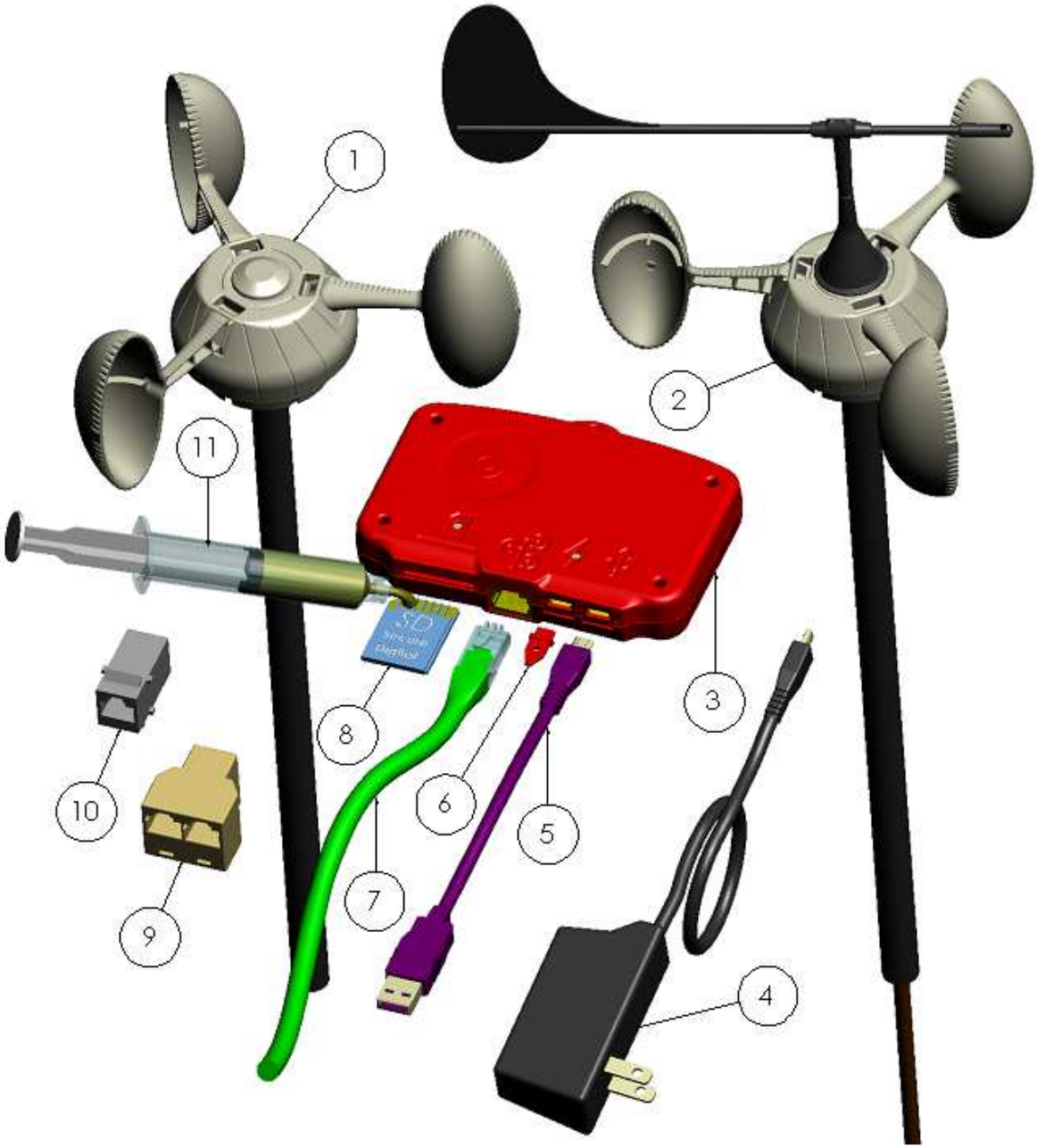
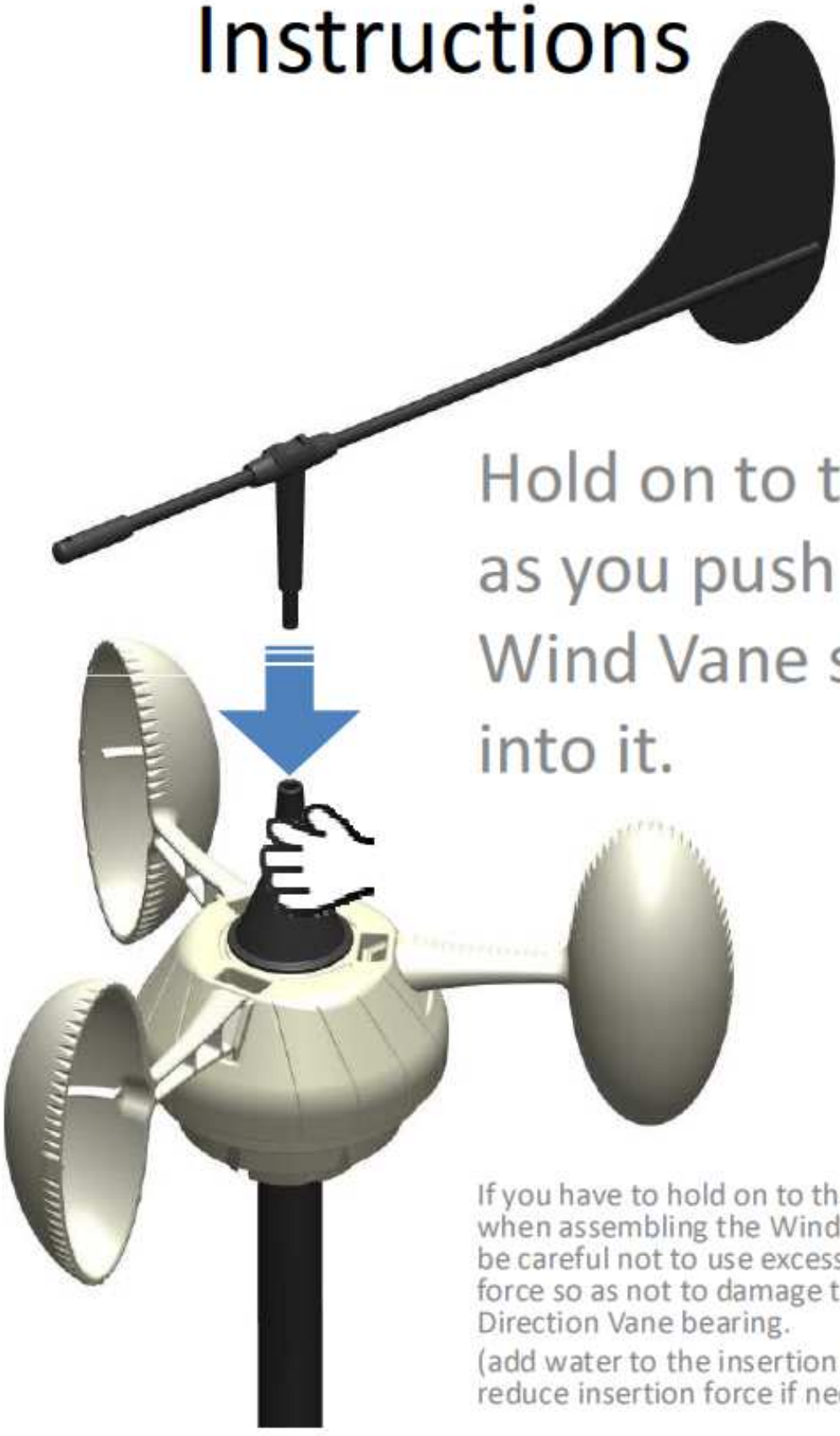
Elliptic Anemometer™
&
DATA Logger

USER'S GUIDE

Num.	Name	Description
1	**Anemometer**	Elliptic Anemometer Sensor of type *VT, VTH* or *VTHP*
2	**Anemomter with Direction Vane**	Elliptic Anemometer Sensor with integrated Direction Vane of type *VDT, VDTH* or *VDTHP*
3	**Data Logger**	Data Logger for Elliptic Anemometer (all versions) for logging sensor data
4	**Power Supply**	5V wall power supply (110-220V, 50-60Hz input) for powering a data logger
5	**USB Cable**	Cable for connecting data logger to computer
6	**USB Micro Plug**	Plug for protecting unused USB micro ports in data logger from dirt
7	**Sensor Cable**	Sensor signal cable for transmitting Elliptic Anemometer data to Data Logger
8	**SD Card**	Memory card for storing sensor data in Data Logger.
9	**Cable Splitter**	Enables the use of multiple Anemometers with one Data Logger
10	**Cable Coupler**	Enables extending the sensor cable between Anemometer and Data Logger
11	**Conn. Sealing Gel**	Used to make outdoor electrical connections weather resistant.



Wind Vane Assembly Instructions



If you have to hold on to the support tube when assembling the Wind Direction Vane, be careful not to use excessive insertion force so as not to damage the Wind Direction Vane bearing.

(add water to the insertion shaft surface to reduce insertion force if necessary)

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For latest information and Errata, please visit our website:
http://www.baranidesign.com/support.html

Legal Obligations

This manual does not create any legally binding obligations for Barani Design towards the customer or end user. All legally binding commitments and agreements are included exclusively in the Conditions of Sale or applicable supply contract.

Feedback

Please send comments or corrections to this manual by email to:
info@baranidesign.com

Version Information

Table 1 Revisions

General Safety Considerations

Throughout the manual, important safety considerations are highlighted as follows:

WARNING Alerts you to a serious hazard that may lead to injury or death.

CAUTION Warns you of a potential hazard that may lead to product damage or loss of data.

NOTE Highlights important information about using the product.

Product Related Safety Precautions

CAUTION Do not modify the unit. Tampering or improper modification will void the warranty and can damage the product or lead to malfunction.

Warranty
Please see the Warranty packaged with each product for specific warranty information on each product.

Conditions of Sale
Please see the Conditions of Sale packaged with each product for specific information on each product.

Table Contents

WARNING!!! **LIGHTNING HAZARD** **WARNING!!!**

WARNING Lightning poses a substantial danger to any persons or animals near outdoor mounted atmospheric instruments & sensors.

WARNING Following recommendations will reduce but not eliminate lightning hazard. To minimize danger of lightning related injury or death please follow the following precautions:

- Avoid servicing Anemometer and any associated weather equipment during weather conditions with possible lightning hazard…check with your local weather center for local weather information.
- Keep any devices with a direct connection to outdoor weather instruments away from any persons or animals or occupied spaces.
- Do not approach any wiring connected to an anemometer during possible lightning hazard conditions, as the unit may act as a lightning guide.
- Consult your local building code for proper lightning protection in the vicinity of weather instruments or antennas.

Lightning Protection Mounting

WARNING Please consult your local house building code for proper lightning rod placement and grounding.

WARNING The following are only guidelines and should not be used in place of your local housing code due to risk of lightning induced injury or death to persons or animals.

Lightning protection rules of thumb:

- Minimum lightning rod height: 1m (3ft) above top of anemometer.
- Place lightning rod at least 1m (3ft) away from anemometer to avoid wind interference effects.
- Lightning rod height should be higher or equal to the distance between the lightning rod and the anemometer.

Electro-Static Protection

SENSORS ARE ELECTROSTATIC SENSITIVE DEVICES.
ELECTROSTATIC (STATIC ELECTRICITY) SHOCK CAN LEAD TO SENSOR DAMAGE.

ATTENTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE DEVICES

HUMIDITY SENSOR PRODUCTS: *Elliptic Anemometer **VTH** & **VTHP***
It is of great importance to understand that a humidity sensor is not a normal electronic component and needs to be handled with care.

Chemical vapors at high concentration in combination with long exposure times may offset the sensor reading, sometimes, permanently. Sensors shall be prevented of high concentration of chemical solvents and long exposure times. Out-gassing of glues, adhesive tapes and stickers or out-gassing packaging material such as bubble foils, foams, etc. shall be avoided.

Long term storage conditions:	Temperature	10°C	to	50°C
	Humidity	20%	to	60%RH

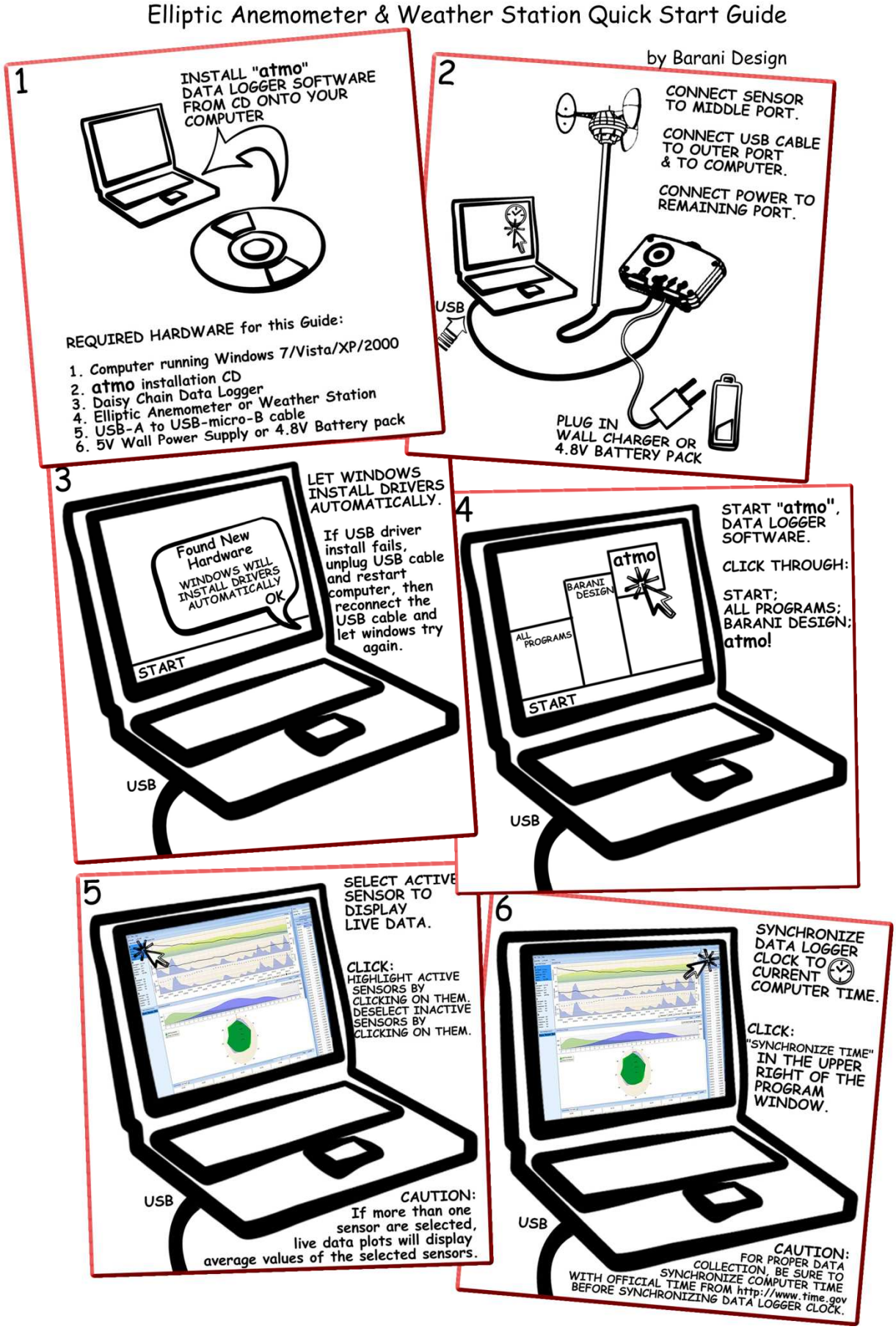
For more detailed information please contact BARANI DESIGN by email:
info@baranidesign.com

USER NOTES:

NOTE Sensors have to be plugged in to the Data Logger before turning on so that network size can be set automatically, otherwise network size must be set through the Sensor Setup in the Setup menu in Atmo Data Logging Software.

1. To view Data in the HISTORICAL SECTION of Atmo, first **Import** the data through the **Data Menu** in Atmo. Once imported, you will need to select the database in the left column below the sensor selections to view the data.
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

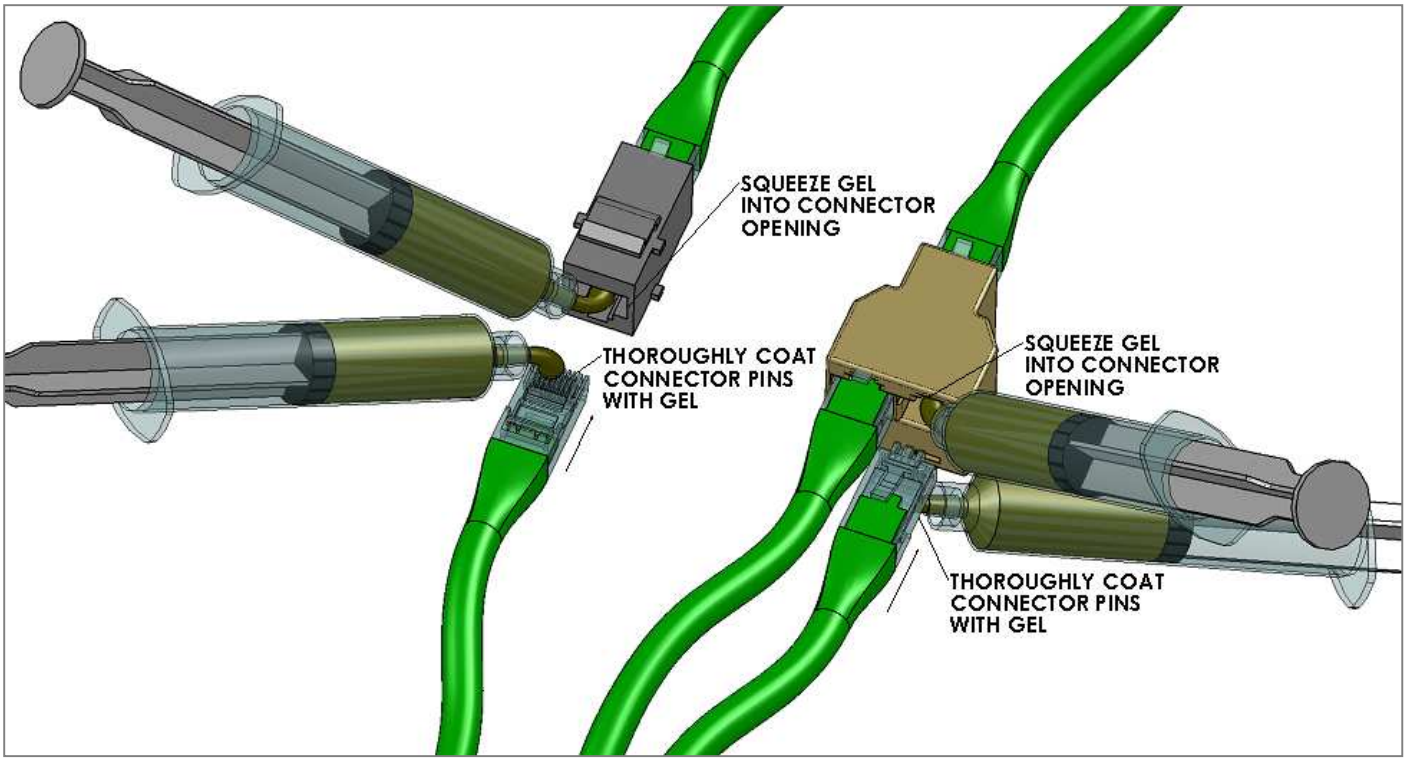
Quick Start Guide



Weather Proofing – Sensor Wire Connections

For outdoor sensor wire connections:

- Thoroughly coat the connections with supplied connector sealing gel.
- Wipe away excess gel to tidy up each connection.
- If reinserting connectors after extended periods of field time, always wipe away old gel and replenish gel inside the connector.
- Our connector sealing gel has been specially formulated to repel water and dust and extend connector life by preventing corrosive substances (Water/Salt/Ozone/Oxygen) from reaching connector contacts.
- The gel will remain inside the connector (will not leak out) in temperatures over 80°C (176°F).
- **SEE ILLUSTRATION BELOW.**



Weather Proofing –Data Logger Installations

For outdoor Data Logger installations:

- Thoroughly coat the connections with supplied connector sealing gel.
- Thoroughly coat SD Memory Card pins with connector sealing gel before inserting SD Card into socket.
- Wipe away excess gel to tidy up each connection.
- If reinserting connectors after extended periods of field time, always wipe away old gel and replenish gel inside the connector.
- Our connector sealing gel has been specially formulated to repel water and dust and extend connector life by preventing corrosive substances (Water/Salt/Ozone/Oxygen) from reaching connector contacts.
- The gel will remain inside the connector (will not leak out) in temperatures over 80°C (176°F).
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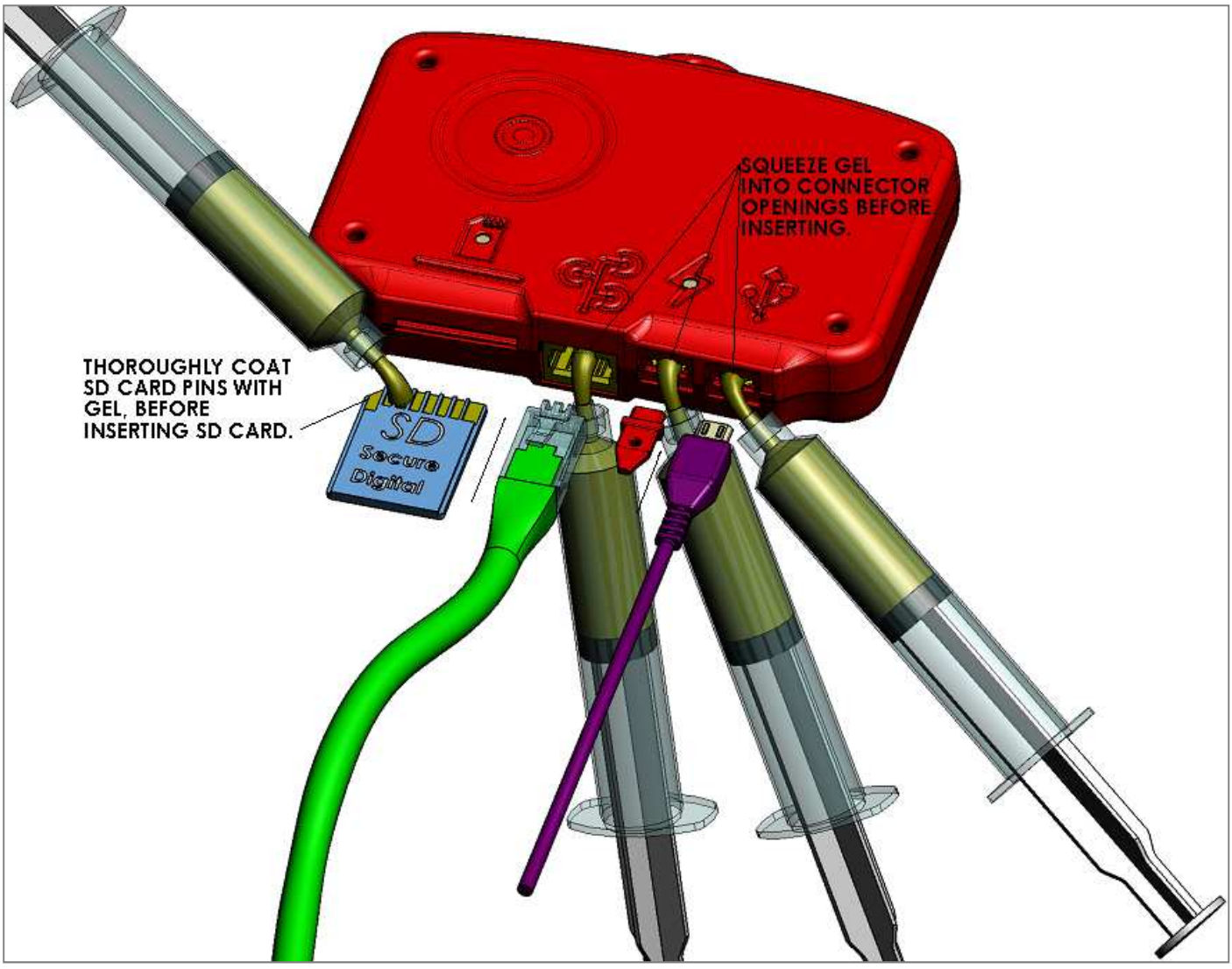
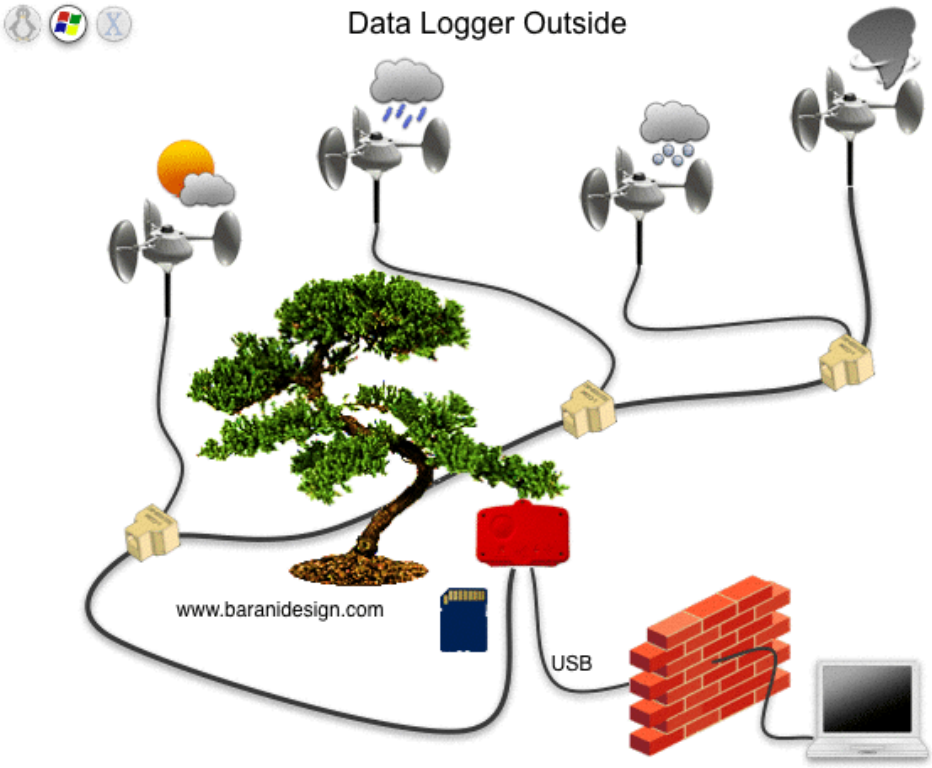
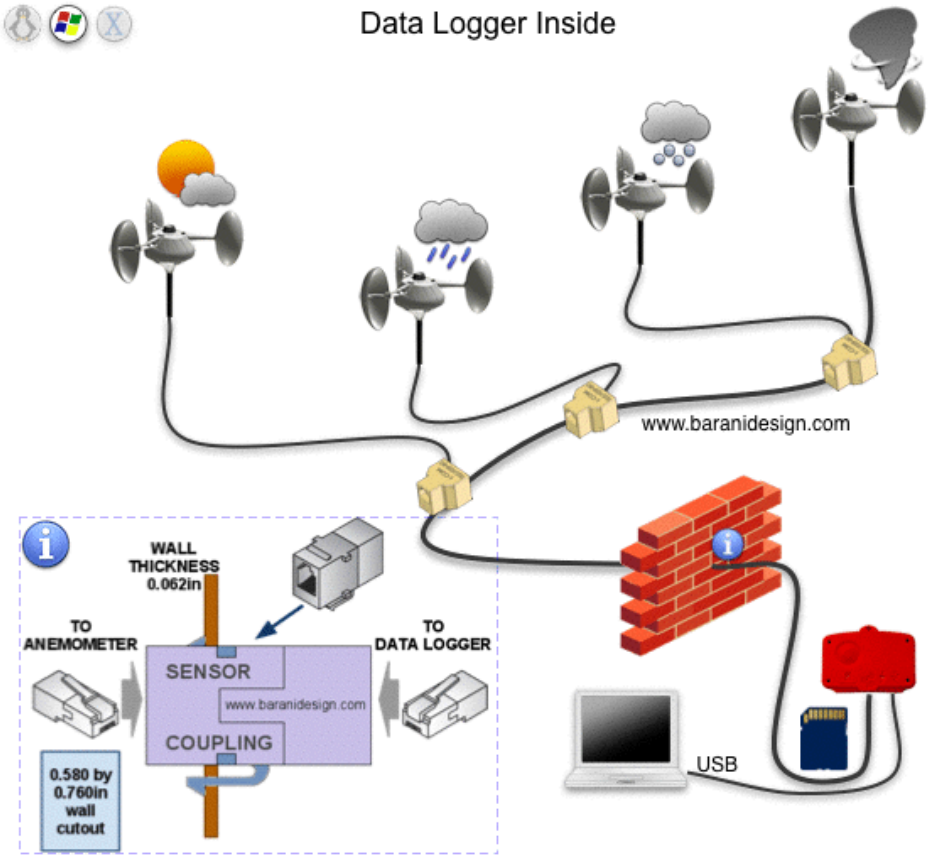
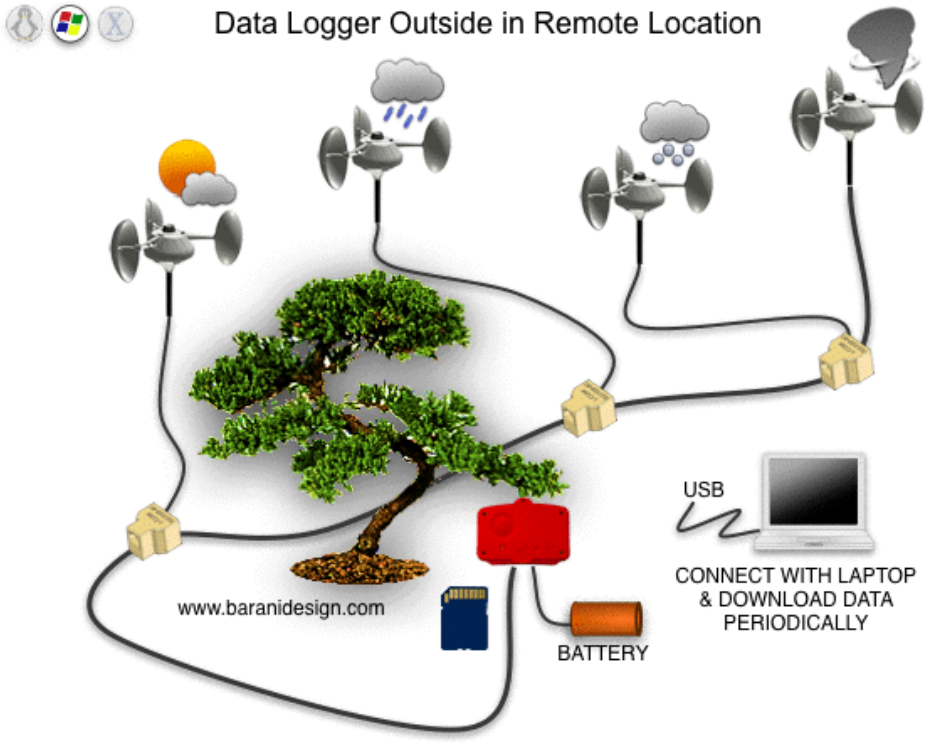


Sensor Setup Scenarios






Data Logger Outside in Remote Location
USB
CONNECT WITH LAPTOP
& DOWNLOAD DATA
PERIODICALLY
www.baranidesign.com
BATTERY

Guidelines for Anemometer Placement:

To ensure precise and reliable long term measurement, please use the following rules for anemometer placement.

For sparsely placed non solid objects like trees:

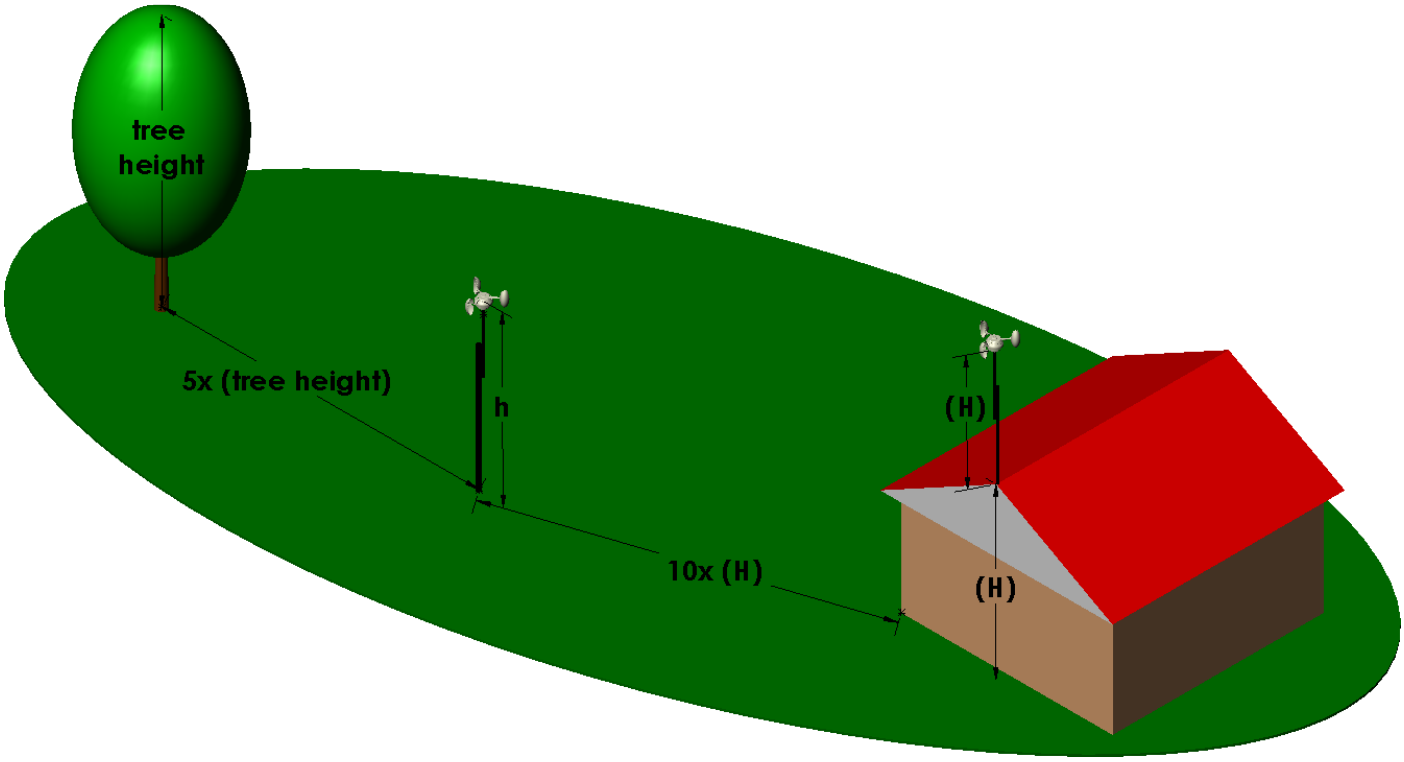
* Stay at least 2x the tree height upwind.
* Stay at least 5x the tree height downwind.

For sparsely placed solid objects like houses:

* Stay at least 3x the house height upwind.
* Stay at least 10x the house height downwind.

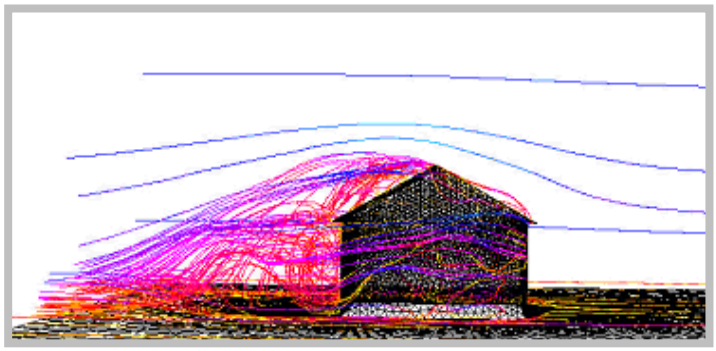
For thin objects like poles:

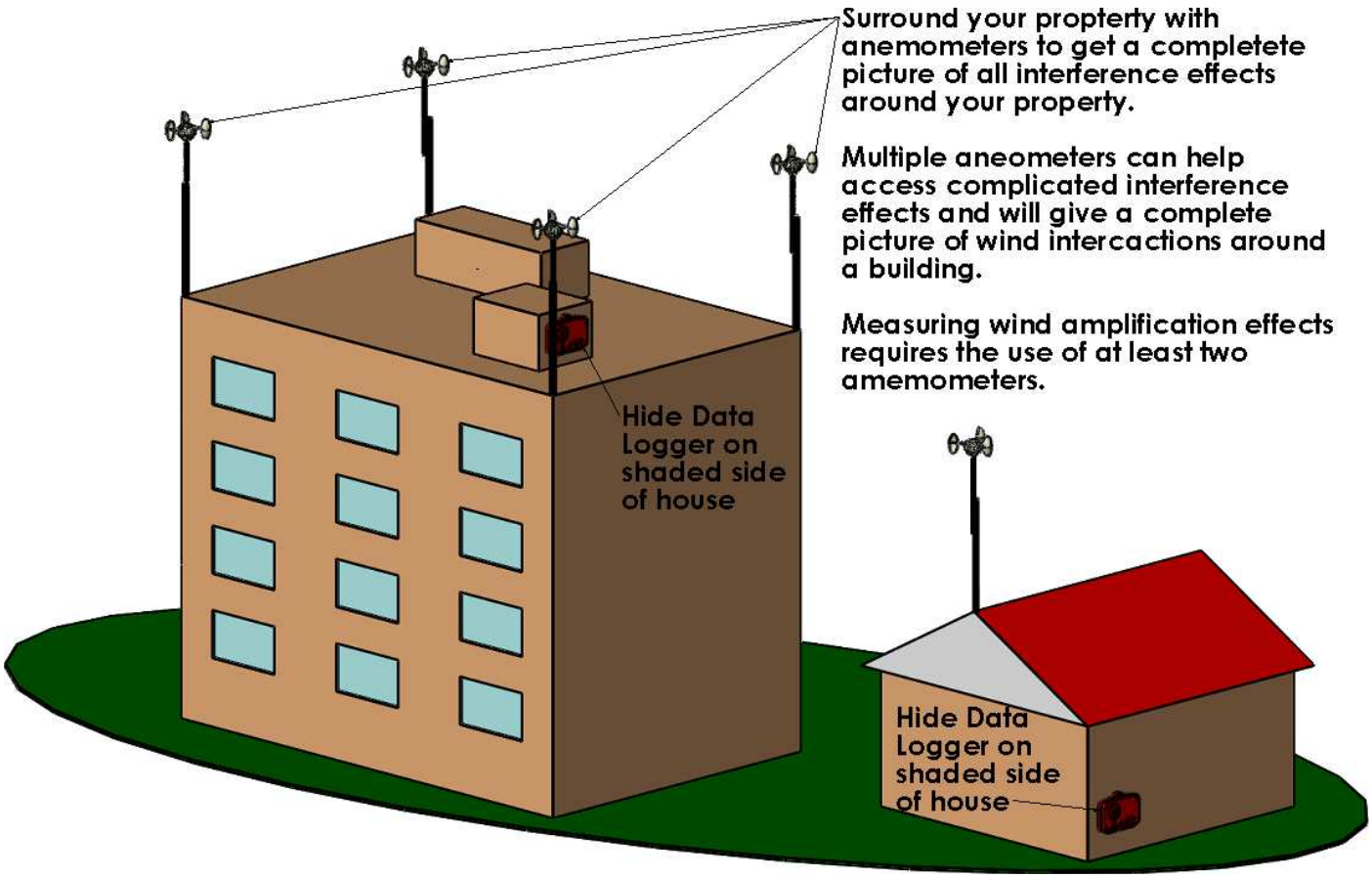
* Stay at least 50 pole diameters away.



Recommendation for wind mapping with Anemometer for Wind Turbine placement

* If wind prevails from a single direction, the top of your house (or a hill) may be the best place. (up to 30% gain in wind speed!...see image of house in wind above)
* Wind accelerates as it flows past most solid objects' tallest point (the top of a hill, edge of a cliff, roof line) (see image of house in wind above)
* Object's shape and wind direction are critical to maximizing wind speed gains, and if improperly placed losses, noise and vibration can result. (If you are unsure, contact us and we will help you out)





Initial Check

After unpacking the sensor, please check for shipping damage. One of the most important things to check for is smoothness of rotation of the cup assembly as it may affect accuracy of measurement. If damage is found, please document via digital pictures if possible and promptly notify us preferably via email or by phone.

Anemometer Mounting

WARNING Do not install the wind sensor above the top of lightning rod protection.

WARNING Whenever running the sensor wire to any location where people or animals may be present, always surround the sensor by at least one properly grounded lightning rod to avoid risk of lightning induced injury or death.

CAUTION Avoid overly compressing the mounting shaft by mounting clamps or cable ties. It is designed to efficiently withstand wind bending loads and may be damaged by crushing due to improper mounting.

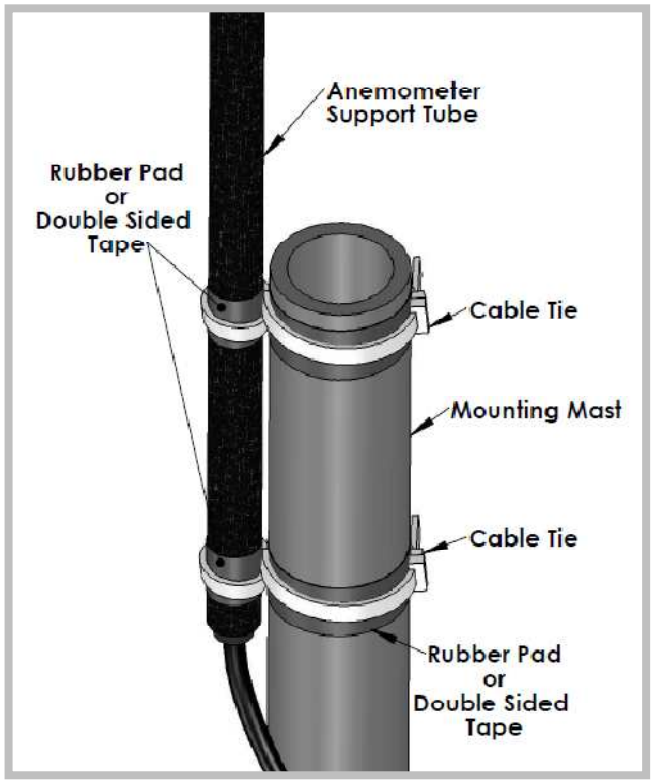
Sensor Orientation

We highly recommend mounting the sensor vertically (upright). Upright orientation will ensure its ability to shed water, airborne dust dirt and sand properly to maintain a healthy bearing for a lifetime of accurate and consistent performance.

Mounting to a Mast or Pole

To mount the wind sensor mast to a metallic mast, do the following:

1. Install a Rubber Pad or Double Sided Tape between the Metallic Mast and Anemometer support tube to for electrical insulation and grip.
2. The diameter of the mounting shaft is 0.5in or 12.7mm.
3. Attach the Anemometer support tube to the mast using the cable ties. For more robust mounting, use stainless steel or anodized steel cable ties. **Always wrap the cable tie all the way (360 degrees) around the support tube before continuing to wrap it around the mast.** This will avoid crushing the Anemometer support tube by equally distributing cable tie force all around the circumference of the support tube. If one cable tie is not long enough, combine 2 cable ties.
4. Route the sensor cable down along the mast and always attach the cable to the mast with cable ties.
5. Connect the sensor cable to the Data Logger.



Elliptic Anemometer™ Product Versions & Accessories

	SENSOR	Range	Typical Accuracy*	Resolution
VT	Wind Speed	0.4 to 81.0 m/s	±1% from 4-28m/s	0.1m/s
	0.4 to 36.0 m/s	±0.06m/s from 0-36m/s	±1% from 4-28m/s	
	Temperature Sensor	-40 to 80°C	±0.5°C	0.1°C

	SENSOR	Range	Typical Accuracy*	Resolution
VTHP	Wind Speed	0.4 to 81.0 m/s	±0.06m/s from 0-36m/s	0.1m/s
	0.4 to 36.0 m/s	±0.06m/s from 0-36m/s	0.1m/s	
	Temperature Sensor	-40 to 80°C	±0.5°C	0.1°C
	Humidity	0 to 100% RH	±2 %	±0.1 %
	Pressure	0.3 to 1.3 Atm /$3x10^4$ to $1.3x10^4$hPa	±0.3hPa	1hPa / 0.0001Atm

* Typical accuracy is within the following conditions: -20°C-60°C, 10%-90%RH
Please call or email us for available custom options: info@baranidesign.com

AVAILABLE ASSECORIES	Description	Details
Sensor Cable	RS-485 network compatible sensor cable	50ft & 100ft (15m & 30m)
Hydrophobic Connector Sealing Gel	Water repellent, UV and Ozone resistant connector gel that increases useful lifespan of most connector types, couplers & splitters.	Squeeze gel into connector openings, then insert connector. Gel should squeeze out if properly filled. Wipe away excess gel.
Weather Resistant Coupler *(for cable extensions)*	RS-485 cable extender (coupler) for extending sensor reach to remote locations. Can be wall installed as weather resistant wall pass through. Weather resistant.	L 0.5" (13mm) W 0.5" (13mm) H 1.5" (38mm)
Weather Resistant Splitter *(for connecting multiple anemometers to one data logger)*	RJ45 splitter adapter for multiple Anemometer sensor installations on a single daisy chain network. Weather resistant.	L 1.5" (38mm) W 1.5" (38mm) H 1.0" (25mm)
Battery	4.8V Li-Ion NiCd 12,000mAh battery	360hr@ *25°C
Power Supply	5V 400mA Power Supply	120 to 240 Volt Power Supply

Elliptic Anemometer™ OVERVIEW

Elliptic Anemometer has been designed to withstand wind gusts up to 200mph and most weather conditions.

Lifetime Bearings:
Each Elliptic Anemometer features lifetime self cleaning bearings that are designed to withstand most any severe naturally occurring weather conditions. As a precaution and to due to the unpredictability of nature, we recommend a yearly bearing inspection by feeling for roughness in anemometer rotation.

Elliptic Cups:
The elliptical cup shape along with its size and moment arm combine to provide an aerodynamically efficient planform for fast positive response to ever changing wind conditions. They are less sensitive to vertical cross flow and provide consistent performance even in out of plane wind conditions. Materials for the cups have been chosen to have good impact strength even at temperatures of -40°C/F, thus ensuring longevity, robustness and a lifetime of trouble free operation.

Center Hub:
Center hub shape has been designed to provide maximum protection for the internal atmospheric sensors from water, dirt, dust and sand while minimally effecting wind speed measurement response and consistency. Through harmonized internal design the hub ensures fresh air flow even at the lowest of wind speeds to the internal atmospheric sensors which may include temperature, humidity and pressure sensors.

Sensor Shroud:
Below the rotating assembly is the stationary sensor shroud. Depending on your anemometer model, it can house a variety of atmospheric sensors which may measure temperature, humidity and pressure.

Carbon Fiber Support Tube:
Support tube is made of Carbon Fiber for its strength and stiffness. This ensures a strong and stable base which minimizes sensor vibrations and deflections in high and turbulent winds for accurate wind readings.

Data logger for the Elliptic Anemometer ™ OVERVIEW

Our data logger features the latest technology to make reliable atmospheric data logging easy and effortless. Seamless integration with our data logging software Atmo ™ and with our line of Elliptic Anemometer wind and weather sensors will make setup a breeze. Start logging in seconds by loading the software and just connecting the unit to any USB port. See live data stream down from up to 20 sensors.

Internal Temperature Sensor:
Each Data Logger features an internal temperature sensor capable of 0.1°C resolution and 0.5°C accuracy. Placing the Data Logger outdoors in a shaded and well vented area, enables the user to eliminate solar heating effects from the sensor readings of the anemometer.

One Button Operation:
USB plug and play nature of the Data Logger makes one button functionality possible. Virtually every part of the data logger functionality can be set up via the USB connection to a computer running our free Atmo software. Pressing the button signals the Data Logger to perform a data to the SD Memory Card in preparation for SD card withdrawal. This enables the user to remove the SD card for 4min 20sec without loosing any valuable live data.

Temperature Compensated Internal Clock:
For stable and reliable data logging an accurate clock is necessary. Our Data Logger has a temperature compensated clock to ensure reliable data logging.

Dual Color Status Lights:
Two dual color (red/yellow) LED lights indicate the status of the Data Logger, SD Card, Sensor Network and other data logger and sensor functionality.

Elliptic Anemometer & Data Logger List of Features

A Complete Solution:

- Wind Energy Site Evaluation
- Environmental studies
- Weather monitoring for outdoor events
- Wind Turbine control and monitoring
- Rooftop wind and weather monitoring for Commercial and Residential sites

Anemometer Features

- Robust impact resistant anemometer construction.
- Optical wind speed sensor reliability
- Lifetime maintenance free self cleaning bearings
- Carbon Fiber mounting shaft for strength and stability in high winds & gusts
- Temperature sensor on all products
- Humidity Sensor on VTH & VTHP versions
- Barometric Pressure Sensor on VTHP versions

Data Logger Features

- Robust impact resistant construction.
- Flexible power input from 5V to 20Volts.
- Portable: Accepts power from any new mobile (cell) phone charger even car phone chargers.
- Dual multicolor status LED's for quick status updates.
- Temperature sensor integrated into data logger.
- Clock timer compensation for temperature effects.
- High accuracy clock timer with less than ±30ppm error.
- SD card data storage for flexibility and expandability.
- Robust and interference resistant RS-485 communication for reliability.
- On the fly sensor firmware updates.
- Ability to create on the fly sensor offsets to measure changes in conditions.
- Seamless plug and play integration with sensors and computer.
- Included software automatically recognizes data logger, no need to play with drivers and settings.

Atmo Software

Please see Atmo User guide for software instructions of use, features, requirements and details.

Anemometer Performance Specifications

Parameter	Accuracy	Resolution
Wind Speed	±1% from 5 to 25m/s, otherwise ±1.5%	0.1m/s (0.2mph)
Pressure	±0.3hPa (±0.009inHg)	0.1hPa (0.01inHg)
Temperature	±0.5°C (±0.9°F)	0.1°C (0.2°F)
Humidity	±2% RH	0.1%

Anemometer Mechanical Specifications

Operating Temperature range	-40°C to 80°C (-40°F to 175°F)
Humidity range	0 to 100% RH
Barometric Pressure range	30kPa-120kPa(9inHg - 35inHg)
Starting wind speed threshold	0.5m/s (1mph)
Distance constant	5m at 5m/s.
Rotor diameter	180mm (7.3in)
Sensor height w/o support shaft	60mm (3.5in)
Support shaft	400mm (16in) (Carbon Fiber)
Sensor wire length	14.5m (47.5ft) (up to 30m (100ft) lengths available)
Anemometer body material	UV, Ozone and Impact-resistant
Bearings	Low-inertia self-lubricating hybrid ball bearings with self-cleaning properties.
Sensor Weight:	0.25 kg (0.5 lbs)

Data Logger Technical Details:

Parameter	Description	Value
Sensors	Maximum Number of Sensor input values	20 sensors
Anemometers	Max Number of Anemometers (VT/VTH/VTHP)	4
Temperature	Accuracy ±0.5°C (±0.9°F), Res 0.1°C (0.2°F)	Integrated Sensor
Data Storage	SD Card (FAT16 format) (128mb included)	2GB = 6years
Connectors	Sensor=RJ45, Power & USB = USB micro B	3 connectors
Status	Two dual color daylight visible LED lights	Yellow / Red

Internal Sensors	Range	Precision	Resolution
Temperature Sensor	-40 to 80°C	±0.5°C	0.1°C

Data Logger Mechanical Specifications

Operating Temperature range	-40°C to 80°C (-40°F to 175°F)
Operating Humidity range	0% to 100%RH
Data Logger body material	UV, Ozone and impact-resistant
Dimensions	Width= 180mm(7.3in), Height= 180mm(7.3in), Thickness=180mm(7.3in)
Weight	0.25 kg (0.5 lbs)

Data Logger Electrical Specifications

USB Plug & Play.
USB 1.0/2.0 compatible.
Power source: 5-20V, any mobile phone charger 2010 and newer or battery.
Average current draw of 13 mA (1 anemometer with data logger on 15m (50ft) sensor spacing)

Requirements for initial configuration & setup:

Computer with Windows installed. (Apple computer running Windows is OK).
Available USB 1.0/2.0 port on computer.
1GHz single core processor, or 0.5GHz multi-core.
512Mb of Ram.
100Mb of Hard Drive space.
(Apple, Unix & Linux compatibility coming soon.

Periodic Maintenance

Testing for Proper Operation

It is recommended to check the ball bearings of the anemometer and the vane every year. If the cup wheel or the vane is not rotating smoothly or it creates detectable noise, the bearings must be replaced.

CAUTION Too much force or pressure on the Anemometer bearing during cleaning may cause the bearing to be damaged or to stop rotating smoothly. This will negatively affect anemometer accuracy. Bearing static load rating is only 20 Newtons (5lbs).

Cleaning

Whipping down the anemometer in dusty environments will help maintain clean appearance and proper operation over extended periods of time. Cleaning any dirt buildup on the outside of the anemometer and inside and outside of the 3 cups will ensure reliable response time throughout the anemometer's lifetime.

TROUBLESHOOTING

This chapter describes common problems, their probable causes, remedies, and contact information.

Common Problems

Some Common Problems and their Remedies

Problem:	Fix:
All the wires are connected no readings are showing up on my computer.	1. Check that the USB cable connecting your computer to the Data Logger is the supplied USB cable on not a USB charging cable. 2. Check that the USB cable is plugged into the outside USB port on the Data Logger (engraved with a USB symbol). 3. Check that the proper USB driver is installed so that your computer can properly see the Data Logger on the USB port.
I see the data streaming in on the 5 and 15minute plot, but no data is showing up on the hourly or longer timescale plots.	1. For larger time scales, enough data has to accumulate to fill a tick mark on the plot before it can be shown. (usually 1 minute of data)
I have been collecting data for a few hours or days, and no historical data is showing up in Atmo Software.	1. For historical data to show up, you must import the data from the SD card into Atmo software on the computer. Atmo will keep the sensor data organized in a database it can be easily accessed.

Data Logger LED Light Status Codes

Please see webpage for most up to date information.			

Technical Support

For technical questions, please contact the Barani Design technical support:

E-mail	info@baranidesign.com	
Telephone	+1-619-573-9463	*(+ may be replaced by 00)*
Fax	+1-925-905-4142	*(+ may be replaced by 00)*

Return Instructions

If the product needs to be repaired, please follow the instructions below for speedy resolution and to avoid extra costs.

1. Read the warranty information.
2. Write a Problem Report with the name and contact information of a technically competent person who can provide further information on the problem.

In the Problem Report, please explain:

A. -What failed (what worked / did not work)?
B. -Where did it fail (location and environment)?
C. -When did it fail (date, immediately / after a while / periodically / randomly)?
D. -How many failed (only one defect / other same or similar defects / several failures in one unit)?
E. -What was connected to the product and to which connectors?
F. -Input power source type, voltage and list of other items (lighting, heaters, motors etc.) that were connected to the same power output.
G. -What was done when the failure was noticed?

Include a detailed return address with your preferred shipping method on the Problem Report.
Pack the faulty product using an ESD protection bag of good quality with proper cushioning material in a strong box of adequate size. Please include the Problem Report in the same box.

Send the properly packaged anemometer to:
Please contact us for the most up to date information on a service center near your area.
If in doubt, please send product to:
Barani Design
525 Nelson Rising Ln. Suite 909
San Francisco, CA 94158
USA

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