# Requirements for the ISEE-3 Datapool Encyclopedia Generator System

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## GENERAL INFORMATION

An Encyclopedia (ENCY) database is to be created which contains summary data and raw data quantities from the ISEE-3 Datapool Tapes. The Datapool (DPT) ENCY database will be used in some applications with the Cosmic Ray Experiment database for scientific studies.

This ENCY database will be used by members of the LHEA at Goddard. The data production will occur on the SACC IBM 3081 computer.

## OVERVIEW

The DPT ENCY database will provide access to magnetic field summary and raw magnetic data allowing Fourier analysis studies to supplement rates/flux data studies. The database will also preserve the other DPT quantities in raw form.

The existing Datapool Tape handling system is shown in Figure 1. The CSC memorandum of December 1982 mentioned some of the inherent limitations of that system. The principle limitation of the current LIBRARY tape database comes from it's multi-filed, non-time ordered nature. Programs which further process those tapes do not handle time-line changes, and there is no provision for insertion of new or redo data into the summarized output tapes created by the latter programs. (DPTSUM, MAGSUM)

Figure 2 shows the desired system. Applications programs run from the ENCY database, which is time ordered with some data in summarized form. New and reprocessed data will be merged into the DPT ENCY database.

**Figure 1:** Current Datapool System

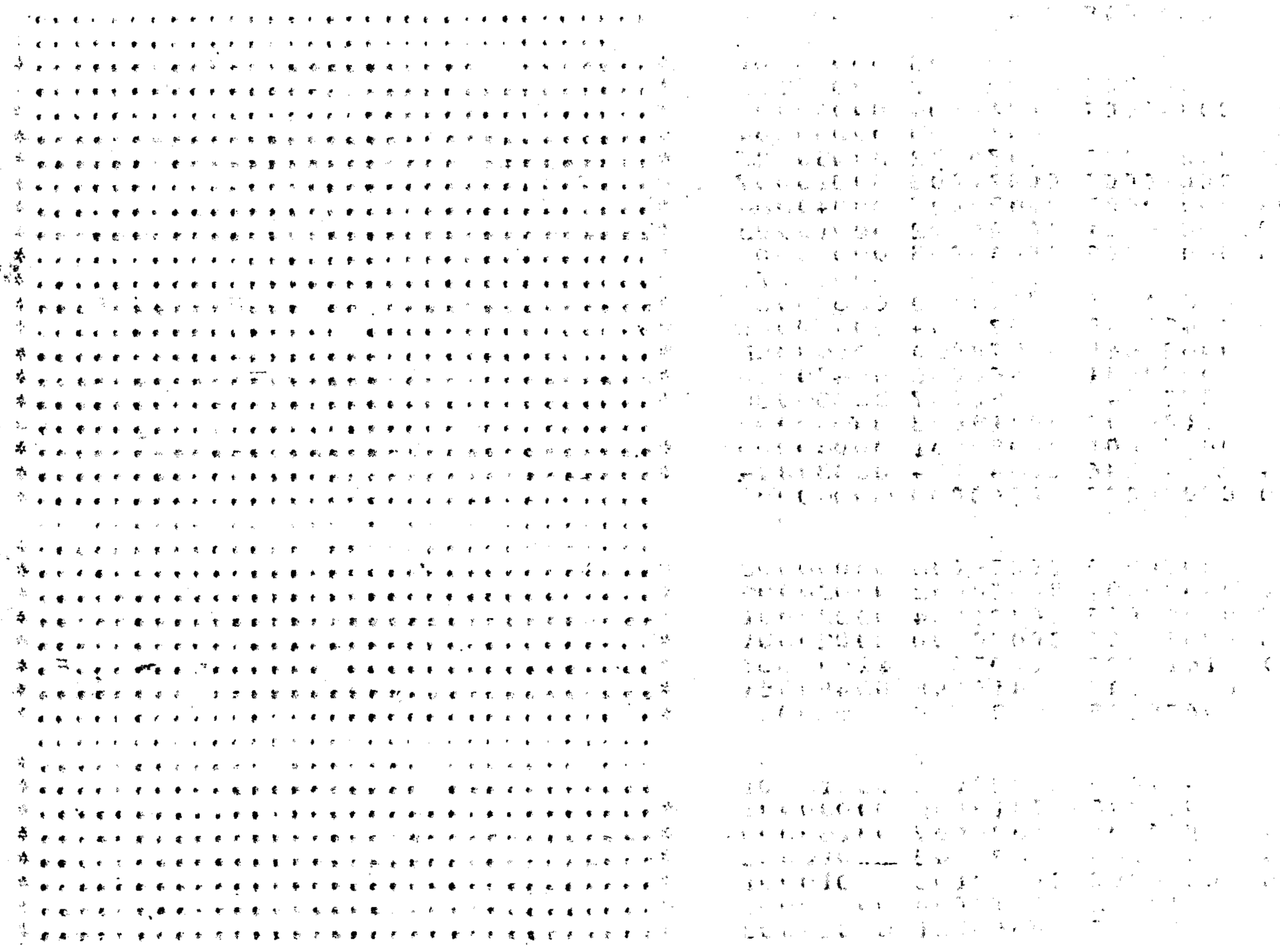

Figure 2: Desired Datapool System

The output ENCY tape will be single-filed, and interfaced to an automatic LOG in a fashion analagous to the Cosmic Ray System.

## GENERAL SYSTEM REQUIREMENTS

The Following general system requirements apply:

1. The database will be single-filed, time-ordered, 9-TRACK, 6250 BPI; tape format provided by GSFC must comform to the ISEE Cosmic Ray System MERGE program needs.

2. The existing LIBRARY tape files will be used as input tapes. (One LIB file per week of DPT data)

3. The DPT ENCY database will be accessed through a LOG analagous to the ISEE Cosmic Ray System Automatic LOG., using those existing LOG manipulating routines and utilities.

4. The system will be able to merge data. The ISEE Cosmic Ray MERGE program should be used, and the DPTENC output tape records should be compatible with Volume, Chapter, and Verse header formats. (This requirement is made to save costs. Since the MERGE program LOG access routines are all in non-fortran callable assembler, we will use that program for

merging data, even though that means the creation of a 'WORK' type tape which is redundant and unneeded in the DPT ENCY system.)

5. Core requirements limitations are not critical; overnight processing for a tape is acceptable

6. The system will allow multiplt LIBRARY BLOCK processing as does the Cosmic Ray Encyclopedia Generator. (A maximum of 15 LIB BLOCKS per WORK BLOCK is provided for in the LOG structure. There is one LIB BLOCK in the LOG for each week of DPT data= one DPT raw data tape)

7. No overlap processing will be done in the same job by the DPTENC program. Overlap is not expected within one LIB tape file, but is possible at file boundaries. (i.e. All overlap data at file boundaries will be eventually processed; the MERGE program will decide which data is kept)

8. The system will properly handle time-line changes.

9. The system will provide summarized data and preserve raw data, as per GSFC specification.

## HARDWARE REQUIREMENTS

### Location

The data base production will be done on the IBM 3081 computer.

### Peripherals

1. The automatic LOG will reside on a SACC permanent disk.

2. The encyclopedia magnetic tapes will be 9-Track, single-filed, 6250 BPI, and time-ordered.

3. The library magnetic tapes have been defined by a previous program DPTSAV to be 9-Track, multi-filed, 6250 BPI, and not necessarily time-ordered.

4. The work magnetic tapes may be specified by the software designer, within the restrictions made above.

## DATA PRODUCTION PROBLEMS REQUIREMENTS

1. The DPTENC program will provide a means by which no overlapping data is processed in the same job. Overlapping data within a LIB file should be noted, and bypassed. Data overlaps at LIB file boundaries will be handled by the merge process.

2. Should an I/O error be detected, the unsuccessful process will be noted in the automatic LOG and the current immediate process cycle stopped. The operator will have to decide to attempt reprocessing or to regenerate the problem data.

3. System failure will be handled similarly to a magnetic tape I/O error.

4. Processes updating the automatic LOG cannot run concurrently. The JCL proceedures provided will insure that jobs do not run at the same time.

# DATA HANDLING REQUIREMENTS

## Automatic Log

1. The structure and format of the automatic LOG will be identical to the Cosmic Ray LOG, thus allowing existing utility and access programs to be used.

2. Currently the Datapool LOG has 2 ENCY attribute blocks.

* The first is the normal one assigned to all processed DPT data.:
* The second exists to handle data which is later replaced by bett: er data.

The old LIB blocks are presently modified in that they have their ENCY attribute block changed to refer to the second block. One additional change must be made to all LIB blocks which have the second ENCY attribute block reference: each LIB block must be marked to be skipped. The LOG routines pick up any LIB file which is marked to be processed. The first one encountered defines the ENCY attribute which will be used in the whole processing run.

Data Pool Data

1\. The data will be grouped into time intervals called VOLUMES. Times in VOLUMEs are universal time units. The reference start time for Volume one is the start of year 1977.

2\. Fifteen minute VOLUMEs will ber used, so as to be keyed to the Cosmic Ray database VOLUME numbers.

3\. For any data, no capability of larger than 15 minute VOLUMEs need be included in the DPTENC program. GSFC will not ask for larger VOLUME length times. (i.e. The DPTSUM function of the current system will be handled by a revised DPTSUM program which uses the DPTENC tapes as input.)

4\. Selected data will be summarized for each VOLUME. The summary algorithm will be supplied by GSFC. Units for magnetic data summaries will be as in MAGSUM, unless otherwise provided by GSFC.

5\. One chapter per VOLUME will be provided. The start times in the chapter INTRO will correspond to the start of the first magnetic field entry included in the VOLUME. The stop time in the chapter INTRO will correspond to the stop time of the last magnetic field entry included in the VOLUME. The latter statement implies that the VOLUME end time may be exceeded by the chapter end time. It also implies that the chapter start time may precede the VOLUME start time.

6\. The following method will be used to determine if any of the data quantities belong in the current VOLUME: If greater than half of the data sampling period falls in one chapter, the whole data quantity will be included in the chapter- for all data types.

7\. For the 'raw rates' type data, all quantities sampled at the same time for a given data type will appear together. The start time for each sampling pwriod must be retrievable or calculable.

8\. Time calculations for data quantities should allow for about 2 seconds potential calculated overlap between input DPT LIBRARY tape records. The overlap is a calculation limitation only.

9\. Messages which indicate the processing status should be output. Time- line changes, data gaps, overlaps, etc. should be noted.

10\. Complete fill VOLUMEs will not be generated

11\. The start time in the 'raw rates' verse will be in seconds since 1977.

12.
The GSEX, Y, Z values should be interpolated for each chapter. (Use the DPT input data record header information for interpolation.) The interpolation algorithm will be supplied by GSFC.

13.
All input data for one week will be read into core.

14.
Time-line corrections to data are to be made before data is collected for output. Multiple time-line changes in successive 64 minute input records should be allowed for.

15.
The 'data quality' parameter will be used in the following way:

DQ = 1 This data belongs to the last 64 minute record of a DPT tape (= LIB tape file)

DQ = 0 This data is bad (never expected to be used)

Dq = 3 This value should be assigned to all other data

The DQ = 1 value is intended to accomodate processing needs where the next DPT file in time order happens to have a time-line change at it's first record (time-line indicator flag = 7).

16.
Where overlap data is assigned the same DQ value, data pro-

cessed later according to processing job run time will replace formerly processed data ( done by the MERGE program ). Data of higher quality will always replace existing data of the same time.

17. The output tape format is provided below.

## DATA POOL
## ENCYCLOPEDIA TAPE FORMAT

The output tape has three types of records. There is a volume introduction which occurs every fifteen minutes. The volume introduction is followed by one or more chapter introduction. Each chapter introduction is followed by two verses. Each verse has its own format, which is dependent on the verse data type.

Normally an output tape will look as follows:

```
+--------------------------------------------------------+
|                 Volume Introduction                    |
+--------------------------------------------------------+
|     Chapter Introduction for Current Volume            |
+--------------------------------------------------------+
|     Raw Data Pool Verse for Current Chapter            |
+--------------------------------------------------------+
|      Magnetic Summary for Current Chapter              |
+--------------------------------------------------------+
|                 Volume Introduction                    |
+--------------------------------------------------------+
|     Chapter Introduction for Current Volume            |
+--------------------------------------------------------+
|     Raw Data Pool Verse for Current Chapter            |
+--------------------------------------------------------+
|      Magnetic Summary for Current Chapter              |
+--------------------------------------------------------+
                           .
                           .
                           .
+--------------------------------------------------------+
|      Magnetic Summary for Current Chapter              |
+--------------------------------------------------------+
```

# VOLUME INTRODUCTION FORMAT

| Word | HW | Byte | Type | Length | Name | Desription |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | I | 1 | VOCPN | Chapter Number (= 0) |
| | | 1 | I | 1 | VOVERN | Verse Number (= 0) |
| | 2 | 2 | I | 1 | EPN | Encyclopedia Program Version |
| | | 3 | I | 1 | SCID | Satellite Identification (= ) |
| 2 | 3 | 4 | I | 4 | VOVOLN | Volume number, nth 15-minute interval since the start of 1977 |
| 3 | 5 | 8 | | 6 | EPDT | Encyclopedia Program Date |
| 3 | 5 | 8 | I | 2 | EPYR | ( Year - 1900) |
| | 6 | 10 | I | 2 | EPMON | Month of Year |
| 4 | 7 | 12 | I | 2 | EPDY | Day of Month |
| | 8 | 14 | | 6 | VCDT | Volume Creation Date |
| | 8 | 14 | I | 2 | VCYR | (Year - 1900) |
| 5 | 9 | 16 | I | 2 | VCMN | Month of Year |
| | 10 | 18 | I | 2 | VCDY | Day of Month |
| 6 | 11 | 20 | | 10 | VSTRT | Time of Volume (Start Time) |
| 6 | 11 | 20 | I | 2 | VSYR | (Year - 1900) |
| | 12 | 22 | I | 2 | VSMO | Month of Year |
| 7 | 13 | 24 | I | 2 | VSDY | Day of Month |
| | 14 | 26 | I | 2 | VSHR | Hour of Day |
| 8 | 15 | 28 | I | 2 | VSMN | Minute of Hour |
| | 16 | 30 | I | 2 | VSSC | Second of Minute |
| 9 | 17 | 32 | I | 2 | NMCHP | Number of chapters in this volume |
| | 18 | 34 | | 50 | | Spare |
| 22 | 43 | 84 | I | 2 | DQSUM | For Volume, Weighted sums of data quality for this volume<br>3 = good data quality<br>1 = suspect data quality<br>0 = bad data quality |
| | 44 | 86 | | 2 | | Spare |

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 23 | 45 | 88 | | 8 | CHSMC | Subject matter code for each of the chapters in the volume. One byte field identifies each of the chapters in this volume according to the following code:<br>80 bit 0 - 0=status not nominal<br>1=status not nominal<br>40 bit 1 - 0=<br>1=<br>20 bit 2 - 0=<br>1=<br>10 bit 3 - 0=<br>1=<br>08 bit 4 - 0=no bit rate change<br>1=bit rate change<br>04 bit 5 - spare<br>02 bit 6 - 0=<br>1=<br>01 bit 7 - spare |
| 25 | 53 | 96 | | 4 | | Spare |
| | | 100 | | | | |

## CHAPTER INTRODUCTION FORMAT

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | I | 1 | CHCHPN | Chapter Number(GE 1) |
| | | 1 | I | 1 | CHVERN | Chapter Verse Number (= 0) |
| | 2 | 2 | | 1 | | Spare |
| | | 3 | I | 1 | CHCHSMC | Subject Matter Code (see Volume Introduction Format under name CHSMC) |
| 2 | 3 | 4 | I | 4 | CHVOLN | Volume Number |
| 3 | 5 | 8 | | 8 | DTSTRT | Chapter start time, according to the start time of the first included magnetic field data point |
| 3 | 5 | 8 | I | 2 | DTYR | Year - 1900 |
| | 6 | 10 | I | 2 | DTHR | Hour of Year + 24 (such that 24hrs = Jan. 1 00:00:00) |
| 4 | 7 | 12 | I | 2 | DTSC | Second of Hour |
| | 8 | 14 | I | 2 | DTMSC | Millisecond of Second |
| 5 | 9 | 16 | | 8 | DTEND | Chapter end time, according to the stop time of the last included magnetic field data point |
| 5 | 9 | 16 | I | 2 | ENDYR | Year - 1900 |
| | 10 | 18 | I | 2 | ENDHR | Hour of Year + 24 |
| 6 | 11 | 20 | I | 2 | ENDSC | Second of Hour |
| | 12 | 22 | I | 2 | ENDMSC | Millisecond of Second |
| 7 | 13 | 24 | | 8 | | Spare |
| 9 | 17 | 32 | I | 2 | NMVER | Number of verses in this chapter |
| | 18 | 34 | L | 20 | CHCN | Chapter Table of Contents, nth byte of this fied points to the verse containing the nth type of data |
| | 28 | 54 | | 2 | | Spare |
| 15 | 29 | 56 | R | 4 | OPGSEX | Orbital Position (GSE-X) average for chapter |
| 16 | 31 | 60 | R | 4 | OPGSEY | Orbital Position (GSE-Y) average for chapter |
| 17 | 33 | 64 | R | 4 | OPGSEZ | Orbital Position (GSE-Z) average for chapter |
| 18 | 35 | 68 | R | 4 | SPINPD | Spin Period in msec, average for chapter |
| 19 | 37 | 72 | I | 2 | BITRT | Bit rate 01 = 1024 BPS, low<br>02 = 2048 BPS, high<br>03 = 512 BPS, back-up |
| | 38 | 74 | | 2 | | Spare |

## CHAPTER INTRODUCTION

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 20 | 39 | 76 | R | 4 | SMH1 | Z-offset used for this run |
| 21 | 41 | 80 | R | 4 | SMH2 | Number of estimates made for Z-offset above |
| 22 | 43 | 84 | R | 4 | SMH3 | Alpha used for X-offset above |
| 23 | 45 | 88 | R | 4 | SMH4 | Group number of the data group used to determine Z-offset |
| 24 | 47 | 92 | R | 4 | BOX | Offset used for SMH BX |
| 25 | 49 | 96 | R | 4 | BOY | Offset used for SMH BY |
| | | 100 | | | | |

Magnetic field data is placed in the chapter in which the start of the measument occurred. Since the stop time of the chapter is according to the first excluded interval of the magnetic field data points, the chapter times may not coincide with the absolute volume and stop time.

```
[----Volume Span----)
[ Chapter Span      )
[---Data---[---Data---)
```

# RAW DATA POOL VERSE FORMAT

Note: Time of first data point group or time of first data point is in seconds since the start of 1977. The time refers to the start time of the collection interval.

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | I | 1 | VECHPN | Chapter number |
| | | 1 | I | 1 | VEVERN | Verse number (= 1) |
| | 2 | 2 | | 1 | | Spare |
| | | 3 | I | 1 | VESMC | Subject matter code (= 1) |
| 2 | 3 | 4 | I | 4 | VEVOLN | Volume number |
| 3 | 5 | 8 | | 4 | | Spare |
| 4 | 7 | 12 | I | 4 | HOVESN | Number of Hovstadt Algorithm data point groups (0 - 2) |
| 5 | 9 | 16 | R | 4 | HOVESI | Seconds between data points |
| 6 | 11 | 20 | R | 4 | HOVEST | Time of first Hovstadt group |
| 7 | 13 | 24 | R | 40 | HOVESG | Hovstadt data point groups. A group is as follows: PROLP ALFLA HEAVYS PROHP1 PROHP2 |
| 17 | 33 | 64 | I | 4 | MANEUN | Number of maneuvers (0 - 5) |
| 18 | 35 | 68 | R | 4 | MANEUT | Time of first maneuver |
| 19 | 37 | 72 | R | 4 | MANEUI | Seconds between data points |
| 20 | 39 | 76 | R | 20 | MANEUD | Maneuver data points Algorithm data point groups |
| 25 | 49 | 96 | I | 4 | SMITHN | Number of Smith Algorithm data point groups (0 - 16) |
| 26 | 51 | 100 | R | 4 | SMITHI | Seconds between data points |
| 27 | 53 | 104 | R | 4 | SMITHT | Time of first Smith data point group |
| 28 | 55 | 108 | R | 384 | SMITHG | Smith data point groups. A group is as follows: BZ BX BY BMAG BDELTA BPHI |

## RAW DATA POOL VERSE

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 124 | 247 | 492 | I | 4 | STEINN | Number of Stein Algorithm data point groups (0 - 9) |
| 125 | 249 | 496 | R | 4 | STEINI | Seconds between data points |
| 126 | 251 | 500 | R | 4 | STEINT | Time of first Stein data group |
| 127 | 253 | 504 | R | 144 | STEING | Stein data point groups. A group is as follows: RAMAP1 RARMS1 RAMAP2 RARMS2 |
| 163 | 325 | 648 | I | 4 | ANDERN | Number of Anderson Algorithm data point groups (0 - 4) |
| 164 | 327 | 652 | R | 4 | ANDERI | Seconds between data points |
| 165 | 329 | 656 | R | 4 | ANDERT | Time of first Anderson data point group |
| 166 | 331 | 660 | R | 32 | ANDERG | Anderson data point groups. A group is as follows: EFLUX XRAY |
| 174 | 347 | 692 | I | 4 | BANEN | Number of Bane Algorithm data point groups (0 - 4) |
| 175 | 349 | 696 | R | 4 | BANEI | Seconds between data points |
| 176 | 351 | 700 | R | 4 | BANET | Time of first Bane group |
| 177 | 353 | 704 | R | 48 | BANEG | Bane data point groups. A group is as follows: IONPD WINDPS WINDPA |
| 189 | 377 | 752 | I | 4 | SCARFN | Number of Scarf Algorithm data point groups (0 - 4) |
| 190 | 379 | 756 | R | 4 | SCARFI | Seconds between data points |
| 191 | 381 | 760 | R | 4 | SCARFT | Time of first Scarf group |
| 192 | 383 | 764 | R | 64 | SCARFG | Scarf data point groups. A group is as follows: PLA31 PLA1K PLA31K PLANT |

## RAW DATA POOL VERSE

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 208 | 415 | 828 | I | 4 | VONRON | Number of Von Rosenvinge Algorithm data point groups (0 - 2) |
| 209 | 417 | 832 | R | 4 | VONROI | Seconds between data points |
| 210 | 419 | 836 | R | 4 | VONROT | Time of first Von Rosen- vinge data point group |
| 211 | 421 | 840 | R | 16 | VONROG | Von Rosenvinge data point groups. A group is as follows: PARTLO PARTHI |
| 215 | 429 | 856 | I | 4 | DEFEIN | Number of De Feiter Algo- rithm data point groups (0 - 2) |
| 216 | 431 | 860 | R | 4 | DEFIEI | Seconds between data points |
| 217 | 433 | 864 | R | 4 | DEFEIT | Time of first De Feiter data point group |
| 218 | 435 | 868 | R | 32 | DEFEIG | De Feiter data point groups. A group is as follows: PROLO1 PROLO2 ISOTRO QUAD |
| 226 | 451 | 900 | I | 4 | MEYERN | Number of Meyer Algorithm data point groups (0 - 2) |
| 227 | 453 | 904 | R | 4 | MEYERI | Seconds between data points |
| 228 | 455 | 908 | I | 4 | MEYERT | Time of first Meyer data point group |
| 229 | 447 | 912 | R | 8 | MEYERD | Meyer data points |
| | | 920 | | | | |

## MAGNETIC SUMMARY VERSE FORMAT

| Word | HW | Byte | Type | Length | Name | Description |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | I | 1 | VECHPN | Chapter number |
| | | 1 | I | 1 | VEVERN | Verse number (= 2) |
| | 2 | 2 | | 1 | | Spare |
| | | 3 | I | 1 | VESMC | Subject matter code (= 2) |
| 2 | 3 | 4 | I | 4 | VEVOLN | Volume number |
| 3 | 5 | 8 | | 4 | | Spare |
| 4 | 7 | 12 | R | 4 | SMCOSA | *<cosa> in S/C spin coordinates |
| 5 | 9 | 16 | R | 4 | SMCOSB | *<cosB> in S/C spin coordinates |
| 6 | 11 | 20 | R | 4 | SMCOSG | *<cosg> in S/C spin coordinates |
| 7 | 13 | 24 | L*1 | 24 | SMPHI | PHI sector counts, 15 degree sectors |
| 13 | 25 | 48 | L*1 | 12 | SMTHTA | THETA sector counts, 15 degree sectors |
| 16 | 31 | 60 | R | 4 | SMBX | <Bx> in input tape coordinates |
| 17 | 33 | 64 | R | 4 | SMBY | <By> in input tape coordinates |
| 18 | 35 | 68 | R | 4 | SMBZ | <Bz> in input tape coordinates |
| 19 | 37 | 72 | R | 4 | SMBXBX | <Bx*Bx> in input tape coordinates |
| 20 | 39 | 76 | R | 4 | SMBXBY | <BX*By> in input tape coordinates |
| 21 | 41 | 80 | R | 4 | SMBXBZ | <Bx*Bz> in input tape coordinates |
| 22 | 43 | 84 | R | 4 | SMBYBY | <By*By> in input tape coordinates |
| 23 | 45 | 88 | R | 4 | SMBYBZ | <By*Bz> in input tape coordinates |
| 24 | 47 | 92 | R | 4 | SMBZBZ | <Bz*Bz> in input tape coordinates |
| 25 | 49 | 96 | R | 4 | SMBLEN | \|<B>\| |
| 26 | 51 | 100 | R | 4 | SMLEN2 | \|<B>\|*\|<B>\| |
| 27 | 53 | 104 | I | 4 | AVEINT | Averaging interval length in seconds |
| 28 | 55 | 108 | R | 4 | ACTMSC | Milliseconds of actual data |
| | | 112 | | | | |

Count padded pts
mult. x interval
subtract

output tape format

28
4