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COMMONLY USED DIGITAL TAPE, DISK AND CARD FORMATS

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GSFC

GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND

VOYAGER CONJOINT DATA TAPE FORMAT
FOR COMBINED MAG AND PLS ANALYSIS

Tapes are IBM standard label, 9 track and contain IBM variable blocked (VB) records. Master tapes are 6250 BPI, distribution copies may be 1600/800 BPI.

There are three distinct types of records, magnetometer science, plasma science, and engineering. All Master Library tapes will contain all data record types. Prior to filing of these tapes in the NSSDC at GSFC, any tapes distributed outside the principle sphere of interest, (MIT and GSFC) will contain only one type of data (MAG or PLS) plus engineering, unless there is mutual PI agreement to do otherwise.

Engineering records always precede science records. Science records are time ordered by the end time of the PLS data blocks and the begin time of the MAG data blocks. The time tag represents the begin time of a block.

The first word in each record is an identifier for that type of data. The following table lists the record characteristics and their frequency of occurrence.

Record Type	ID	Rate	Len (Bytes)	Mode
Engineering	ENG	1/12min 1/48min	1092v	GS-3, CR-1, CR-2 CR-3, CR-4, CR-5, CR-6, CR-7
Low field magnetometer	LFM	1/48sec	2076	A11 modes
Proton high resolution	M	1/12sec 1/96sec 1/192sec	2540v	CR-1 GS-3, CR-2, CR-3, CR-4, CR-5, CR-6
Proton low resolution	L	1/96sec 1/192sec 1/384sec	1056	GS-3, CR-2, CR-3, CR-4 CR-5, CR-6 CR-7
Electron	E1/E2	1/12sec 2/96sec 2/192sec 2/384	680	CR-1 GS-3, CR-2, CR-3, CR-4 CR-5, CR-6 CR-7

High field MAG data is not compacted and therefore will not appear on this tape.

The DD card necessary to read this tape is:

```
//ddname DD UNIT=(9TRACK,,DEFER),LABEL=(,SL),DISP=SHR,
//        DCB=(RECFM=VB,LRECL=2608,BLKSIZE=18260,DEN=4),
//        DSN=VOYAGER.CONJOINT.MAG.PLS,VOL=SER=FPxxx
```

Each logical record consists of two or more parts. The following diagrams show the different record types and the different segments in each.

ENG - ENGINEERING

Header	SELECTED ENGINEERING DATA
32 words	2-240 words

LFM - MAGNETOMETER

Header	MAG DATA	SEDR
32 words	496 words	50 words

M - PROTON MODE

Header	OUTPUT DATA	SEDR	RAW DATA	OVERLAP
32 words	150 words	50 words	256 words	VARIABLE

L - PROTON MODE

Header	OUTPUT DATA	SEDR	RAW DATA
32 words	150 words	50 words	32 words

E1/E2 - ELECTRON MODE

Header	OUTPUT DATA	SEDR	RAW DATA (8)
32 words	80 words	50 words	

Because of the variable length of each record, a word has been added to the HEADER to allow use of FORTRAN in reading this tape. The last halfword in HEADER contains the count of the number of words remaining in the logical record.

COMMON RECORD HEADER BLOCK
(32 WORDS)

WORD	NAME	TYPE*LEN	COMMENTS
1	ID	A*4	Data identifier i.e. 'ENG ' 'LFM ' 'M ' 'L ' 'E1 ' 'E2 '
2	TELFMT	A*4	Telemetry format
3	SCID	A*4	Spacecraft ID 'FLT1' 'FLT2'
4	IYR	I*2	Year of data (time tag at beginning of data block)- 1900
	IDAY	I*2	Day of year (Jan 1 = 1)
5	IHR	I*2	Hour of day (0-23)
	MIN	I*2	Minute of hour (0-59)
6	ISEC	I*2	Seconds of minute (0-59)
	MSEC	I*2	Milliseconds of second (0-999)
7-8	DDAY	R*8	Decimal day of year of data (Jan 1 = 0)
9-10	EPICDAY	R*8	Decimal day count since 20 Aug. 1977
11	TYPE	A*4	Type of time - SCET or ERT
12	BLOCKTIM	R*4	Time period of this data block in seconds
13	COUNT16	I*2	2**16 seq counter of data at time of telemetry readout (increments once in 48 min)
	MOD60	I*2	Modulo 60 seq counter of data readout (increments once in 48 sec)
14	LINECNT	I*2	Line counter of data readout (1-800) (increments once in 60 ms)
		I*2	Spare
15	STATUS	Z*4	Status word
16	COMMAND	Z*4	Command
17	ID2	I*2	Data identifier LFM=1, HFM=2, M=3, E1=4, L=5, E2=6, ENG=7
	MODE	I*2	Data rate GS-3=0, CR-1=1, CR-2=2, CR-3=3, CR-4=4, CR-5=5, CR-6A=6, CR-6B=7, CR-7=8
18			SPARE
19-20	MEDDLE	A*8	A character flag which indicates software or S/C hardware intervention reducing confidence in data
21-29			SPARE
30-31			
32	NREC	I*2	Record number on tape
	NWORD	I*2	Number of words remaining in logical record

LFM
LOW FIELD MAG DATA AREA

Relative Word	Name	Count	Type*Len	Comments	Units
		48 sec av			
1	F1	1	R*4	$(\Sigma^{n} \lvert\overline{B}_i\rvert)/N$	γ
2	F2	1	R*4	$\sqrt{(B_x^2 + B_y^2 + B_z^2)}$	γ
3	θ	1	R*4	$\sin^{-1}(B_z/F2)$	Deg
4	ϕ	1	R*4	$180. - \mathrm{Tan}^{-1}(B_y, -B_x)$	Deg
5	X	1	R*4	B_x	γ
6	Y	1	R*4	B_y	γ
7	Z	1	R*4	B_z	γ
8-10	RMS	3	R*4	Vector rms	γ
11	N	1	I*4	Number of 9.6 sec av that made up this av (≤ 5)	
		9.6 sec av			
12-16	F1	5	R*4	See word 33 above	γ
17-21	F2	5	R*4	See word 34 above	γ
22-26	θ	5	R*4	See word 35 above	γ
27-31	ϕ	5	R*4	See word 36 above	Deg
32-36	X	5	R*4	See word 37 above	Deg
37-41	Y	5	R*4	See word 38 above	γ
42-46	Z	5	R*4	See word 39 above	γ
47-61	RMS	3 x 5	R*4	See word 40-42 above	γ
62-66	N	5	I*4	Number of 1.92 sec av that make up this av (≤ 5)	
		1.92 sec av			
67-91	F1	25	R*4	See word 33 above	γ
92-116	F2	25	R*4	See word 34 above	γ
117-141	θ	25	R*4	See word 35 above	Deg
142-166	ϕ	25	R*4	See word 36 above	Deg
167-191	X	25	R*4	See word 37 above	γ
192-216	Y	25	R*4	See word 38 above	γ
217-241	Z	25	R*4	See word 39 above	γ
242-316	RMS	3 x 25	R*4	See words 40-42 above	γ
317-341	N	25	I*4	Number of detail points that make up this av (1 for CR-6)	

SPACECRAFT FIELD AVERAGES IN PAYLOAD COORDINATES

342-391	XSC	50	R*4	B_x		γ
392-441	YSC	50	R*4	B_y		γ
442-491	ZSC	50	R*4	B_z		γ
492	NSC	1	I*4	NUMBER OF AVERAGES IN 48 SEC.		
493	SCX	1	R*4	B_x	48 sec. ave.	γ
494	SCY	1	R*4	B_y	48 sec. ave.	γ
495	SCZ	1	R*4	B_z	48 sec. ave.	γ
496	SCF	1	R*4	$\lvert B\rvert$	48 sec. ave.	γ

PLS PROTON DATA AREA

Relative Word	Name	Count	Type*Len	Comments	Units
1		1	I*2	Number of words in this block	
		1	I*2	Tally of number of calls to PLSANL	
2		1	I*2	Peak channel number sensor A	
		1	I*2	" B	
3		1	I*2	" C	
		1	I*2	" D	
4		1	R*4	Δ time from mode start to peak	Sec
5	XA	1	R*4	B_x Ambient field	γ
6	YA	1	R*4	B^y in spacecraft coordinates	γ
7	ZA	1	R*4	B_x^y	γ
8	F1	1	R*4	$(\Sigma^N \lvert\overline{B}_i\rvert)/N$	γ
9	F2	1	R*4	$\sqrt{(B_x^2 + B_y^2 + B_z^2)}$	γ
10-12	RMS	3	R*4	Vector rms	γ
13	NA	1	I*4	Number of MAG detail samples in this average	
14		1	R*4	Δ time from peak to MAG ave	Sec
15		1	R*4	Time period of MAG ave	Sec
16-19		4	I*4	Number of channels in moment calibration	
20-23		4	R*4	Density (moment)	$\#/cm^3$
24-27		4	R*4	(Normal) speed	km/sec
28-30		3	R*4	V_x, V_y, V_z in S/C coordinates	km/sec
31		1	R*4	$\lvert V\rvert$	km/sec
32		1	R*4	θ	DEG
33		1	R*4	ϕ	DEG
34-37		4	R*4	Thermal speed	km/sec
38		1	R*4	Average density	$\#/cm^3$
39		1	R*4	Density criterion	dimensionless
40		1	R*4	ω_{trace}	km/sec
41		1	R*4	$\omega_{\lvert\lvert}^2/\omega_{\perp}^2$	
42		1	R*4	Reduced χ^2_W	
43-46		4	R*4	(Moment) heat flux	$ergs/cm^2/sec$
47		1	R*4	norm Q_{11}^2	$ergs/cm^2/sec$
48		1	R*4	Reduced χ^2_Q	
49-51		3	R*4	(Fit) V_x, V_y, V_z	km/sec
52		1	R*4	(Fit) density	$\#/cm^3$
53		1	R*4	(Fit) thermal speed trace	km/sec
54		1	R*4	(Fit) $\omega_{11}^2/\omega_{\perp}^2$	
55-150				SPARE	

PLS ELECTRON DATA AREA

Word	Name	Count	Type*Len	Comments	Units
1		1	I*2	Number of words in this block	
		1	I*2	Tally of number of calls to PLSANL	
2		1	I*2	Peak channel number sensor A	
3		1	I*2	" B	
		1	I*2	" C	
4		1	I*2	" D	
		1	R*4	Δ time from mode start to peak	Sec
5	XA	1	R*4	B_x ambient field in spacecraft coordinates	γ
6	YA	1	R*4	B_y	γ
7	ZA	1	R*4	B_x	γ
8	F1	1	R*4	$\Sigma^N \lvert\overline{B}_i\rvert)/N$	γ
9	F2	1	R*4	$\sqrt{(B_x^2 + B_y^2 + B_z^2)}$	γ
10-12	RMS	3	R*4	Vector rms	γ
13	NA	1	I*4	Number of MAG detail samples in this average	
14		1	R*4	Δ time from peak to MAG ave	Sec
15		1	R*4	Time period of MAG ave	Sec
16		1	R*4	Flux	#/cm /Sec
17		1	R*4	Temperature	Degrees Kelvin
18-33		16	R*4	"Distribution" function	$\#/V^3/cm^3$
23-80				SPARE	

ENG FORMAT

Word	Name	Count	Type*Len	Comments
1	IDECK	1	I*2	Deck (ENG code) 620-672
	IENG	1	I*2	Value of ENG
2	ITIME	1	R*4	Δ time of Δ day (word (7-8))
3 4	as same as word (1-2)			
. . .				
239 240	"			

SEDR DATA BLOCK

Relative Word	Name	Type*Len	Comments	Units
1-2	TN	R*8	EPIC time of navigation block from date of launch	Days
3-4	TP	R*8	EPIC time of pointing vector block from time of launch	Days
5-10	SPV	R*4	Spacecraft relative position and velocity (vector) in Inertial Sun Equator system	A.U. (PR) km/sec
11	RANGE	R*4	Spacecraft distance from Sun (planet)	A.U. (PR)
12-13	ANG	R*4	Spacecraft relative latitude and longitude from Sun (planet)	deg.
14-22	TTB	R*4	Matrix to rotate data from Sun-True Equator to Heliographic coordinates	
23-31	TTB5	R*4	Matrix to rotate data from Heliographic to Earth-Orbit-True coordinates	
32-40	THG	R*4	Matrix to rotate data from payload to Heliographic coordinates	
41-50			Spare	