Weather station memory map

Source: This information was copied directly from Jim Easterbrooks website, http://www.jim-easterbrook.me.uk/weather/mm/ as a precaution, in case it should ever be taken down. I have contributed nothing to this, and can only acknowledge the work of all the people who have.

Cautionary note: this is not official information from any manufacturer. It has been compiled from various sources, including careful "reverse engineering" of data from a small number of users' weather stations. Use at your own risk.

An essential precursor to writing software for the Fine offset weather stations (WH1080, WH1081, W-8681, WH3080, WH3081 etc.) was to decode the data read from them. This was discussed in Michael Pendec's weather station forum a few years ago. Michael had decoded the current and stored data, and Dave Wells contributed an almost complete map of the remaining data. That forum message has since been deleted (Michael had a spam problem, and wiping everything was his only option) so I've reproduced the info here, with a few additions of my own. Credit is also due to Steve from Sandaysoft for decoding the strange wind speed layout and to Chris Naunton for decoding the extra data stored by the '3080' family of stations.

Note that there are gaps and overlaps in the memory layout, with different models using the same locations for different data. Writing software that works with all the different models (and different generations of firmware) can be tricky!

Data is read from the weather station, via USB, in 32-byte chunks. Each chunk has an address, in the range 0 to 65504, so it is convenient to describe the data as a memory map with an address range of 0 to 65535.

The first 256 bytes of the memory map is a "fixed" block, containing data such as maximum and minimum temperature records and alarm settings. The remaining data is an array of 4080 16-byte records (or 3264 20-byte records), which store the weather history.

Note that there are some pecularities about the data formats. Signed numbers use the most significant bit to indicate sign, so -1 would be represented in binary as 1000 0001 (signed byte) or 1000 0000 0000 0001 (signed short). Date-time values are stored as year (last two digits), month, day, hour and minute in binary coded decimal, two digits per byte.

Weather record layout

The weather station's history is stored in 4080 16-byte records (3264 20-byte records in the 3080), each of which has the following layout.

Address	Bytes	Item	Format	Comments
0	1	delay	unsigned byte	Minutes since last stored reading.
1	1	indoor humidity	unsigned byte	
2	2	indoor temperature	signed short	Multiply by 0.1 to get °C.
4	1	outdoor humidity	unsigned byte	
5	2	outdoor temperature	signed short	Multiply by 0.1 to get °C.
7	2	absolute pressure	unsigned short	Multiply by 0.1 to get hPa.
9	1	average wind speed, low bits	unsigned byte	Multiply by 0.1 to get m/s.
10	1	gust wind speed,	unsigned byte	Multiply by 0.1 to get m/s.

Address	Bytes	Item	Format	Comments
		low bits		
11	1	wind speed, high bits	unsigned byte	Lower 4 bits are the average wind speed high bits, upper 4 bits are the gust wind speed high bits.
12	1	wind direction	unsigned byte	Multiply by 22.5 to get ° from north.
13	2	total rain	unsigned short	Multiply by 0.3 to get mm.
15	1	status	bits	bit 6: 1 = loss of contact with sensors bit 7: 1 = rain counter overflow
16	3	(3080 only) illuminance	unsigned 3-byte integer	Multiply by 0.1 to get lux.
19	1	(3080 only) UV	unsigned byte	

Fixed block layout

Other weather station data is stored in a 256 byte "fixed block", which has the following layout.

Address	Bytes	Item	Format	Access	Comments
0	2	EEPROM initialised flag	raw	R/W	Should be 0x55AA.
2	2	(2080 only) model	unsigned short	R/W	Expected to be 0x8010 (i.e. big-endian 1080)
2	2	(3080 only) rain factor (?)	unsigned short	R	Divide by 8192
4	1	(2080 only) version	unsigned byte	R/W	Expected to be 0x20
4	2	(3080 only) wind factor (?)	unsigned short	R	Divide by 8192
5	2	(2080 only) ID	unsigned short	R/W	?
6	5	(3080 only) maximum, UV, when	date-time	R/W	
7	2	(2080 only) rain factor (?)	unsigned short	R/W	Divide by 8192
9	2	(2080 only) wind factor (?)	unsigned short	R/W	Divide by 8192
11	2	(2080 only) inverted rain factor (?)	unsigned short	R/W	Rain factor ^ 0xffff
11	5	(3080 only) maximum, illuminance, when	date-time	R/W	
13	2	(2080 only) inverted wind factor (?)	unsigned short	R/W	Wind factor ^ 0xffff
16	1	read period	unsigned	R/W	Minutes between each stored reading

Address	Bytes	Item	Format	Access	Comments
			byte		
17	1	unit settings 1	bits	R/W	bit 0: indoor temperature: 0 = °C, 1 = °F bit 1: outdoor temperature: 0 = °C, 1 = °F bit 2: rain: 0 = mm, 1 = inch bit 5: pressure: 1 = hPa bit 6: pressure: 1 = inHg bit 7: pressure: 1 = mmHg
18	1	unit settings 2	bits	R/W	bit 0: wind speed: 1 = m/s bit 1: wind speed: 1 = km/h bit 2: wind speed: 1 = knot bit 3: wind speed: 1 = m/h bit 4: wind speed: 1 = bft
19	1	display options 1	bits	R/W	bit 0: pressure: 0 = absolute, 1 = relative bit 1: wind speed: 0 = average, 1 = gust bit 2: time: 0 = 24 hour, 1 = 12 hour bit 3: date: 0 = day-month-year, 1 = month-day-year bit 4: time scale(?): 0 = 12 hour, 1 = 24 hour bit 5: date: 1 = show year year bit 6: date: 1 = show day name bit 7: date: 1 = alarm time
20	1	display options 2	bits	R/W	bit 0: outdoor temperature: 1 = temperature bit 1: outdoor temperature: 1 = wind chill bit 2: outdoor temperature: 1 = dew point bit 3: rain: 1 = hour bit 4: rain: 1 = day bit 5: rain: 1 = week bit 6: rain: 1 = month bit 7: rain: 1 = total
21	1	alarm enable 1	bits	R/W	bit 1: time bit 2: wind direction bit 4: indoor humidity low bit 5: indoor humidity high bit 6: outdoor humidity low bit 7: outdoor humidity high
22	1	alarm enable 2	bits	R/W	bit 0: wind average bit 1: wind gust bit 2: rain hourly bit 3: rain daily bit 4: absolute pressure low bit 5: absolute pressure high bit 6: relative pressure low bit 7: relative pressure high
23	1	alarm enable 3	bits	R/W	bit 0: indoor temperature low bit 1: indoor temperature high bit 2: outdoor temperature low bit 3: outdoor temperature high bit 4: wind chill low bit 5: wind chill high

Address	Bytes	Item	Format	Access	Comments
					bit 6: dew point low bit 7: dew point high
24	1	time zone	signed byte	R/W	Hours offset from Central European Time, so in the UK this should be set to -1. In stations without a radio controlled clock this is always zero.
25					
26	1	data refreshed	raw	R/W	Computer writes 0xAA to indicate a change of settings. Weather station clears value to acknowledge.
27	2	data count	unsigned short	R/W	Number of stored readings. Starts at one, rises to 4080 (3264 in the 3080).
29	1	(3080 only) display options 3	bits	R/W	bit 0: illuminance: 0 = lux, 1 = foot-candle bit 1: illuminance high alarm bit 2: UV high alarm bit 5: illuminance: 1 = W/m^2
30	2	current position	unsigned short	R/W	Address of the stored reading currently being created. Starts at 256, rises to 65520 in steps of 16 (or 65516 in steps of 20 in the 3080), then loops back to 256. The data at this address is updated every 48 seconds or so, until the read period is reached. Then the address is incremented and the next record becomes current.
32	2	relative pressure	unsigned short	R	Current relative (sea level) atmospheric pressure, multiply by 0.1 to get hPa.
34	2	absolute pressure	unsigned short	R	Current absolute atmospheric pressure, multiply by 0.1 to get hPa.
36	2	(3080 only) Lux to W/m^2 coefficient	unsigned short	R/W	Divide by 10.
38	2	(2080 only?) wind correction factor	unsigned short	R/W	Percent in range 75..125
40	2	(2080 only?) outdoor temperature offset	signed short	R/W	Multiply by 0.1 to get °C?
42	2	(2080 only?) indoor temperature offset	signed short	R/W	Multiply by 0.1 to get °C?
43	5	(1080 only?) current date & time	date-time	R	
44	2	(2080 only?) outdoor	signed short	R/W	Unknown units

Address	Bytes	Item	Format	Access	Comments
		humidity offset			
46	2	(2080 only?) indoor humidity offset	signed short	R/W	Unknown units
48	1	alarm, indoor humidity, high	unsigned byte	R/W	
49	1	alarm, indoor humidity, low	unsigned byte	R/W	
50	2	alarm, indoor temperature, high	signed short	R/W	Multiply by 0.1 to get °C.
52	2	alarm, indoor temperature, low	signed short	R/W	Multiply by 0.1 to get °C.
54	1	alarm, outdoor humidity, high	unsigned byte	R/W	
55	1	alarm, outdoor humidity, low	unsigned byte	R/W	
56	2	alarm, outdoor temperature, high	signed short	R/W	Multiply by 0.1 to get °C.
58	2	alarm, outdoor temperature, low	signed short	R/W	Multiply by 0.1 to get °C.
60	2	alarm, wind chill, high	signed short	R/W	Multiply by 0.1 to get °C.
62	2	alarm, wind chill, low	signed short	R/W	Multiply by 0.1 to get °C.
64	2	alarm, dew point, high	signed short	R/W	Multiply by 0.1 to get °C.
66	2	alarm, dew point, low	signed short	R/W	Multiply by 0.1 to get °C.
68	2	alarm, absolute pressure, high	unsigned short	R/W	Multiply by 0.1 to get hPa.
70	2	alarm, absolute pressure, low	unsigned short	R/W	Multiply by 0.1 to get hPa.
72	2	alarm, relative pressure, high	unsigned short	R/W	Multiply by 0.1 to get hPa.
74	2	alarm, relative pressure, low	unsigned short	R/W	Multiply by 0.1 to get hPa.
76	1	alarm, average wind speed, Beaufort	unsigned byte	R/W	
77	2	alarm, average wind speed, m/s	unsigned short	R/W	Multiply by 0.1 to get m/s.
79	1	alarm, gust	unsigned	R/W	

Address	Bytes	Item	Format	Access	Comments
		wind speed, Beaufort	byte		
80	2	alarm, gust wind speed, m/s	unsigned short	R/W	Multiply by 0.1 to get m/s.
82	1	alarm, wind direction	unsigned byte	R/W	Multiply by 22.5 to get ° from north.
83	2	alarm, rain, hourly	unsigned short	R/W	Multiply by 0.1 to get mm.
85	2	alarm, rain, daily	unsigned short	R/W	Multiply by 0.1 to get mm.
87	2	alarm, time	BCD	R/W	Hour & minute.
89	3	(3080 only) alarm, illuminance	unsigned 3-byte integer	R/W	Multiply by 0.1 to get lux or fc, according to setting at address 29 bit 0.
92	1	(3080 only) alarm, UV	unsigned byte	R/W	
93	1	(3080 only) maximum, UV, value	unsigned byte	R/W	
94	3	(3080 only) maximum, illuminance, value	unsigned 3-byte integer	R/W	Multiply by 0.1 to get lux.
97					
98	1	maximum, indoor humidity, value	unsigned byte	R/W	
99	1	minimum, indoor humidity, value	unsigned byte	R/W	
100	1	maximum, outdoor humidity, value	unsigned byte	R/W	
101	1	minimum, outdoor humidity, value	unsigned byte	R/W	
102	2	maximum, indoor temperature, value	signed short	R/W	Multiply by 0.1 to get °C.
104	2	minimum, indoor temperature, value	signed short	R/W	Multiply by 0.1 to get °C.
106	2	maximum, outdoor	signed short	R/W	Multiply by 0.1 to get °C.

Address	Bytes	Item	Format	Access	Comments
		temperature, value			
108	2	minimum, outdoor temperature, value	signed short	R/W	Multiply by 0.1 to get °C.
110	2	maximum, wind chill, value	signed short	R/W	Multiply by 0.1 to get °C.
112	2	minimum, wind chill, value	signed short	R/W	Multiply by 0.1 to get °C.
114	2	maximum, dew point, value	signed short	R/W	Multiply by 0.1 to get °C.
116	2	minimum, dew point, value	signed short	R/W	Multiply by 0.1 to get °C.
118	2	maximum, absolute pressure, value	unsigned short	R/W	Multiply by 0.1 to get hPa.
120	2	minimum, absolute pressure, value	unsigned short	R/W	Multiply by 0.1 to get hPa.
122	2	maximum, relative pressure, value	unsigned short	R/W	Multiply by 0.1 to get hPa.
124	2	minimum, relative pressure, value	unsigned short	R/W	Multiply by 0.1 to get hPa.
126	2	maximum, average wind speed, value	unsigned short	R/W	Multiply by 0.1 to get m/s.
128	2	maximum, gust wind speed, value	unsigned short	R/W	Multiply by 0.1 to get m/s.
130	2	maximum, rain hourly, value	unsigned short	R/W	Multiply by 0.1 to get mm.
132	2	maximum, rain daily, value	unsigned short	R/W	Multiply by 0.1 to get mm.
134	2	maximum, rain weekly, value	unsigned short	R/W	Multiply by 0.1 to get mm.
136	2	maximum, rain monthly, value	unsigned short	R/W	Multiply by 0.1 to get mm.
138	2	maximum, rain total, value	unsigned short	R/W	Multiply by 0.1 to get mm.
140	1	high nibble for month and total rainfall		R/W	high nibble - month rainfall, low nibble - total rainfall

Address	Bytes	Item	Format	Access	Comments
141	5	maximum, indoor humidity, when	date-time	R/W	
146	5	minimum, indoor humidity, when	date-time	R/W	
151	5	maximum, outdoor humidity, when	date-time	R/W	
156	5	minimum, outdoor humidity, when	date-time	R/W	
161	5	maximum, indoor temperature, when	date-time	R/W	
166	5	minimum, indoor temperature, when	date-time	R/W	
171	5	maximum, outdoor temperature, when	date-time	R/W	
176	5	minimum, outdoor temperature, when	date-time	R/W	
181	5	maximum, wind chill, when	date-time	R/W	
186	5	minimum, wind chill, when	date-time	R/W	
191	5	maximum, dew point, when	date-time	R/W	
196	5	minimum, dew point, when	date-time	R/W	
201	5	maximum, absolute pressure, when	date-time	R/W	
206	5	minimum, absolute pressure, when	date-time	R/W	
211	5	maximum, relative pressure, when	date-time	R/W	
216	5	minimum,	date-time	R/W	

Address	Bytes	Item	Format	Access	Comments
		relative pressure, when			
221	5	maximum, average wind speed, when	date-time	R/W	
226	5	maximum, gust wind speed, when	date-time	R/W	
231	5	maximum, rain hourly, when	date-time	R/W	
236	5	maximum, rain daily, when	date-time	R/W	
241	5	maximum, rain weekly, when	date-time	R/W	
246	5	maximum, rain monthly, when	date-time	R/W	
251	5	maximum, rain total, when	date-time	R/W	