Calculating Wind Speed from an AAG V3 Weather Station

Wind speed from an AAG Weather Station is calculated by the following formula:

Wind Speed = CONSTANT*V_{rotor} (in revolutions per second)

To display in other units, apply the CONSTANT as follows:

Wind Speed Units	CONSTANT
METER_PER_SECOND	1.096
KMS_PER_HOUR	3.9477
MILES_PER_HOUR	2.453
KNOTS	2.130

Note that V_{rotor} is the actual rotor revolutions and, depending on your anemometer, that may be twice the actual counter value (AAG V3 units count twice per rev. Previous versions only count once). Adjust the revs/sec to accommodate the actual counter poll time (one minute poll time is 60 seconds for instance).

A good reference for the Weather Station is
http://www.sensorsmag.com/articles/0501/34/main.shtml

Some of the following information is extracted directly from that article.

Calculating Wind Direction from DS2450 Voltage outputs of an AAG V3 Weather Station

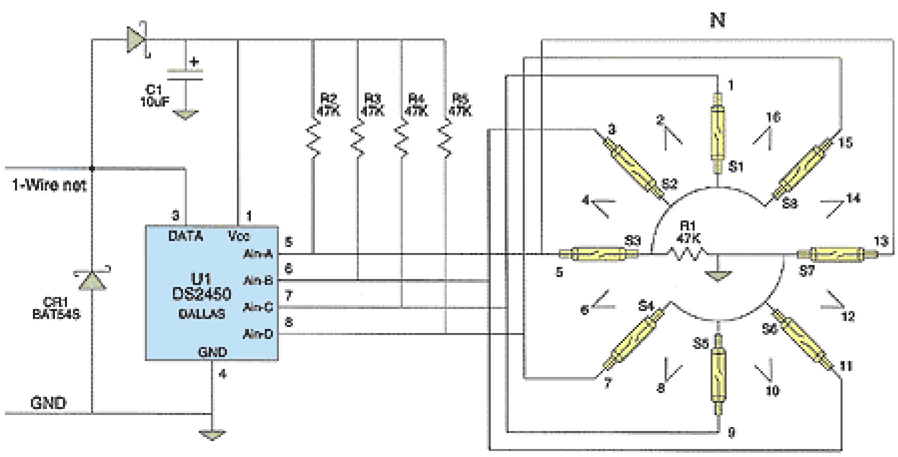

Figure 1 1-Wire Weather Station Schematic

As the wind rotates the wind vane, a magnet mounted on a rotor that tracks the rotation opens and closes one (or two) of the reed switches. When a reed switch closes, it changes the voltages seen on the input pins of U1, the DS2450. For example, if the magnet is in a position to close S1 (North), the voltage seen on pin 7 changes from V_{cc} to $^1/_2$ V_{cc}, or approximately 5–2.5 V. Since all 16 positions of the wind vane produce unique 4-bit signals from the ADC, it is an absolute indicator. There is accordingly no need to initialize the sensor or store a tagging code on the board as was required by the original 1-Wire™ weather station. It is necessary only to indicate North, or, equivalently, the direction the wind vane is pointing. Table 1 lists the voltages seen at the ADC inputs for all 16 cardinal points.

Because two reed switches are closed when the magnet is halfway between them, 16 compass points are indicated with just eight reed switches. Referring to the schematic and position 2 in Table 1, observe that when S1 and S2 are closed, 3.3 V is applied to ADC inputs A and B. The reason is that pull-up resistors R2 and R3 are placed in parallel and the pair is connected in series with R1 to form a voltage divider with 0.66 V_{cc} across R1. Notice that this also occurs twice more at switch positions 4 and 16.

TABLE 1

Wind Vane Position vs. Voltage

(seen on the four DS 2450 inputs)

POS.	D	C	B	A
1	5	2.5	5	5
2	5	3.3	3.3	5
3	5	5	2.5	5
4	5	5	3.3	3.3
5	5	5	5	2.5
6	0	5	5	2.5
7	0	5	5	5
8	0	0	5	5
9	5	0	5	5
10	5	0	0	5
11	5	5	0	5
12	5	5	0	0
13	5	5	5	0
14	2.5	5	5	0
15	2.5	5	5	5
16	3.3	3.3	5	5

Referencing Table 1, North is chosen to be whichever position number matches North. Then the rest of the 16 cardinal points are simply referenced to that. So, if North is position 3, then NNE would 4, NE would be 5, NEE would be 6, E would be 7, etc... Of course, this is complicated by the possibility that you have the sensor PCB mounted upside down (it happens!). In that case, the direction of rotation changes to the opposite.

So, modifying Table 1 to show the results if North was position 3 gives us Table 2.

TABLE 2

Wind Vane Position vs. Voltage

(seen on the four DS 2450 inputs)

POS.	D	C	B	A	Direction
1	5	2.5	5	5	NW
2	5	3.3	3.3	5	NNW
3	5	5	2.5	5	N
4	5	5	3.3	3.3	NNE

5	5	5	5	2.5	NE
6	0	5	5	2.5	ENE
7	0	5	5	5	E
8	0	0	5	5	ESE
9	5	0	5	5	SE
10	5	0	0	5	SSE
11	5	5	0	5	S
12	5	5	0	0	SSW
13	5	5	5	0	SW
14	2.5	5	5	0	WSW
15	2.5	5	5	5	W
16	3.3	3.3	5	5	WNW