Pinnacle UPD File Format

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INTRODUCTION

The UPD (Universal Pinnacle Data) file format is a binary, tag driven format designed to meet the goals of current and future data storage for Pinnacle Technologies. Data in UPD files is stored in blocks which are generally 1K in size, but block size is not restricted by the format. The files are written in IEEE little-endian format. Each block begins with a Block Header section followed by one or more Value Pairs.

Block Header

Name	Bytes	Description
BlockSize	4	Size of this block in bytes (including these four)
ValuePairs	2	Number of Value Pairs in this block

Value Pair

Name	Bytes	Description
ByteSize	4	Total size in bytes of the data in this Value Pair (not including these 4 or the 2 bytes for the Data Type)
DataType	2	Code for the data type of this Value Pair. See UPD VALUE PAIR TAGS for a listing of codes.
Data	Determined by DataType	Value Pair data. Number of data points in the value pair must equal ByteSize divided by the bytes/data point for this DataType.

In a typical file, each block begins with a time value described by Value Pair Tags 1-8. Time is always stored as UTC. The first block usually contains tags 9 and 10 to describe the Timezone and Timezone Type (DST rules) for the file. The Timezone, which is an offset from UTC to local standard time, can be found from table. The Timezone Type is an index into the table “DST Types” which describes the start and end of DST. Both the start and end time are given in the local standard time.; The time zone name is determined by matching the offset in hours (tag 9) and the Timezone Type (tag 10) in the table.

UPD VALUE PAIR TAGS

The UPD Value Pair tags are listed below. The table below lists the commands with their command number or command code (in both decimal and hexadecimal), size in bytes, command name and a brief description. If the size in bytes is N/A, the byte size of the Value Pair is used to read the correct number of bytes from the file.

UPD VALUE PAIR TAGS

Code (decimal)	Code (HEX)	Bytes	Name	Description & Multiplier
1	01H	1	Year	Add 2000 to get year
2	02H	1	Month	
3	03H	1	Day Of Week	
4	04H	1	Day	
5	05H	1	Hour	
6	06H	1	Minute	
7	07H	1	Second	
8	08H	1	Millisec	Multiply value by 10 to get milliseconds
9	09H	1	Timezone	Offset from UTC (hrs) = (timezone - 48)/4
10	0AH	1	Timezone Type	See “DST Types”
11	0BH	1	Data Flash ID	Type of Flash Memory (HEX)
12	0CH	1	Status Bits	Tool Diagnostics
13	0DH	1	Poll Rate	Polling Rate in Seconds
14	0EH	2	Serial Number	Serial number of this tool
15	0FH	1	Software Version	Software version of the code in the tool
16	10H	1	2.5V supply reading (ver 1)	Multiply by 0.01296875 to get 2.5V supply output
17	11H	1	3.3V supply reading (ver 1)	Multiply by 0.0171211 to get 3.3V supply output
18	12H	1	5V supply reading (ver 1)	Multiply by 0.0259375 to get 5V supply output
19	13H	1	5V High Current reading (ver 1)	Multiply by 0.0259375 to get Motor power supply output
20	14H	1	12V supply reading (ver 1)	Multiply by 0.0622578 to get 12V supply output
21	15H	1	Raw Voltage reading (ver 1)	Raw voltage coming into the tool
22	16H	1	Temperature	Valid from -65C to 190C. Values > 190, subtract 256
23	17H	2	Cross Channel Calibration	Defined as uR/V on gain 1
24	18H	2	Long Channel Calibration	Defined as uR/V on gain 1
25	19H	N/A	Location	ASCII String of Tool Name
26	1AH	2	X Accelerometer Reading (ver 1)	Multiply by 0.00244379 to get accelerometer output in volts

27	1BH	2	Y Accelerometer Reading (ver 1)	Multiply by 0.00244379 to get accelerometer output in volts
28	1CH	2	Z Accelerometer Reading (ver 1)	Multiply by 0.00244379 to get accelerometer output in volts
29	1DH	1	Cross Channel Rezero	Indicates a rezero occurred at the end of this block
30	1EH	1	Long Channel Rezero	Indicates a rezero occurred at the end of this block
31	1FH	4	Sequence Number	CURRENTLY NOT USED
32	20H	2	Pressure	CURRENTLY NOT USED
33	21H	1	Gain	Divide calibration by the gain to get uR/V
34	22H	2	Compass	In degrees
35	23H	2	Tool Memory Block Number	CURRENTLY NOT USED
36	24H	1	Data Type	1 = 16 bit Tilt, 2 = Press/Temp, 3 = Accel, 4 = Tilt + Accel, 5 = 24 bit tilt
37	25H	1	Bad Data	Data point indices where checksum failed (zero based)
38	26H	1	Skip Data	Data point indices where polling was skipped (zero based)
39	27H	2	X Accelerometer Calibration	Conversion from V to uR for X accelerometer
40	28H	2	Y Accelerometer Calibration	Conversion from V to uR for Y accelerometer
41	29H	2	Z Accelerometer Calibration	Conversion from V to uR for Z accelerometer
42	2AH	1	2.5V Supply reading (ver 2)	Version 2 - 2.5 v (mult by 0.0098039)
43	2BH	1	3.3V Supply reading (ver 2)	Version 2 - 3.3 v (mult by 0.019608)
44	2CH	1	5V Supply reading (ver 2)	Version 2 - 5.0 v (mult by 0.029412)
45	2DH	1	5V High Current reading (ver 2)	Version 2 - 5.H v (mult by 0.029412)
46	2EH	1	12V Supply reading (ver 2)	Version 2 - 12 v (mult by 0.06886)
47	2FH	1	Raw Voltage (ver 2)	Version 2 - Raw v (mult by 0.019477)
48	30H	1	Temperature (ver 2)	Version 2 - Temperature (mult by 0.98039216 for C)
49	31H	2	X Accelerometer Reading (ver 2)	Version 2 - X Accel
50	32H	2	Y Accelerometer Reading (ver 2)	Version 2 - Y Accel
51	33H	2	Z Accelerometer Reading (ver 2)	Version 2 - Z Accel
52	34H	N/A	Tool Code Version	Tool code version (ASCII String)
53	35H	N/A	TiltTalk2 Version	TiltTalk2 version (ASCII String)
54	36H	N/A	Computer Name	Name of computer collecting the data (ASCII String)
256	100H	2	2 Byte Tilt Data	2 bytes for each of cross and long for each point. Multiply by 3.814755474e-5 to get volts.

257	101H	2	Fluid Pressure/Temperature Data	
258	102H	2	High Rate Accelerometer Data	2 bytes for each of x, y and z for each point. Multiply by .00244379 to get volts.
259	103H	2	Accelerometer and Tilt Data	2 bytes each of cross, long bubble, then x,y,z accel for each point.
260	104H	3	3 Byte Tilt Data	3 bytes for each of cross and long for each point. Multiply by 1.49011612e-7 to get volts.

TIME ZONES

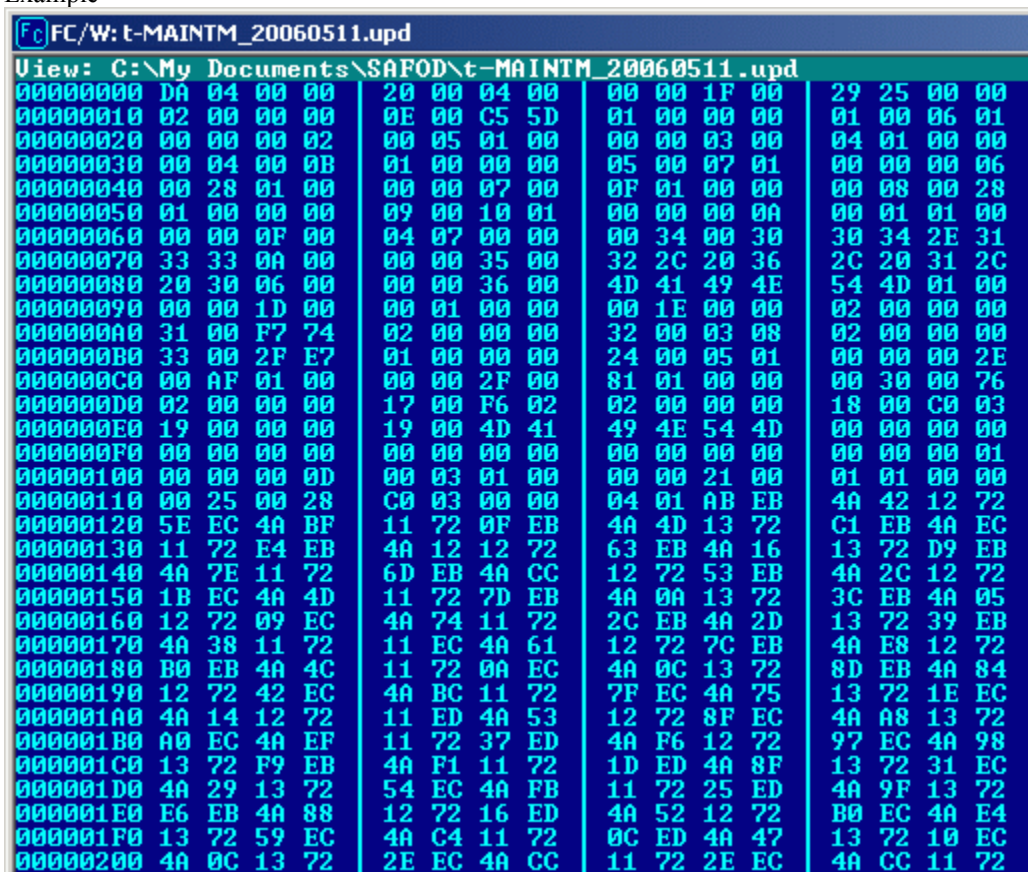
Name	Offset	DST Rule
Marshall Islands	-12	0
Samoa	-11	0
Hawaii	-10	0
Alaska	-9	1
US(Pacific)	-8	1
Arizona	-7	0
US(Mountain)	-7	1
Saskatchewan/Central America	-6	0
US(Central)	-6	1
Indiana/Columbia/Peru	-5	0
US(East)	-5	1
Atlantic	-4	1
Newfoundland	-3.5	1
Argentina	-3	1
Greenland	-3	1
Brazil	-3	2
Mid-Atlantic	-2	3
Azores	-1	4
UTC	0	0
UK/Ireland	0	4
West Central Africa	1	0
West & Central Europe	1	4
South Africa/Isreal	2	0
Romania	2	3
Eastern Europe	2	4
Egypt	2	5
Kuwait & Saudi Arabia	3	0
Western Russia (Moscow)	3	4
Iraq	3	6
Iran	3.5	7
UAE/Oman/Khazakhstan(West)	4	0
Armenia/Georgia/Azerbaijan	4	4
Afghanistan	4.5	0
Pakistan/Uzbekistan/Khazakhstan(Central)	5	0
Urals	5	4
India	5.5	0
Nepal	5.75	0
Khazakhstan(East)/Bangladesh/Sri Lanka	6	0
Burma	6.5	0
Thailand/Vietnam/Indonesia	7	0
Russia/Central	7	4
China/Taiwan/Malaysia/Australia(West)	8	0
Eastern Siberia/Mongolia	8	4
Japan	9	0
Russia/East	9	4
Australia(Northern Territory)	9.5	0
South Australia	9.5	8
Australia(Queensland)	10	0
Australia(East)	10	8
Solomon Islands	11	0
Fiji/Marshall Islands	12	0
New Zealand	12	9
Tonga	13	0

DST RULES

Rule Number	Start Month	Start Day	Nth Day*	Hour	End Month	End Day	Nth Day	Hour
0	0	0	0	0	0	0	0	0
1	April	Sunday	1	2	October	Sunday	5	1
2	October	Sunday	3	0	February	Sunday	3	0
3	March	Sunday	5	0	September	Sunday	5	0
4	March	Sunday	5	2	October	Sunday	5	1
5	April	Sunday	5	0	September	Sunday	5	0
6	April	Sunday	1	3	October	Sunday	1	2
7	March	Tuesday	3	3	September	Thursday	3	2
8	October	Sunday	5	2	March	Sunday	1	2
9	October	Sunday	1	2	March	Sunday	3	1

- Nth day indicates which Start Day in the Start Month or End Day of the End Month has the transition. For instance, for Rule 2 (Brasil), DST starts on the 3rd Sunday in October. Five indicates the last Start Day (eg. Last Sunday) of that month.

Example



Offset	Val [hex] *)	Description [dezimal]
0000	00 00 04 DA	Blocksize = 1242 bytes
0004	00 20	32 Value Pairs
0006	00 00 00 04	ValuePair #1 Size = 4
000A	00 1F	Data Type 31 (Sequence Number)
000C	00 00 25 29	Data
0010	00 00 00 02	Value Pair #2 Size = 2
0014	00 0E	Data Type 14 (Serial Number)
0016	5D C5	Data (Value = 24005)
0018	00 00 00 01	Value Pair #3 Size=1
001C	00 01	Data Type 1 (Year)
001E	06	Year 2006
001F	00 00 00 01	Value Pair #4 Size=1
0023	00 02	Data Type 2 (Month)
0025	05	Month 5 (May)
0026	00 00 00 01	Value Pair #5 Size=1
002A	00 03	Data Type 3 (Day of Week)
002C	04	Thursday
002D	00 00 00 01	Value Pair #6, Size=1
0031	00 04	Data Type 4 (Day)
0033	00 0B	11
0034	00 00 00 01	Value Pair #7, Size=1
0038	00 05	Data Type 5 (Hour)
003A	07	7
003B	00 00 00 01	Value Pair #8, Size=1
003F	00 06	Data Type 6 (Minute)
0041	28	40
0042	00 00 00 01	Value Pair #9, Size=1

0046	00 07	Data Type 7 (Seconds)
0048	0F	15
0049	00 00 00 01	Value Pair #10, Size=1
004D	00 08	Data Type 8 (Millisecs)
004F	28	40 (400 msec)
0050	00 00 00 01	Value Pair #11, Size=1
0054	00 09	Data Type 9 (Timezone)
0056	10	16 (offset=-8h)
0057	00 00 00 01	Value Pair #12, Size=1
005B	00 0A	Data Type 10 (Timezone Type)
005D	01	Timezone Type=1
005E	00 00 00 01	Value Pair#13, Size=1
0062	00 0F	Data Type 15 (Software Version)
0064	04	Major Version = 4
0065	00 00 00 07	Value Pair #14, Size=7
0069	00 34	Data Type 52 (Tool Code Version)
006B		“004.133”
0072	00 00 00 0A	Value Pair #15, Size=10
0076	00 35	Data Type 53 (TiltTalk Version)
0078		“2, 6, 1, 0”
0082	00 00 00 06	Value Pair #16, Size=6
0086	00 36	Data Type 54 (Computer Name)
0088		“MAINTM”
008E	00 00 00 01	Value Pair #17, Size=1
0092	00 1D	Data Type 29 (Cross Channel Rezero)
0094	00	0: No cross rezero
0095	00 00 00 01	Value Pair #18, Size=1
0099	00 1E	Data Type 30 (Long Channel Rezero)
009B	00	0: No long rezero
009C	00 00 00 02	Value Pair#19, Size=2
00A0	00 31	Data Type 49 (X Accel)
00A2	74 F7	X-Accel: 0x74F7
00A4	00 00 00 02	Value Pair#20, Size=2
00A8	00 32	Data Type 50 (Y Accel)
00AA	08 03	Y-Accel: 0x0803
00AC	00 00 00 02	Value Pair#21, Size=2
00B0	00 33	Data Type 51 (Z Accel)
00B2	E7 2F	Y-Accel: 0xE72F
00B4	00 00 00 01	Value Pair#22, Size=1
00B8	00 24	Data Type 36 (Data Type)
00BA	05	5: 24bit Tilt
00BB	00 00 00 01	Value Pair #23, Size=1
00BF	00 2E	Data Type 46 (12V Supply)
00C1	AF	0xAF = 12.05V
00C2	00 00 00 01	Value Pair #24, Size=1
00C6	00 2F	Data Type 47 (Raw Voltage)
00C8	81	0x81 = 25.1V
00C9	00 00 00 01	Value Pair #25, Size=1
00CD	00 30	Data Type 48 (Temperature)
00CF	76	0x76 = 115.7C
00D0	00 00 00 02	Value Pair #26, Size=2
00D4	00 17	Data Type 23 (Cross Calib)
00D6	02 F6	
00D8	00 00 00 02	Value Pair #27, Size=2
00DC	00 18	Data Type 24 (Long Calib)
00DE	03 C0	
00E0	00 00 00 19	Value Pair #28, Size=25
00E4	00 19	Data Type 25 (Location)

00E6		“MAINTM” filled with 0x00
00FF	00 00 00 01	Value Pair #29, Size=1
0103	00 0D	Data Type 13 (Poll Rate)
0105	03	3 sec
0106	00 00 00 01	Value Pair #30, Size=1
010A	00 21	Data Type 33 (Gain)
010C	01	Gain = 1
010D	00 00 00 01	Value Pair#31, Size=1
0111	00 25	Data Type 37 (Bad Data)
0113	28	Bad Data at offset 40
0114	00 00 03 C0	Value Pair #32, Size=960
0018	01 04	Data Type 260 (32 bit tilt)
001A	4A EB AB	First Cross Sample
001D	72 12 42	First Long Sample
0020	4A EC 5E	Second Cross Sample
0023	72 11 BF	Second Long Sample
…	…	…

*) Hex values in reversed order (least significant byte to the right) to increase readability