

Davis D6410 anemometer configuration instructions

The Davis D6410 anemometer is because of its high impedance wind direction vane and powerless reed switched base wind speed sensor very suitable for low power wind monitoring. An ML-x15/17AD(S) data logger can sample the sensors with 1Hz and record averages, minimums, maximums, deviations and gust at a 2 minute, 10 minute or other interval. A 10 minute aggregation interval sampled at 1Hz will draw less than 60mWh energy per day. An ML-x15/17AD(S)-PV with integrated 1Wp solar panel provides multiple times the requested draw, leaving plenty energy to run indefinitely and to do hourly 2G/3G data transfers and connect other sensors as well. The average daily yield (battery stored energy) during the darkest season in Northern Europe is >400mWh.

ML-x15/17 D6410 wiring



Connector	Pin#	Name	D6410 Wire
X1	1	0..20mA, input 1	
	2	0..20mA, input 2	
	3	0..10V, input 3	
	4	0..10V, input 4	
	5,6	GND	Red wire (ground)
	7	0..100% Resistance, input 5	Green wire (direction wiper)
	8	Resistance reference terminal	Yellow wire (direction reference voltage)
	X3	1	Digital input 1 (0..5V)
2		Digital input 2 (0..5V)	
3		Digital input 3 (0..5V)	
4		GND	

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Wind speed

The wind speed sensor causes 'Digital Pulses' by reed switch closures, so it should be connected to one of the 'Digital inputs' of the data logger (e.g. input 1 in this example).

```
Configuration setup
[0] Exit
[1] General settings      >> YD0C6721BK
[2] Modem settings
[3] NTP time update     >> Used
[4] Alarm SMS           >> Not used
[5] SMS commands        >> Not used
[6] Internal sensors    >> Internal
[7] Analog sensors     >> Potmeter
[8] Digital sensors     >> Digital pulse
[9] Network signal sensor >> Not used
[A] Serial port         >> Not used
[B] Accessory port      >> Not used
[C] Derived channels    >> Used
[D] DTU connection     >> Not used
[E] Email output        >> Not used
[F] FTP output          >> Not used
[G] TCP output          >> TCP
[-] HTTP output         >> N/A
>
```

```
Digital pulse sensor
[0] Exit
[1] Name                 >> Digital pulse
[2] Sample interval     >> 00:00:01
[3] Port mode           >> Port 1; Internal pull up
[4] Register mode       >> Pulse (low frequency)
[5] Units per pulse     >> 0.001032
[6] Register value      >> 0 pulses
[7] Register reset      >> Off
[8] Log each counter change >> Off
[9] Counter (unit)      >> Not used
[A] Quantity (unit)     >> Not used
[B] Mean rate (unit/h)  >> Speed
[C] Max rate (unit/h)   >> Not used
[D] Min rate (unit/h)   >> Not used
[R] Remove
>
```

Wind is very fluctuating so set 'Sample interval' to 1 second (1Hz).

Set the 'Port mode' to 'Pull up'

Set 'Units per pulse' to 0.001032, as each reed switch closure of a D6410 refers to a wind displacement 0.001032 km and this will give us a 'Mean rate' in km/h (unit/h).

Select [B] to configure the 'Mean rate' parameter.

```

Parameter settings
[0] Exit
[1] Name          >> Speed
[2] Code         >> V
[3] Unit         >> m/s
[4] Value factor >> 0.277778
[5] Value offset >> 0
[6] Decimals    >> 3
[7] Data log    >> Off
[-] Data transpond >> Disabled
[-] Alarm SMS    >> Disabled
[A] Alarm log   >> Off
[B] Alarm output >> Off
[R] Remove
>
    
```

For identifying purpose every parameter should have some unique ‘Code’ we choose ‘V’ in this example. Wind speed is commonly expressed in m/s but as the ‘Mean Rate’ is sampled in km/h we apply a factor of $1000/3600 = 0.277778$ to convert to m/s.

If only interested in an average wind speed the ‘Mean rate’ will suffice, but if interested in standard deviation, gust and accurate minimum and maximum values you need to sample every second and aggregate the values over the period of interest (e.g. 10 minutes), See chapter Aggregations.

Wind direction

The wind direction sensor is a potentiometer where a value of 0% impedance between wiper and ground equals 0 degrees and a value of 100% equals about 360 degrees. The wind direction sensor is an ‘Analog sensor’ and should be connected to ‘Analog input 5’, the ‘Potentiometer’ input.

```

Configuration setup
[0] Exit
[1] General settings >> YD0Cb721BK
[2] Modem settings
[3] NTP time update >> Used
[4] Alarm SMS       >> Not used
[5] SMS commands   >> Not used
[6] Internal sensors >> Internal
[7] Analog sensors >> Potmeter
[8] Digital sensors >> Digital pulse
[9] Network signal sensor >> Not used
[A] Serial port     >> Not used
[B] Accessory port >> Not used
[C] Derived channels >> Used
[D] DTU connection >> Not used
[E] Email output    >> Not used
[F] FTP output      >> Not used
[G] TCP output      >> TCP
[-] HTTP output     >> N/A
>
    
```

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```
Analog sensor

[0] Exit
[1] Name >> Potmeter
[-] Sensor power switch >> N/A
[3] Sample interval >> 00:00:01
[-] Port mode >> Port 5; 0-3.3 V
[5] Parameter settings >> Direction
[6] Parameter value at 0 V >> 0 Deg
[7] Parameter value at 3.3 V >> 360 Deg
[8] Determine linear conversion function (2 calibration points)
[9] Determine linear offset only (1 calibration point)
[R] Remove
>
```

Wind is very fluctuating so set the 'Sample interval' to 1 second (1Hz).

Set the range of the sensor from 0 to 360 degrees.

Set the value at 0V (0%) to 0 degrees.

Set the value of 3.3V to 360 degrees.

Select [5] to configure the 'Direction' parameter.

```
Parameter settings

[0] Exit
[1] Name >> Direction
[2] Code >> D
[3] Unit >> Deg
[4] Value factor >> 1
[5] Value offset >> 180
[6] Decimals >> 3
[7] Data log >> Off
[-] Data transpond >> Disabled
[-] Alarm SMS >> Disabled
[A] Alarm log >> Off
[B] Alarm output >> Off
[R] Remove
>
```

For identifying purpose every parameter should have some unique 'Code' [2] we choose 'D' in this example.

If the vane mounting arm is not exactly North oriented you can add [5] an offset value (e.g. 180 for an orientation to the South).

Wind is very fluctuating and to be able to calculate an accurate average wind direction you have to sample every seconds and perform aggregations over the period of interest (e.g. 10 minutes), see chapter Aggregations.

Aggregations

The logger is equipped with 8 aggregation channels, where each channel has an aggregation buffer of 600 values. So a 10 minute aggregation period (600 seconds) can be sampled with 1Hz, longer aggregation periods e.g. 20 minutes can be sampled with 1Hz but will effectively be sampled every 2 seconds. As 1Hz is the highest possible aggregation sample rate, shorter aggregation periods will contain less samples (e.g. 120 samples for a 2 minute aggregation interval). An aggregation interval can be shorter or longer than a data log interval, so it's possible to record a 10 minute (rolling) average every 2 minutes. Or record the last 2 minute average every 10 minutes.

```
Configuration setup

[0] Exit
[1] General settings      >> YD0C6721BK
[2] Modem settings
[3] NTP time update      >> Used
[4] Alarm SMS            >> Not used
[5] SMS commands         >> Not used
[6] Internal sensors     >> Internal
[7] Analog sensors      >> Potmeter
[8] Digital sensors      >> Digital pulse
[9] Network signal sensor >> Not used
[A] Serial port          >> Not used
[B] Accessory port       >> Not used
[C] Derived channels     >> Used
[D] DTU connection      >> Not used
[E] Email output         >> Not used
[F] FTP output           >> Not used
[G] TCP output           >> TCP
[-] HTTP output          >> N/A
>
```

```
Derived channels

[0] Exit
[1] Aggregations >> Used
[2] Calculations >> Not used
```

To setup aggregation channels select [C] from the main 'Configuration setup' menu, followed by selecting [1] from the 'Derived channels' menu.

You have to define 2 aggregation channels one for wind speed and one for wind direction.

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```
Aggregation channel 1
[0] Exit
[1] Input parameter >> Direction (D)
[2] Aggregation period >> 00:10:00
[3] Vector aggregation >> On
[4] Average >> Average Direction
[5] Minimum >> Minimum Direction
[6] Maximum >> Maximum Direction
[7] Gust >> Not used
[8] Deviation >> Deviation Direction
[R] Remove
>
```

Per aggregation channel you have to choose which input/sensor values you want to use for aggregation (in the screen above we choose the wind direction sensor identified by the code 'D')

Choose an aggregation period, a commonly used wind speed aggregation period is 10 minutes.

As wind direction is a vector, please switch 'Vector Aggregation' to 'On', this will split up the samples in to an x and y components and combine them back to an aggregated vector. E.g. a northern wind flapping between 340 and 10 degrees will result in an average northern wind of 355 instead of a faulty 175 degrees southern wind.

Choose which aggregation results you want to record, being average, minimum, maximum, standard deviation and/or gust. A gust is the highest 3 sample average occurred in the aggregation period.