

Analyse de trames de la station météo

1 Analyse de l'échange

Voilà ci-dessous une capture d'écran d'un logiciel qui reçoit et affiche les trames



envoyées par la station météo, ces trames sont réceptionnées sur la liaison série RS232.

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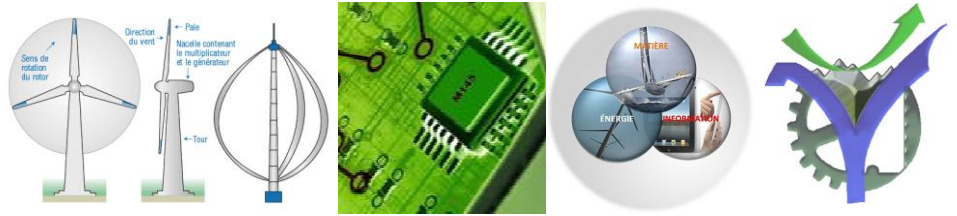
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
8: FF FF 06 00 51 01 53 06<OK>
6: 42 31 00 00 06 28<TimeOut>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
5: FF FF 0E 15 21<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 06 00 97 00 00 00 00 14 A9<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
5: FF FF 0E 16 22<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
5: FF FF 0E 17 23<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
5: FF FF 00 00 97<OK>
6: 00 00 00 00 14 A9<TimeOut>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
5: FF FF 00 00 97<OK>
6: 00 00 00 00 14 A9<TimeOut>
5: FF FF 0E 18 24<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
4: FF FF 00 00<OK>
7: 97 00 00 00 00 00 14 A9<TimeOut>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
5: FF FF 0E 19 25<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
9: FF FF 03 01 44 01 45 02 8E<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
5: FF FF 0E 20 2C<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
    
```

Trame n°1

$0 \times 8 + 0 \times 4 + 0 \times 2 + 0 \times 1 = 0$	0000
$0 \times 8 + 0 \times 4 + 0 \times 2 + 1 \times 1 = 1$	0001
$0 \times 8 + 0 \times 4 + 1 \times 2 + 0 \times 1 = 2$	0010
$0 \times 8 + 0 \times 4 + 1 \times 2 + 1 \times 1 = 3$	0011
$0 \times 8 + 1 \times 4 + 0 \times 2 + 0 \times 1 = 4$	0100
$0 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1 = 5$	0101
$0 \times 8 + 1 \times 4 + 1 \times 2 + 0 \times 1 = 6$	0110
$0 \times 8 + 1 \times 4 + 1 \times 2 + 1 \times 1 = 7$	0111
$1 \times 8 + 0 \times 4 + 0 \times 2 + 0 \times 1 = 8$	1000
$1 \times 8 + 0 \times 4 + 0 \times 2 + 1 \times 1 = 9$	1001

Trame n°2

Donner le nombre de trames défectueuses.



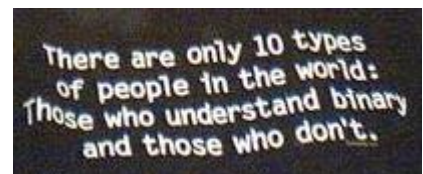
Nous rappelons ci-dessous la signification des trois premiers octets d'une trame :

Data		Data Type								
		Wind	Rain	TH	Mushroom	T	BTH	Minute	Clock	EXTBTH
Header 1	Bit 0	1	1	1	1	1	1	1	1	1
	Bit 1	1	1	1	1	1	1	1	1	1
	Bit 2	1	1	1	1	1	1	1	1	1
	Bit 3	1	1	1	1	1	1	1	1	1
	Bit 4	1	1	1	1	1	1	1	1	1
	Bit 5	1	1	1	1	1	1	1	1	1
	Bit 6	1	1	1	1	1	1	1	1	1
	Bit 7	1	1	1	1	1	1	1	1	1
Header 2	Bit 0	1	1	1	1	1	1	1	1	1
	Bit 1	1	1	1	1	1	1	1	1	1
	Bit 2	1	1	1	1	1	1	1	1	1
	Bit 3	1	1	1	1	1	1	1	1	1
	Bit 4	1	1	1	1	1	1	1	1	1
	Bit 5	1	1	1	1	1	1	1	1	1
	Bit 6	1	1	1	1	1	1	1	1	1
	Bit 7	1	1	1	1	1	1	1	1	1
3rd Byte (Device type)	Bit 0	0000000	00000001	00000010	00000011	00000100	00000101	00001110	00001111	00000110
	Bit 1	wind	rain	thermo hygro	mushroom	thermo only	thermo hygrobaro	Minute	Clock	thermo hygrobaro
	Bit 2									
	Bit 3									
	Bit 4									
	Bit 5									
	Bit 6									
	Bit 7									

2 Déterminer :

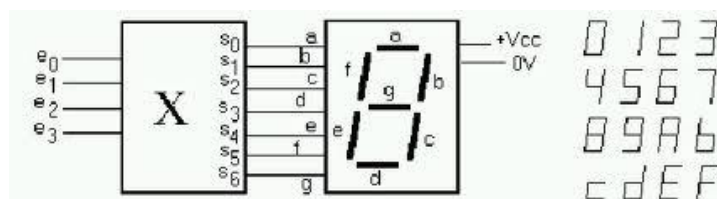
- Q1 : Le nombre de capteurs différents connectés à la station.
- Q2 : Les mesures réalisées.
- Q3 : Combien de minutes se sont écoulées pendant cet enregistrement ?

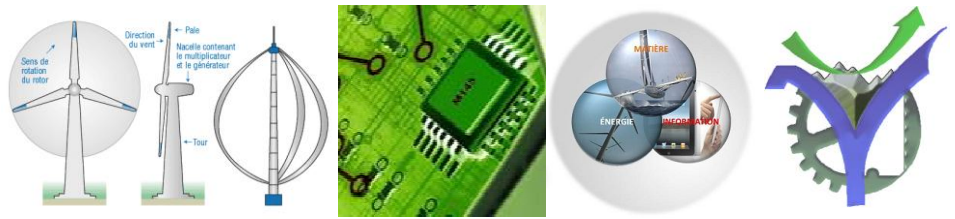
3 Analyser les deux trames repérées



A l'aide du document ressource [WMR928Protocol.pdf](#)

- Analyser deux trames différentes.





Q4 : Première trame grille d'analyse :

octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$
7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0	

octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$
7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0	

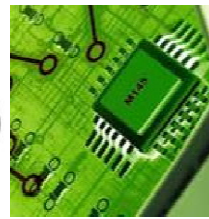
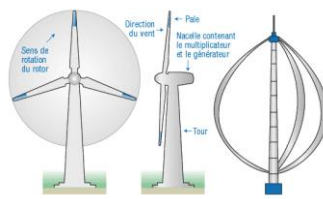
octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$
7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0	

octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$
7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0	

octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$
7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0		7 6 5 4 3 2 1 0	

Conclusion :

Qu'est-ce qu'un checksum ?
Qu'est-ce qu'un time out ?



Q5 : Deuxième trame grille d'analyse :

octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$

7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
-----------------	-----------------	-----------------	-----------------

octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$

7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
-----------------	-----------------	-----------------	-----------------

octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$

7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
-----------------	-----------------	-----------------	-----------------

octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$ octet n° valeur : \$

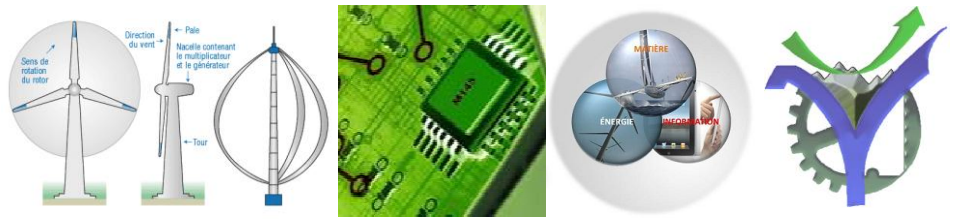
7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
-----------------	-----------------	-----------------	-----------------

octet n° valeur : \$ octet n° valeur : \$ octet n°

7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4
-----------------	-----------------	---------

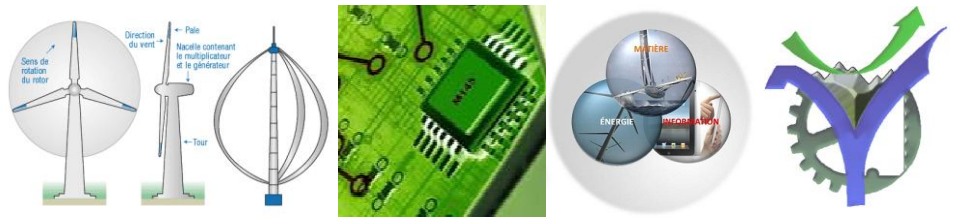
Prefixes for multiples of bits (b) or bytes (B)				
Decimal			Binary	
Value	Metric		Value	JEDEC IEC
1000	k kilo		1024	K kilo Ki kibi
1000 ²	M mega		1024 ²	M mega Mi mebi
1000 ³	G giga		1024 ³	G giga Gi gibi
1000 ⁴	T tera		1024 ⁴	Ti tebi
1000 ⁵	P peta		1024 ⁵	Pi pebi
1000 ⁶	E exa		1024 ⁶	Ei exbi
1000 ⁷	Z zetta		1024 ⁷	Zi zebi
1000 ⁸	Y yotta		1024 ⁸	Yi yobi

Conclusion :



Trame complète capteur HygroBaro

Data		EXTBTH	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Header 1	Bit 0	1								
	Bit 1	1								
	Bit 2	1								
	Bit 3	1								
	Bit 4	1								
	Bit 5	1								
	Bit 6	1								
	Bit 7	1								
Header 2	Bit 0	1								
	Bit 1	1								
	Bit 2	1								
	Bit 3	1								
	Bit 4	1								
	Bit 5	1								
	Bit 6	1								
	Bit 7	1								
3rd Byte (Device type)	Bit 0	00000110 thermo hygrobaro								
	Bit 1									
	Bit 2									
	Bit 3									
	Bit 4									
	Bit 5									
	Bit 6									
	Bit 7									
4th Byte										
5thByte	Bit 0									
	Bit 1	Temp0.1°Cdigit								
	Bit 2									
	Bit 3									
	Bit 4	Temp1°Cdigit								
	Bit 5									
	Bit 6									
	Bit 7									
6thByte	Bit 0									
	Bit 1	Temp10°Cdigit								
	Bit 2									
	Bit 3									
	Bit 4	Temp100°C								
	Bit 5	Over/Under								
	Bit 6	Sign								
	Bit 7									
7thByte	Bit 0									
	Bit 1	Hum1% digit								
	Bit 2									
	Bit 3									
	Bit 4	Hum10% digit								
	Bit 5									
	Bit 6									
	Bit 7									
8thByte	Bit 0									
	Bit 1	DewTemp1°Cdigit								
	Bit 2									
	Bit 3									
	Bit 4									
	Bit 5	DewTemp10°Cdigit								
	Bit 6									
	Bit 7									
9thByte										
10thByte	Bit 0	ADCbit9								
	Bit 1									
	Bit 2	--								
	Bit 3									
	Bit 4	WeatherStatus								
	Bit 5									
	Bit 6									
	Bit 7									
11thByte	Bit 0									
	Bit 1	--								
	Bit 2									
	Bit 3									
	Bit 4	Sea level offset0.1 digitmb								
	Bit 5									
	Bit 6									
	Bit 7									
12thByte	Bit 0	Sea level offset1 digitmb								
	Bit 1									
	Bit 2									
	Bit 3									
	Bit 4	Sea level offset10 digitmb								
	Bit 5									
	Bit 6									
	Bit 7									
13thByte	Bit 0	Sea level offset100 digitmb								
	Bit 1									
	Bit 2									
	Bit 3									
	Bit 4									
	Bit 5	Sea level offset1000 digitmb								
	Bit 6									
	Bit 7									



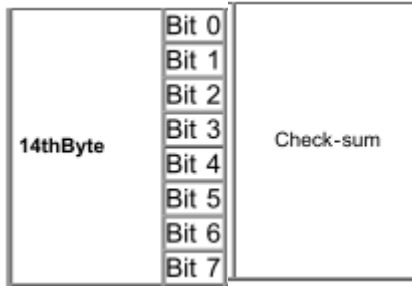
Weather Status :

1100-sunny
 0110-half cloudy
 0010-cloudy
 0011-rainny

under:
 1=under range
 0=normal

Batt.Low :
 1=low battery of main unit

Sign:
 0=positive
 1-negative



Channel :

0001- Channel 1
 0010- Channel 2
 0100- Channel 3

over/under :
 1=over /under
 0=normal
 * to identify over/under
 check also the sign of data

ADC baro reading :
 range 0 to FF (hex)

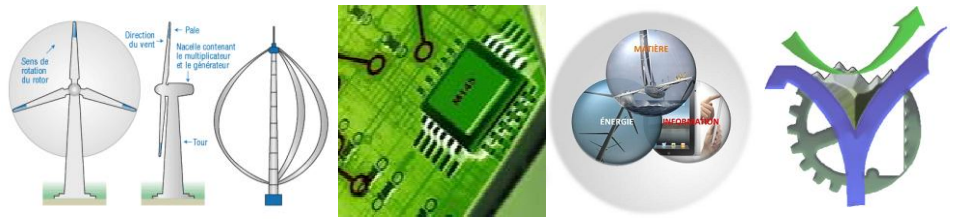
over:
 1=over range
 0=normal

Low batt. :
 1=low battery

ADC0 & ADCbit9
 range : 0 to 1FF (Hex)
 where ADC0 is the LSB
 ADCbit9 is the MSbit

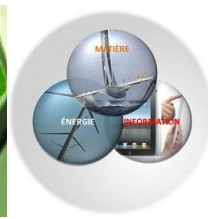
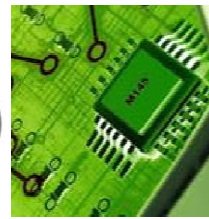
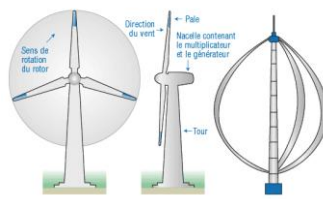
Note :

- For Device 5 (BTH), the barometric pressure reading = ADC baro reading (converted from HEX to BCD) + 795mb
 For Device 6 (EXTBTH), the barometric pressure reading = ADC reading (converted from 9 bit HEX to BCD) + 600mb
- For Device 5 (BTH), the Sea level offset of 1000mb digit is not send out. If the Sea level offset pressure is less than 400.0mb, then it means the Sea level offset is (1000mb + offset). However, if the offset is larger or equal to 400.0mb, then (0mb + Offset)
 The above will only applied to device 5. There is NO NEED TO ADJUST FOR DEVICE 6 (EXTBTH)
- Sea level pressure reading = ADC baro reading (converted from HEX to BCD) + Sea level offset
- Total start date = The date that total rainfall started to count.
- The total rainfall that send is added by 0.5mm, please minus 0.5mm before display.
- Check sum = the lower byte of the sum of the data send (include header)



Trame du capteur Mushroom

Data		Data Type
Header 1	Bit 0	1
	Bit 1	1
	Bit 2	1
	Bit 3	1
	Bit 4	1
	Bit 5	1
	Bit 6	1
	Bit 7	1
Header 2	Bit 0	1
	Bit 1	1
	Bit 2	1
	Bit 3	1
	Bit 4	1
	Bit 5	1
	Bit 6	1
	Bit 7	1
3rd Byte (Device type)	Bit 0	0000011 mushroom
	Bit 1	
	Bit 2	
	Bit 3	
	Bit 4	
	Bit 5	
	Bit 6	
	Bit 7	
Bit 0		
Bit 1		
4th Byte	Bit 0	--
	Bit 1	--
	Bit 2	--
	Bit 3	--
	Bit 4	Dew under
	Bit 5	--
	Bit 6	Low batt.
	Bit 7	--
5thByte	Bit 0	
	Bit 1	Temp0.1°Cdigit
	Bit 2	
	Bit 3	
	Bit 4	
	Bit 5	Temp1°Cdigit
	Bit 6	
	Bit 7	
6thByte	Bit 0	
	Bit 1	Temp10°Cdigit
	Bit 2	
	Bit 3	
	Bit 4	Temp100°C
	Bit 5	
	Bit 6	Over/Under
	Bit 7	Sign
7thByte	Bit 0	
	Bit 1	Hum1% digit
	Bit 2	
	Bit 3	
	Bit 4	
	Bit 5	Hum10% digit
	Bit 6	
	Bit 7	
8thByte	Bit 0	
	Bit 1	DewTemp1°Cdigit
	Bit 2	
	Bit 3	
	Bit 4	
	Bit 5	DewTemp10°Cdigit
	Bit 6	
	Bit 7	
9thByte	Bit 0	
	Bit 1	
	Bit 2	
	Bit 3	
	Bit 4	Check-sum
	Bit 5	
	Bit 6	
	Bit 7	



Exercice analyse de la trame '0E' :

```

11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
14: FF FF 06 00 51 01 53 06 42 31 00 00 06 28<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
5: FF FF 0E 16 22<OK>
11: FF FF 00 00 97 00 00 00 00 14 A9<OK>
    
```

Q6 : Compléter le tableau d'analyse ci-dessous :

octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$	octet n°	valeur : \$
7		7		7		7	
6		6		6		6	
5		5		5		5	
4		4		4		4	
3		3		3		3	
2		2		2		2	
1		1		1		1	
0		0		0		0	

octet n°	valeur : \$
7	
6	
5	
4	
3	
2	
1	
0	

Q7 : Interpréter les résultats avec la documentation jointe ci-après donner la signification de chaque octet :

Data		Minute	
Header 1	Bit 0	1	
	Bit 1	1	
	Bit 2	1	
	Bit 3	1	
	Bit 4	1	
	Bit 5	1	
	Bit 6	1	
	Bit 7	1	
Header 2	Bit 0	1	
	Bit 1	1	
	Bit 2	1	
	Bit 3	1	
	Bit 4	1	
	Bit 5	1	
	Bit 6	1	
	Bit 7	1	
3rd Byte (Device type)	Bit 0	00001110	
	Bit 1	Minute	
	Bit 2		
	Bit 3		
	Bit 4		
	Bit 5		
	Bit 6		
	Bit 7		
4th Byte	Bit 2		
	Bit 3		
	Bit 4	Date10 digit minute	
	Bit 5		
	Bit 6		
	Bit 7	Batt. Low	
	5thByte	Bit 0	
		Bit 1	
Bit 2			
Bit 3		Check-sum	
Bit 4			
Bit 5			
Bit 6			
Bit 7			
Date1 digit minute	Bit 0		
	Bit 1		

Bilan :