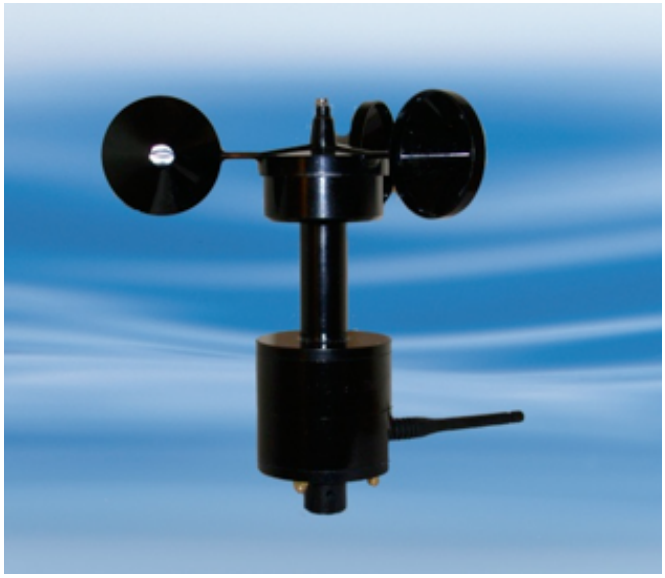
breeze Logger Users Manual



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Installation Instructions for Model 101 and 301 Anemometer/Receiver/Logger

Introduction

Thank you for purchasing the Etesian Technologies wireless, self powered anemometer. Etesian's anemometer is designed for long life and trouble free use. With a small amount of planning and set-up, you should have an accurate, reliable and convenient wind sensor. Each sensor utilizes a conventional 3 cup design. The cups are conical in shape and molded of high-impact polycarbonate. The entire cup assembly is affixed to a beryllium copper shaft, which rotates on two self-lubricating bearings. The advantages of wireless connectivity are self-evident. The advantages of self-contained eternal power is also self-evident!

Theory of Operation

Each anemometer contains a small AC generator. This AC generator provides power for the signal conditioning circuitry and RF transmitter. Additionally the frequency of the AC generator is directly related to the rotational speed of the anemometer cups and likewise the speed of the wind being measured. The signal-conditioning circuitry contains an event counter that totalizes the number of whole waveforms occurring in a fixed interval of time, approximately 1 second. Figure 1 is a block diagram of the generator, signal-conditioning and RF transmitter.

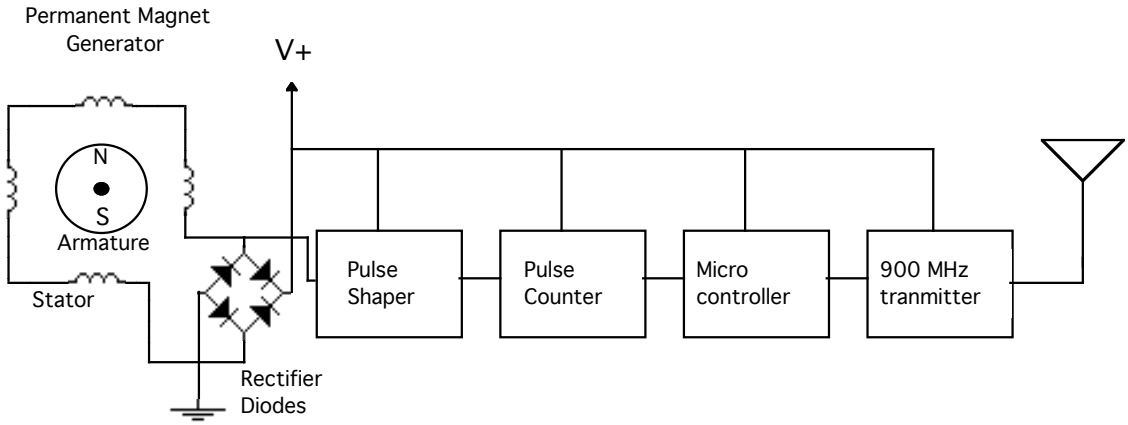

Figure 1 Wireless, Self Powered Anemometer Block Diagram

Every second, the microcontroller fetches the accumulated count from the pulse counter, formats a data packet and initiates a 40 millisecond transmission to the receiver. The receiver decodes the packet. This packet includes the sensor's ID number, a sequence number, and the wind speed data. If you have purchased the optional wind direction sensor, its data is included in the packet as well.

The receiver/logger stores data on a USB flash drive. Data stored on this flash drive can be downloaded via the logger's serial port or by simply shutting the logger off, removing the flash drive and reading the flash drive with any PC with a USB port.

Setting Up the Sensor(s)

Land Based
Good judgment will provide accurate measurements of the winds. This includes making sure there are no obstructions to the wind you are trying to measure. For land based measurements, especially for wind resource assessments, installing the sensor at the prospective wind turbine's hub height is ideal. This may not be practical depending upon the turbine hub height. In any case be sure that the anemometer is 30 feet above any obstacle within a 100 ft radius of the sensor. When mounting to the side of a tower, a boom of 3 to 6 feet in length will minimize the effect of tower shadow. It should be oriented such that the sensor is upwind of the tower in the direction of the predominant winds.

Marine
Getting good measurements on boats or ships requires mounting on top of the highest mast. The sensor's size and weight should not present any appreciable load on an existing mast.

Mechanical Dimensions
The sensor has a 1/2 inch diameter mounting hole. A cotter pin and Phillips head screw will firmly attach the sensor to a suitable 1/2 inch bar or tube. See Figure 2.

Sensor Antenna Orientation
Keep the sensor's antenna away from metal objects. Preferable orientation would be to place the sensor at the end of the boom with the antenna pointing straight to the side. The antenna should NOT point toward or away from the receiver and its antenna, but should be sideways to it.

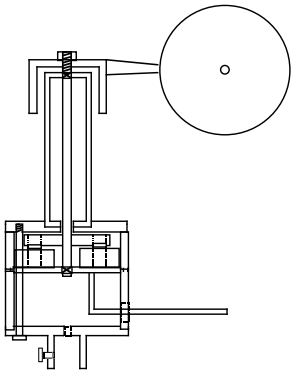

Figure 2 Cross Sectional Sketch (1 of 3 cups drawn)

Connecting the Receiver

Power
Power requirement are 9 to 28 VDC 125 mA. The power jack on the receiver is a standard circular DC power jack with a 2.0 mm center pin and 5.5 MM O.D. Be sure the plug is fully inserted. There is a slight click as it snaps into place when fully seated.

Antenna
An SMA connector is located on the top side of the receiver. In most instances, with clear paths up to 150 feet between the sensor and receiver, a simple "rubber duckie" stick antenna should be suitable. If your path is longer you may need an external antenna. A higher gain antenna will require an adapter cable. All RF cables introduce signal loss. Plan carefully to minimize the length of this cable. Several lengths are available from Etesian. Lengths longer than 20 feet are not recommended. If your situation requires a longer cable please contact Etesian for recommendations for preamplifiers. If your system includes a Yagi aim the Yagi directly toward the sensor. The Yagi antenna elements should be in a horizontal orientation. If your system includes an external whip or stub antenna, align it horizontally if possible. Some experimentation in placement and orientation may be necessary.

Serial Data
The receiver includes a 9 pin RS-232 serial port. A standard straight cable will connect the receiver to a PC serial port. Most laptops that have serial ports will have a 9 pin D connector. Refer to Figure 3 below.

Figure 3 Receiver Connections and Controls

However, many modern laptops do NOT include serial ports. Etesian sells USB to serial adapter cables should your computer have USB ports instead.

USB Port
The USB port ONLY accommodates a USB flash memory device. Never insert a USB cable, or any other type of USB device. Doing so will damage the logger.

Wired Sensors (Optional – not included on all models)

The breeze logger can accommodate wired sensors as well as the Etesian's wireless sensor. Many types of sensor are compatible. Anemometers from NRG, Second Wind, RM Young, and Met One, among others are all compatible. AC generator based sensors connect directly to the pulse inputs as shown in Figure 4 below. Reed switch type sensors will require the addition of 4.7 Kohm pull-up resistor connected between the +3.3 V out terminal and the Pulse In + terminal.

Potentiometer based wind direction vanes are connected to the 3 direction screw terminals as shown in Figure 4 below.

Figure 4 Optional screw terminal connector back view

Output Signals

Display
The local LCD display will indicate the wind speed and the wind direction. The wind speed is shown on the top line of the display. When the unit is first turned on, the display will scroll the company banner. A looping arrow will display until the first sensor packet is transmitted. The first reading will indicate "???". After the unit has received two consecutive transmissions, which takes about 2 seconds, the display will indicate the proper wind speed, and will then update on 1second intervals.

Wind Trigger Relay (Optional)

Units with the optional wind trigger relay provide one set of normally open relay contacts rated at 28 volts and 1 amp maximum. These may be utilized for control or alarm functions. The relay has 3 settable parameters: Actuation wind speed, release wind speed and number of samples required for actuation. For example, setting the relay to actuate at 20 MPH, release at 17 MPH and to require 3 samples at those set points might be a typical setting. The release speed must always be less than the actuation speed, and the number of sample packets can be set from 1 to 60 samples.

Serial Port
A standard 9 pin serial connector enables logger management, data download, and real-time data display. All these features can be accomplished with a terminal session. Windows users would typically use Hyperterminal, Macintosh users typically the freeware Zterm. Set the terminal parameters to 9600 baud, 8 data bits, 1 stop bit and no parity.

If you type stream, the logger streams the real-time data. Here is a snippet:

$ stream
Press <Esc> to exit
2010/7/23,12:39:30,5,18.1 mph,-999
2010/7/23,12:39:30,5,19.7 mph,-999
2010/7/23,12:39:31,5,19.7 mph,-999
2010/7/23,12:39:32,5,19.5 mph,-999
2010/7/23,12:39:32,5,19.7 mph,-999

Moving Data to your PC

Data is preserved on a USB flash drive. On the averaging interval, you will see a bright LED situated just to the right of the LCD display light momentarily as data is being written to the flash drive. **Never remove the flash drive when the LED is lighted.** Doing so will corrupt the data file. For instance, f you are taking 10 minute averages, then the data will be written on the hour and at 10 minute intervals. Removing the drive from the logger at 10:05, for instance, would give you 5 minutes to copy the files to your computer and re-insert into the logger without loss of a data record.

Log Files

Wind data is saved to the USB flash drive as a text file of comma (,) separated data. Each day is concluded with an individual "day file." The day file is named with the day's date i.e. 20100824.DAT indicates that the file is the data recorded on August 24 2010.

File contents

Below is a snippet of data from a logger programmed to take one minute averages on a single wind speed sensor:

date	time	ws_14_n	ws_14_mean[mph]	ws_14_sd	ws_14_min	ws_14_max
8/11/10	17:54	4	7.7	0.5	6.9	8.1
8/11/10	17:55	87	7.7	0.5	6.8	8.1
8/11/10	17:56	88	7.8	0.5	6.8	8.1
8/11/10	17:57	88	7.7	0.5	6.8	8.1
8/11/10	17:58	88	7.8	0.5	6.8	8.1

Mostly the data is self-explanatory. The columns are as follows:

date: date of the data
time: beginning of the time interval of the average
ws_14_n: this is the number of samples taken during the averaging interval.
ws_14_mean[mph]: this is the mean wind speed based upon the number of samples taken during the interval
ws_14_sd: this is the standard deviation of the averaged data
ws_14_min: this is the minimum wind speed measured during the averaging interval
ws_14_max: this is the maximum wind speed measured during the averaging interval

The number 14 is the sensor ID. Each sensor has a unique sensor ID so that multiple sensors can be used with each logger. Each sensor sends its ID with every broadcast packet.

Appendix A

Help Commands and Configuration

Via the serial terminal connection at the prompt ($) type help and you will find a list of commands, each of which you can get individual help on.

$ help
$ help
Type 'help name' to get help on specific command.

add <ser#>
admin
alarm [on|off|monitor|reset|<thresh_hi_mph> <thresh_lo_mph> [<N>]]
baud [4800|9600]
cal [<ser#> anem [on|off|<slope> [<offset>]]|vane [on|off|<offset>]|analog [on|off|<slope> [<offset>]]]
cat <filename>
clock [set <year>/<month>/<date> <hour>:<minute>:<second>]
config [save]
delete <ser#>|all
echo [on|off]
format [raw|data|NMEA]
help [<name>]
interval [<minutes>]
logger [on|off]
ls
manch [<thresh>]
mount [flash|sd]
primary [<serial#>]
restore
stream
t
timeout [<seconds>]
units [mph|m/s|kts|kph]
$
Generally, the logger will come pre-configured for your particular requirements but can be modified for changes to the logging interval, number of system sensors, re-setting the clock etc.

Etesian Technologies Warrantee Statement

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