspirated Radiation Shield

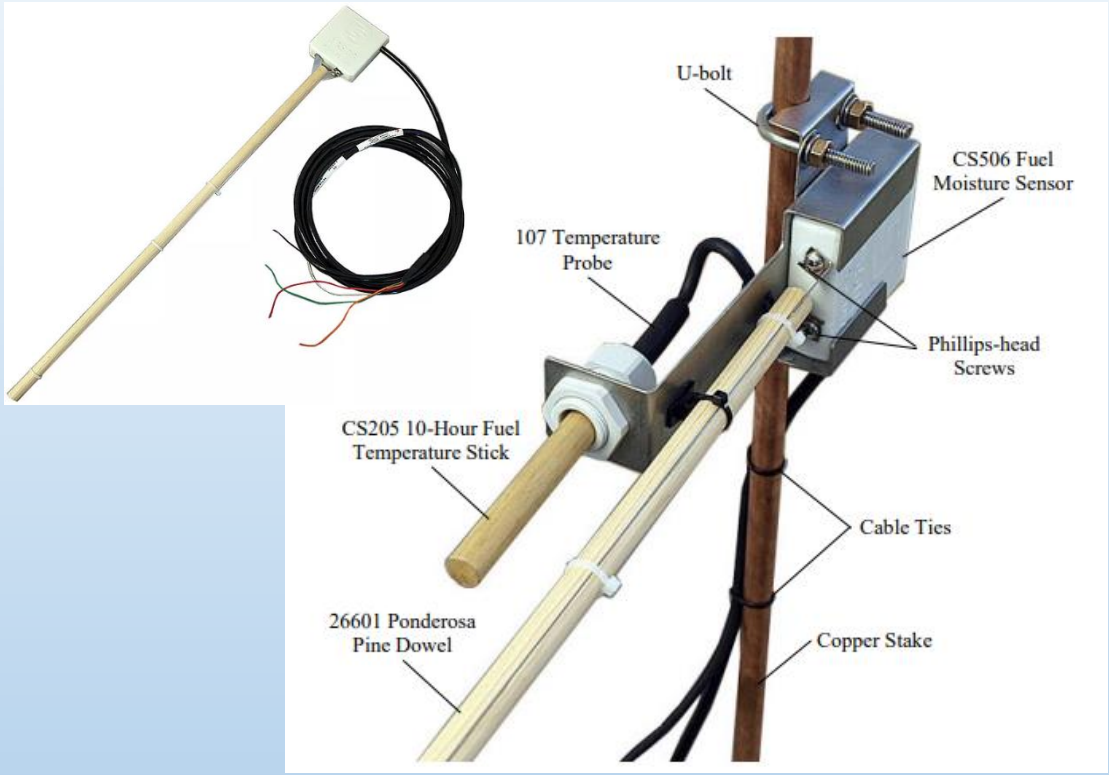
- White coating on aluminum and white material housing
- Protect sensors from rain and from direct sun rays
- Fan produce continuous ambient air flow through shield and sensor
- Prevents convective heat transfer to sensor
- Requires more cleaning of housing and replacement of fan

RM Young Aspirated Radiation Shield 43408-L



Fuel Moisture & Fuel Temperature Sensor

- Basically a Temp/RH sensor
- Measures moisture and temperature in forest fire fuel in area. Mounted over fuel bed
- Used for applications such as fire management
- Can help determine fire danger levels
- Typical fuels may be forest material: timber, brushes & also trash



Color	Description	CR800, CR1000, CR3000, CR5000	CR6
Red	Power	12 V	12 V
Black	Ground	G	G
Green	Signal	Single-Ended Channel	Universal Channel
Orange	Enable	Control Port	Control Port
Clear	Ground	⏚	⏚

Barometric Pressure Sensor

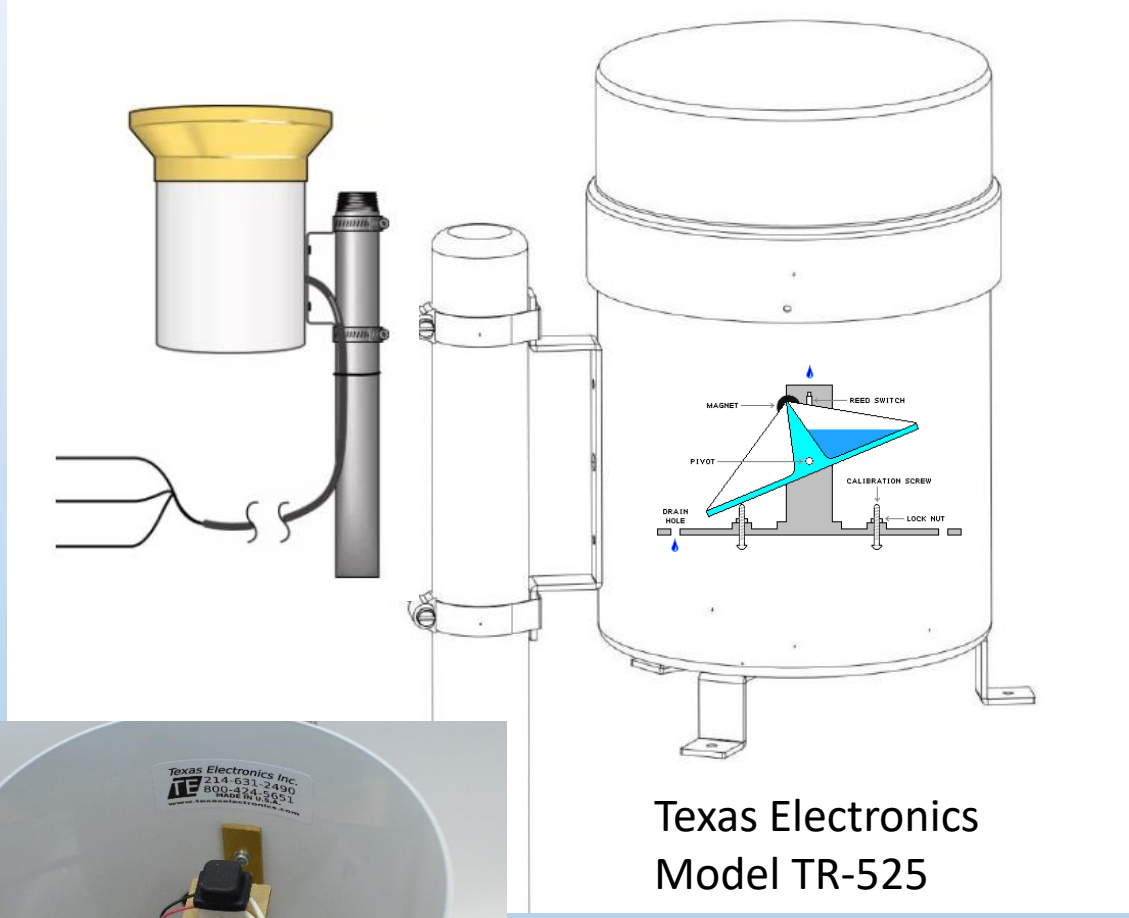
- Outside & Inside Sensors
- Detect atmospheric pressure
- Typically barometers respond to mercury or some other liquid in response to changing air pressure
- Internal diaphragm is capable of detecting a slight change in the applied pressure
- Analog output voltage

Campbell Scientific CS100 Barometric Pressure Sensor

Setra Model 246 Barometric Pressure Transducer

Precipitation Rain Gage Tipping Bucket

- Measures amount of rain fall
- See-saw tipping bucket located below funnel
- Rain droplets collects in tipping bucket
- Tipping action activates switch
- Switch contact closure sends signal to data logger (ex. 0.01 inch = 1 tip)
- Important to level bucket, some buckets have a internal bubble level



Texas Electronics
Model TR-525

Solar Radiation Sensor

- Solar Radiation Sensor (Pyranometer)
- Measure light (photons) and heat from the sun (W/m^2) - Solar irradiance
  - Complements ozone data
  - Complements fuel stick data
- Theory of Operation
  - Thermopile sensor coated in black to absorb solar radiation, converts to heat
  - Thermopile generates a voltage output signal proportional to solar irradiance
  - Be aware of obstruction that may effect data
    - Shade from trees or buildings
    - Night light from street lights

Huskseflux SR30-M2-D1 Pyranometer

Meteorological Towers

Top

Tip

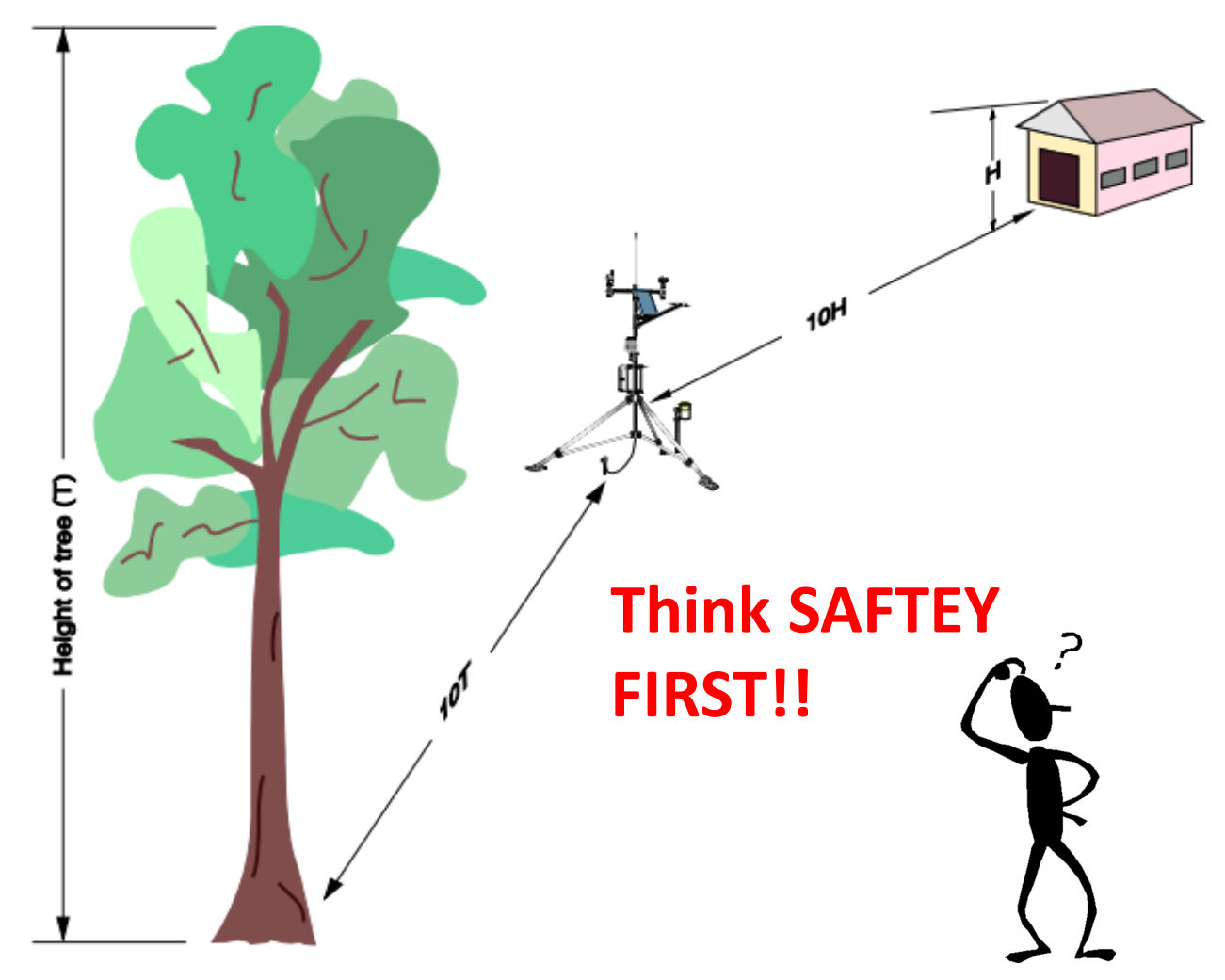
Side

Meteorological Tower Siting Criteria

Tower 10 x the distance of the height of obstruction (tree drip line, buildings)

- May not be ideal location due to:
  - Security
  - Access Power
  - Accessible

- *EPA Quality Assurance Handbook for Pollution Measurement Systems: Volume IV Meteorological Measurements*
- *EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications*

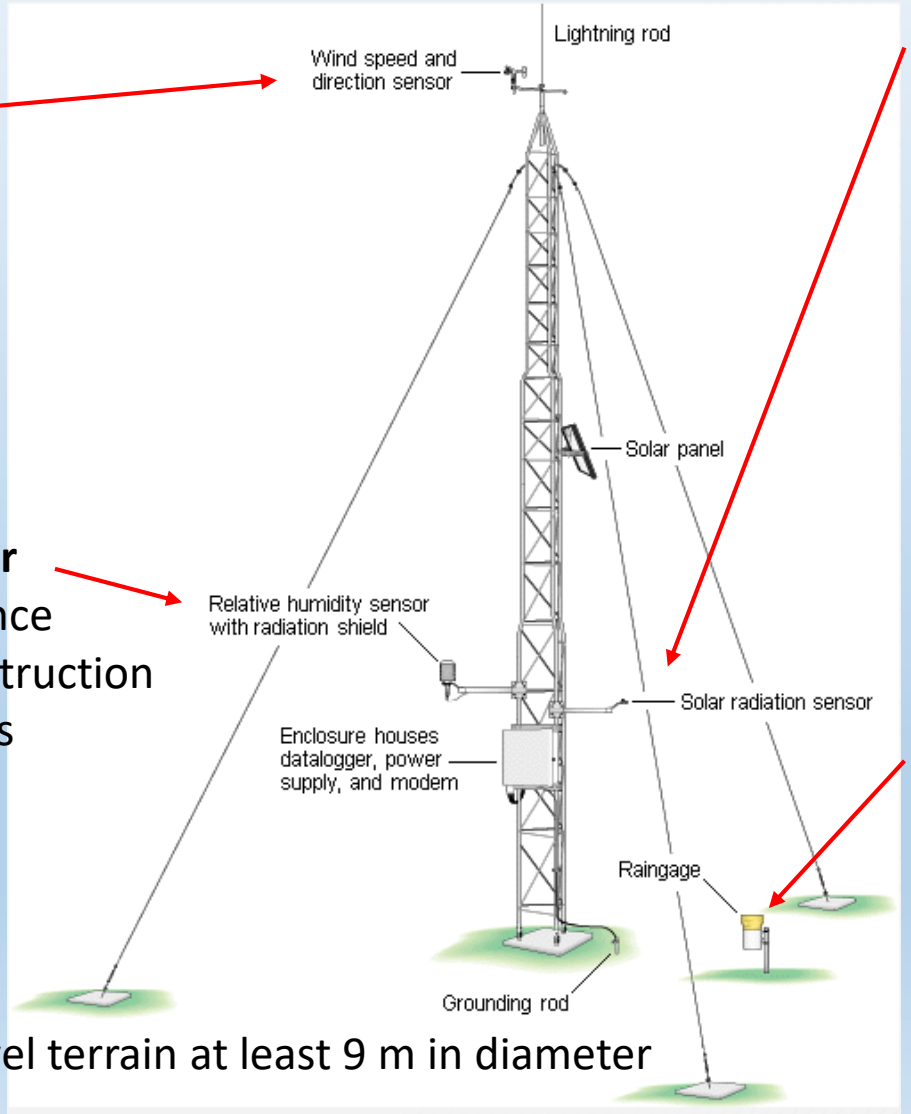


Meteorological Tower Sensor Exposure Placement

Campbell Scientific UT30 (10 m) Aluminum Tilt-Over Tower

Wind Monitor
- 10 m height above ground
- 10x height distance from nearest obstruction

Relative Humidity/Temperature Sensor
- 2 m & 10 m height for temp difference
- 4x height distance from nearest obstruction
- At least 30 m from large paved areas



Open level terrain at least 9 m in diameter

Solar Radiation (Pyronometer)
- Mount on southernmost portion of tower to avoid shading
- 2 m distance from obstruction
- 2 to 10 m height (no requirements)
- Avoid reflective surfaces & sources of artificial radiation (light)

Barometric Pressure
- 1 m distance from obstruction
- 1 to 10 m height (no requirements)
- Mounted in enclosure box

Precipitation Rain Gage
- At least 30 cm off ground-level covered in short grass or gravel
- 4x height distance from nearest obstruction

Meteorological Tower Sensor Exposure Placement

QA Handbook Vol IV: Meteorological Measurements

Table 0.12 Siting and Exposure for Meteorological Sensors[a]

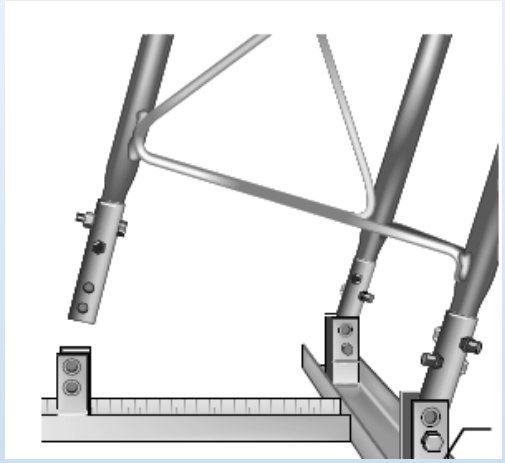
Measurement	Distance from Obstruction	Distance Above Ground	Recommended Group Cover	Comments
Wind Speed/Direction	10x the height of the obstruction	10 meters	Grass or gravel	The standard exposure of the wind instruments over level, open terrain is 10 meters above ground
Temperature/Dew Point	1.5x the tower diameter	1.25 to 2 meters	Non-irrigated or un-watered short grass, or natural earth	The surface should not be concrete or asphalt or oil-soaked. Reflection from these surfaces may affect the performance of the sensor.
Vertical Temperature Difference	1.5x the tower diameter	2 meters and 10 meters	Non-irrigated or un-watered short grass, or natural earth	The surface should not be concrete or asphalt or oil-soaked. Reflection from these surfaces may affect the performance of the sensor.
Solar Radiation	2 meters	2 to 10 meters	No requirements	Sensor should be free from obstructions above the plane of the sensor. It should be located so that shadows will not cast on the device.
Barometric pressure	1meter	1 to 10 meters	No requirements	The location should have uniform, constant temperature, shielded from the sun, away from drafts or heaters
Precipitation	2x to 4x the obstruction height	30 cm, minimum	Natural vegetation or gravel	Asphalt or concrete should be avoided to avoid splashing the gage. The gage should be high enough to avoid it being covered by snow.

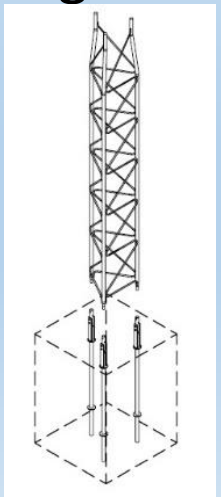
[a] Note: More details on siting and exposure are available in the individual sections of this Handbook. Please see the installation section of each chapter for more information.

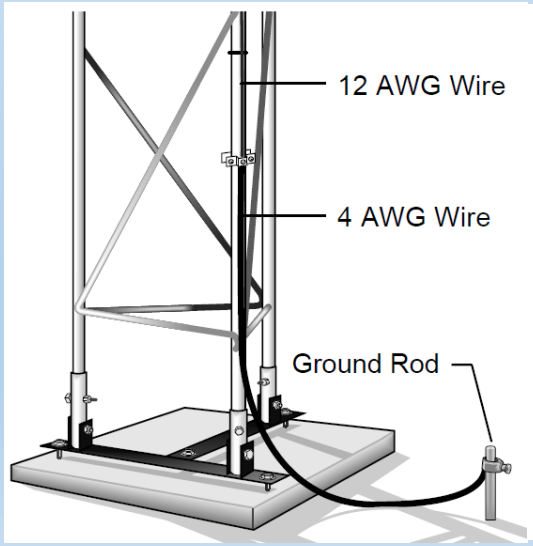
Meteorological Tower Types

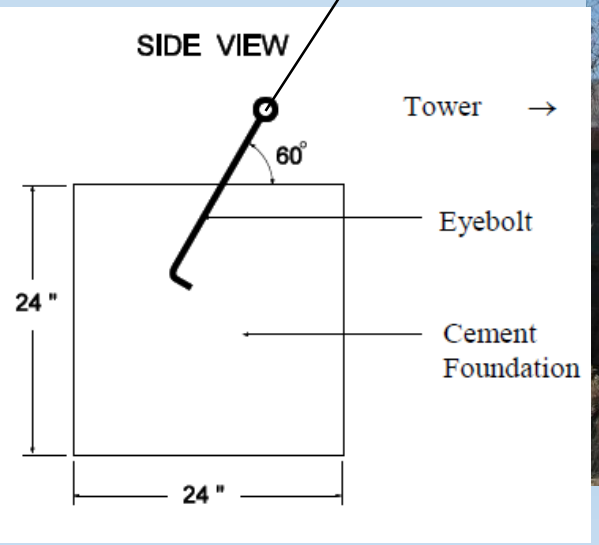
Free Standing Tilt-Over Tower (stationary)

- 10 meter height (30 ft), 6 meter (20ft)
- Grounding kit (lightening rod)
- Lowering clearance free of electrical lines
- Set hinge base correctly for lowering
- Concrete base or attach to structure and/or guy wiring
- Secured area
- Needs clearance for lowering down









Meteorological Tower Types

Telescoping Tower (stationary or mobile)

- No clearance for lowering
- Tower stay in vertical position
- Top sections lowers into lower section
- Hand or Electrical Winch
- Parts for winch
- Secured area

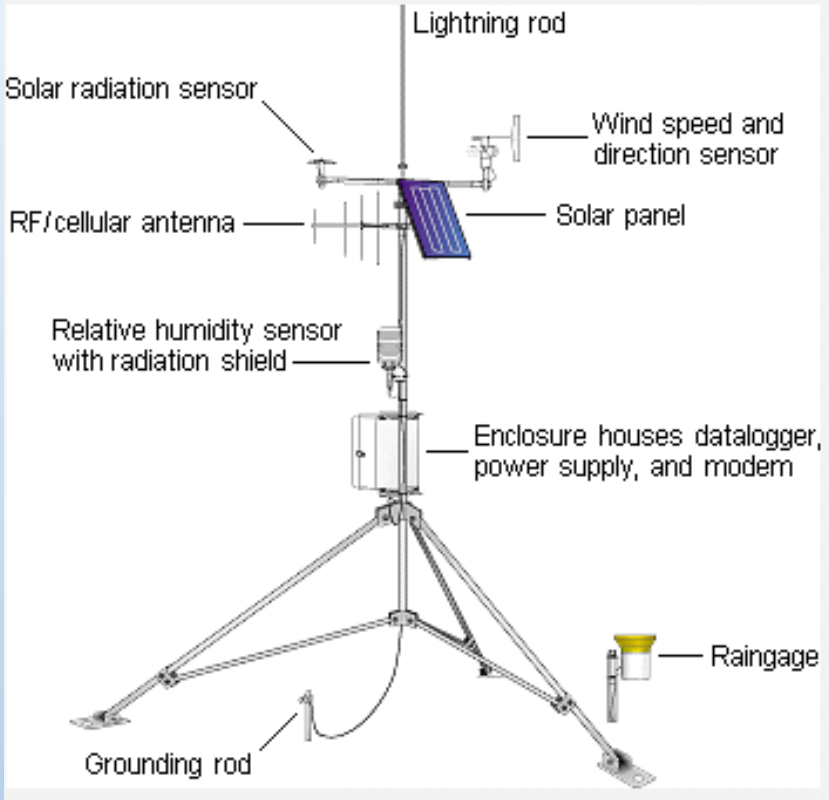
How to Lower a Tilt-Over Meteorological Tower

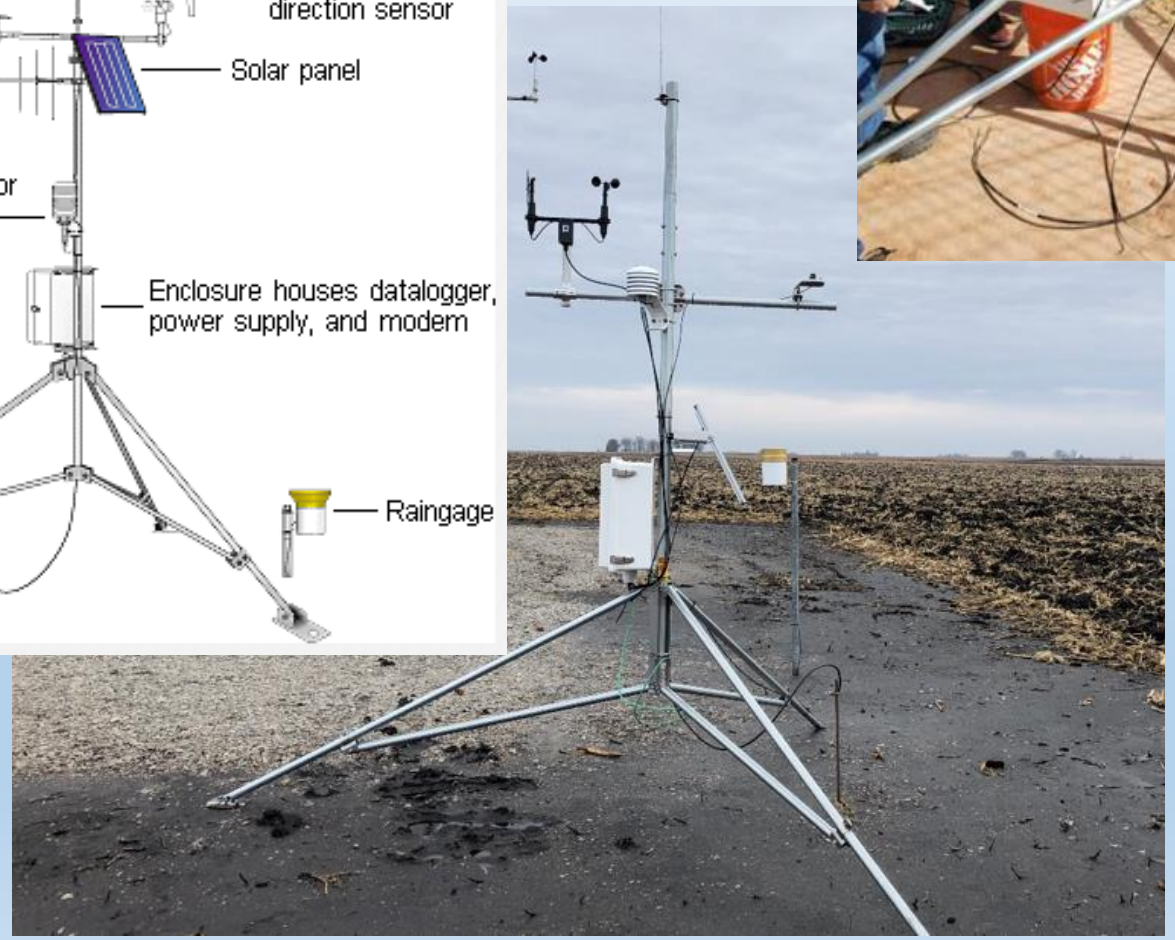
- https://www.youtube.com/watch?v=oqrvzPMIUj8

Meteorological Tower Types

Tri-Pod Tower (mobile)

- Quick setup
- Guy wiring and secure footing
- Not for regulatory purposes
- Informational or screening purposes (short-term monitoring)





Dataloggers for Meteorological Monitoring

- ESC/Agilaire (PC based)
  - AC source, use in temperature control environment
  - Voltage Input Card
  - Sensor power source
- Campbell Scientific
  - DC source, use in outdoor enclosure box
  - Good for solar panels
  - Sensor power source
- Retrieve Data
  - Download data on laptop computer w/ RS-232 cable. Phone line w/ modem, Wireless, Satellite, Radio

- Sine wave (Hz)
- Pulse wave
- Resistance (ohms)
- Voltage (0 – 1V)

Wind Monitor Calibration Equipment

Vane Torque Gauge

- Checks for wear on wind direction sensor bearing

Propeller Torque Disc

- Checks for wear on speed sensor bearings
- Also used for Cup assay sensors
- RM Young Wind Monitor Bearing Replacement
  - How-To-Videos
  - https://www.youtube.com/watch?v=a7PPHedn-AU
  - https://www.youtube.com/watch?v=O_leZ1Wtnfk

Wind Monitor Calibration Equipment

Anemometer Drive

- Wind-speed calibrator (RPM)
- Used for propeller and cup assay sensor
- Annual calibration traceable to NIST
- RM Young Wind Monitor Speed Calibration Check Procedures
  - https://www.youtube.com/watch?v=RkEsiANll8U

Vane Angle Stand

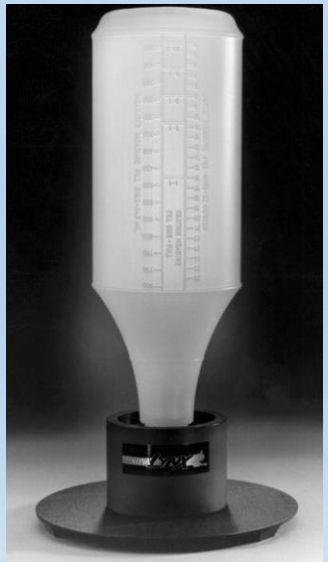
- Set points of degree angles
- Airfoil vane requires another angle bench
- RM Young Wind Monitor Direction Calibration
  - https://www.youtube.com/watch?v=3VKFGUAXOF0

RM Young
Wind Tracker

Calibration/Verification (6 months)

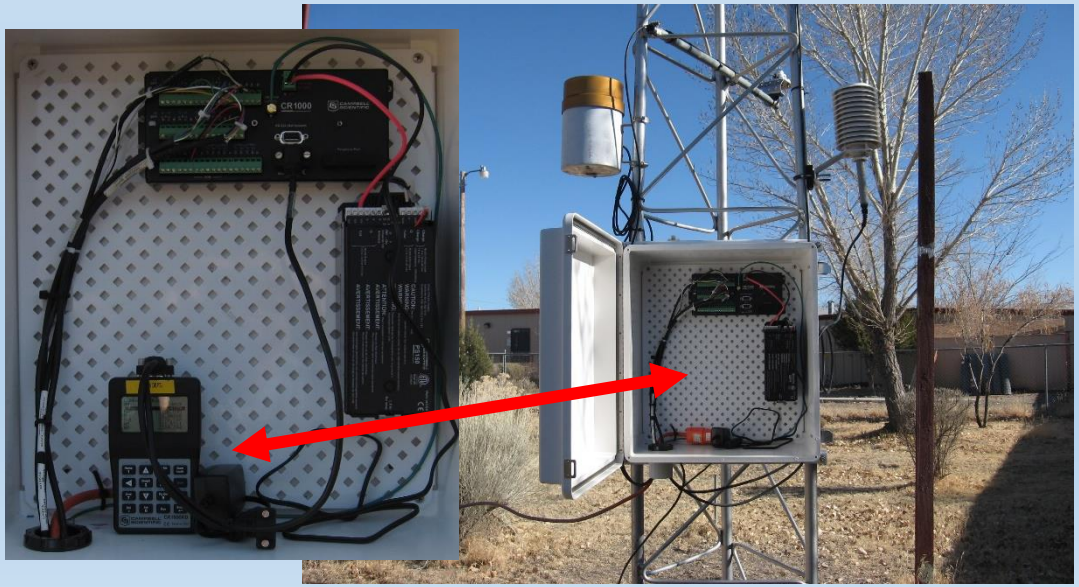
- **Wind Sp**eed 7-point checks
- **Wind Direction** 5-point checks
- Collocate **Temperature Sensor** with NIST temperature probe - 3 point wet bath check
  - Ambient Temperature
  - Hot water Temperature
  - Cold water Temperature
- Collocate **Relative Humidity** sensor
  - Micro-Bath /Dry Cal
  - Salt solution
  - Chamber (very expensive)

- **Precipitation Gage**
  - Measure known volume of distill water
  - Use calibration bottle or graduated glass tube (burette with nozzle)
  - Clean rain bucket and screen(s) several times a year



Calibration/Verification (6 months)

- **Barometric Pressure** sensor
  - 1-point ambient pressure reading
- Collocate **Solar Radiation** sensor
  - Clean sensor of debris
  - Cover and Uncover sensor



Verification/Calibration & Accuracy Criteria

Meteorological Sensors
Audit Ranges and Acceptance Criteria

Parameter	Audit Method	Acceptance Criteria
Wind Speed	Accuracy at five speeds with anemometer drive	≤ ± 0.25 m/s @ ≤ 5 m/s ≤ ± 5.0% @ > 2 m/s
	Starting threshold with torque gauge	Manufacturer specs
Wind Direction	Accuracy with compass	≤ ± 5 °
	Starting threshold with torque gauge	Manufacturer specs
Ambient Temperature (non-immersible sensor)	Accuracy via collocation in ambient conditions	≤ ± 1.0 °
Ambient Temperature (immersible sensor)	Accuracy via collocation in three water baths	≤ ± 1.0 °
Relative Humidity	Accuracy via collocation in ambient conditions	≤ ± 10%
Solar Radiation	Accuracy via collocation in ambient conditions	≤ ± 10%
Precipitation	Accuracy via known volume of water	≤ ± 10%

Annual Independent Performance Audit

QA Handbook Vol IV: Meteorological Measurements

Table 0-5. SLAMS/SPM (non-NCore) Meteorological Measurement Quality Objectives

Measurement	Method	Reporting Units	Operating Range	Resolution	Minimum Sample Frequency	Raw Data Collection Frequency	Completeness
Ambient Temperature	Thermistor	°C	-30 – 50	0.5	Hourly	1 minute	75%
Relative Humidity	Psychrometer/ Hygrometer	%	0 – 100	1.0	Hourly	1 minute	75%
Wind Speed	Cup, prop or sonic anemometer	m/s	0.5 – 50.0	0.2	Hourly	1 minute	75%
Wind Direction	Vane or sonic anemometer	Degrees	0 – 360 (540)	1.0	Hourly	1 minute	75%

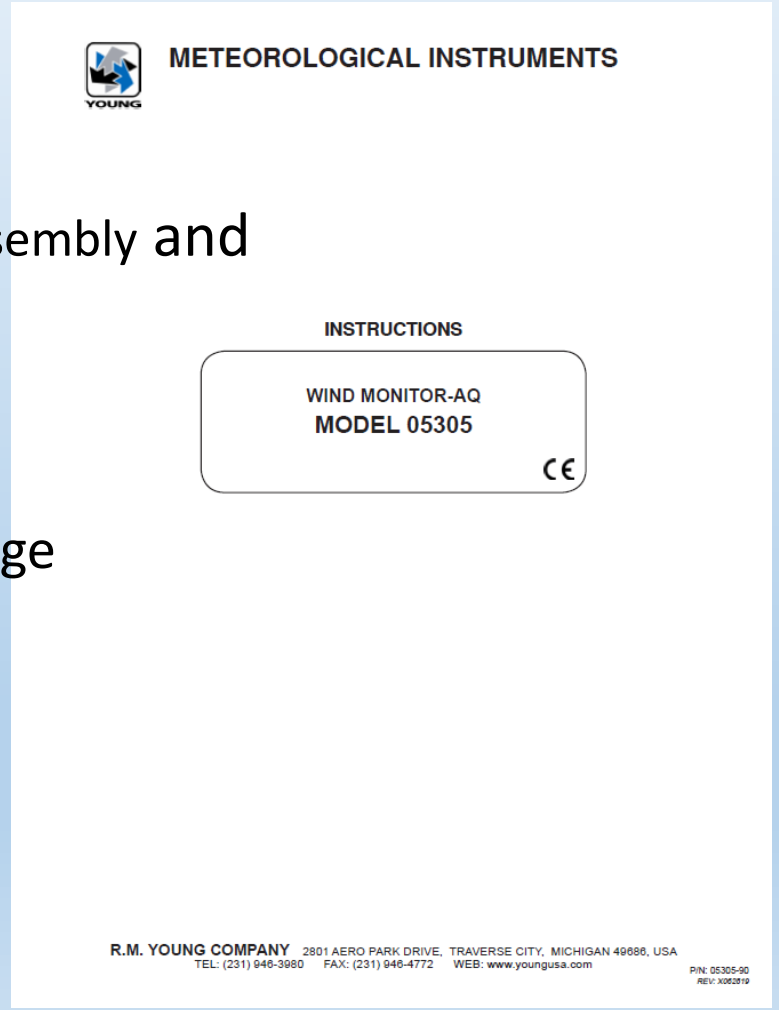
Table 0-6. SLAMS/SPM (non-NCore) Verification/Calibration and Accuracy Criteria

Measurement	Verification/Calibration			Accuracy		
	Type	Acceptance Criteria	Frequency	Type	Acceptance Criteria	Frequency
Ambient Temperature	3 pt. Water Bath with NIST-traceable thermistor or thermometer	±1.0 °C	Annually	3 pt. Water Bath With NIST-traceable thermistor or thermometer	±1.0 °C	Annually
Relative Humidity	NIST-traceable Psychrometer or standards solution	±10% RH	Annually	NIST-traceable Psychrometer or standards solution	±10% RH	Annually
Wind Speed	NIST-traceable Synchronous Motor, CTS Method	±0.25m/s ≤5m/s; 5%>2m/s not to exceed 2.5m/s	Annually	NIST-traceable Synchronous Motor	0.25m/s ≤5m/s; 5%>2m/s not to exceed 2.5m/s	Annually
Wind Direction	Solar Noon, GPS Magnetic Compass, CTS Method	±5 degrees; includes orientation error	Annually	Solar Noon, GPS or Magnetic Compass	±5 degrees; includes orientation error	Annually

a. This method is described in detail in Section 2.72 – 2.74 of this Handbook.

Meteorological Sensor Maintenance

- Routine operational checks (daily remotely and weekly on-site)
- For cold climates sensor have internal heaters
- Maintenance (see Operation/User Manuals)
  - Clean sensors: direction vane, speed propeller or 3 cups assembly and temperature shield housing
  - Replace bearings and worn parts
  - Lubricate rubber rings
    - Tighten connectors to sensors to prevent moisture damage
  - Check for crack lines
  - Check guy wires and tighten bolts
  - Tighten connectors to cross-arm shields and sensors


METEOROLOGICAL INSTRUMENTS

YOUNG

INSTRUCTIONS

WIND MONITOR-AQ
MODEL 05305

CE

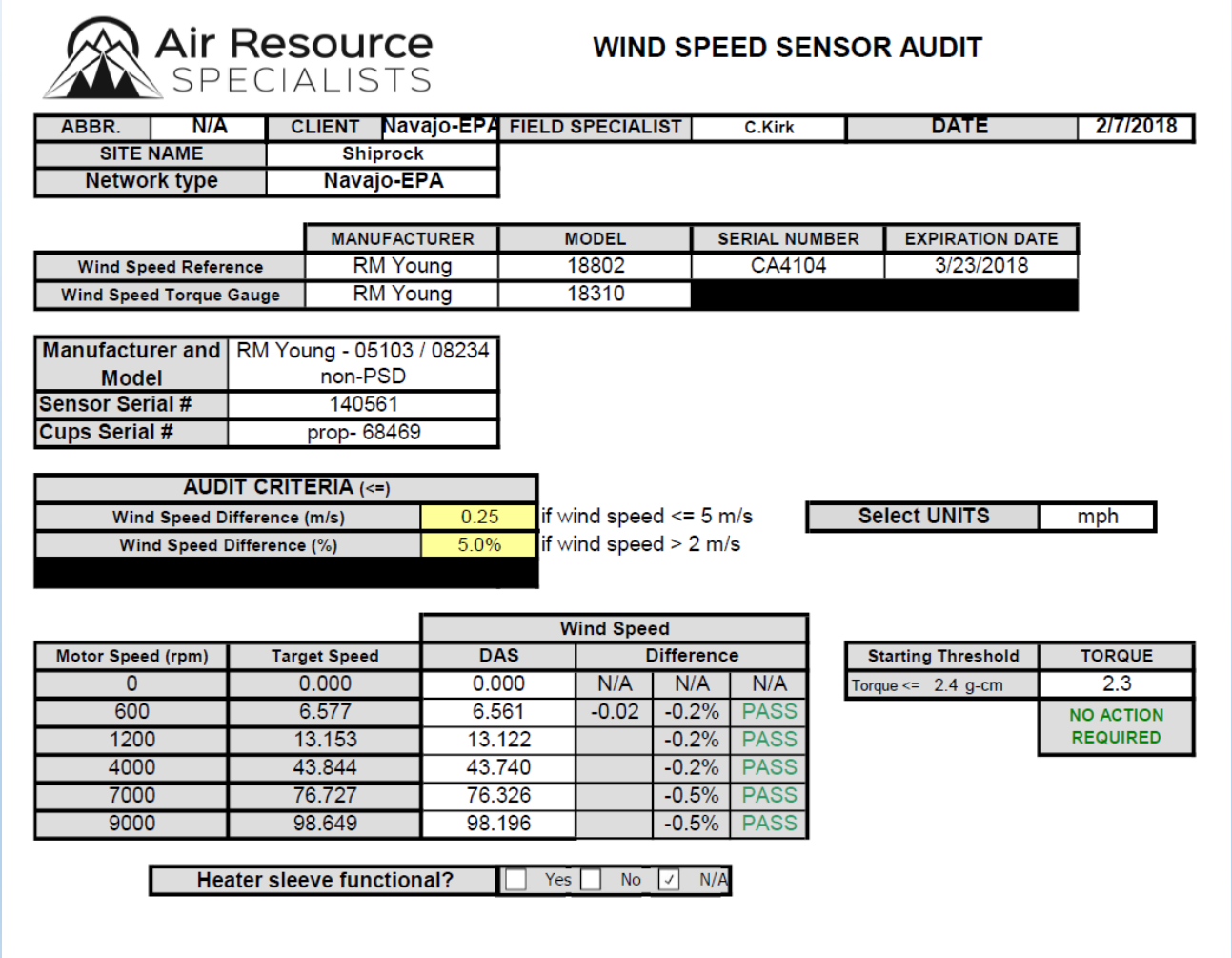
R.M. YOUNG COMPANY 2801 AERO PARK DRIVE, TRAVERSE CITY, MICHIGAN 49686, USA
TEL: (231) 946-3980 FAX: (231) 946-4772 WEB: www.youngusa.com

P/N: 05305-90
REV: X062619

Quality Assurance Documentation

Documentation

- QAPP/Sampling Plan
- Site log book
- Personal log book
- Site check list
- Calibration & audit forms
- Repair forms
- Purchase-order forms
- Ship for certification and/or repairs
- Shipping receipts
- etc…



Air Resource SPECIALISTS

WIND SPEED SENSOR AUDIT

ABBR.	N/A	CLIENT	Navajo-EPA	FIELD SPECIALIST	C.Kirk	DATE	2/7/2018
SITE NAME		Shiprock					
Network type		Navajo-EPA					

	MANUFACTURER	MODEL	SERIAL NUMBER	EXPIRATION DATE
Wind Speed Reference	RM Young	18802	CA4104	3/23/2018
Wind Speed Torque Gauge	RM Young	18310		

Manufacturer and Model	RM Young - 05103 / 08234 non-PSD
Sensor Serial #	140561
Cups Serial #	prop- 68469

AUDIT CRITERIA (<=)		
Wind Speed Difference (m/s)	0.25	if wind speed <= 5 m/s
Wind Speed Difference (%)	5.0%	if wind speed > 2 m/s

Select UNITS	mph

		Wind Speed			
Motor Speed (rpm)	Target Speed	DAS	Difference		
0	0.000	0.000	N/A	N/A	N/A
600	6.577	6.561	-0.02	-0.2%	PASS
1200	13.153	13.122		-0.2%	PASS
4000	43.844	43.740		-0.2%	PASS
7000	76.727	76.326		-0.5%	PASS
9000	98.649	98.196		-0.5%	PASS

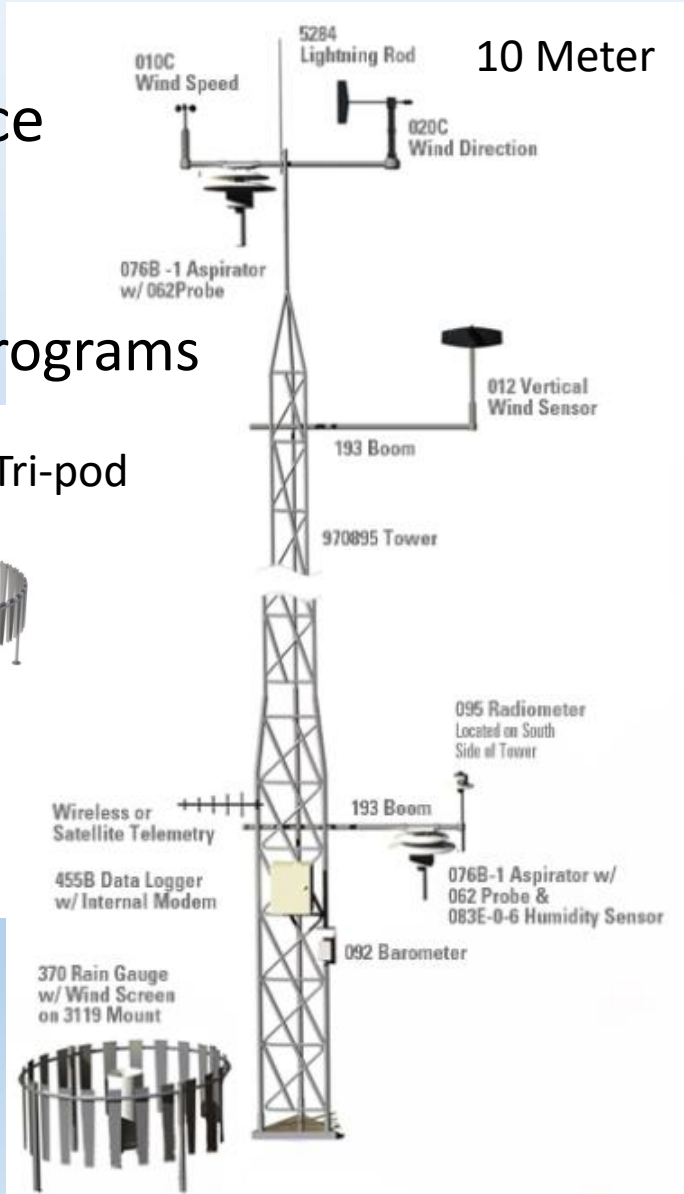
Starting Threshold	TORQUE
Torque <= 2.4 g-cm	2.3
	NO ACTION REQUIRED

Heater sleeve functional?	☐ Yes	☐ No	☑ N/A

Meteorological Monitoring Recommendations

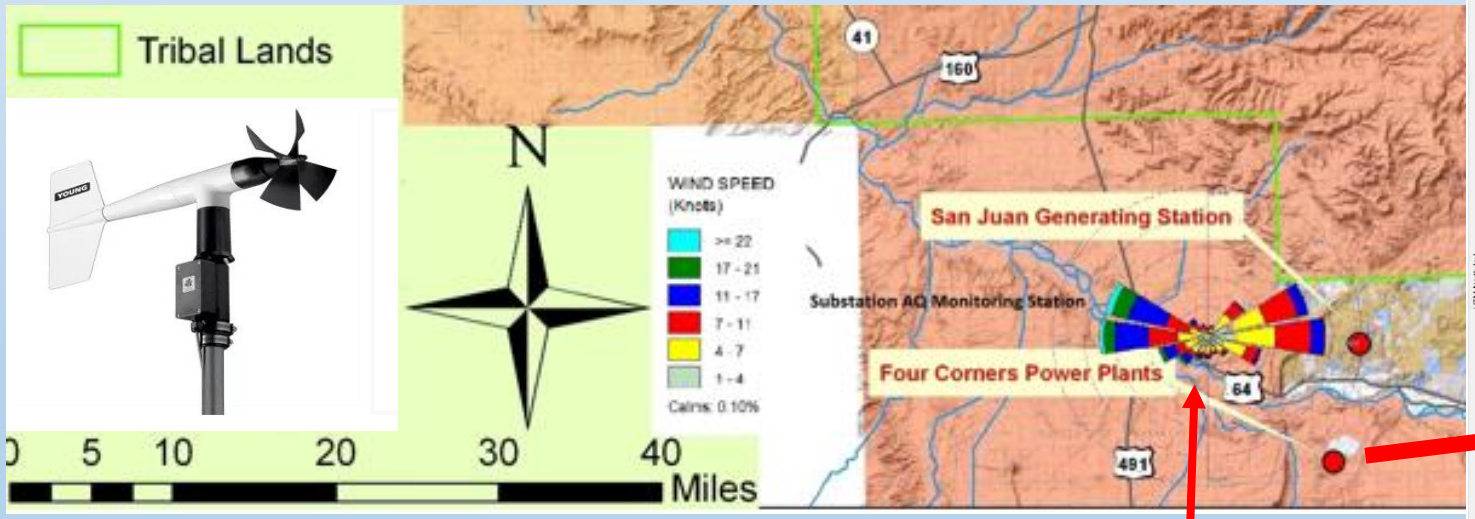
- Have some experience in Excel
- Work with Tribal Facilities, Public Works or Building Maintenance
  - Knowledgeable in carpentry and electricity
- Use vendors to calibrate equipment and/or repair
- Purchase equipment similar to surrounding agencies and Tribal Air Programs
  - For troubleshooting tips
  - Audits
- Basis set of tools
  - Digital multi-meter & hand tools
  - PC laptop w/ datalogger support software
  - Ty-wrap to secure cables, cross arms, mounts, u-bolts
  - Grounding kit and sensor cables (correct length)
  - Purchase calibration equipment to calibrate sensors
  - Have spare sensors and parts ready
  - Review operational and service manuals
  - If you have questions call tribes, state, county TAMS for technical help

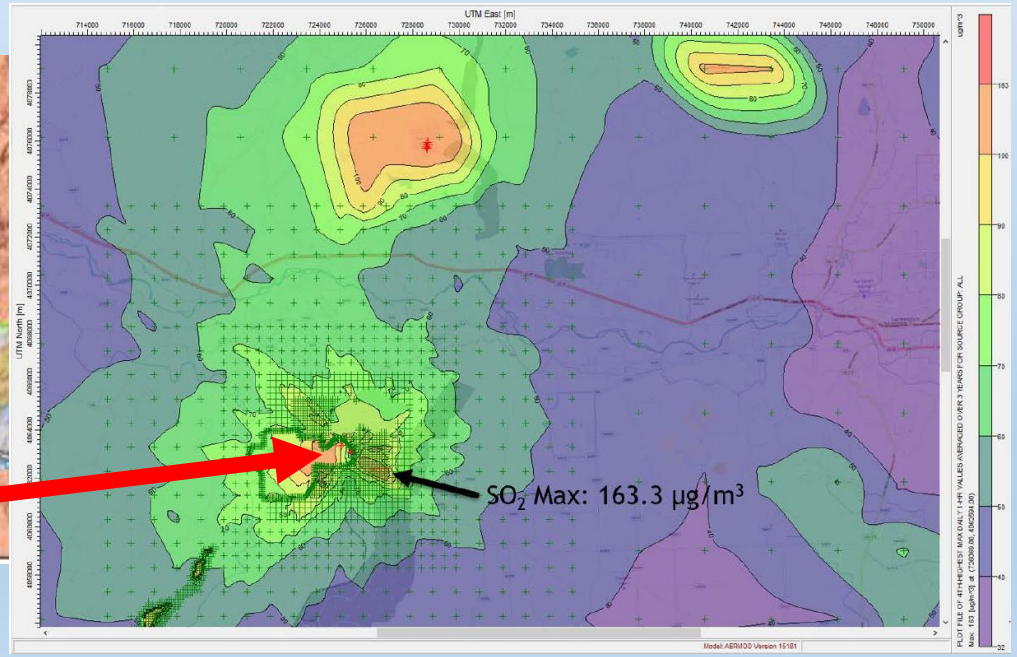
Tri-pod



Meteorological Data

- Supplement ambient air quality monitoring stations
- Air Quality Dispersion Models (AERMOD, HYSPLIT), Air Quality Models (CMAQ), WRPLOT, AirNow
- Insight into air pollution dispersion, deposition, transport





Air Monitoring Station
Wind Rose

Resources

- EPA Quality Assurance Handbook for Pollution Measurement Systems: Volume IV Meteorological Measurements
  - https://www.epa.gov/amtic/ambient-air-monitoring-quality-assurance-guidance-documents
- EPA On-Site Meteorological Program Guidance for Regulatory Modeling Applications
- Lakes Environmental WRPLOT View
  - https://www.weblakes.com/software/freeware/wrplot-view/
- Campbell Scientific: https://www.campbellsci.com/ut30
- How to Videos (see attached handout)

NAU
NORTHERN ARIZONA UNIVERSITY

INSTITUTE for TRIBAL ENVIRONMENTAL PROFESSIONALS

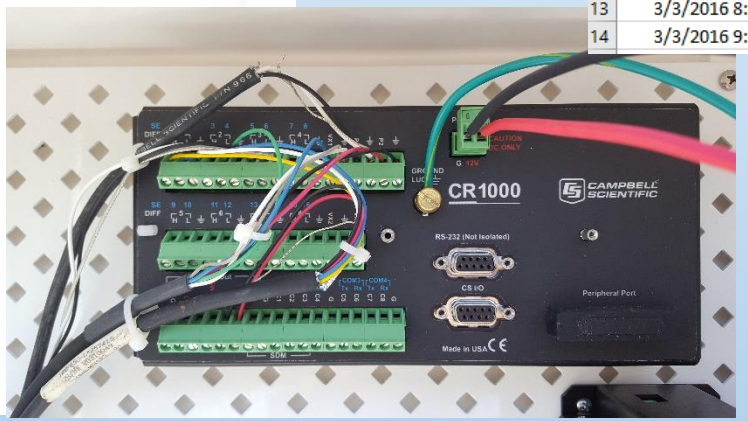
Tribal Air Monitoring Support Center

Thank you for joining todays webinar!

How to Create a Wind Rose

- Go to Lakes Environmental & download free WRPLOT VIEW software (https://www.weblakes.com/software/freeware/wrplot-view/)
  1. Download the self-extracting installation file above to a temporary folder in your computer.
  2. Submit your Registration to obtain an activation code. An activation code will be e-mailed to you within 24 hours.
  3. Install WRPLOT View onto your computer.
  4. Once you have received your activation code, start-up WRPLOT View. When prompted to register, click on Yes, and the Registration dialog box will be displayed.
  5. Enter your activation code (product registration key) you received by e-mail and press OK.
  6. You can now start using WRPLOT View!

How to Create a Wind Rose



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	TOA5	CR1000 SH	CR1000	74636	CR1000.St	CPU:SHIPF	25002	Hourly						
2	TIMESTAMP	RECORD	AT	RH	BP	RNF	SOL	SWS	uVWD	SDWD	SWS2	VWS	VWD	SDWD2
3	TS	RN	deg C	%	mmHg	inches	W/m2	mph	Deg	Deg	mph	mph	Deg	Deg
4			Avg	Avg	Avg	Tot	Avg	WVc	WVc	WVc	WVc	WVc	WVc	WVc
5	3/3/2016 0:00	7	4.027	29.92	273.1	0	-2.483	3.854372	106.0404	15.03791	3.854372	2.842131	109.3926	13.55071
6	3/3/2016 1:00	8	3.293	31.08	272.6	0	-2.169	1.693763	135.5869	34.0813	1.693763	1.192554	133.9443	29.921
7	3/3/2016 2:00	9	3.493	30.29	272.4	0	-2.42	2.483133	136.2824	18.14675	2.483133	2.270311	134.0083	17.34894
8	3/3/2016 3:00	10	1.004	37.03	271.7	0	-2.471	2.034768	95.51066	26.22554	2.034768	1.828517	93.02174	23.21858
9	3/3/2016 4:00	11	-0.784	42.98	271.4	0	-2.044	1.017383	95.07642	55.4205	1.017383	0.483306	106.0931	44.87035
10	3/3/2016 5:00	12	-1.238	45.91	271.5	0	-1.758	1.818358	115.1997	38.80435	1.818358	1.265282	102.3359	31.72005
11	3/3/2016 6:00	13	-0.558	44.62	271.8	0	-1.996	2.793101	133.434	17.30845	2.793101	2.635079	132.3192	16.58733
12	3/3/2016 7:00	14	-1.205	49.02	272.3	0	2.46	4.270582	137.7819	14.78524	4.270582	4.130157	136.3098	13.724
13	3/3/2016 8:00	15	-0.774	48.34	272.6	0	115.7	3.472714	127.3156	13.76956	3.472714	3.369907	127.6715	13.00411
14	3/3/2016 9:00	16	3.81	34.55	274.1	0	346.6	4.284206	133.5666	16.41782	4.284206	4.122407	132.4471	15.33456

- Download 1-hour WS/WD data from logger, typically a .CSV file
- QA review the data
- Format data to import into WRPLOT

Demonstration of WRPLOT VIEW Using Sample Meteorological Data