Specification of the IWF Flat-File Data Base Managment System

Version 1.01 Date: 18. December 1997

1 Header File

1) The IWF-FLAT Filesystem's Header File (*.HED) is an ASCII-file with 80 bytes printableASCII characters. Each record starts with a blank character (0x20) at position 1 (i.e. 1st character of record) and ends with a blank character at position 80.
Due to historical reasion on different operation systems and platforms the Header File have different line end marks. This come from the FORTRAN implementation of the Flat File. With the same source code the header have differnt line end marks.
[OPEN(.. , ACCESS = 'direct', FORM = 'formatted', ..)]
On the PC-Platform under MSDOS / Windows a Carriage Return (CR) and Line Feed (LF) will be added each line. So on this Platform the Header File have 82 bytes.
(Position 81: CR, Position 82 LF)
On the VAX and ALPHA under OpenVMS the header have following file format.
Record format: Fixed length 80 byte record
Record attributes: Fortran carriage control
Under Unix on different Platforms the Header have no line end marks.
Only 80 bytes per line (DEC Unix, SUN Solaris and Solarisx86)

2) An IWF-Flatfile may contain up to 499 items including the timestamp (i.e. 1 real*8 timestamp plus 498 real*4 variables).

3) Unused space within a header record is filled with blanks (0x20).

4) The detailed header record structure is given in Table 1.

5) The date for entry " date files created: " may be in format "22-AUG-96" or "1996-AUG-22".

6) The timestring for entry " Start time = " and " End time = " may be in format "1977-JAN-01 00:00:00.000" or "31-DEC-77 23:00:00.000".

7) The encoding strings are "PC ", "VAX", "DEC", "DEC". The encoding strings stands for the system on which the file is created.
"PC " Personal Computer (MS-DOS, SOLARIS x86)
"VAX" VAX or ALPHA Machines under OpenVMS
"DEC" DECStation under Ultrix
"SOL" SPARC under Solaris
The encoding information must be in the first abstract line.

8) Other predefined Abstract keywords:
Owner: Owner of Flat File

Source: Flat Master File
Orbit: Data Orbit
Mode: Data Mode
Resol: Data Resolution
CoordSystem: Coordinate System
DataType: Data Type
Offset: Data Offset
SpaceCraft: Space Craft

These predifined Abstracts can stand in the abstract section but the must not.

9) Sample IWF-FLAT Header Files are given in Table 2 and Table 3.

Table 1: Field Definition of IWF-FLAT Header File

Record	Contents	From - To	Fmt	Align
1	" name of header and data files: "	1 - 32	a32	---
	FlatFile Base Name (no Extension)	33 - 79	a47	left
2	" date files created: "	1 - 21	a11	---
	Date String (-> Rule 6)	39 - 49	a11	right
3	" record length of data file, in bytes: "	1 - 39	a39	---
	*.DAT File Record Length	40 - 49	i10	right
4	" number of columns: "	1 - 20	a20	---
	Number of Items incl. Time	40 - 49	i10	right
5	" number of rows: "	1 - 17	a17	---
	Number of Records in *.DAT File	40 - 49	i10	right
6	" flag for missing data : "	1 - 25	a25	---
	Missing Data Flag Value	42 - 50	e9.2	right
7	Blank Line (80 0x20 chars)	1 - 80	a80	---
8	"#"	4 - 4	a1	---
	"name"	8 - 11	a4	---
	"units"	22 - 26	a5	---
	"source"	36 - 41	a6	---
	"type"	67 - 70	a4	---
	"loc"	73 - 75	a3	---
9	" ---------< 75 minus chars >----------"	1 - 76	a76	---
10	item/variable number (1 <=> Time)	2 - 4	i3	right
to	item/variable name	8 - 19	a12	left
9	item/variable unit	22 - 33	a12	left
+	item/variable source	36 - 65	a30	left
num	item/variable type ("T" or "R")	68 - 68	a1	---
items	item/variable offset in *.DAT record	73 - 76	i4	left

10 +	Blank Line (80 0x20 chars)	1 - 80	a80	---
11 +	" NOTES: "	1 - 8	a8	---
12 +	Blank Line (80 0x20 chars)	1 - 80	a80	---
13 +	" Start time = "	1 - 14	a14	---
	Time String (-> Rule 7)	15 - 38	a24	left
14 +	" End time = "	1 - 14	a14	---
	Time String (-> Rule 7)	15 - 38	a24	left
15 +	Blank Line (80 0x20 chars)	1 - 80	a80	---
16 +	" ABSTRACT "	1 - 10	a10	---
17 +	" ENCODING: "	3 - 12	a10	---
	Encoding String(-> Rule 8)	13 - 15	a3	
18 +	" This is a sample Abstract text "	3 - 79	a77	left
num	" which would start at column 3 !!! "			
items	".. next line is a blank line "			
to	" "			
17 +	" Note: all abstract text lines "			
num	" start at column 3 "			
itmes +				
num				
abstract				
lines				
18 + +	Blank Line (80 0x20 chars)	1 - 80	a80	---
19 + +	" END"	1 - 5	a5	---

2 Data File

1) The IWF-FLAT Filesystem's Data File (*.DAT) is an Binary-file with a variable recordlength.

2) Each record starts with double precision floating point value which represent the time. The data values are single precision floating point values. The description of the differnt data culomns in the data file are in the header file.

3) The used floting point format for the data file is the natural floating point format oft the platform. The used floating point format for the PC Flat File data format is the IEEE-P754 standard. For the VAX and ALPHA under OpenVMS only the D_floting format for the double precision floating point value is used.

4) The value for the time in the first column of the data file record are seconds since Jan. 1, 1965

PC-Platform:

Floating Point Standard IEEE-P754

IEEE Format	word wide	sign S	exponent E wide	exponent E range	mantissa M wide precision
single-precision	32 bits	1 bit	8 bits	$2^{\pm 127} \approx 10^{\pm 38}$	23 bits ≈ 7 digits
double-precision	64 bits	1 bit	11 bits	$2^{\pm 1023} \approx 10^{\pm 308}$	52 bits ≈ 16 digits

$$M = 1 + m_1 * 2^{-1} + m_2 * 2^{-2} + m_3 * 2^{-3} + \ldots = 1 + \sum_{i=1}^{k} m_i * 2^{-i} \qquad 1 < M < 2$$

Wide

1	32	64

Single precition: 4 byte

s	e_7 e_0	$.m_1$ m_{23}

Double precition: 8 byte

s	e_{10} e_0	$.m_1$ m_{52}

Table 2: IWF-FLAT Header File with new Timestrings

```
+--------------------------------------------------------------------------------+
|0         1         2         3         4         5         6         7         8|
|12345678901234567890123456789012345678901234567890123456789012345678901234567890|
+--------------------------------------------------------------------------------+
| name of header and data files: TESTFILE                                        |
| date files created:                  1996-AUG-22                               |
| record length of data file, in bytes:         60                               |
| number of columns:                            14                               |
| number of rows:                             8760                               |
| flag for missing data:                    1.00E+32                             |
|                                                                                |
|   #   name          units         source                         type  loc     |
| -------------------------------------------------------------------------------|
| 001   UT            s             Timeline - Epoch                T    0         |
| 002   Time_PB5-01   year          I_4 [1] - Year                  R    8         |
| 003   Time_PB5-02   day           I_4 [2] - Day of Year (Jan 1    R    12        |
| 004   Time_PB5-03   msec          I_4 [3] - Elapsed millisecond   R    16        |
| 005   Traj_HI-01    AU            R_4 [1] - R                     R    20        |
| 006   Traj_HI-02    DEG           R_4 [2] - lat                   R    24        |
| 007   Traj_HI-03    DEG           R_4 [3] - long                  R    28        |
| 008   B_RTN_c-01    nT            R_4 [1] - Br (RTN)              R    32        |
| 009   B_RTN_c-02    nT            R_4 [2] - Bt (RTN)              R    36        |
| 010   B_RTN_c-03    nT            R_4 [3] - Bn (RTN)              R    40        |
| 011   B_scalar      nT            R_4 - Scalar B                  R    44        |
| 012   V             km/sec        R_4 - V                         R    48        |
| 013   N             no/cc         R_4 - Np                        R    52        |
| 014   temp          K             R_4 - Temp                      R    56        |
|                                                                                |
| NOTES:                                                                         |
|                                                                                |
| Start time = 1977-JAN-01 00:00:00.000                                          |
| End time   = 1977-DEC-31 23:00:00.000                                          |
|                                                                                |
| ABSTRACT                                                                       |
|  ENCODING: PC                                                                  |
|  Autoprocessed by CDF2FIWF from CDF-File: p10_77                               |
|                  -------> Skeleton-file: p10_77.SKT                            |
|                                                                                |
| END                                                                            |
+--------------------------------------------------------------------------------+
|12345678901234567890123456789012345678901234567890123456789012345678901234567890|
|0         1         2         3         4         5         6         7         8|
+--------------------------------------------------------------------------------+
```

Table 3: IWF-FLAT Header File with old Timestrings

```
+--------------------------------------------------------------------------------+
|0         1         2         3         4         5         6         7         8|
|12345678901234567890123456789012345678901234567890123456789012345678901234567890|
+--------------------------------------------------------------------------------+
| name of header and data files: TESTFILE
| date files created:                    22-AUG-96
| record length of data file, in bytes:         60
| number of columns:                            14
| number of rows:                             8760
| flag for missing data:                   1.00E+32
|
|   #   name          units         source                          type  loc
| ---------------------------------------------------------------------------
| 001   UT            s             Timeline - Epoch                 T    0
| 002   Time_PB5-01   year          I_4 [1] - Year                   R    8
| 003   Time_PB5-02   day           I_4 [2] - Day of Year (Jan 1     R    12
| 004   Time_PB5-03   msec          I_4 [3] - Elapsed millisecond    R    16
| 005   Traj_HI-01    AU            R_4 [1] - R                      R    20
| 006   Traj_HI-02    DEG           R_4 [2] - lat                    R    24
| 007   Traj_HI-03    DEG           R_4 [3] - long                   R    28
| 008   B_RTN_c-01    nT            R_4 [1] - Br (RTN)               R    32
| 009   B_RTN_c-02    nT            R_4 [2] - Bt (RTN)               R    36
| 010   B_RTN_c-03    nT            R_4 [3] - Bn (RTN)               R    40
| 011   B_scalar      nT            R_4 - Scalar B                   R    44
| 012   V             km/sec        R_4 - V                          R    48
| 013   N             no/cc         R_4 - Np                         R    52
| 014   temp          K             R_4 - Temp                       R    56
|
| NOTES:
|
| Start time = 01-JAN-77 00:00:00.000
| End time   = 31-DEC-77 23:00:00.000
|
| ABSTRACT
|  ENCODING: PC
|  Autoprocessed by CDF2FIWF from CDF-File: p10_77
|                  -------> Skeleton-file: p10_77.SKT
|
| END
+--------------------------------------------------------------------------------+
|12345678901234567890123456789012345678901234567890123456789012345678901234567890|
|0         1         2         3         4         5         6         7         8|
+--------------------------------------------------------------------------------+
```