SECTION	PROGRAM / PROCEDURE	(PROGRAM NAME
A	INTRODUCTION / EDR TAPE LIST PROGRAM	(EDRLS
B	DATA REDUCTION PROGRAM	(PIODRP
C	DATA REDUCTION SYSTEM CATALOG MAINTENANCE	(DRSMNT
D	LOGISTIC COMPRESSION PROGRAM	(LOGIST
E	RATE TAPE LIST PROGRAM	(PFRTPL
F	PHA TAPE LIST PROGRAM	(PRNPHA
G	RATE/PHA TAPE COPYING PROG.	(UBSCOPY
H	FLUX DATA BASE GENERATOR and FLUX CATALOG MAINTENANCE	(FLXDBG (FLXMNT
I	FLUXPLOT DATA CARD STRUCTURE	
J	PIONEER-F/G RATE TABLES	
K	PIONEER-F/G MODE & GENERATION IDS.	
L	PIONEER MATRIX INPUT CARDS	
Mc	PIONEER STANDARD ANALYSIS DEFINITION AND 26 DAY CALENDAR	
* M	PIONEER FLUCTUATION ANALYSIS PROG.	(FLUC)
N	SECTORED RATE DISPLAY PROGRAM	
* O	FOURIER PROGRAM	(MAGDBE FOURIER)
Q	PIONEER-F BIT2ON CONNECTION	(QUICKBIT BIT2ON)
R	PIONEER TRAJECTORY	

also
DIRFIX Guide
modification of last AFN in 'PENC' source

5 PLASMA VELOCITY LIST/PLOT

W RATE SUMMARY USERS GUIDE

I. INTRODUCTION.

This document contains a useful description of the Pioneer F/G GSFC/CRT Data Reduction Program (PIODRP), Flux Database Generator (FLXDBG) and Flux Plotting Program (FLUXPLOT) and the supplemental programs which comprise the Pioneer F/G GSFC/CRT Data Reduction System.

PIODRP has as its main input the Pioneer Experimenter Data Record (EDR) tapes received from Ames Research Center in Moffett Field, California and its main output the Pulse Height Anlaysis (PHA) tapes and the Events per second (RATES) tapes. The PHA and RATES tapes contain the GSFC/CRT experiment data in a readily accessible format for subsequent analysis programs.

FLUXDBG has as its main input the PHA and Rates tapes generated by PIODRP and its main output is Flux tapes in a readily accessible format for a subsequent analysis program, FLUXPLOT.

FLUXPLOT has as its main input the Flux tapes generated by FLUXDBG and its main output is listings and plot tapes, if requested.

These three major programs make up the Pioneer Data Processing System.

II. EXPERIMENTER DATA RECORD TAPE.

A. Experimenter Data Record (EDR) tapes are received from Ames Research Center (ARC), Moffett Field, California. Each tape ~~usually~~ contains 1 to 3 days worth of data for either of 2 satellites (Pioneer 10 or 11). GSFC/CRT EDRs are 9 TRACK, NL, 800 BPI data tapes containing 4 files of fixed length records:

1. Logistics
2. Command data (not processed)
3. Attitude data (not processed)
4. Experiment data
5. In the very near future multi-day EDR tape will be generated due to the reduced amount of data which will be received by tracking stations.

B. With each tape we receive a shipping letter which contains vital statistics such as Day, Pass no, start/stop times, date generated, and volume serial no. Each shipping letter is filed in a notebook for reference and is also used as a logging in function. A sample of a shipping letter is shown on the next page. All EDRs are checked to be sure they are physically undamaged by shipment and are then separated by Satellite ID. Following this procedure each tape should be checked for write-rings (which are plastic rings in the back of each tape) which should be removed and a 'NO RING' sticker placed on the back side of the tape. This is to ensure that the tape will not be written on. After this, the tapes should be put in chronological order for processing.

C. The EDRs are then assigned temporary slots in the computer room in Bldg. 1 near the ~~360/75, 91~~ 3081 so they will be ready for the first phase of processing (PIODRP). The temporary slots assigned to Pioneer 10 and 11 are E02101 thru E02150 inclusive.

V. PIONEER F/G EDR TAPE LIST PROGRAM (EDRLST).

A. Description.

The purpose of the Pioneer F/G EDR Tape List Program is to provide a formatted listing of selected data.

There is only one tape utilized by EDRLST. This tape is the Pioneer F/G EDR tape which contains the GSFC/CRT experiment data and related spacecraft information. This tape is 9-track, odd parity with a recording density of 800 BPI. Each tape consists of four files of data per day having fixed length records with a different record length for each file. Files one through four contain the logistics, command, attitude and experiment data, respectively. The tape contains undefined records with a maximum block size of 5204 bytes. EDRLST reads parameter cards to determine the EDR tapes and the amounts of data to list. One or more tapes may be listed in each run and each tape must be specified on a separate parameter card.

B. EDRLST JCL.

The program requires 100K bytes of main storage and approximately .5 minutes of CPU time and .5 minutes of I/O time to list 100 records from a particular EDR tape. A description of the DD cards required by EDRLST, the purpose of each data set, and when it is required follows:

DD Name	Purpose of Data Set	Input/ Output	Device Type	Code*
FT06F001	Formatted Data Listing	Output	Printer	A
FT10F001	EDR Tape	Input	Tape	A
SYSDUMP	Abend Dumps	Output	Printer	A
DATA5	Parameter Cards	Input	Card Reader	A

* A = Always Required.

```
//*LIST EDR
//*.TAPES..
//PEDR EXEC LINKGO,REGION.GO=100K
//LINK.SYSLIB DD DSN=K3.SBCID.SB001.OPIONEER,DISP=SHR
//LINK.SYSLIN DD *
  INCLUDE SYSLIB(EDRLST)
  ENTRY EDRLST
//GO.FT06F001 DD DCB=(BLFNO=4)
//GO.FT10F001 DD DSN=EDRIN,UNIT=(2400-9,,DEFER),DISP=SHR,
//  DCB=(RECFM=U,BLKSIZE=5204,DEN=2),LABEL=(,BLP,,IN),VOL=SER=DUM1
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
```

6250

See SB#PR.LIB.CNTL(UEDRLST)

C. Data Cards.

The data cards follow the last DD card in the program setup and are read using the NAMELIST convention of FORTRAN IV. The first column in each card must be blank. The next six columns of the first card of a group of cards must contain the characters "&INPUT", followed by a blank. The blank is followed by data items separated by commas. The end of a group of cards is signaled by the characters "&END". One or more groups of cards, each identifying a unique EDR tape, may be submitted each run.

Each group of cards, with the NAMELIST name INPUT, identifies an EDR tape to list and specifies the amount of data to list. The form of the data items within this group follows, along with the standard default value they assume whenever they are not specified. The underlined keywords and equal sign must be written

as follows. Below is a sample of a data card:

```
&INPUT DTAPE='E02131',QATT=T,LIMITS=1,1                    &END
```

DTAPE= The location (tape slot) or symbol identifying the EDR tape to be listed. The tape slot or symbol may contain a maximum of six characters and must be enclosed in apostrophes. This symbol appears on the operator's console whenever the EDR tape is to be mounted.

(Default - None. The EDR tape must always be identified.)

DALIAS= The label or identifying symbol for the EDR tape being processed. This label may contain a maximum of six characters and must be enclosed in apostrophes. This label appears in all the listings generated by EDRLST which all associated with this EDR tape.

(Default - Assumes the value of DTAPE when not specified.)

LSTRCN= 0 If the records on the EDR tape are to be listed by record number.
1 If the records on the EDR tape are to be listed by time period (MS of day).

(Default = 0)

LIMITS= Pairs of start and end record sequence numbers or time periods (MS of day) that are to be listed from the EDR tape specified via the "DTAPE" keyword. A maximum of 20 pairs (2 entries) may be supplied and each entry must be separated from the previous one by a comma. Both entries of a pair must be supplied even if only one record is desired. The pairs must be supplied in sequence and the end entry of a pair must always be larger than or equal to the start entry. Only the data contained in the first three files of the EDR tape is listed when only one pair is supplied with both entries set equal to zero.

(Default - Only the data contained in the first three files of the EDR tape is listed.)

QATT= T If the Attitude information contained in file 3 of the EDR tape is to be listed.
F if the Attitude information is not to be listed.

(Default = T)

D. Output.

The primary output from EDRLST is the listing of the first three files of data contained on the EDR tape, followed by the listing of the specified records contained in file four. The first three files of data (logistics, commands and attitude) are printed on one page followed by four pages for each full data record from file four. When a data record does not contain all good data, the following message will be printed after the last good frame of data:

***** REMAINDER OF RECORD ALL PAD *****

The listing generated by EDRLST for all four files of data on an all-EDR tape is self-explanatory. Also, all messages generated by EDRLST are self-explanatory except for the following message:

ERROR ENCOUNTERED:FILE-XX REC-XXX STATUS INFORMATION FOLLOWS: This message indicates that an error occurred during a read operation and the pertinent information describing the error is provided in the following line of printout. A detailed description of the status information is provided in the I/O Errors section of the "IBM System/360 General I/O Package," written by Alan R. Thompson.

E. ABENDS.

When a job is terminated abnormally with a user completion code, refer to the User Abends section of the "IBM System/360 General I/O Package," written by Alan R. Thompson (see Section FTIO).

III. PIONEER F/G DATA REDUCTION PROGRAM (PIODRP).

A. Description.

1. The purpose of the Pioneer F/G Data Reduction Program (PIODRP) is to read the Pioneer F/G EDR tapes and create time-ordered PHA, RATES and CATALOG tapes which contain GSFC/CRT experiment data and related spacecraft information.

PIODRP reads parameter cards to determine the processing options requested and the EDR tapes to process. The latest version of the Data Reduction System (DRS) Tape Catalog is then searched, provided Quick-Look processing was not requested, to determine what tapes are currently available for saving the data being processed. If the new data needs to be merged with data previously processed and the data merge option was specified, the tapes (PHA and/or RATES) containing the old data are copies and the new data is merged onto new tapes (PHA and/or RATES). At the end of each run a Processing Messages Report, a Data Quality Summary Report, a FILE/LOGISTICS/HISTORY Catalog Report and a Current Status Report are generated. These reports provide a history of the EDR tapes processed, the abnormal conditions encountered, the quality of the GSFC/CRT experiment data processed and a status report of all tapes available to the system.

2. System Design Specifications and Assumptions:

a. The following assumptions and considerations were included in the system design: After each production run of PIODRP, a new/updated version of the DRS Tape Catalog is created. To facilitate this continual updating of the Tape Catalog and to provide the capability of rerunning a job that ran to completion but was in error, the four latest versions of the Tape Catalog are kept on the disk. Also, a tape backup of the four

latest Tape Catalogs is maintained by PIODRP on the associated primary and backup CATALOG tapes. If a Tape Catalog on disk is destroyed, DRSMNT may be used to restore it from the appropriate backup tape.

b. It is assumed that each EDR tape processed by PIODRP will contain data for ~~only~~ one or more days and the start and stop times of the data provided in the Logistics data (file 1) is an accurate indication of the experiment data contained in file four of the EDR tape.

c. The processing of subsequent EDR tapes in the same run of PIODRP is based on the restriction that all EDR tapes must be submitted for processing in time-ordered sequence. All tapes not in time-ordered sequence for the current run are rejected by PIODRP and an appropriate message is written in the Processing Messages Report and the run continues.

d. The PHA and RATES tapes are created in a one pass system rather than a two pass system to eliminate duplication of the setup functions inherent to a Data Reduction System, the computer time required to process the same data a second time and the tapes required for the intermediate storage of the experiment data.

e. A Quick-Look option has been provided in PIODRP to allow for the processing of the most recent GSFC/CRT EDR tapes available onto temporary PHA and/or RATES tapes. The temporary data tapes are supplied to PIODRP via the OPTION group of parameter cards and only the blank tapes required for the new PHA and/or RATES tapes can be supplied (the data processed in the Quick-Look mode cannot be merged or added to data previously processed). The DRS Tape Catalogs are not referenced when Quick-Look processing is requested, therefore all EDR tapes processed in this manner must be reprocessed in their proper chronological sequence by PIODRP in the normal (not Quick-Look) mode.

The Quick-Look option provides the capability to process all the Pioneer F/G EDR tapes and create the PHA and RATES tapes in the most efficient manner possible. This is, new data is always added after previously processed data and the unnecessary copying of old PHA and RATES tapes for the purpose of merging new data with previously processed data is eliminated.

3. Definitions and Abbreviations.

Definitions:

Many of the following terms have several meanings; however, only the definition pertinent to this report is given.

Absolute File - All the data (Logistics, Command, Attitude and Experiment) processed from a particular EDR tape in same run of PIODRP.

Absolute File Number - A number assigned to each absolute file (consists of data for an entire day) of data processed by PIODRP. Each file processed is assigned an absolute file number one larger than the previous file; therefore, each file is uniquely identified.

Catalog Pointer - A disk data set which contains the character (1, 2, 3, or 4) indicating which of the four Tape Catalogs is the most recent.

CATALOG Tape - Tape(s) containing all the time-ordered Logistics, Command and Attitude information related to the Pioneer F/G missions.

Events per second (RATES) Tape - Tape(s) containing all the time-ordered events per second information from the GSFC/CRT experiment.

Experiment Data Record (EDR) Tape - Input tape received from Ames Research Center in Moffett Field, California.

Pulse Height Analysis (PHA) Tape - Tape(s) containing all the time-ordered pulse height analysis information from the GSFC/CRT experiment

and the corresponding events per second information.

Relative Modified Julian Day (RMJD) - Date assigned to each day of data referenced from day 0 to launch year, 1972 (Modified Julian Day 41316).

Tape Catalog - A disk data set which contains pointers to all the tapes used by the D.R.S. along with certain control information.

Abbreviations

ARC	Ames Research Center, Moffett Field, California
BPI	Bytes Per Inch
DASD	Direct Access Storage Device
EBCDIC	Extended Binary Coded Decimal Interchange Code
EDR	Experimenter Data Record
GMT	Greenwich Mean Time (UT)
GSFC/CRT	Goddard Space Flight Center/Cosmic Ray Telescope
HET	High Energy Telescope
LET	Low Energy Telescope
MS	Milliseconds
PHA	Pulse Height Analysis
RTLT	Round Trip Light Time
TLM	Telemetry
UT	Universal Time (GMT)

4. Tapes.

There are four types of tapes utilized by PIODRP. The first type is the Pioneer GSFC/CRT EDR tapes which contain the GSFC/CRT experiment data and related spacecraft information. These tapes are 9-track, odd parity and the recording density is 800 BPI. Each tape consists of four

files of data having fixed length records with a different record length for each file. Files one through four contain the logistics, command, attitude and experiment data, respectively. The tape contains undefined records with a maximum blocksize of 5204 bytes.

The second type of tape is the PHA tape that is created and read by PIODRP. These tapes are 9-track with standard OS/360 labels and the data set name (DSNAME) is PIOPHA. The tapes are written in the binary mode and odd parity at a recording density of 1600 BPI. The tapes contain variable length blocked records with a maximum logical record length of 1524 bytes and a maximum physical record length of 7624 bytes.

The third type of tape is the RATES tape that is created and read by PIODRP. These tapes are 9-track with standard OS/360 labels and the data set name (DSNAME) is PIORAT. The tapes are written in the binary mode and odd parity at a recording density of 1600 BPI. The tapes contain variable length blocked records with a maximum logical record length of 1740 bytes and a maximum physical record length of 8704 bytes.

The fourth type of tape is the CATALOG tape that is created and read by PIODRP. These tapes are 9-track with standard OS/360 lables and the data set name (DSNAME) is PIOCAT. The tapes are written in the binary mode and odd parity at a recording density of 1600 BPI. The tapes contain variable length blocked records with a maximum logical record length of 7288 bytes and a maximum physical record length of 7292 bytes.

B. PIODRP JCL.

The program was designed so that the JCL need not be changed from one production run to the next for a particular satellite. However,

the data set names (DSNAME) for all the permanent disk data sets must be unique for each satellite (F/G). Only the parameter cards, which specify the processing options and identify the EDR tapes to be processed must be updated each run. However, to make more efficient use of the computer, it is advisable to remove Data Definition (DD) cards for tapes which will not be used during a particular job. By doing so, unnecessary tape drives are not allocated for the job. DD cards for data sets on disk that will not be used, need not be removed since disk drives are shared by other jobs.

The program requires 300 bytes of main storage and approximately one minute of CPU time and 1.5 minutes of I/O time (I/O time includes one minute for tape mount charge) for each EDR tape processed. The DD cards required for PIODRP are shown below in the following table which shows the purpose of each data set and indicates when it is required.

DD Name	Purpose of Data Set	Input/ Output	Device Type	Code
FT06F001	Error Message (No Data Cards)	Output	Printer	A
FT10F001	EDR Tape	Input	Tape	A
FT11F001	PHA Tape	Output	Tape	P/C
FT12F001	PHA Tape	Output	Tape	P/C
FT13F001	PHA Tape	Input	Tape	PM/C
FT14F001	RATES Tape	Output	Tape	R
FT15F001	RATES Tape	Output	Tape	R
FT16F001	RATES Tape	Input	Tape	RM
FT17F001	CATALOG Tape	Input	Tape	C/U

DD Name	Purpose of Data Set	Input Output	Device Type	Code
FT18F001	CATALOG Tape (Primary)	Output	Tape	C
FT19F001	CATALOG Tape (Backup)	Output	Tape	C
FT20F001	Logistics Catalog (Permanent)	Input/ Output	Disk	A
FT21F001	Logistics Catalog (Temporary)	Input/ Output	Disk	M
FT22F001	Command Catalog (Temporary)	Input Output	Disk	N
FT30F001	Processing Messages	Output	Printer	A
FT31F001	Data Quality Summary Report	Output	Printer	A
FT32F001	FILE/LOGISTICS/HISTORY Rpt	Output	Printer	A
FT33F001	Current Status Report	Output	Printer	A
FT40F001	DRS Tape Catalog Pointer	Input/ Output	Disk	A
FT41F001	DRS Tape Catalog 1	Input/ Output	Disk	A
FT42F001	DRS Tape Catalog 2	Input/ Output	Disk	A
FT43F001	DRS Tape Catalog 3	Input/ Output	Disk	A
FT44F001	DRS Tape Catalog 4	Input/ Output	Disk	A
FT60F001	Processing Messages	Output	Printer	A
SYSUDUMP	Abend Dumps	Output	Printer	A
DATA5	Parameter Cards	Input	Card Reader	A

The meaning of code is as follows:

A - Always required.

C - Required if a CATALOG Tape is to be generated.

P - Required if a PHA Tape is to be generated.

PM - Required if a PHA Tape is to be generated and data merge is specified.

R - Required if a RATES Tape is to be generated.

RM - Required if a RATES Tape is to be generated and data merge is specified.

U - Required if the DRS Tape Catalog Pointer is specified on the Namelist Card/OPTION.

M - Required if data merge is specified.

N - Required if Command data is specified to be processed.

```
//*F PIODRP
//*JCL   PHA
//PDRS EXEC LINKGO,REGION.GO=300K,NBLK=120
//LINK.SYSLIB DD DSN=K3.SBCID.SB001.OPIONEER,DISP=SHR
//            DD DSN=K3.SBCID.SB001.OPICTEMP,DISP=SHR
//LINK.SYSLIN DD *
  INCLUDE SYSLIB(PIODRP)
  ENTRY PIODRP
//GO.FT06F001 DD DCB=(BUFNO=1)
//GO.FT10F001 DD DSN=EDRIN,UNIT=(1600,,DEFER),DISP=(OLD,KEEP),
// DCB=(RECFM=U,BLKSIZE=5204,DEN=2,BUFNO=1),LABEL=(,BLP),VOL=SER=DUM1
//GO.FT11F001 DD DSN=PIOPHA,UNIT=(1600,,DEFER),DISP=(MOD,KEEP),
// DCB=(RECFM=VBS,LRECL=1524,BLKSIZE=7624,BUFNO=1,DEN=3),
// LABEL=(,SL,,OUT),VOL=SER=DMYPH1
//GO.FT12F001 DD DSN=PIOPHA,UNIT=AFF=FT11F001,DISP=(NEW,KEEP),
// DCB=(RECFM=VBS,LRECL=1524,BLKSIZE=7624,BUFNO=1,DEN=3),
// LABEL=(,SL,,OUT),VOL=SER=DMYPH2
//GO.FT13F001 DD DSN=PIOPHA,UNIT=(1600,,DEFER),DISP=(OLD,KEEP),
// VOL=SER=DMYPH3,DCB=(BUFNO=1,DEN=3)
//GO.FT17F001 DD DSN=PIOCAT,UNIT=AFF=FT10F001,DISP=(OLD,KEEP),
// VOL=SER=DMYCT1,DCB=(BUFNO=1,DEN=3)
//GO.FT18F001 DD DSN=PIOCAT,UNIT=AFF=FT11F001,DISP=(NEW,KEEP),
// DCB=(RECFM=VB,LRECL=7288,BLKSIZE=7292,BUFNO=1,DEN=3),VOL=SER=DMYCT2
//GO.FT19F001 DD DSN=PIOCAT,UNIT=AFF=FT13F001,DISP=(NEW,KEEP),
// DCB=(RECFM=VB,LRECL=7288,BLKSIZE=7292,BUFNO=1,DEN=3),VOL=SER=DMYCT3
//GO.FT20F001 DD DSN=K3.SBJPH.SB001.FPDRSLOG,DISP=OLD
//GO.FT21F001 DD UNIT=2314,SPACE=(7294,15),DCB=BLKSIZE=7294
//GO.FT22F001 DD UNIT=2314,SPACE=(708,200),DCB=BLKSIZE=708
//GO.FT23F001 DD DSN=&&ATT,UNIT=2314,DISP=(NEW,PASS),
// DCB=(RECFM=F,BLKSIZE=1240),SPACE=(1240,50)
//GO.FT30F001 DD SYSOUT=A,DCB=*.FT06F001
//GO.FT31F001 DD SYSOUT=A,DCB=*.FT06F001
//GO.FT32F001 DD SYSOUT=A,DCB=*.FT06F001
//GO.FT33F001 DD SYSOUT=A,DCB=*.FT06F001
//GO.FT40F001 DD DSN=K3.SBJPH.SB001.PFDRSCTP,DISP=OLD
//GO.FT41F001 DD DSN=K3.SBJPH.SB001.PFDRSCT1,DISP=OLD
//GO.FT42F001 DD DSN=K3.SBJPH.SB001.PFDRSCT2,DISP=OLD
//GO.FT43F001 DD DSN=K3.SBJPH.SB001.PFDRSCT3,DISP=OLD
//GO.FT44F001 DD DSN=K3.SBJPH.SB001.PFDRSCT4,DISP=OLD
//GO.FT60F001 DD SYSOUT=A,DCB=(RECFM=V8A,LRECL=137,BLKSIZE=141)
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
```

SB#PR.LIB.CNTL(DRPF) (DRPG)

Following is an example of the data cards which are required:

```
&OPTION IDRUN='G',HCPUTM=3,HIOTM=4,QMERGE=T,QPRTID=T, &END
&EDRTAP DTSLOT='E02101',  &END
&EDRTAP DTSLOT='E02102',  &END
```

C. Data Cards.

Parameter cards follow the last DD card in the program setup and are of two types:

1. Processing options (OPTION) card.
2. Input EDR tape (EDRTAP) cards.

All cards are read using the NAMELIST convention of FORTRAN IV. The first column in each card must be blank. The second column in the first card of a group of data cards associated with the same NAMELIST name must contain an ampersand (&), immediately followed by the NAMELIST name (OPTION/EDRTAP). The name is followed by a blank and then a series of data items separated by commas. The end of the data group is indicated by the characters "&END".

The first data group for each run must be the option group of cards. This group is used to specify various program variables and options to be used throughout the current run. All program variables and options which may be specified in this group are listed below along with their associated purpose and the standard default value they assume whenever they are not specified. The underlined keywords and equal sign must be written exactly as shown.

IDRUN= 'F' If Pioneer F EDR tapes are to be processed.
'G' If Pioneer G EDR Tapes are to be processed.

(Default - The job is terminated with a user completion code of 47.)

NQLHIG= The high limit for the Data Quality Indicator to be used when accepting data this run. The Data Quality indicator may have the following values:

0 - Data is bad (no sync).
1 - At least two quality indicators are bad (data is suspect).

2 - At least one quality indicator is bad (data is suspect).
3 - All quality indicators are good (data is good).

(Default = 3)

NQLLOW= The low limit for the Data Quality Indicator to be used when accepting data this run (see NQLHIG for possible values).

(Default = 2)

HCPUTM= The CPU time in minutes needed to process one EDR tape and terminate the job normally which includes the generation of the CATALOG tape when specified (see QCTLGT).

(Default = 2 min)

HIOTM= The I/O time in minutes needed to process one EDR tape and terminate the job normally which includes the generation of the CATALOG tape when specified (see QCTLGT).

(Default = 2 min if CATALOG tape not being created and 5 min if CATALOG tape is being created.)

QMERGE=
T If data processed this run is to be merged with data processed previously.
F If data processed this run is to be added after all data processed previously.

(Default = F)

QPHATP=
T If PHA tapes are to be created this run.
F If PHA tapes are not to be created this run.

(Default = T)

QRATTP=
T If RATES tapes are to be created this run.
F If RATES tapes are not to be created this run.

(Default = T)

QCTLGT=
T If CATALOG tapes are to be created this run.
F If CATALOG tapes are not to be created this run.

(Default = T)

QCMMND= T If command data is to be processed this run.
F If command data is not to be processed this run.

(Default = T)

QPRTID= T If the entire FILE/LOGISTICS/HISTORY catalog is to be printed at the end of the run.
F If only the updated section of the catalog is to be printed.

(Default = F)

QATT= T If attitude data is to be processed this run.
F If attitude data is not to be processed this run.

(Default = T)

NUMCAT= The sequence number of the DRS Tape Catalog to be read. This number +40 is the FORTRAN logical unit from which the Catalog will be read.

(Default - The DRS Tape Catalog will be read from the last unit on which the latest version of the DRS Tape Catalog was written by PIODRP. This Catalog is pointed to by the DRS Tape Catalog Pointer on disk.)

QLOOK= T If Quick-Look processing is to be performed this run. The DRS Tape Catalogs and the current FILE/LOGISTICS/HISTORY catalog are not referenced for this type of processing. Also, the command data and CATALOG tapes are not processed.
F If normal processing is to be presented this run.

(Default = F)

DTPPHA= Labels of tapes to be used for PHA tapes when Quick-Look processing is specified (see QLOOK). A maximum of 10 tape labels may be supplied. Each tape label must be enclosed in apostrophes and be separated from the previous one by a comma.

(Default - Blank PHA tapes will be used from the latest version of the DRS Tape Catalog.)

DTPRAT= Labels of tapes to be used for RATES tapes when Quick-Look processing is specified (see QLOOK). A maximum of 10 tape labels may be supplied. Each tape label must be enclosed in apostrophes and be separated from the previous one by a comma.

(Default - Blank RATES tapes will be used from the latest version of the DRS Tape Catalog.)

One or more NAMELIST groups with the name EDRTAP must follow the OPTION group of cards. These cards are used to identify the EDR tapes to be processed this run and these tapes must be submitted in time sequence. The form of the data items within this group is given below along with the standard default value they assume whenever they are not specified. The underlined keywords and equal sign must be written exactly as shown.

DTSLOT= The location (tape slot) or symbol identifying the EDR tape to be processed. The tape slot or symbol may contain a maximum of six characters and must be enclosed in apostrophes. This symbol appears on on the operator's console whenever the EDR tape is to be mounted.

(Default - None. The EDR tape must always be identified.)

DTLABL= The label or identifying symbol for the EDR tape being processed. This label may contain a maximum of six characters and must be enclosed in apostrophes. This label appears in all the printed reports generated by PIODRP which are associated with this EDR tape.

(Default - Assumes the value of DTSLOT when not specified.)

QREPLC=

T If the PHA and RATES data processed from this EDR tape is to replace all PHA and RATES data processed previously for the same time period.

F If the PHA and RATES data processed from this EDR tape is not to replace all PHA and Rates data processed previously for the same time period.

(Default = F)

Note: When data replace is specified (QREPLC=T) for a particular EDR tape, the tape must either be the last tape processed in the run or all subsequent EDR tapes to be processed must also have data replace specified. Also, data merge must be specified (QMERGE=T) on the OPTION group of cards.

D. Output.

1. Tapes

There are three types of output tapes generated from a PIODRP run. PHA and Rates tapes with merged or new data are created as well as a catalog tape and its backup.

2. Printed Reports.

PIODRP provides four types of printed reports at the end of each production run: a Processing Messages Report, a Data Quality Summary Report, a FILE/LOGISTICS/HISTORY catalog Report, and the Current Status Report. Each page of a report contains the following standard header information:

a. Type of Report.

b. Name of the spacecraft and experiment.

c. Date of run (MM/DD/YY).

d. Page number.

3. Processing Messages Report.

The Processing Messages Report provides a history of all the EDR tapes processed and the errors (abnormal conditions) encountered. Each message produced has a standard format (reading left to right) as follows:

a. Time the message was generated (HHMMSS).

b. Name of the routine generating the message.

c. Label of the EDR tape being processed.

d. Tape sequence number for current run.

e. Number of file being processed from EDR tape.

f. Number of record being processed.

g. Message content.

All Processing Messages generated by PIODRP are self-explanatory and provide the following information:

a. Indications of all abnormal conditions encountered during processing.

b. Reasons for discarding data either on a record basis or an entire EDR tape.

c. First message generated lists all the pertinent processing options specified for run.

d. The last message generated either provides the total EDR tapes mounted and the total EDR tapes rejected (normal End of Job) or provides the reason the job was abnormally terminated with a user dump.

4. Data Quality Summary Report.

The Data Quality Summary Report provides an indication of the quality and status of the Pioneer GSFC/CRT experiment data processed. A Data Quality Summary Report is generated for each EDR tape processed and contains the following information:

a. EDR tape label (source of data).

b. Absolute File Number assigned to data.

c. Start time of data coverage (MM/DD/YY - HH/MM/SS.SSS).

d. End time of data coverage (MM/DD/YY - HH/MM/SS.SSS).

The following information is provided for each data format (A, A/D, B, B/D) along with an over-all total:

a. Total records processed.

b. Number of good records.

c. Number of records discarded due to pad.

d. Number of records discarded due to sync errors.

e. Number of records discarded due to time errors.

f. Number of records discarded with power off.

g. Number of records when GSFC/CRT experiment was operating in low power mode (no PHA data).

h. Number of records when GSFC/CRT experiment was operating with Sector Sync Inhibited.

i. Number of records when the SPSG (Spin Period Sector Generator) roll reference was 180°.

j. Number of good pages processed (PHA/RATES).

k. Number of pages discarded due to pad (this number does not include item c).

l. Number of pages discarded with power off (this number does not include item f).

m. Number of pages discarded due to time errors (this number does not include item e).

n. Number of pages discarded due to sync errors (this number does not include item d).

o. Number of pages of PHA data discarded due to overlap with data previously processed (not provided as a function of format).

p. Number of pages of RATES data discarded due to overlap with data previously processed (not provided as a function of format).

The following information is provided for each PHA event priority mode (0-3 for HET and 0-1 for LET) along with an over-all total:

a. Number of good PHA events as a function of type (0-3 for HET and 0-1 for LET).

b. Number of Null PHA events.

c. Total number of PHA events (this number does not include Null events).

Finally, the total number of PHA events (HET and LET) discarded as a function of the following data quality criteria is provided along with an over-all total:

a. All Bad - data is bad (no sync).

b. Two Bad - at least two quality indicators are bad (data is suspect).

c. One Bad - at least one quality indicator is bad (data is suspect).

d. Padded - all or part of the data necessary for a PHA event is padded.

5. FILE/LOGISTICS/HISTORY Catalog Report.

The FILE/LOGISTICS/HISTORY Catalog Report provides a permanent history of all the EDR tapes processed by PIORP and provides a permanent record of the data processed from each tape. This report contains the following information for each EDR tape processed:

a. Absolute File Number assigned to data.

b. Start time of data (MM/DD/YY - HH/MM/SS.SSS).

c. End time of data (MM/DD/YY - HH/MM/SS.SSS).

d. EDR sequence number.

e. Date EDR was generated (MM/DD/YY).

f. Date EDR was regenerated (MM/DD/YY).

g. Date EDR was processed by PIODRP (MM/DD/YY).

h. Total records processed.

i. Total good records.

j. High limit of the Data Quality Indicator used for accepting data.

k. Low limit of the Data Quality Indicator used for accepting data.

l. Record of the data processed from this EDR tape (PHA/RATES/ COMMANDS).

6. Current Status of D.R.S. Report.

This report provides the current status of all tapes available to the Pioneer Data Reduction System. This report provides the following information at the end of each production run of PIODRP:

a. Total number of good PHA and RATES tapes currently in the system.

b. Total number of blank PHA and RATES tapes currently available to the system.

c. First and last tapes assigned to the PHA and RATES block of tapes.

d. Current versions of the primary and backup CATALOG tapes and a record of the data sets contained on them.

e. List of all blank PHA and RATES tapes currently available to the system.

f. List of all PHA and RATES tapes created in the current run.

g. List of all PHA and RATES tapes copied in the current run.

h. List of all GOOD PHA and RATES tapes giving the start and end times and the amount of tape (feet) used on each.

i. List absolute File Number assigned to data.

j. Last track and last entry on the track used by the FILE/LOGISTICS/HISTORY catalog.

k. Current value of the D.R.S. Tape Catalog Pointer (1, 2, 3, or 4) indicating which Tape Catalog is the latest.

E. ABENDS.

Abnormal Conditions

1. PIODRP recognizes several abnormal conditions and terminates a run with a user dump when they are encountered. Normally all user dumps with a completion code that is less than 50 will be explained by the last printed message in the Processing Messages Report. For user dumps 001 and 002 when this does not apply, and all user dumps with a completion code that is greater than 50, refer to the User Abends section of the "IBM System/360 General I/O Package".

After the error condition is corrected, the job may be resubmitted without any other changes to the deck. However, when data merge was not specified (QMERGE=F) for the job which abnormally terminated, (i.e., with a user or system completion code) the job must be resubmitted with data merge specified (QMERGE=T). This is necessary to prevent the PHA and RATES tapes from containing any duplicate and/or unwanted data.

2. If an error is detected by the user after one or more production runs has executed successfully, (job was not abnormally terminated with a dump) the error may be corrected and the job may usually be resubmitted

by setting NUMCAT (on OPTION group cards) to a Tape Catalog prior to the error. However, this may not be done if more than two production runs have been run since the error.

Once the error has been defined most likely all the data which was processed after the error occurred will have to be run. The programmer responsible for maintenance of the programs should be consulted before any action is taken.

3. A program in executible load module form, VBSCOPY, has been written to duplicate and correct PHA and RATES tape which have developed I/O errors. This was done to keep the logical integrity of the data because of Variable Block Spanning (VBS) Records. See the Utilities Section for VBSCOPY.

JCL in
SB#PR.LIB.CNTL(DCPYRAT)
(DCPYPHA)

IV. PIONEER F/G DATA REDUCTION SYSTEM CATALOG MAINTENANCE PROGRAM (DRSMNT).

A. Description.

DRSMNT is used to perform the following nine basic functions on the DRS Tape Catalog:

1. Initialize and list all four Tape Catalogs and the Tape Catalog Pointer.
2. Add blank tapes (PHA and/or RATES) to the latest version of the Tape Catalog indicated by the Tape Catalog Pointer and provide a listing of the Tape Catalog before and after update.
3. Modify the Tape Catalog Pointer and provide a listing of the Tape Catalog to which it points before and after update.
4. List the contents of a specified Tape Catalog.
5. Restore and list a specified Tape Catalog from the appropriate backup tape.
6. Eliminate one PHA and/or one Rate tape from the catalog.
7. Replace one or more PHA and/or one more RATE tape with backup tapes.
8. Create a backup tape of a specified catalog.
9. Read and print catalog from backup tape.

DRSMNT reads parameter cards to determine what function is requested. The DRS Tape Catalogs or the DRS Tape Catalog Pointer is updated as requested and a listing of all the Tape Catalogs affected by the update is generated.

The program was designed so that the JCL need not be changed from one production run to the next for a particular satellite. However, the data set names (DSNAMES) for all the permanent disk data sets must be unique for each satellite (F/G). Only the parameter cards, which specify the function to be performed, identify the appropriate satellite (F/G) and provide the necessary input data, must be updated each run. However, to make more efficient use of the computer, it is advisable to remove the Data Definition (DD) cards for the CATALOG tape which will not be used during a particular job. By doing so, an unnecessary tape drive is not allocated for the job. DD cards for data sets on disk that will not be used, however, need not be removed since disk drives are shared by other jobs.

B. JCL for DRSMNT.

The program requires 100K bytes of main storage and approximately .5 minutes of CPU time and .5 minutes of I/O time to perform any function requested. The DD cards required for DRSMNT are shown in the following table, explaining the purpose of each data set and when it is required:

DD Name	Purpose of Data Set	Input/ Output	Device Type	Code*
FT06F001	Processing Messages	Output	Printer	A
FT10F001	CATALOG Tape	Input	Tape	U/R
FT20F001	Logistics Catalog (Permanent)	Output	Disk	U
FT40F001	DRS Tape Catalog 1	Input/ Output	Disk	A
FT41F001	DRS Tape Catalog 2	Input/ Output	Disk	A
FT43F001	DRS Tape Catalog 3	Input/ Output	Disk	A
FT44F001	DRS Tape Catalog 4	Input/ Output	Disk	A
SYSUDUMP	Abend Dumps	Output	Printer	A
Data5	Parameter Cards	Input	Card Reader	A

* A = Always required.
U = Required if the DRS Tape Catalog Pointer is being updated.
R = Required if a DRS Tape Catalog (1-4) is being restored from the CATALOG tape.

```
//*F PIODRP
//*CAT MAIN
//* H00/H00
//PDRS EXEC LINKGO,REGION.GO=100K
//LINK.SYSLIB DD DSN=K3.SBCID.SB001.OPICNEER,DISP=SHR
//LINK.SYSLIN DD *
  INCLUDE SYSLIB(DRSMNT)
  ENTRY DRSMNT
//GO.FT06F001 DD SYSOUT=A,DCB=BLKSIZE=3564
//GO.FT10F001 DD DSN=PIOCAT,UNIT=(1600,,DEFER),DISP=SHR,
//  VOL=SER=DMYCAT
//GO.FT20F001 DD DSN=K3.SBJPH.SB001.PFDRSLOG,DISP=CLD
//GO.FT40F001 DD DSN=K3.SBJPH.SB001.PFDRSCTP,DISP=CLD
//GO.FT41F001 DD DSN=K3.SBJPH.SB001.PFDRSCT1,DISP=CLD
//GO.FT42F001 DD DSN=K3.SBJPH.SB001.PFDRSCT2,DISP=CLD
//GO.FT43F001 DD DSN=K3.SBJPH.SB001.PFDRSCT3,DISP=CLD
//GO.FT44F001 DD DSN=K3.SBJPH.SB001.PFDRSCT4,DISP=CLD
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
```

See SB#PR.LIB.CNTL
DRSADD ForG
DRSRES ForG
DRSLST ForG

C. Data Cards.

The parameter cards follow the last DD card in the program setup and must be supplied to the program as shown in the following table:

Number	Columns	Format	Variable Name	Field Description
1	1	I1	MODE	Maintenance function requested. MODE = 1: Initialize and list all four DRS Tape Catalogs and the DRS Tape Catalog Pointer. MODE = 2: Add blank tapes (PHA and/or RATES) to the latest Tape Catalog indicated by the Tape Catalog Pointer.
1	1	A1	MODE	MODE=3: Modify the Catalog Pointer and generate a listing of the Catalog to which it points before and after update. MODE=4: List the contents of a specified tape catalog. MODE=5: Restore a specified Tape Catalog from a specified backup tape.
				MODE=6: Eliminate one PHA and/or one rate tape from the catalog. MODE=7: Replace one or more PHA and/or RATE tape with backup tapes. MODE=8: Create a backup tape of a specified catalog. MODE=9: Read and print catalog from backup tape.
	2	A1	IDCAT	Pioneer (F/G) identification. F: Perform maintenance function for Pioneer F Tape Catalogs. G. Perform maintenance function for Pioneer G Tape Catalogs.

Card Number	Columns	Format	Variable Name	Field Description
(Cards '2 to N1+4' must have the following format when MODE=1 is specified on Card 1.)				
2	1-2	I2	NUMPHA	Number of blank PHA tapes to be placed in the DRS Tape Catalogs (must be greater than zero and less than 51).
	5-6	I2	NUMRAT	Number of blank RATES tapes to be placed in the DRS Tape Catalogs (must be greater than zero and less than 51).
	11-16	A6	DPHAST	First tape assigned to PHA block of tapes.

Card Number	Columns	Format	Variable Name	Field Description
2	21-26	A6	DPHAEN	Last tape assigned to PHA block of tapes
	31-36	A6	DRATST	First tape assigned to RATES block of tapes.
	41-46	A6	DRATEN	Last tape assigned to RATES block of tapes.
3	1-6	A6	DTAP(1)	Blank PHA tape number 1.
	9-14	A6	DTAP(2)	Blank PHA tape number 2.
	17-22	A6	DTAP(3)	Blank PHA tape number 3.
	25-30	A6	DTAP(4)	Blank PHA tape number 4.
	33-38	A6	DTAP(5)	Blank PHA tape number 5.
	41-46	A6	DTAP(6)	Blank PHA tape number 6.
	49-54	A6	DTAP(7)	Blank PHA tape number 7.
	57-62	A6	DTAP(8)	Blank PHA tape number 8.
	65-70	A6	DTAP(9)	Blank PHA tape number 9.
	73-78	A6	DTAP(10)	Blank PHA tape number 10.
4-N	(same as card 3)			Repeat card 3 for Blank PHA tapes 11-50 if necessary.
N+1	(same as card 3)			Blank RATES tapes 1-10.
N+2 to N1	(same as card 3)			Blank RATES 11-50 if necessary.
N1+1	1-6	A6	DCATLG (1,1)	Primary CATALOG tape for backup Tape Catalog 1 and the FILE/ LOGISTICS/HISTORY catalog associated with Tape Catalog 1.
	9-14	A6	DCATLG (1,2)	Primary CATALOG tape for backup Tape Catalog 1 and the FILE/LOGISTICS/HISTORY catalog associated with Tape Catalog 1.
	17-22	A6	DCATLG (2,1)	Backup CATALOG tape for the Command and Attitude catalogs associated with Tape Catalog 1.

Card Number	Columns	Format	Variable Name	Field Description
N1+1	25-30	A6	DCATLG (2,2)	Backup CATALOG tape for the Command and Attitude catalogs associated with Tape Catalog 1.
N1+2	(same as card N1+1)			Primary and backup CATALOG tapes associated with Tape Catalog 3.
N1+4	(same as card N1+1)			Primary and backup CATALOG tapes associated with Tape Cagalot 4.

* (Cards '2 to N' must have the following format with MODE=2 is specified on Card 1.)

2	1-2	I1	NUMPHA	Number of blank PHA tapes to be added to the latest DRS Tape Catalog (this number can be zero).
	5-6	I2	NUMRAT	Number of blank RATES tapes to be added to the latest DRS Tape Catalog (this number can be zero).
3-N	(same as card 3 when MODE=1)			Blank PHA and/or RATES tapes to be added to the latest DRS Tape Catalog (when both PHA and RATES tapes are added, the RATES tapes must follow the PHA tapes and they must begin on a new parameter card).

(Card '2' must have the following format when MODE=3 is specified on Card 1.)

2	1	I1	NCAT	Value to be assigned to the DRS Tape Catalog Pointer indicating the latest version to the Tape Catalog (must be a value from 1 to 4).

(Card '2' must have the following format when MODE=4 is specified on Card 1.)

2	1	I1	NCAT	Number specifying the DRS Tape Catalog to list. A value of zero defaults to the latest version of Tape Catalog indicated by the Tape Catalog Pointer (must be value from 0 to 4).

Card Number	Columns	Format	Variable Name	Field Description
(Card '2' must have the following format when MODE=5 is specified on Card 1.)				
2	1	I1	NCAT	Number specifying the DRS Tape Catalog to restore (must be a value from 1 to 4).
	6-11	A6	DCLGTP	CATALOG tape containing the appropriate backup Tape Catalog (must always be specified on data card).
(Card '2' must have the following format when MODE=6 is specified on Card 1.)				
2	1-8	A8	DPOUT	PHA tape that is to be eliminated.
	11-18	A8	DROUT	RATE tape that is to be eliminated.
NOTE: When there is no PHA or RATES tape to be eliminated, the appropriate field is left blank.				
(Cards '2 to N' must have the following format when MODE=7 is specified on Card 1.)				
2	1-4	A4	NAME	Tape identification for either PHA or RATE. This must have the value 'PHAb' or 'RATE.' (b=blank)
2	6-13	A8	DOLDTP	PHA or RATES tape that is to be replaced.
	15-22	A8	DNEWTP	Backup PHA or RATES tape.
	24-31	I8	ITIMES	Start time of backup tape (milliseconds).
	33-40	I8	ITIMEE	End time of backup tape (milliseconds).
	42-45	I4	HDAYS	Start date of backup tape (relative modified Julian date).
	47-50	I4	HDAYE	End date of backup tape (relative modified Julian date).
	52-55	I4	HFEET	Amount of space (feet) used on backup tape.
3-N	(same as card 2)			Repeat card 2 for each PHA and/or RATES tape that is to be replaced.

NOTE: If it is desired to continue to use the same PHA and/or RATES tape parameters as found on the DRS Tape Catalogs, leave the following field blank: ITIMES. Otherwise, the program will replace the appropriate PHA and/or RATES tape parameters of the backup tape.

(Card '2' must have the following format when MODE=8 or MODE=9 is specified on Card 1.)

Card Number	Columns	Format	Variable Name	Field Description
2	1	I1	NCAT	Number specifying the DRS Tape Catalog (must be a value from 1 to 4).
	4-11	A8	DTAPBK	Backup tape number.

Added to the JCL are the following cards for the execution of MODE=8 and MODE=9:

For MODE=8:

```
//GO.FT11F001 DD DSN=PIOTAP,UNIT=(1600,DEFER),
//      DISP=(NEW,KEEP),DCB=(RECFM=U,BLKSIZE=5540),
//      VOL=SER=DMYTAP
```

For MODE=9:

```
//GO.FT11F001 DD DSN=PIOTAP,UNIT=(1600,,DEFER),
//      DISP=(OLD,KEEP),DCB=(RECFM=U,BLKSIZE=5540),
//      VOL=SER=DMYTAP
```

Following is an example of a data card to add tapes to the catalog:

```
2F
 5
E00405  E00407  E00415  E00418  E00419
```

D. Output.

DRSMNT provides one printed report at the end of each production run. This report is divided into two sections; the first section contains the processing messages which indicate all abnormal conditions encountered and the action taken by the program,and the second section is the Current Status Report. Each page of the report contains the following standard header information:

1. Type of report.
2. Name of the spacecraft.
3. Date of run (MM/DD/YY).
4. Page number.

There are three categories of messages generated by DRSMNT and all are self-explanatory. The first category is the group of messages which list all PHA and RATES tapes rejected by the program. These messages should be investigated for possible errors with the parameter cards. The second category is the group of messages which begin with "JOB TERMINATED" and provide an explicit reason for the abnormal termination of the job. All messages in this group must be investigated and the abnormal condition corrected before the job is resubmitted. The third category is the group of messages which signify the normal "end of job," and these always follow the Current Status report.

The contents of the Current Status report generated by DRSMNT is identical to the Current Status report generated by PIODRP. However, all the DRS Tape Catalogs affected by the current maintenance run are listed by DRSMNT.

E. ABENDS.

DRSMNT recognizes several abnormal conditions and terminates a run without a dump whenever they occur. The last message printed by the job will always indicate the abnormal condition encountered. This condition must be corrected before the job is resubmitted. When a job is terminated abnormally with a user completion code, refer to the User Abends section of the "IBM System/360 General I/O Package," written by Alan R. Thompson included in this procedures document.

APPENDIX A

(DRSMNT MODIFICATIONS)

Prepared by

M. W. Scott

COMPUTER SCIENCES CORPORATION

For

GODDARD SPACE FLIGHT CENTER

Under

Contract No. NAS 5-11790
Task No. 3101-02000

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DRSMNT MODIFICATIONS

The Pioneer F/G Data Reduction System Catalog Maintenance Program (DRSMNT) has been modified for the following purposes: to eliminate one PHA and/or one RATES tape from the Pioneer DRS tape catalogs; to replace one or more PHA and/or RATES tapes from the Pioneer DRS catalogs with backup tapes; to create a backup tape of a specified catalog; and to print the catalog information from the backup tape.

The parameter cards for the additional functions must be supplied to the program as shown in the following table.

Card	Col	Format	Variable Name	Field Description
1	1	I1	MODE	Maintenance function requested: MODE=6 Eliminate one PHA and/or one rate tape from the catalog. MODE=7 - Replace one or more PHA and/or one or more RATE tape with backup tapes. MODE=8 - Create a backup tape of a specified catalog. MODE=9 - Read and print catalog from backup tape.
	2	A1	IDCAT	Pioneer (F/G) identification. F- Perform maintenance function for Pioneer F Tape Catalogs. G- Perform maintenance function for Pioneer G Tape Catalogs.

There are only two input data cards when MODE=6, MODE=8 or MODE=9 is specified. When MODE=7 is specified there are more than two input cards. Cards '2 to N', where 'N' is the number of PHA and RATES tapes that are to be replaced, have the same format.

(Card '2' must have the following format when MODE=6 is specified on Card 1)

2	1-8	A8	DPOUT	PHA tape that is to be eliminated.
	11-18	A8	DROUT	RATE tape that is to be eliminated.

Note: When there is no PHA or RATES tape to be eliminated, the appropriate field is left blank.

Card	Col	Format	Variable Name	Field Description
(Cards '2 to N' must have the following format when MODE=7 is specified on Card 1)				
2	1-4	A4	NAME	Tape identification for either PHA or RATE. This must have the value 'PHAb' or 'RATE'. (b = blank)
	6-13	A8	DOLDTP	PHA or RATES tapes that is to be replaced.
	15-22	A8	DNEWTP	Backup PHA or RATES tape.
	24-31	I8	ITIMES	Start time of backup tape (milliseconds).
	33-40	I8	ITIMEE	End time of backup tape (milliseconds).
	42-45	I4	HDAYS	Start date of backup tape (Relative Modified Julian Date).
	47-50	I4	HDAYE	End date of backup tape (Relative Modified Julian Date).
	52-55	I4	HFEET	Amount of space (feet) used on backup tape.
3-N	(same as card 2)			Repeat card 2 for each PHA and/or RATES tape that is to be replaced.

Note: If it is desired to continue to use the same PHA and/or RATES tape parameters as found on the DRS Tape Catalogs, leave the following field blank: ITIMES. Otherwise, the program will replace the appropriate PHA and/or RATES tape parameters of the backup tape.

(Card '2' must have the following format when MODE=8 or MODE=9 is specified on Card 1).				
2	1	I1	NCAT	Number specifying the DRS Tape Catalog (must be a value from 1 to 4).
	4-11	A8	DTAPBK	Backup tape number.

DECK SETUP

There are no additions to the JCL for MODE=6 and MODE=7.

Added to the JCL are the following JCL cards for the execution of MODE=8 and MODE = 9.

For MODE = 8:

```
//GO.FT11F001 DD DSN=PIOTAP,UNIT=(2400-9,,DEFER),
//       DISP=(NEW,KEEP),DCB=(RECFM=U,BLKSIZE=5540),
//       VOL=SER=DMYTAP
```

For MODE = 9:

```
//GO.FT11F001 DD DSN=PIOTAP,UNIT=(2400-9,,DEFER),
//       DISP=(OLD,KEEP),DCB=(RECFM=U,BLKSIZE=5540),
//       VOL=SER=DMYTAP
```

```
//PDRS EXEC LINKGO,REGION.GO=100K
//LINK.SYSLIB DD DSN=K3.ZBRXB.SB001.OPIONEER,DISP=SHR
//LINK.SYSLIN DD *
  INCLUDE SYSLIB(DRSMNT)
  ENTRY DRSMNT
//GO.FT00F001 DD DCB=(BUFNO=1)
//GO.FT10F001 DD DSN=PIOCAT,UNIT=(2400-9,,DEFER),DISP=(OLD,KEEP),
// VOL=SER=DMYCAT
//GO.FT11F001 DD DSN=PIOTAP,UNIT=(2400-9,,DEFER),
//       DISP=(NEW,KEEP),DCB=(RECFM=U,BLKSIZE=5540),
//       VOL=SER=DMYTAP
***
  (NOTE: WHEN MODE=9, DISP=(OLD,KEEP)        )
***
//GO.FT20F001 DD DSN=K3SBJPH.SB001,PFDRSLOG,DISP=OLD
//GO.FT40F001 DD DSN=K3SBJPH.SB001.PFDRSCTP,DISP=OLD
//GO.FT41F001 DD DSN=K3SBJPH.SB001.PFDRSCT1,DISP=OLD
//GO.FT42F001 DD DSN=K3SBJPH.SB001.PFDRSCT2,DISP=OLD
//GO.FT43F001 DD DSN=K3SBJPH.SB001.PFDRSCT3,DISP=OLD
//GO.FT44F001 DD DSN=K3SBJPH.SB001.PFDRSCT4,DISP=OLD
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
```

(Note: This is the revised Deck Setup and the data set FT11F001 is used only when MODE=8 and MODE=9. Refer to 6.2.2 for general information.

Figure 1. Revised General Deck Setup for Executing the Pioneer F Data Reduction System Catalog Maintenance Program (DRSMNT)

The following are the data cards for each additional mode:

For MODE=6:

```
6F
E00311    E00202
```

For MODE=7:

```
7F
PHA   E00206   E00215   24685999 86389000  165  356 1300
PHA   E00207   E00216   23000000 85000000  178  200 2200
RATE  E00313   E00323   00000060 86000000  001  100 1500
RATE  E00314   E00324   00000120 86000000  300  300 1500
```

For MODE=8 and MODE=9:

```
F8
1  Z0169

9F
1  Z0169
```

PRINTED REPORTS

Additional printed reports define the program maintenance functions for MODE=6; MODE=7; MODE=8; and MODE=9, and generate self-explanatory messages which list all PHA and RATES tapes rejected by the program. These messages should be investigated for possible errors with the parameter cards. (Refer to Section 6.2.3.3 for a detailed description of the Printed Reports)

VIII. LOGISTICS.

A. Description.

The purpose of the Pioneer F&G Logistic Compress program is to compress the Logistic data set on disk associated with either satellite as determined by the JCL. The program can modify any or all entries via data cards in "NAMELIST" form.

Normally, this program is run to delete the oldest exact duplicate entries in the logistic dataset specified, but it can be run to delete specific absolute file numbers if desired.

B. JCL for Logistics.

The program requires 150 bytes of main storage and approximately .5 minutes of CPU time and 1.0 minutes of I/O time to do any operation desired. The DD cards required by LOGISTIC, and the purpose of each data set, are shown below:

DD NAME	PURPOSE OF DATA SET	INPUT/ OUTPUT	DEVICE TYPE	CODE
FT06F001	Processing Messages	Output	Printer	A
FT10F001	DRS Tape Catalog Pointer	Input	Disk	A
FT11F001	DRS Tape Catalog 1	Input	Disk	A
FT12F001	DRS Tape Catalog 2	Input	Disk	A
FT13F001	DRS Tape Catalog 3	Input	Disk	A
FT14F001	DRS Tape Catalog 4	Input	Disk	A
FT15F001	DRS Logistic Catalog	Input	Disk	A
FT16F001	Temp. Logistic Work Catalog	Output	Disk	A

DD NAME	PURPOSE OF DATA SET	INPUT/ OUTPUT	DEVICE TYPE	CODE
FT17F001	Temp. Logistic Work Catalog	Output	Disk	A
SYSUDUMP	ABEND DUMPS	Output	Printer	A
DATA5	Parameter cards	Input	Card/ Reader	B

CODE: A = Always Required.
B = Required only if normal compress is not requested. See Data Cards.

```
//* LOGISTIC
//*  THISDATE
//  EXEC LINKGO,REGION.GO=150K
//LINK.SYSLIB DD DSN=K3.SBCID.SB001.QPIONEER,DISP=SHR
//  DD DSN=K3.SBCID.SB001.QPIOTEMP,DISP=SHR
//LINK.SYSLIN DD *
 INCLUDE SYSLIB(LOGIST)
//GO.FT10F001 DD DSN=K3.SBCID.SB001.PFREDORP,DISP=SHR
//GO.FT11F001 DD DSN=K3.SBCID.SB001.PFREDOR1,DISP=(OLD,KEEP,KEEP)
//GO.FT12F001 DD DSN=K3.SBCID.SB001.PFREDOR2,DISP=(OLD,KEEP,KEEP)
//GO.FT13F001 DD DSN=K3.SBCID.SB001.PFREDOR3,DISP=(OLD,KEEP,KEEP)
//GO.FT14F001 DD DSN=K3.SBCID.SB001.PFREDOR4,DISP=(OLD,KEEP,KEEP)
//GO.FT15F001 DD DSN=K3.SBCID.SB001.PFREDOLG,DISP=(OLD,KEEP,KEEP)
//GO.FT16F001 DD UNIT=2314,DISP=(NEW,DELETE,DELETE),SPACE=(TRK,20),
//  DCB=(RECFM=F,LRECL=7294,BLKSIZE=7294)
//GO.FT17F001 DD UNIT=2314,DISP=(NEW,DELETE,DELETE),SPACE=(TRK,20),
//  DCB=(RECFM=F,LRECL=7294,BLKSIZE=7294)
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
```

see SB#PR.LIB.CNTL
ULOGISTF or G

C. Data Cards.

The data cards follow the last DD card in the job setup and are read using the NAMELIST convention of FORTRAN IV. If no data cards are specified* only those entries in the Logistics Catalog which have exact duplicate entries except for absolute file number (QABSF) will be analyzed. If duplicate entries are found, the most recent entry is kept and all other entries are deleted. If a particular type of entry is to be

---

*Under normal conditions no data cards are specified--this is a simple compression run.

deleted, options to key on must be specified. When an option is specified, any duplicate entry for that particular option specified will be deleted. The options to be keyed on must be set to true, all options default to false. The first column of each card must be blank. The second column in the first card of a group of data cards associated with the same NAMELIST must contain an ampersand (@) immediately followed by the NAMELIST Name CNTROL. If the data card CNTROL is defined the first absolute file number (QABSF) and the number of files (NABSF) must be spedified. This second parameter (NABSF) number of files must not exceed 20. The following are the options which may be keyed on for deletion of duplicate entries.

QSMDY	Start month/day/year.
QSHMS	Start hour/min/sec.
QEMDY	END month/day/year.
QEHMS	END hour/min/sec.
QEDRG	EDR generated.
QEDRRG	EDR re-generated.
QTLREC	Total records read.
QGDREC	Total good records processed.
QUALLW	Data Quality Low.
QUALHG	Data Quality High.
QPROCP	PHA generated.
QPROCR	Rates Generated.
QPROCC	Commands Processed.

D. Output.

The output from the Logistics Compress programs is (1) a formatted list of the logistics data set from disk before the requested operation was performed, (2) the absolute file numbers a requested operation was asked to perform, and (3) the Logistic data set as it appears after the requested operation was performed.

E. Abends.

When a job is terminated abnormally with a user completion code, refer to the User Abends section of the "IBM System/360 General I/O Package," Section FTIO.

VI. PIONEER RATES TAPE LIST PROGRAM USER'S GUIDE.

A. Description.

The Pioneer Rates Tape List Program is designed to create formatted listings of all RATES tapes, or part of a specified tape.

The user may request listings of specific contiguous records from a specified tape (record option), or of all Rates records spanning a given time interval (time option). Several Rate tapes may be mounted to satisfy a time option request. As many requests as desired may be processed in a run, with one input card required for each request. Time and record option requests may be mixed. Request for listings from Pioneer-F/G spacecraft may also be mixed. If the spacecraft ID is not specified, and this is the first request of a run, the assumed ID is F. After the first request, the ID of the previous request is assumed when none is specified.

When the time option is used, and the start time is not specified, then a tape label must be specified. Listing will then begin with the first record of this tape, and will continue until the specified end time, which may be on the same or some other tape. Failure to specify a tape label when no start time is specified will result in the list request being ignored. Any time option request not specifying an end time will cause the listing to end with the last record of the first tape mounted.

When the record option is specified, and no stapt record is specified, the listing will begin with the first record of the tape. If no stop record is specified, the listing will end with the last record on the tape.

Thus, it is possible to list all of a Rate tape using either the time or record option merely by specifying the tape label in the Time/Record data card.

B. JCL FOR RATES.

The program requires 150K bytes of main storage and .5 minutes of CPU time and 1.0 minutes of I/O time to list approximately 100 records.

The program references the following data sets (by DDNAME):

DATA SET	DESCRIPTION
FT06F001	Defines output data set for listing of Rate tapes. This is usually directed to a line printer (SYSOUT=A).
FT08F001	Defines output data set to receive program messages and error messages. This is normally directed to a line printer (SYSOUT=A) with following DCB specification: RECFM=VBA, LRECL=137, BLKSIZE=7265.
FT09F001	Defines input data set for Rate tape. A 9-track tape drive (UNIT=1600) should be specified with defer mounting. A dummy volume serial number should be specified. User must also specify DISP=SHR, and a dummy parameter for DSNAME.
FT20F001	Defines Pioneer-F DRS catalog pointer data set. If cataloged, only DSNAME and DISP parameters must be specified. Otherwise UNIT and VOL parameters must also be specified.

DATA SET	DESCRIPTION
FT21F001 FT22F001 FT23F001 FT24F001	Define Pioneer-F DRS Catalogs 1,2,3 and 4, respectively. If cataloged, only DSNAME and DISP parameters must be specified. Otherwise, UNIT and VOL parameters must also be specified.
FT30F001 FT31F001 FT32F001 FT33F001 FT34F001	Define Pioneer-G DRS catalog pointer data set, and Pioneer-G DRS catalog numbers 1, 2, 3, and 4, respectively. If cataloged, only DSNAME and DISP parameters must be specified. Otherwise, UNIT and VOL parameters must also be specified.
FT05F001	Defines card input data set to contain request for listing of Rate tapes by time and record option.

RATE TAPE LIST JCL:

```
//*F&G LIST
//*RATETAPE
//LINKGO  EXEC  LINKGC,REGION.GO=150K
//LINK.SYSLIB  DD  DSN=K3.ZB2NL.SB001.OPIOFRAT,DISP=SHR
//  DD DSN=K3.SBCID.SB001.OPIONEER,DISP=SHR
//LINK.SYSLIN  DD  *
 INCLUDE SYSLIB(PFRTPL)
 ENTRY PFRTPL
//GO.FT08F001  DD  SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265)
//GO.FT09F001  DD  DSN=PIORAT,UNIT=(6250,,DEFER),DISP=SHR,
//  VOL=SER=DUMRAT,DCB=DEN=3
//GO.FT20F001  DD  DSN=K3.SBCID.SB001.PFREDORP,DISP=SHR
//GO.FT21F001  DD  DSN=K3.SBCID.SB001.PFREDOR1,DISP=SHR
//GO.FT22F001  DD  DSN=K3.SBCID.SB001.PFREDOR2,DISP=SHR
//GO.FT23F001  DD  DSN=K3.SBCID.SB001.PFREDOR3,DISP=SHR
//GO.FT24F001  DD  DSN=K3.SBCID.SB001.PFREDOR4,DISP=SHR
//GO.FT30F001  DD  DSN=K3.SBJPH.SB001.PGDRSCTP,DISP=SHR
//GO.FT31F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT1,DISP=SHR
//GO.FT32F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT2,DISP=SHR
//GO.FT33F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT3,DISP=SHR
//GO.FT34F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT4,DISP=SHR
//* DATA CARD: COL. 1-8 (TYPE), 9 (ID), 13 (TAPE), 26-49 (START & END)
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
```

See SBAPR.NIB.CNTL
(URATLST)
also (URATLSTS)

C. Data Cards.

An example of a data card follows:

```
TIME     G                    77C12705300077012706300O
```

INPUT CARD FORMAT (RECORD OPTION):

Card Columns	Description
1-6	Must contain word RECORD starting in Column 1.
7-12	Blank
13-20	Label of tape to be read
21-25	Blank
26-29	Integer specifying first record of tape to be listed (Default: 1)
30-37	Blank
38-41	Integer specifying last record to be listed (Default: last record on tape)

INPUT CARD FORMAT (TIME OPTION):

Card Columns	Description
1-4	Must contain word TIME starting in Column 1
5-8	Blank
9	Spacecraft ID (F or G). If not specified on first request of run, F is assumed. If not specified on other than first request, ID of previous request is assumed.
10-12	Blank
13-20	Optional--label of tape for start of processing for this request, or label of tape known to contain requested start time. Must be specified if start time is not specified.
21-25	Blank
26-27	Two-digit year for start of processing:
28-29	Start month
30-31	Start day

Card Columns	Description
32-33	Start hour
34-35	Start minute
36-37	Start second
38-39	Two-digit year of last time to be listed:
40-41	End month
42-43	End day
44-45	End hour
46-47	End minute
48-49	End second

D. Output.

The primary output from the Rates Tape List Program is a formatted listing of the Rates Data by time or record, whichever was specified.

E. Abends.

Following is a list of program error and information messages with appropriate user responses:

1. LISTING WAS TO BEGIN WITH RECORD XXXXXX BUT END OF VOLUME WAS REACHED AT RECORD XXXXXX.

   Cause: The user on a record option request specified a start record index larger than the number of records on the tape.

   User Response: Either decrease the start record specified or make sure the correct tape label is specified.

2. *** ERROR TAPE NOT SPECIFIED IN RECORD MODE - REQUEST IGNORED.

   Cause: As stated.

   User Response: If the tape label is not known, use the time option to obtain desired listing. Otherwise, specify the tape label on the record option card.

3. *** ERROR MODE COULD NOT BE IDENTIFIED. MODE FIELD CONTAINED XXXXXXX. REQUEST IGNORED.

   Cause: The first characters of a user request card were neither TIME nor RECORD.

   User Response: Obvious.

4. *** ERROR BEGIN TIME WAS NOT SPECIFIED THUS IMPLYING THE START OF THE TAPE. BUT NO LABEL WAS SPECIFIED. REQUEST IGNORED.

   Cause: A time option request specified neither start time nor tape label.

   User Response: A time option request must specify either the tape label or start time.

5. *** ERROR S/C ID READ FROM THE CATALOG POINTER DATASET (X), DOES NOT MATCH ID READ DROM CATALOG # X, (UNIT XX)--X. RUN TERMINATED.

   Cause: A unit designated as defining an "F" DRS catalog (FT21-FT24 contains the DSNAME of a "G" DRS catalog. Conversely, a unit designated as "G" (FT31-FT34) contains the DSNAME of an "F" DRS catalog.

User Response: FORTRAN units 21 through 24 should define only "F" DRS catalogs, FORTRAN units 31 through 34 should define only "G" DRS catalogs.

6. *** ERROR EITHER AN END-OF-FILE OR AN I/O ERROR WAS DETECTED WHILE READING DRS CATALOG # X ON UNIT XX. RUN TERMINATED.

   Cause: As stated

   User Response: Check the DD card of the indicated unit. Make sure the data set with this DSNAME has been written on and in fact is a DRS catalog; if so, try resubmitting run as before since this may be an intermittant I/O error.

7. TIME PERIOD REQUESTED IS NOT ENTIRELY CONTAINED ON TAPES CURRENTLY IN THE DRS CATALOG.

   Cause: Not an error. The user-requested listing of data is not currently available.

   User Response: N/A.

8. *** I/O ERROR DETECTED ON TAPE XXXXXX AT RECORD XXXXXX. PROCESSING FOR THIS REQUEST TERMINATED. (Message from FTIO is printed.)

   Cause: As stated.

   User Response: Check FTIO manual for an interpretation of the message. Try copying tape using the utility VBSCOPY and replace the tape in the catalog with the new copy.

9. ---- BEGIN TIME NOT FOUND ON GIVEN TAPE.

Cause: A time option request contained both a tape label and a start time; however, the tape ended prior to the requested start time.

User Response: If the desired tape must be listed, eliminate the start time from request or change to the record option. If data from the time interval is desired, do not specify a tape label and let the program find the correct tape.

VII. PIONEER PHA TAPE LIST PROGRAM USER'S GUIDE.

A. Description.

The Pioneer PHA Tape List Program is designed to create formatted listings of all PHA tapes, or part of a specified tape.

The user may request listings of specific contiguous records from a specified tape (record option), or of all PHA records spanning a given time interval (time option). Several PHA tapes may be mounted to satisfy a time option request. As many requests as desired may be processed in a run, with one input card required for each request. Time and record option requests may be mixed. Request for listings from Pioneer-F/G spacecraft may also be mixed. If the spacecraft ID is not specified, and this is the first request of a run, the assumed ID is F. After the first request, the ID of the previous request is assumed when none is specified.

When the time option is used, and the start time is not specified, then a tape label must be specified. Listing will then begin with the first record of this tape, and will continue until the specified end time, which may be on the same or some other tape. Failure to specify a tape label when no start time is specified will result in the list request being ignored. Any time option request not specifying an end time will cause the listing to end with the last record of the first tape mounted.

When the record option is specified, and no stapt record is specified, the listing will begin with the first record of the tape. If no stop record is specified, the listing will end with the last record on the tape.

Thus, it is possible to list all of a PHA tape using either the time or record option merely by specifying the tape label in the Time/Record data card.

B. JCL FOR RATES.

The program requires 150K bytes of main storage and .5 minutes of CPU time and 1.0 minutes of I/O time to list approximately 100 records.

The program references the following data sets (by DDNAME):

DATA SET	DESCRIPTION
FT06F001	Defines output data set for listing of PHA tapes. This is usually directed to a line printer (SYSOUT=A).
FT08F001	Defines output data set to receive program messages and error messages. This is normally directed to a line printer (SYSOUT=A) with following DCB specification: RECFM=VBA, LRECL=137, BLKSIZE=7265.
FT10F001	Defines input data set for PHA tape. A 9-track tape drive (UNIT=1600) should be specified with defer mounting. A dummy volume serial number should be specified. User must also specify DISP=SHR, and a dummy parameter for DSNAME.
FT20F001	Defines Pioneer-F DRS catalog pointer data set. If cataloged, only DSNAME and DISP parameters must be specified. Otherwise UNIT and VOL parameters must also be specified.

DATA SET	DESCRIPTION
FT21F001 FT22F001 FT23F001 FT24F001	Define Pioneer-F DRS Catalogs 1,2,3 and 4, respectively. If cataloged, only DSNAME and DISP parameters must be specified. Otherwise, UNIT and VOL parameters must also be specified.
FT30F001 FT31F001 FT32F001 FT33F001 FT34F001	Define Pioneer-G DRS catalog pointer data set, and Pioneer-G DRS catalog numbers 1, 2, 3, and 4, respectively. If cataloged, only DSNAME and DISP parameters must be specified. Otherwise, UNIT and VOL parameters must also be specified.
FT05F001	Defines card input data set to contain request for listing of PHA tapes by time and record option.

PHA TAPE LIST JCL:

```
//*F&G LIST
//*PHA TAPE
//LINKGO  EXEC  LINKGO,REGION.GO=150K
//LINK.SYSLIB  DD  DSN=K3.ZB2NL.SB001.OPIOFRAT,DISP=SHR
//LINK.SYSLIN DD *
 INCLUDE SYSLIB(PRNPHA)
 ENTRY PRNPHA
//GO.FT08F001  DD  SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265)
//GO.FT10F001  DD  DSN=PIOPHA,UNIT=(1600,,DEFER),DISP=SHR,
//  VOL=SER=DUM1,DCB=DEN=3
//GO.FT20F001  DD  DSN=K3.SBJPH.SB001.PFDRSCTP,DISP=SHR
//GO.FT21F001  DD  DSN=K3.SBJPH.SB001.PFDRSCT1,DISP=SHR
//GO.FT22F001  DD  DSN=K3.SBJPH.SB001.PFDRSCT2,DISP=SHR
//GO.FT23F001  DD  DSN=K3.SBJPH.SB001.PFDRSCT3,DISP=SHR
//GO.FT24F001  DD  DSN=K3.SBJPH.SB001.PFDRSCT4,DISP=SHR
//GO.FT30F001  DD  DSN=K3.SBJPH.SB001.PGDRSCTP,DISP=SHR
//GO.FT31F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT1,DISP=SHR
//GO.FT32F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT2,DISP=SHR
//GO.FT33F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT3,DISP=SHR
//GO.FT34F001  DD  DSN=K3.SBJPH.SB001.PGDRSCT4,DISP=SHR
//GO.SYSUDUMP DD SYSOUT=A
//* DATA CARD: COL. 1-8 (TYPE), 9 (ID), 13 (TAPE), 26-49 (START & END)
12345678901234567890123456789012345678901234567890123456789012345678901234567890
//GO.DATA5 DD *
```

Dec SB#PR.LIB.CNTL(UPHALST)

C. Data Cards.

An example of a data card follows:

```
TIME     G                    770127053000770127063000
```

C. Data Cards.

INPUT CARD FORMAT (RECORD OPTION):

Card Columns	Description
1-6	Must contain word RECORD starting in Column 1.
7-12	Blank
13-20	Label of tape to be read
21-25	Blank
26-29	Integer specifying first record of tape to be listed (Default: 1)
30-37	Blank
38-41	Integer specifying last record to be listed (Default: last record on tape)

INPUT CARD FORMAT (TIME OPTION):

Card Columns	Description
1-4	Must contain word TIME starting in Column 1
5-8	Blank
9	Spacecraft ID (F or G). If not specified on first request of run, F is assumed. If not specified on other than first request, ID of previous request is assumed.
10-12	Blank
13-20	Optional--label of tape for start of processing for this request, or label of tape known to contain requested start time. Must be specified if start time is not specified.
21-25	Blank
26-27	Two-digit year for start of processing:
28-29	Start month
30-31	Start day

Card Columns	Description
32-33	Start hour
34-35	Start minute
36-37	Start second
38-39	Two-digit year of last time to be listed:
40-41	End month
42-43	End day
44-45	End hour
46-47	End minute
48-49	End second

D. Output.

The primary output from the PHA Tape List Program is a formatted listing of the PHA Data by time or record, whichever was specified.

E. Abends.

Following is a list of program error and information messages with appropriate user responses:

1. LISTING WAS TO BEGIN WITH RECORD XXXXXX BUT END OF VOLUME WAS REACHED AT RECORD XXXXXX.

   Cause: The user on a record option request specified a start record index larger than the number of records on the tape.

   User Response: Either decrease the start record specified or make sure the correct tape label is specified.

2. *** ERROR TAPE NOT SPECIFIED IN RECORD MODE - REQUEST IGNORED.

   Cause: As stated.

   User Response: If the tape label is not known, use the time option to obtain desired listing. Otherwise, specify the tape label on the record option card.

3. *** ERROR MODE COULD NOT BE IDENTIFIED. MODE FIELD CONTAINED XXXXXXX. REQUEST IGNORED.

   Cause: The first characters of a user request card were neither TIME nor RECORD.

   User Response: Obvious.

4. *** ERROR BEGIN TIME WAS NOT SPECIFIED THUS IMPLYING THE START OF THE TAPE. BUT NO LABEL WAS SPECIFIED. REQUEST IGNORED.

   Cause: A time option request specified neither start time nor tape label.

   User Response: A time option request must specify either the tape label or start time.

5. *** ERROR S/C ID READ FROM THE CATALOG POINTER DATASET (X), DOES NOT MATCH ID READ DROM CATALOG # X, (UNIT XX)--X. RUN TERMINATED.

   Cause: A unit designated as defining an "F" DRS catalog (FT21-FT24 contains the DSNAME of a "G" DRS catalog. Conversely, a unit designated as "G" (FT31-FT34) contains the DSNAME of an "F" DRS catalog.

User Response: FORTRAN units 21 through 24 should define only "F" DRS catalogs, FORTRAN units 31 through 34 should define only "G" DRS catalogs.

6. *** ERROR EITHER AN END-OF-FILE OR AN I/O ERROR WAS DETECTED WHILE READING DRS CATALOG # X ON UNIT XX. RUN TERMINATED.

   Cause: As stated

   User Response: Check the DD card of the indicated unit. Make sure the data set with this DSNAME has been written on and in fact is a DRS catalog; if so, try resubmitting run as before since this may be an intermittant I/O error.

7. TIME PERIOD REQUESTED IS NOT ENTIRELY CONTAINED ON TAPES CURRENTLY IN THE DRS CATALOG.

   Cause: Not an error. The user-requested listing of data is not currently available.

   User Response: N/A.

8. *** I/O ERROR DETECTED ON TAPE XXXXXX AT RECORD XXXXXX. PROCESSING FOR THIS REQUEST TERMINATED. (Message from FTIO is printed.)

   Cause: As stated.

   User Response: Check FTIO manual for an interpretation of the message. Try copying tape using the utility VBSCOPY and replace the tape in the catalog with the new copy.

9. ---- BEGIN TIME NOT FOUND ON GIVEN TAPE.

Cause: A time option request contained both a tape label and a start time; however, the tape ended prior to the requested start time.

User Response: If the desired tape must be listed, eliminate the start time from request or change to the record option. If data from the time interval is desired, do not specify a tape label and let the program find the correct tape.

IX. VBSCOPY.

A. Description.

The purpose of the Pioneer F&G VBSCOPY program is to create backup tapes of the Rates and PHA tape data base. It is also used to correct the PHA and Rate tapes with I/O Errors, Wrong Length Records, and Data Checks. The program basically keeps the logical integrity of VBS Records.

B. JCL for VBSCOPY.

The program VBSCOPY is in executable load module form on SYS2.LOADLIB named SEHGDVBS. The program requires .5 minutes of CPU time and 2. minutes of I/O for a full 2200-ft. tape. This program may be used for both PHA and Rates tapes with slight changes to the JCL. The changes are data set name, LRECL and BLKSIZE. The DD cards required by VBSCOPY are shown below and the purpose of each data set is defined.

DD NAME	PURPOSE OF DATA SET	INPUT/ OUTPUT	DEVICE TYPE	CODE
STEPLIB	User Program	Input	Disk	A
SYSPRINT	Formatted Listing	Output	Printer	A
ORIGINAL	PHA or RATE Tape	Input	Tape	A
COPY	Corrected PHA or Rate Tape	Output	Tape	A
SYSUDUMP	ABEND LISTING	Output	Printer	A

CODE: A = Always required

JCL FOR RATES TAPES:

```
//COPYVBS   PROC   INVOL=,OUTVOL=
//BACKITUP   EXEC   PGM=SEHGDVBS,REGION=150K
//STEPLIB   DD   DSN=SYS2.LOADLIB,UNIT=3330,DISP=SHR
//SYSPRINT   DD   SYSOUT=A
//ORIGINAL   DD   DSN=PIORAT,UNIT=6250,VOL=SER=&INVOL.,
//   DISP=SHR,DCB=(RECFM=U,BLKSIZE=8704,LRECL=8704,OPTCD=BZ,DEN=3)
//COPY   DD   DSN=PIORAT,UNIT=6250,VOL=SER=&OUTVOL.,
//   DISP=(SHR,KEEP),DCB=(RECFM=VBS,LRECL=1740,BLKSIZE=8704,DEN=3)
//SYSUDUMP   DD   SYSOUT=A
//   PEND
```

JCL FOR PHA TAPES:

```
//COPYVBS   PROC   INVOL=,OUTVOL=
//BACKITUP   EXEC   PGM=SEHGDVBS,REGION=150K
//STEPLIB   DD   DSN=SYS2.LOADLIB,UNIT=3330,DISP=SHR
//SYSPRINT   DD   SYSOUT=A,DCB=BLKSIZE=3564
//ORIGINAL   DD   DSN=PIOPHA,UNIT=6250,VOL=SER=&INVOL.,
//   DISP=SHR,DCB=(RECFM=U,LRECL=1524,BLKSIZE=7624,OPTCD=Z,EROPT=ACC,
//  DEN=3)
//COPY   DD   DSN=PIOPHA,UNIT=6250,VOL=SER=&OUTVOL.,
//   DISP=(SHR,KEEP),DCB=(RECFM=VBS,LRECL=1524,BLKSIZE=7624,DEN=3)
//SYSUDUMP   DD   SYSOUT=A
//   PEND
```

C. Data Cards.

Only one card is used for this program. It merely envokes the procedure and defines the input and output tape:

```
// EXEC COPYVBS,INVOL=E02644,OUTVOL=E02687
```

D. Output.

The output from this program is a corrected or backup PHA or RATES tape and a listing. The listing has the number of blocks read, copied, not copied and why.

E. Abends.

This program does not abend except due to bad Output tapes or tape drives. If a bad output tape is encountered, have the tape Librarian in the Building 1 Computer Facility clean it and rerun the job. If the drive is bad, resubmit the job, specifying a different drive.

Phase II

INTRODUCTION

The Flux Data Base Generator (FLXDBG) program creates a time ordered sequence of summaries of PHA and RATES data. The primary inputs to the program are the Rates and PHA tapes generated by the Pioneer Data Reduction Program.

A directory of the flux summary tapes is maintained in the flux summary catalog. The catalog can store information for up to four different spacecraft with four flux datasets allowed for each spacecraft. The catalog resides on disk.

Associated with each flux dataset is a utility dataset containing the amount of time for which data is missing for each interval in all or some part of the flux dataset. This utility dataset resides on tape, but is copied to temporary DASD by FLXDBG.

Each summary interval in the dataset can be uniquely referenced by an absolute index number. For this purpose, interval number one is defined as starting at Time Zero or Jan 1, 1972; and interval K starts at Time (Interval (K-1)) + Summary Interval period for K integer> 1.

The flux data base generator has two primary modes of operation. In the normal or update mode, the program adds new summaries contiguously, starting with the first interval following the last one currently in the dataset.

In the replace/insert mode, summary intervals already in the dataset are replaced to reflect arrival of data not previously available.

Note: Prior to the first run of FLXDBG for a given flux dataset, space in the flux catalog for the dataset must be allocated. This is done via the catalog maintenance program. (See user's guide for this program.)

JCL in SB#PR.NIB.CNTL
(FLUXDBGF)
(FLUXDBGG)

USE OF FLXDBG

To use the flux data base generator in update mode, the user need specify only the flux dataset to be updated.

To use the replace/insert option, the dataset definition is followed by one or more replacement interval definitions. The program may proceed with an update operation after all replace intervals are processed, or the user may request program termination after insert/replace operation is complete.

All input is by the namelist convention of FORTRAN. There are two different Namelist Inputs. The FLUX Namelist is a required input to define the Flux dataset to be processed. The INSERT Namelist is optional and is used to specify intervals to be replaced.

FLUX CARD

For the FLUX Namelist Card, the character string &FLUX should be placed starting in column 2. Each of the following must be specified (in any order), separated by commas.

SATID =	Spacecraft I. D; up to twelve characters.
ISINT =	Summary interval period in seconds.
ASOURC =	Source of Data; up to four characters.
QTRENT = T F	Trend check flag for rates data.
QCALIB = F T	Calibrate mode flag for PHA data.

Following the last parameter above and an optional comma, the character string &END should be placed. (Note: Only one flux dataset may be specified in each job.)

INSERT CARD

The character string &INSERT should be placed starting in column 2. Parameters on this card are:

NFAFN =		Absolute index of first summary interval to be replaced.
NLAFN =		Absolute index of last summary interval to be replaced.
QNOUPD =	F	(DEFAULT = F)
	T	If QNOUPD = T is specified, no further cards are read; and the program terminates. If this is not done, the program will proceed with an update operation after the last insert/replace operation is complete.

Following the last parameter above, the character string &END should be placed.

DATASETS REFERENCED

The following is a list of external datasets referenced by FLXDBG:

FT06F001	SYSOUT = A Program error and processing messages.
FT07F001	SYSOUT = A Printed summary of PHA events processed each interval.
FT10F001	PHA tape input dataset; should specify a 9-track drive and deferred mounting.
FT11F001	Rates tape input dataset; a 7-track drive with deferred mounting should be specified.
FT18F001	New (output) flux tape; a 9-track drive with deferred mounting should be requested. DISP = (NEW, KEEP) should be specified along with the following DCB: RECFM=VB, LRECL=32008, BLKSIZE=32012
FT19F001	Old (input) flux tape. DISP = OLD; or SHR should be specified.
FT20F001	DRS Catalog Pointer Dataset (Normally resides on DASD.)
FT21F001 FT22F001 FT23F001 FT24F001	The four DRS catalogs. They are normally cataloged and reside on DASD. DISP=SHR should be specified. If not cataloged, unit and vol. parameters must also be specified.
FT30F001	Defines Flux summary catalog. DISP=SHR should be specified. If not cataloged, the VOL and UNIT parameters should also be specified.

PROGRAM ERROR MESSAGES

The following is a list of program error messages that may require some action by the user to correct the indicated error. These messages are written on logical unit 6 and may appear singly or with other error messages.

1) ERROR - S/C ID ON POINTER WAS X WHILE THAT ON THE CATALOG WAS Y

Explanation: The error occured reading the DRS catalog. The spacecraft ID of the DRS catalog does not match that of the DRS catalog pointer.

User Response: Be sure the datasets defined by FT20F001 through FT24F001 specify datasets whose spacecraft ID is the same as the Flux dataset specified on input.

2) I/O ERROR READING DRS CATALOG

(FTIO ERROR MESSAGE)

User Response: Check FTIO manual; rerun program. If error recurs, check with programmer.

3) WARNING - PROGRAM ENDING - NO TAPES IN BLANK TAPE QUE

User Response: Run program again after adding blank tapes via catalog maintenance program. (Note: Check with programmer first.)

4) I/O ERROR READING BLANK TAPE ARRAY

(FTIO ERROR MESSAGE)

User Response: Check FTIO manual; rerun program and see programmer if error occurs again.

5) UNEXPECTED END OF FILE - COPYING OLD TAPE

Explanation: While copying the old flux tape to the new one, an end of file was reached when more data was expected.

User Response: Show dump to a programmer.

6) I/O ERROR COPYING OLD TAPE

(FTIO ERROR MESSAGE)

User Response: See FTIO manual. If error recurs, show to programmer.

7) INSERT OPERATION REQUESTED BUT THE INTERVAL NUMBERS INPUT ARE MEANINGLESS

NFAFN = xxxxxx NLAFN=xxxxxx

User Response: Correct interval numbers on insert card.

8) ERROR READING CATALOG RECORD NUMBER XX
DREAD I/O ERROR MESSAGE FOLLOWS:
(DAIO ERROR MESSAGE)

Explanation: The error occurred reading the flux tape arrays of the flux catalog.

User Response: Check DAIO manual and rerun program.

9) PROGRAM TERMINATION - LAST AFN ON LAST TAPE IN USED TAPE ARRAY WAS XXXXXX
BUT LAST AFN INDICATED ON CATALOG WAS XXXXXX

User Response: Show printout to programmer, or restore catalog to previous version from backup tape.

10) PROGRAM TERMINATION BECAUSE PROGRAM DOES NOT HAVE ENOUGH TIME TO MOUNT THE INPUT AND OUTPUT TAPES

User Response: Increase I/O Time estimate, and rerun job.

11) ERROR - ATTEMPT TO INSERT STARTING AT INTERVAL # XXXXXX.
TAPE CONTAINING THIS INTERVAL NOT FOUND - PROGRAM TERMINATING

User Response: Make corrections to insert card, so that requested insert interval is a valid interval for this dataset.

12) UNEXPECTED END OF TAPE SKIPPING RECORDS ON INPUT TAPE

Explanation: The error occurred after an insert/replace operation while skipping records of the old flux tape corresponding to those replaced. An end of file was reached where more records should have been.

User Response: Consult with programmer.

13) I/O ERROR SKIPPING RECORDS ON INPUT TAPE

(FTIO ERROR MESSAGE)

User Response: Rerun job. If error recurrs, consult programmer.

15) NOT ENOUGH TIME TO MOUNT TAPES - QUITTING

User Response: Increase I/O time estimate, and rerun job.

16) I/O ERROR ATTEMPTING TO READ RECORD XX OF TEMPORARY UTILITY DATASET

(DAIO ERROR MESSAGE)

User Response: Rerun job.

17) AN ATTEMPT TO MOUNT A PHA TAPE INDICATES THERE IS NOT ENOUGH TIME TO - PROGRAM TERMINATING

User Response: Rerun program.

18) I/O ERROR READING PHA TAPE MESSAGE FOLLOWS:

(FTIO ERROR MESSAGE)

User Response: Rerun program. If error recurs, consult with programmer.

19) I/O ERROR DETECTED WHILE READING RECORD XXXXXX OF RATES TAPE XXXXXX MESSAGE FOLLOWS

(FTIO ERROR MESSAGE)

20) NO MORE TIME DETECTED PRIOR TO MOUNT OF NEXT RATES TAPE - RUN TERMINATING

User Response: Rune job again to complete summaries not finished.

21) ERROR READING FIRST INSERT RECORD FROM OLD TAPE FOR HLSID

(FTIO ERROR MESSAGE)

Cause: An I/O error or end offile occurred while reading the rate summary record of the old flux tape (for last sectored sequence ID) corresponding to the first insert interval.

User Response: Show dump to programmer.

22) ERROR - I/O ERROR READING CATALOG PROGRAM TERMINATING - ERROR MESSAGE FOLLOWS:

(FTIO ERROR MESSAGE)

Cause: The error occurred reading the flux catalog.

User Response: Rerun program. If error occurs again, consult with programmer.

23) TAPE XXXXXX IS FREE AT END OF THIS JOB

If the job ends normally, all tapes listed with this message are free and should be added back to the blank tape que using the catalog maintenance program.

To maintain the flux data base, there is a utility program which allows the user to initialize the catalog, list the catalog, initialize a data set for a satellite, add blank tapes to the queue, and list rates tables.

The flux catalog can store four different types of spacecraft information. For each spacecraft, four different data sets can be maintained. Each spacecraft will have a different queue of blank tapes, but each data set can have a different record of used tape queue information. Each data set is referenced by a 4-character (alphanumeric) unique name. The input for this program is through a namelist, CATLOG, which should be started in column 2. The output listing shows the status of the catalog. Each of the following must be specified as they appear (in any order) separated by commas.

Type		
Complex	SATID=	Spacecraft ID up to 12 characters. (Complex)
I * 4	ISINT=	Summary interval in seconds. Integer.
R * 8	DPHANM=	PHA data set name (Alpha) Not needed to list - add blanks.
R * 8	DRATNM=	Rates data set (Alpha) Not needed to list - add blanks.
R * 4	ASOURC=	4-character Alphanumeric.
L * 4	QTREND=	Logical variable trend check flag for Rates data. T or F Defaults to T
L * 4	QCALIB=	Logical variable calibrate mode flag for PHA data. T or F Defaults to F

Integer * 2 variables are YY,MM,DD,HR,MN,SC (each one separated by commas).

R * 4	FUNCT=	specify the function 4-character log. Function should be enclosed in apostrophies. ='INIT' initializes a data set for the first time.

Where this is specified, all the namelist parameters should be present, otherwise the program takes an alternate exit and writes out an appropriate message, (except that Dtapes may add blanks or may not). If FUNCT= is not specified, it abends and writes out a message.

='LIST' will list the entire catalog for a specified SATELLITE. In this case, it only needs SATID= and FUNCT='LIST'. If one wants to list only one or two data sets, all the attributes of a specified spacecraft should be given in two namelist entries.

='ADDB' adds the blank tapes to a given spacecraft and lists the catalog if the attributes of the data sets are specified. Up to 20 blanks can be added at one time.

R * 8 DTAPES= Labels of the blank tapes up to 20. Each are separated by commas and enclosed in apostrophies. These tape labels should not be in the catalog already, either used or blank; the program does not make a check or compare with the blank or used labels.

New modifications:

NOTE: If Dtapes numbers are the same as for a good flux tape in the catalog, they will not get added to the catalog; FLXMNT writes out a message for that tape number.

FUNCT ='RATE' lists all the Rates in the catalog for that spacecraft.

='DELT' deletes the given source for a given satellite.

The JCL for the add and list functions may be found in SBPIO.LIB.CNTL (FCATLST or FCATADD F/G).

SB#PR

Dataset name for flux catalogs. unit 50 + S card. Dmcheck
Line card before data card.

FLUX PLOT PROGRAM - Input Data Layout

JCL referenced in SB#PR.LIB.CNTL (PLOTPIOFORG) + (RETAPLTFORG)

1. STRUCTURE OF SATELLITE CARD

JCL IS .LIB.CNTL (AFLXPROC)

Column		Description
1	S	
2	Blank	
3 - 14	(EBCDIC)	Satellite ID (left justified)
15	Blank	
16 - 19	(EBCDIC)	Source of data (left justified)
20	Blank	
21	L1	trend-check attribute of dataset
22	L1	Cal mode attribute of dataset
25 - 27	I3	Number of days in averaging interval
28	Not used	
29 - 30	I2	Number of hours in averaging interval
31		
32 - 33	I2	Number of minutes
34		
35 - 36	I2	Number of seconds
37 - 40	Not used	
41 - 44	I4	maximum error code allowed (defaults to 0)
45	Not used	
46 - 48	I3	maximum number of points/frame for 4060 plots (defaults to 125)
49 - 50	Not used	
51	L1	T process PHA data (defaults to .TRUE.)
52	L1	T process RATES data (defaults to .FALS
53	L1	F process data for histograms (defaults - False)
54 - 55	Not used	

Column		Description
56	L1	T create semi-log time/history plots (default - T)
57	L1	F create linear time/history plots (default = F) —
58	L1	F create time/history listings (default = T)
59 - 60	Not used	
61	L1	F create log-log spectrum plots (default - T) —
62	L1	F create semi-log spectrum plots (default - F)
63	L1	F create spectrum lists (default - T) (PHA data only)

Note that flags in columns 56 - 58 and 61 - 63 are global specifications. If any of these flags are set to false, request for corresponding option on the following data cards will not be honored. If, on the other hand, a flag is set to .TRUE., the request for the option (explicit or implied) will be honored.

$CARD

P col 1

3-10 particle-id

11-20 log-log

21-30 semi-log

10.0

Include Card:

Column		
1	S	
2	I	
11 - 12	two-digit year	start-time of period to be included
13		
14 - 15	month	
16		
17 - 18	day	
19		
20 - 21	hour	
22		
23 - 24	minute	
25		
26 - 27	second	
28		
29 - 30	year	end-time of period to be included
31		
32 - 33	month	
34		
35 - 36	day	
37		
38 - 39	hour	
40		
41 - 42	minute	
43		
44 - 45	second	

Exclude Card: Identifies time periods from which data is to be excluded.

Character E in Column 2.

The time period to be excluded must lie entirely within the time span defined by the current include card. If this condition is not met, the program will signal an error condition.

Mode Card: SPECTRA

(Card 1)

Column			
1	M		
2	Blank		
3 - 6	Mode ID (left justified) EBCDIC		
7 - 8	Blank		
9 - 10	Two-character generation ID		
11 - 20	Blank		
21	Log-log spectrum plots desired flag	Y, N, blank	
22	Semi-log spectrum plots desired flag	Y, N, blank	
23	Spectrum list desired flag	Y, N, blank	
24 - 35	Not used		
36 - 44	Lower limit of ordinate (Log-log plots)	(E9.0)	10^{-3}
45 - 53	Upper limit of ordinate (Log-log plots)	(E9.0)	10^{6}
54 - 62	Lower limit of abcissa (log-log plots)	(E9.0)	1.
63 - 71	Upper limit of abcissa (log-log plots)	(E9.0)	1000.
72	Blank, if semi-log spectrum plots are not required Non-blank character if semi-log spectrum plots are required		
73 - 80	Not used		

(Card 2) - must be present if Column 72 of the previous card contains a non-blank character

Column			
~~1 - 9~~ 3-11	Lower limit of ordinate (semi-log)	(E9.0)	10^{-3}
~~10 - 18~~ 12-20	Upper limit of ordinate (semi-log)	(E9.0)	10^{6}
~~19 - 27~~ 21-29	Lower limit of abcissa (semi-log)	(E9.0)	0
~~28 - 36~~ 30-38	Upper limit of abcissa (semi-log)	(E9.0)	24.0

List of Mode ID's

HS2	AB¬CI events
HS3	ABCI
HPFB	CIII CI+CII B A events
HPF	A B CI+CII CIII
HPB	
LS2	→ DI DII ¬F
LS3	→ DI DII F

Note: Knowledge of precise ranges of energy in various modes is not essential. The approximate range for Pioneer-10 and -11 are as follows:

LS2	3.2 - 5.2	HPF	57 - 110
LS3	5.2 - 22.0	HPB	57 - 110
HS2	22.0 - 31.0	HPFB	> 110
HS3	31.0 - 57.0		

LS - Low Energy
H - High Energy
PF = Penetrating Forward
PB " Backward

Bin Cards

One bin card is required for each bin for which data is to be obtained from PHA data.

One, or two cards are required for each bin for which flux is to be obtained from RATES data. Two cards are required only when flux has to be displayed and the catalog entry corresponding to the bin needs to be modified.

PHA Bin (one card only):

Column		
1	B	
2	Blank	
3 - 11	Threshold	(F9.0)
12 - 20	Ceiling	(F9.0)
21 - 25	Not used	
26	Linear time history plot flag Y - if a new frame for linear time history plot is to begin with this bin b - if this bin is to be displayed on the current frame - frame becomes current when character Y is encountered in this column N - if this bin is not to be displayed on linear time history plot	
27	Semi-log time/history plot flag (similar to linear time/history flag)	
28	Time/history listing (similar to linear time/history flag)	
29	1 - if ΔA histogram for this bin is required 2 - if ΔB histogram for this bin is required 3 - if both ΔA and ΔB histograms required	
30	ΔA histogram compression	(I1)
31	ΔB histogram compression	(I1)
32 - 35	Not used	

Column		
36 - 44	Ordinate lower limit for semi-log time history plot	(E9.0)
45 - 53	Ordinate upper limit for semi-log time history plot	(E9.0)
54 - 62	Ordinate lower limit for linear time history plot	(E9.0)
63 - 71	Ordinate upper limit for linear time history plot	(E9.0)
72	Blank	
73 - 80	Not used (may be used for sequence number)	

RATE Bin:

(Card 1)

Column	
1	B
2	R
3 - 9	Rate mneumonic for first/only rate (A8)
10	Blank
11	Code for operation to be performed b - flux computation + - sum of rates, or rates modified by specified factors - - difference of rates, or rates modified by specified factors / - ratio of rates , - rate (possibly divided by a factor)
12 - 18	Rate mneumonic for second rate, if any (required if code is + or -)
19	
20	Blank
21 - 25	Not used
26	Linear time/history plot flag Y - if a new frame for linear time/history plot is to begin with this bin b - if this bin is to be displayed on the current frame (frame becomes current when Y is encountered in this column) N - if this bin is not to be displayed on linear time/history plot

Column		
27	Semi-log time/history plot flag (similar to linear time/history flag)	
28	Time/history listing (similar to linear time/history flag)	
29	1 - flux for this bin is to be displayed b - counts/sec for the first rate is to be displayed	
30 - 35	Not used	
36 - 71	SAME AS PHA BIN.	

(Card 2)

Column		
1 - 2	Blank	
3 - 11	Threshold of first, or only rate by which first or only rate is to be divided	flux +, -, .
12 - 20	Threshold of second rate; in case of single rate, ceiling energy factor by which second rate is to be divided	flux +, -
21 - 29	Geometry factor	flux
30 - 37	Particle identifier	

These values need only be specified in case the values are not currently available in the table maintained in the catalog.

Dataset name for flux catalog. unit 50 + 5 card
Line card after data card.

Donncheck

FLUX PLOT PROGRAM - Input Data Layout

FLXPLOT Prog. Catalog

1. STRUCTURE OF SATELLITE CARD

Column		Description
1	S	
2	Blank	
3 - 14	(EBCDIC)	Satellite ID (left justified)
15	Blank	
16 - 19	(EBCDIC)	Source of data (left justified)
20	Blank	
21	L1	trend-check attribute of dataset
22	L1	Cal mode attribute of dataset
25 - 27	I3	Number of days in averaging interval
28	Not used	
29 - 30	I2	Number of hours in averaging interval
31		
32 - 33	I2	Number of minutes
34		
35 - 36	I2	Number of seconds
37 - 40	Not used	
41 - 44	I4	maximum error code allowed (defaults to 0)
45	Not used	
46 - 48	I3	maximum number of points/frame for 4060 plots (defaults to 125)
49 - 50	Not used	
51	L1	process PHA data (defaults to .TRUE.)
52	L1	process RATES data (defaults to .FALSE
53	L1	process data for histograms (defaults - False)
54 - 55	Not used	

Column		Description
56	L1	create semi-log time/history plots (default - T)
57	L1	create linear time/history plots (default - F)
58	L1	create time/history listings (default - T)
59 - 60	Not used	
61	L1	create log-log spectrum plots (default - T)
62	L1	create semi-log spectrum plots (default - F)
63	L1	create spectrum lists (default - T)

Note that flags in columns 56 - 58 and 61 - 63 are global specifications. If any of these flags are set to false, request for corresponding option on the following data cards will not be honored. If, on the other hand, a flag is set to .TRUE., the request for the option (explicit or implied) will be honored.

PCARD

P col 1

3-10 particle id

11-20 log-log

21-30 spectra

TO

10.0

Include Card:

Column		
1	S	
2	I	
11 - 12	two-digit year	start-time of period to be included
13		
14 - 15	month	
16		
17 - 18	day	
19		
20 - 21	hour	
22		
23 - 24	minute	
25		
26 - 27	second	
28		
29 - 30	year	end-time of period to be included
31		
32 - 33	month	
34		
35 - 36	day	
37		
38 - 39	hour	
40		
41 - 42	minute	
43		
44 - 45	second	

Exclude Card: Identifies time periods from which data is to be excluded.

Character E in Column 2.

The time period to be excluded must lie entirely within the time span defined by the current include card. If this condition is not met, the program will signal an error condition.

Mode Card: SPECTRA

(Card 1)

Column			
1	M		
2	Blank		
3 - 6	Mode ID (left justified) EBCDIC		
7 - 8	Blank		
9 - 10	Two-character generation ID		
11 - 20	Blank		
21	Log-log spectrum plots desired flag	Y, N, blank	
22	Semi-log spectrum plots desired flag	Y, N, blank	
23	Spectrum list desired flag	Y, N, blank	
24 - 35	Not used		
36 - 44	Lower limit of ordinate (Log-log plots)	(E9.0)	10^{-3}
45 - 53	Upper limit of ordinate (Log-log plots)	(E9.0)	10^{6}
54 - 62	Lower limit of abcissa (log-log plots)	(E9.0)	1.
63 - 71	Upper limit of abcissa (log-log plots)	(E9.0)	1000.
72	Blank, if semi-log spectrum plots are not required Non-blank character if semi-log spectrum plots are required		
73 - 80	Not used		

(Card 2) - must be present if Column 72 of the previous card contains a non-blank character

Column			
~~1 - 9~~ 3-11	Lower limit of ordinate (semi-log)	(E9.0)	10^{-3}
~~10 - 18~~ 12-20	Upper limit of ordinate (semi-log)	(E9.0)	10^{6}
~~19 - 27~~ 21-29	Lower limit of abcissa (semi-log)	(E9.0)	0
~~28 - 36~~ 30-38	Upper limit of abcissa (semi-log)	(E9.0)	24.0

List of Mode ID's

HS2	AB¬CI events
HS3	ABCI
HPFB	CIII CI+CII B A events
HPF	A B CI+CII CIII
HPB	
LS2	→ DI DII ¬F
LS3	→ DI DII F

Note: Knowledge of precise ranges of energy in various modes is not essential.

The approximate range for Pioneer-10 and -11 are as follows:

LS2	3.2 - 5.2	HPF	57 - 110
LS3	5.2 - 22.0	HPB	57 - 110
HS2	22.0 - 31.0	HPFB	> 110
HS3	31.0 - 57.0		

LS Low Energy
HS High Energy
HF - Forward
HB Backward

Bin Cards

One bin card is required for each bin for which data is to be obtained from PHA data.

One, or two cards are required for each bin for which flux is to be obtained from RATES data. Two cards are required only when flux has to be displayed and the catalog entry corresponding to the bin needs to be modified.

PHA Bin (one card only):

Column		
1	B	
2	Blank	
3 - 11	Threshold	(F9.0)
12 - 20	Ceiling	(F9.0)
21 - 25	Not used	
26	Linear time history plot flag Y - if a new frame for linear time history plot is to begin with this bin b - if this bin is to be displayed on the current frame - frame becomes current when character Y is encountered in this column N - if this bin is not to be displayed on linear time history plot	
27	Semi-log time/history plot flag (similar to linear time/history flag)	
28	Time/history listing (similar to linear time/history flag)	
29	1 - if ΔA histogram for this bin is required 2 - if ΔB histogram for this bin is required 3 - if both ΔA and ΔB histograms required	
30	ΔA histogram compression (I1)	
31	ΔB histogram compression (I1)	
32 - 35	Not used	

Histograms

Column		
36 - 44	Ordinate lower limit for semi-log time history plot	(E9.0)
45 - 53	Ordinate upper limit for semi-log time history plot	(E9.0)
54 - 62	Ordinate lower limit for linear time history plot	(E9.0)
63 - 71	Ordinate upper limit for linear time history plot	(E9.0)
72	Blank	
73 - 80	Not used (may be used for sequence number)	

RATE Bin:

(Card 1)

Column	
1	B
2	R
3 - 9	Rate mneumonic for first/only rate (A8)
10	Blank
11	Code for operation to be performed b - flux computation + - sum of rates, or rates modified by specified factors - - difference of rates, or rates modified by specified factors / - ratio of rates . - rate (possibly divided by a factor)
12 - 18	Rate mneumonic for second rate, if any (required if code is + or -)
19	
20	Blank
21 - 25	Not used
26	Linear time/history plot flag Y - if a new frame for linear time/history plot is to begin with this bin b - if this bin is to be displayed on the current frame (frame becomes current when Y is encountered in this column) N - if this bin is not to be displayed on linear time/history plot

Column		
27	Semi-log time/history plot flag (similar to linear time/history flag)	
28	Time/history listing (similar to linear time/history flag)	
29	1 - flux for this bin is to be displayed b - counts/sec for the first rate is to be displayed	
30 - 35	Not used	
36 - 71	SAME AS PHA BIN.	

(Card 2)

Column		
1 - 2	Blank	
3 - 11	Threshold of first, or only rate by which first or only rate is to be divided	flux +, -, .
12 - 20	Threshold of second rate; in case of single rate, ceiling energy factor by which second rate is to be divided	flux +, -
21 - 29	Geometry factor	flux
30 - 37	Particle identifier	

These values need only be specified in case the values are not currently available in the table maintained in the catalog.

	LINE #	RATE #	SUB-COM INDEX	RATE I.D.				
	20/60	R1	——	$(A_2K_1+A_1CI)B\overline{CII}$	e		ρ	I. Y
	21	R2 – a	0,2,4,6	$A_1\overline{A_2}B\,C\overline{II}$	ρ -	MeV; e ->	MeV	
	61	R2 – b	1,3,5,7	$A_1B\,K_2\,C\overline{II}$	$Z \geq 3$,	ALL STOPPING PARTICLES		
	22	R3 – a	↑	$A_2B\,C\overline{II}$	ρ ->		$Z \geq 2$ ALL PENETRATING PARTICLES	
	62	R3 – b	|	$A_2B\,K_2\,C\overline{I}$	$Z \geq 2$,		MeV/NUC	FOR ALPHAS
	23	R4 – a	|	$A_2BK_2\,CIC\overline{II}$	$2 \geq 2$		MeV/NUC	FOR ALPHAS
	63	R4 – b	|	A_1	THRESHOLD =		KeV	
	24	R5 – a	|	$A_2BK_2CIC\,II\,C\overline{II}$	$Z \geq 2$,		MeV/NUC	FOR ALPHAS
	64	R5 – b	|	A_2	THRESHOLD =		MeV	
	25	R6 – a	|	$A_1\overline{A_2}BC\overline{I}$	e,	MeV }		
	65	R6 – b	|	$A_1\overline{A_2}BCIC\overline{II}$	e,	MeV }	NEGLECTS SCATTERING	
	26	R7 – a	|	$A_1\overline{A_2}BCIC\,II\,C\overline{II}$	e,	MeV }		
	66	R7 – b	↓	$A_2BK_1C\overline{I}$	ρ, $Z \geq 2$		MeV	FOR PROTONS
	27	R8 – a	0,2,4,6	$A_2BK_1CIC\overline{II}$	ρ, $Z \geq 2$ -		MeV	" "
	67	R8 – b	1,3,5,7	$A_2BK_1CIC\,II\,C\overline{III}$	ρ, $Z \geq 3$ -		MeV	" "
HET	30	R9 – a	0,4	B	THRESHOLD =		KeV	
	70	R9 – b	0,4	CI	" =		MeV	
	30	R9 – c	2,6	CII	" =		MeV	
	70	R9 – d	2,6	CIII	" =		KeV	
	31	R10 – a	0	DI_1	THRESHOLD =		KeV	
	71	R10 – b	0	DI_2	"		KeV	
	31	R10 – c	2	DI_3	"		KeV	
	71	R10 – d	2	DI_4	"		KeV	
	31	R10 – e	4	DI_5	"		KeV	
	71	R10 – f	4	DI_6	"		MeV	
	31	R10 – g	6	DI_7	"		MeV	
	71	R10 – h	6	DI_8	"		MeV	
	32	R11 – a	0,2,4,6	$DID\,II\,\overline{F}$	$Z \geq 1$,		MeV	FOR PROTONS ONLY
	72	R11 – b	1,3,5,7	$DID\,II\,\Sigma D\overline{F}$	$Z \geq 2$,		MeV/NUC	FOR ALPHAS ONLY
LET I	33	R12 – a	0,2,4,6	$DID\,II\,E_1\overline{F}$	$Z \geq 1$,		MeV/NUC	FOR PROTONS
	73	R12 – b	1,3,5,7	$DID\,II\,\Sigma DE_3\overline{F}$	$Z \geq 2$,		MeV/NUC	FOR ALPHAS
	34	R13 – a	0,2,4,6	$DID\,II\,E_2\overline{F}$	$Z \geq 1$,		MeV/NUC	FOR PROTONS
	74	R13 – b	1,3,5,7	$DID\,II\,\Sigma\,DE_4\overline{F}$	$Z \geq 2$,		MeV/NUC	FOR ALPHAS
	35	R14 – a	0	DI	THRESHOLD =		KeV	
	75	R14 – b	0	DII	"		KeV	
	35	R14 – c	2	E_1	"		MeV	
	75	R14 – d	2	F	"		KeV	
	35	R14 – e	4	SI	"		KeV	
LET II	75	R14 – f	4	SII	"		KeV	
	35	R14 – g	6	SIII	"		KeV	
	75	R14 – h	6	SII_a	"		KeV	
	36	R15 – a	0,4	$SI_1S\,II\,SII_a\,S\overline{II}$	THRESHOLD =		KeV	ρ,
	76	R15 – b	0,4	$SI_2S\,II\,SII_a\,S\overline{III}$	"	"	KeV	ρ,
	36	R15 – c	2,6	$SI_3S\,II\,SI_a\,S\overline{II}$	"	"	MeV	ρ,
	76	R15 – d	2,6	$SI_4S\,II\,SII_a\,S\overline{III}$	"	"	MeV	ρ
	37	R16 – a	0,4	$SIS\,II_1\,S\overline{II}_a\,S\overline{III}$	"	"	MeV	ρ
	77	R16 – b	0,4	$SIS\,II_2\,S\overline{II}_a\,S\overline{III}$	"	"	MeV	ρ
	37	R16 – c	2,6	$SIS\,II_3\,S\overline{II}_a\,S\overline{III}$	"	"	MeV	ρ
	77	R16 – d	2,6	$SIS\,II_4\,S\overline{II}_a\,S\overline{III}$	"	"	MeV/NUC	α
		ΣD	——	DI+DI+1.6E				
		$K_1 \& K_2$	——	A+B+1.8(CI+CII)				

SR1 & SR2

R-10

LINE #	RATE #	SUB-COM INDEX SECT. SEQ #	RATE I.D.					
00 – 07	SR1 – a	0,4	$A_1\overline{A_2}BCI\overline{CIII}$	e_1	MeV			
40 – 47	SR1 – b	0,4	$A_2BK_1\overline{CIII}$	p_1	$Z \geq 2$			
00 – 07	SR1 – c	2,6	$DIDII\overline{F}$					
40 – 47	SR1 – d	2,6	$DIDIIE_1\overline{F}$					
10 – 17	SR2 – a	0	$SI_5\overline{SII}\overline{SII_a}\overline{SIII}$	p_1				
50 – 57	SR2 – b	0	$SI_6\overline{SII}\overline{SII_a}\overline{SIII}$	p_1				
10 – 17	SR2 – c	2	$SI_7\overline{SII}\overline{SII_a}\overline{SIII}$	p_1				
50 – 57	SR2 – d	2	$SI_8\overline{SII}\overline{SII_a}\overline{SIII}$	p_1				
10 – 17	SR2 – e	4	$\overline{SI}SII_5\overline{SII_a}\overline{SIII}$	e_1		MeV		
50 – 57	SR2 – f	4	$\overline{SI}SII_6\overline{SII_a}\overline{SIII}$	e_1		MeV		
10 – 17	SR2 – g	6	$\overline{SI}SII_7\overline{SII_a}\overline{SIII}$	e_1		MeV		
50 – 57	SR2 – h	6	$\overline{SI}SII_8\overline{SII_a}\overline{SIII}$	e_1	>	MeV	(EFFICIENCY UNKNOWN)	

40 47	SR1 – a	3,7	$A_1\overline{A_2}BCI\overline{CIII}$					
00 – 07	SR1 – b	1,5	$A_2BK_1\overline{CIII}$					
40 – 47	SR1 – c	1,5	$DIDII\overline{F}$					
00 – 07	SR1 – d	3,7	$DIDIIE_1\overline{F}$					
50 – 57	SR2 – a	1	$SI_5\overline{SII}\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – b	1	$SI_6\overline{SII}\overline{SII_a}\overline{SIII}$					
50 – 57	SR2 – c	3	$SI_7\overline{SII}\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – d	3	$SI_8\overline{SII}\overline{SII_a}\overline{SIII}$					
50 – 57	SR2 – e	5	$\overline{SI}SII_5\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – f	5	$\overline{SI}SII_6\overline{SII_a}\overline{SIII}$					
50 – 57	SR2 – g	7	$\overline{SI}SII_7\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – h	7	$\overline{SI}SII_8\overline{SII_a}\overline{SIII}$					

1/1/74 10^{-3} / 10^{2}

LINE #	RATE #	SUB-COM INDEX	RATE ID.	PARTICLES AND ENERGIES ~~COUNTS PER READOUT~~			
20/60	R1	——	$(A_2K_1 + A_1CI)\,B\overline{CII}$	p - ~2-57 MeV	e - 20 - [illegible] MeV		
21	R2 – a	0,2,4,6	$A_1\overline{A_2}\,B\,C\overline{II}$	p - 56-230 MeV; e -> 7 MeV			
61	R2 – b	1,3,5,7	$A_1 B K_2 \overline{CII}$	$Z \geq 3$, ALL STOPPING PARTICLES			
22	R3 – a	↑	$A_2 B C\overline{II}$	p - > 230 MeV; $Z \geq 3$ ALL REMAINING PARTICLES			
62	R3 – b	|	$A_2 B K_2 \overline{CI}$	$Z \geq 2$, 30-30 MeV/NUC FOR ALPHAS			
23	R4 – a	|	$A_2 B K_2 CI\overline{CII}$	$Z \geq 2$ 30 – 45 MeV/NUC FOR ALPHAS			
63	R4 – b	|	A_1	THRESHOLD = 233 keV			
24	R5 – a	|	$A_2 B K_2 CI CII \overline{CIII}$	$Z \geq 2$, 45 – 56 MeV/NUC FOR ALPHAS			
64	R5 – b	|	A_2	THRESHOLD = 3.24 MeV			
25	R6 – a	|	$A_1\overline{A_2}\,B\overline{CI}$	e, 1.0-2.0 MeV }			
65	R6 – b	|	$A_1\overline{A_2}\,B\,CI\overline{CII}$	e, 2.0-3.8 MeV } NEGLECTS SCATTERING			
26	R7 – a	|	$A_1\overline{A_2}\,B\,CI\,CII\overline{CIII}$	e, 3.8 – 5.7 MeV }			
66	R7 – b	↓	$A_2 B K_1 \overline{CI}$	p, $Z \geq 2$ – 20 – 30 MeV	FOR PROTONS		
27	R8 – a	0,2,4,6	$A_2 B K_1 CI\overline{CII}$	p, $Z \geq 2$ – 30-45 MeV	" "		
67	R8 – b	1,3,5,7	$A_2 B K_1 CI CII \overline{CIII}$	p, $Z \geq 2$ – 45-56 MeV	" "		
30	R9 – a	0,4	B	THRESHOLD = 224 keV			
70	R9 – b	0,4	CI	" = 1.1 MeV			
30	R9 – c	2,6	CII	" = 1.08 MeV			
70	R9 – d	2,6	CIII	" = 256 keV			
31	R10 – a	0	DI_1	THRESHOLD = 214 keV			
71	R10 – b	0	DI_2	" 318 keV			
31	R10 – c	2	DI_3	" 509 keV			
71	R10 – d	2	DI_4	" 630 keV	NOTE: THE LET-I		
31	R10 – e	4	DI_5	" 960 keV	WINDOW IS ~600 keV		
71	R10 – f	4	DI_6	" 1.44 MeV	THICK.		
31	R10 – g	6	DI_7	" 2.2 MeV			
71	R10 – h	6	DI_8	" 3.24 MeV			
32	R11 – a	0,2,4,6	$DI\,DII\,\overline{F}$	$Z \geq 1$, 3.2-28.6	MeV FOR PROTONS		
72	R11 – b	1,3,5,7	$DI\,DII\,\Sigma D\overline{F}$	$Z \geq 2$, 3.2-21.6	MeV/NUC FOR ALPHAS		
33	R12 – a	0,2,4,6	$DI\,DII\,E_1\overline{F}$	$Z \geq 1$, 5.6-21.6	MeV/NUC FOR PROTONS		
73	R12 – b	1,3,5,7	$DI\,DII\,\Sigma DE_3\overline{F}$	$Z \geq 2$, 5.6-21.6	MeV/NUC FOR ALPHAS		
34	R13 – a	0,2,4,6	$DI\,DII\,E_2\overline{F}$	$Z \geq 1$, 10.7-21.6	MeV/NUC FOR PROTONS		
74	R13 – b	1,3,5,7	$DI\,DII\,\Sigma\,DE_4\overline{F}$	$Z \geq 2$, 11.7-21.6	MeV/NUC FOR ALPHAS		
35	R14 – a	0	DI	THRESHOLD = 206 keV			
75	R14 – b	0	DII	" 200 KeV			
35	R14 – c	2	E_1	" 1.96 MeV			
75	R14 – d	2	F	" 199 KeV			
35	R14 – e	4	SI	" 147 KeV			
75	R14 – f	4	SII	" 54.8 KeV			
35	R14 – g	6	SI	" 246 KeV			
75	R14 – h	6	SII_a	" 246 keV			
36	R15 – a	0,4	$SI_1\,\overline{SII\,SII_a\,SII}$	INCIDENT THRESHOLD = 215 keV	p, 161 keV e		
76	R15 – b	0,4	$SI_2\,\overline{SII\,SII_a\,SII}$	" " 770 KeV p, 735 KeV e			
36	R15 – c	2,6	$SI_3\,\overline{SII\,SII_a\,SII}$	" " 1.23 MeV p, ~~1.2~~ e			
76	R15 – d	2,6	$SI_4\,\overline{SII\,SII_a\,SII}$	" " 2.45 MeV p	⇒ $Z \geq 2$ (& PROTONS α)		
37	R16 – a	0,4	$SI\,\overline{SII_1\,SII_a\,SII}$	" " 3.3 MeV p			
77	R16 – b	0,4	$SI\,\overline{SII_2\,SII_a\,SII}$	" " 6.2 MeV p			
37	R16 – c	2,6	$SI\,\overline{SII_3\,SII_a\,SII}$	" " 16.2 MeV p			
77	R16 – d	2,6	$SI\,\overline{SI_4\,SII_a\,SII}$	" " 6.1 MeV/NUC α			
	ΣD	——	DI+DII+1.6E				
	K_1 & K_2	——	A+B+1.8(CI+CII)				

LET-I

LET-II

SECTORED RATES

SR1 & SR2

NOTE: SR1 ON THIS PAGE IS THE SAME AS S1 IN SCALERS

LINE #	RATE #	SUB-COM INDEX SECT. SEQ.#	RATE I.D.	COUNTS PER READOUT				
00 – 07	SR1 – a	0,4	$A_1\overline{A_2}BCI\overline{C}\overline{III}$	e, .2 – 5.7 MeV				
40 – 47	SR1 – b	0,4	$A_2BK_1\overline{C}\overline{III}$	p, Z≥2 – 20 – 55 MeV/NUC FOR PANDA				
00 – 07	SR1 – c	2,6	$DID\overline{II}\overline{F}$	p, Z≥2 – 3.2 – 21.6 MeV/NUC FOR PANDA				
40 – 47	SR1 – d	2,6	$DID\overline{II}E_1\overline{F}$	p, Z≥2 – 5.6 – 21.6 MeV/NUC FOR PANDA				
10 – 17	SR2 – a	0	$SI_5\overline{SII}\overline{SII_a}\overline{SIII}$	p,	116 keV – 2.0 MeV			
50 – 57	SR2 – b	0	$SI_6\overline{SII}\overline{SII_a}\overline{SIII}$	p,	435 keV – 2.0 MeV			
10 – 17	SR2 – c	2	$SI_7\overline{SII}\overline{SII_a}\overline{SIII}$	p,	780 keV – 2.0 MeV			
50 – 57	SR2 – d	2	$SI_8\overline{SII}\overline{SII_a}\overline{SIII}$	p,	1.1 MeV – 2.0 MeV			
10 – 17	SR2 – e	4	$\overline{SI}SII_5\overline{SII_a}\overline{SIII}$	e,	~100 keV – 1 MeV			
50 – 57	SR2 – f	4	$\overline{SI}SII_6\overline{SII_a}\overline{SIII}$	e,	410 keV – 1 MeV			
10 – 17	SR2 – g	6	$\overline{SI}SII_7\overline{SII_a}\overline{SIII}$	e,	780 keV – 1 MeV			
50 – 57	SR2 – h	6	$\overline{SI}SII_8\overline{SII_a}\overline{SIII}$	e,	> 1.1 MeV (EFFICIENCY UNKNOWN)			

40 47	SR1 – a	3,7	$A_1\overline{A_2}BCI\overline{C}\overline{III}$					
00 – 07	SR1 – b	1,5	$A_2BK_1\overline{C}\overline{III}$					
40 – 47	SR1 – c	1,5	$DID\overline{II}\overline{F}$					
00 – 07	SR1 – d	3,7	$DID\overline{II}E_1\overline{F}$					
50 – 57	SR2 – a	1	$SI_5\overline{SII}\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – b	1	$SI_6\overline{SII}\overline{SII_a}\overline{SIII}$					
50 – 57	SR2 – c	3	$SI_7\overline{SII}\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – d	3	$SI_8\overline{SII}\overline{SII_a}\overline{SIII}$					
50 – 57	SR2 – e	5	$\overline{SI}SII_5\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – f	5	$\overline{SI}SII_6\overline{SII_a}\overline{SIII}$					
50 – 57	SR2 – g	7	$\overline{SI}SII_7\overline{SII_a}\overline{SIII}$					
10 – 17	SR2 – h	7	$\overline{SI}SII_8\overline{SII_a}\overline{SIII}$					

LINE #	RATE #	SUB-COM INDEX	RATE I.D.	THRESHOLD MeV	COUNTS PER READOUT
20/60	R1	——	$(A_2K_1 + A_1C1)B\bar{C}\bar{\text{II}}$		
21	R2 – a	0,2,4,6	$A_1\bar{A}_2BC\text{II}$		
61	R2 – b	1,3,5,7	$A_1BK_2\bar{C}\text{II}$		
22	R3 – a		$A_2BC\text{II}$		
62	R3 – b		$A_2BK_2\bar{C}\text{I}$		
23	R4 – a		$A_2BK_2C\text{I}\bar{C}\text{II}$		
63	R4 – b		A_1	.223	
24	R5 – a		$A_2BK_2C\text{I}C\text{II}\bar{C}\text{III}$		
64	R5 – b		A_2	2.012	
25	R6 – a		$A_1\bar{A}_2B\bar{C}\text{I}$		
65	R6 – b		$A_1\bar{A}_2BC\text{I}\bar{C}\text{II}$		
26	R7 – a		$A_1\bar{A}_2BC\text{I}C\text{II}\bar{C}\text{III}$		
66	R7 – b		$A_2BK_1\bar{C}\text{I}$		
27	R8 – a	0,2,4,6	$A_2BK_1C\text{I}\bar{C}\text{II}$		
67	R8 – b	1,3,5,7	$A_2BK_1C\text{I}C\text{II}\bar{C}\text{III}$		
30	R9 – a	0,4	B	.213	
70	R9 – b	0,4	CI	1.02	
30	R9 – c	2,6	CII	1.13	
70	R9 – d	2,6	CIII	.227	
31	R10 – a	0	DI_1	.212	.42
71	R10 – b	0	DI_2	.300	
31	R10 – c	2	DI_3	.420	
71	R10 – d	2	DI_4	.597	.75
31	R10 – e	4	DI_5	.957	1.08
71	R10 – f	4	DI_6	1.44	
31	R10 – g	6	DI_7	2.043	2.12
71	R10 – h	6	DI_8	3.072	
32	R11 – a	0,2,4,6	$DI\,D\text{II}\,\bar{F}$		
72	R11 – b	1,3,5,7	$DI\,D\text{II}\,\Sigma D\bar{F}$		
33	R12 – a	0,2,4,6	$DI\,D\text{II}\,E_1\bar{F}$		
73	R12 – b	1,3,5,7	$DI\,D\text{II}\,\Sigma DE_3\bar{F}$		
34	R13 – a	0,2,4,6	$DI\,D\text{II}\,E_2\bar{F}$		
74	R13 – b	1,3,5,7	$DI\,D\text{II}\,\Sigma\,DE_4\bar{F}$		
35	R14 – a	0	DI	.202	
75	R14 – b	0	DII	.205	
35	R14 – c	2	E_1	2.44	
75	R14 – d	2	F	.186	
35	R14 – e	4	SI	.145	
75	R14 – f	4	SII	.0505	
35	R14 – g	6	SIII	.106	
75	R14 – h	6	SI_4	.216	
36	R15 – a	0,4	$SI_1SII\,SII_a\,SII.$	.154	.154
76	R15 – b	0,4	$SI_2SII\,SII_a\,SII$	.920	.720
36	R15 – c	2,6	$SI_3SII\,SII_a\,SII$	1.216	1.216 – 2.15
76	R15 – d	2,6	$SI_4SII\,SII_a\,SII$	2.513	∑ .62 – 2.2 meV/μ.v
37	R16 – a	0,4	$SI\,SII_1\,SII_a\,SII$	2.01	3.1
77	R16 – b	0,4	$SI\,SII_2\,SII_a\,SII$	4.974	5.7
37	R16 – c	2,6	$SI\,SII_3\,SII_a\,SII$	14.6	15.1 – 26.2
77	R16 – d	2,6	$SI\,SII_4\,SII_a\,SII$	24.1	
	∑D	——	DI+DI+1.6E		
	K_1&K_2	——	A+B+1.8(CI+CI)		

HET

LET I

LET II

LINE #	RATE #	SUB-COM INDEX SECT. SEQ.#	RATE I.D.	COUNTS PER READOUT				
00 – 07	SR1 – a	0, 4	$A_1A_2BCI\overline{C}\overline{III}$					
40 – 47	SR1 – b	0, 4	$A_2BK_1\overline{C}\overline{III}$					
00 – 07	SR1 – c	2, 6	$DID_{II}\overline{F}$					
40 – 47	SR1 – d	2, 6	$DID_{II}E_1\overline{F}$					
10 – 17	SR2 – a	0	$SI_5\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$	.051	.116			
50 – 57	SR2 – b	0	$SI_6\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$	.506	.52			
10 – 17	SR2 – c	2	$SI_7\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$	1.015				
50 – 57	SR2 – d	2	$SI_8\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$	1.455				
10 – 17	SR2 – e	4	$\overline{S}_I S_{II_5}\overline{S}_{II_a}\overline{S}_{III}$	.0484	.12			
50 – 57	SR2 – f	4	$\overline{S}_I S_{II_6}\overline{S}_{II_a}\overline{S}_{III}$	.396	.40			
10 – 17	SR2 – g	6	$\overline{S}_I S_{II_7}\overline{S}_{II_a}\overline{S}_{III}$	.676	.68			
50 – 57	SR2 – h	6	$\overline{S}_I S_{II_8}\overline{S}_{II_a}\overline{S}_{III}$	~~.0~~ .968	.97			

40 – 47	SR1 – a	3, 7	$A_1\overline{A_2}BCI\overline{C}\overline{III}$					
00 – 07	SR1 – b	1, 5	$A_2BK_1\overline{C}\overline{III}$					
40 – 47	SR1 – c	1, 5	$DID_{II}\overline{F}$					
00 – 07	SR1 – d	3, 7	$DID_{II}E_1\overline{F}$					
50 – 57	SR2 – a	1	$SI_5\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$					
10 – 17	SR2 – b	1	$SI_6\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$					
50 – 57	SR2 – c	3	$SI_7\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$					
10 – 17	SR2 – d	3	$SI_8\overline{S}_{II}\overline{S}_{II_a}\overline{S}_{III}$					
50 – 57	SR2 – e	5	$\overline{S}_I S_{II_5}\overline{S}_{II_a}\overline{S}_{III}$					
10 – 17	SR2 – f	5	$\overline{S}_I S_{II_6}\overline{S}_{II_a}\overline{S}_{III}$					
50 – 57	SR2 – g	7	$\overline{S}_I S_{II_7}\overline{S}_{II_a}\overline{S}_{III}$					
10 – 17	SR2 – h	7	$\overline{S}_I S_{II_8}\overline{S}_{II_a}\overline{S}_{III}$					

LINE #	RATE #	SUB-COM INDEX	RATE I.D.	Threshold MeV	COUNTS PER READOUT
20/60	R1	——	$(A_2K_1+A_1CI)B\overline{CII}$		
21	R2 – a	0,2,4,6	$A_1\overline{A_2}BC\overline{II}$		
61	R2 – b	1,3,5,7	$A_1BK_2\overline{C\overline{II}}$		
22	R3 – a	↑	$A_2BC\overline{II}$		
62	R3 – b	|	$A_2BK_2\overline{CI}$		
23	R4 – a	|	$A_2BK_2CI\overline{CII}$		
63	R4 – b	|	A_1	.223	
24	R5 – a	|	$A_2BK_2CICII\overline{CII}$		
64	R5 – b	|	A_2	2.012	
25	R6 – a	|	$A_1\overline{A_2}B\overline{CI}$		
65	R6 – b	|	$A_1\overline{A_2}BCI\overline{CII}$		
26	R7 – a	|	$A_1\overline{A_2}BCICII\overline{CII}$		
66	R7 – b	↓	$A_2BK_1\overline{CI}$		
27	R8 – a	0,2,4,6	A_2BK_1GICII		
67	R8 – b	1,3,5,7	$A_2BK_1CICII\overline{CII}$		
30	R9 – a	0,4	B	.213	
70	R9 – b	0,4	CI	1.02	
30	R9 – c	2,6	CII	1.13	
70	R9 – d	2,6	CIII	.227	
31	R10 – a	0	DI_1	.212	.42
71	R10 – b	0	DI_2	.300	
31	R10 – c	2	DI_3	.420	
71	R10 – d	2	DI_4	.597	.75
31	R10 – e	4	DI_5	.957	1.08
71	R10 – f	4	DI_6	1.44	
31	R10 – g	6	DI_7	2.043	2.12
71	R10 – h	6	DI_8	3.072	
32	R11 – a	0,2,4,6	$DIDII\overline{F}$		
72	R11 – b	1,3,5,7	$DIDII\sum D\overline{F}$		
33	R12 – a	0,2,4,6	$DIDIIE_1\overline{F}$		
73	R12 – b	1,3,5,7	$DIDII\sum DE_3\overline{F}$		
34	R13 – a	0,2,4,6	$DIDIIE_2\overline{F}$		
74	R13 – b	1,3,5,7	$DIDII\sum DE_4\overline{F}$		
35	R14 – a	0	DI	.202	
75	R14 – b	0	DII	.205	
35	R14 – c	2	E_1	2.44	
75	R14 – d	2	F	.186	
35	R14 – e	4	SI	1145	
75	R14 – f	4	SII	.0505	
35	R14 – g	6	SIII	.106	
75	R14 – h	6	SI_1	.216	
36	R15 – a	0,4	$SI_1SIISII_0SIII$	.154	.154
76	R15 – b	0,4	$SI_2SIISII_0SIII$	.720	.720
36	R15 – c	2,6	$SI_3SIISII_0SIII$	1.216	1.216 – 2.15
76	R15 – d	2,6	$SI_4SIISII_0SIII$	2.513	≈ .62 – 2.2 mev/μ·c
37	R16 – a	0,4	$SISII_1SII_0SIII$	2.01	3.1
77	R16 – b	0,4	$SISII_2SII_0SIII$	4.974	5.7
37	R16 – c	2,6	$SISII_3SII_0SIII$	14.6	15.1 – 26.2
77	R16 – d	2,6	$SISII_4SII_0SIII$	24.1	
	$\sum D$	——	DI+DII+1.6E		
	$A+B+1.8K_2$	——	A+B+1.8(CI+CII)		

LINE #	RATE #	SUB-COM INDEX SECT. SEQ.#	RATE I.D.	COUNTS PER READOUT			
00 – 07	SR1 – a	0, 4	$A_1A_2BCI\overline{C}\overline{III}$				
40 – 47	SR1 – b	0, 4	$A_2BK_1\overline{C}\overline{III}$				
00 – 07	SR1 – c	2, 6	$DIDII\overline{F}$				
40 – 47	SR1 – d	2, 6	$DIDIIE_1\overline{F}$				
10 – 17	SR2 – a	0	$SI_5\overline{SII}\overline{SII_a}\overline{SIII}$	.051	.116		
50 – 57	SR2 – b	0	$SI_6\overline{SII}\overline{SII_a}\overline{SIII}$	.506	.52		
10 – 17	SR2 – c	2	$SI_7\overline{SII}\overline{SII_a}\overline{SIII}$	1.015			
50 – 57	SR2 – d	2	$SI_8\overline{SII}\overline{SII_a}\overline{SIII}$	1.455			
10 – 17	SR2 – e	4	$\overline{SI}SII_5\overline{SII_a}\overline{SIII}$	.0484	.12		
50 – 57	SR2 – f	4	$\overline{SI}SII_6\overline{SII_a}\overline{SIII}$	.396	.40		
10 – 17	SR2 – g	6	$\overline{SI}SII_7\overline{SII_a}\overline{SIII}$	.676	.68		
50 – 57	SR2 – h	6	$\overline{SI}SII_8\overline{SII_a}\overline{SIII}$	~~E0~~ .968	.97		

40 47	SR1 – a	3, 7	$A_1\overline{A_2}BCI\overline{C}\overline{III}$				
00 – 07	SR1 – b	1, 5	$A_2BK_1\overline{C}\overline{III}$				
40 – 47	SR1 – c	1, 5	$DIDII\overline{F}$				
00 – 07	SR1 – d	3, 7	$DIDIIE_1\overline{F}$				
50 – 57	SR2 – a	1	$SI_5\overline{SII}\overline{SII_a}\overline{SIII}$				
10 – 17	SR2 – b	1	$SI_6\overline{SII}\overline{SII_a}\overline{SIII}$				
50 – 57	SR2 – c	3	$SI_7\overline{SII}\overline{SII_a}\overline{SIII}$				
10 – 17	SR2 – d	3	$SI_8\overline{SII}\overline{SII_a}\overline{SIII}$				
50 – 57	SR2 – e	5	$\overline{SI}SII_5\overline{SII_a}\overline{SIII}$				
10 – 17	SR2 – f	5	$\overline{SI}SII_6\overline{SII_a}\overline{SIII}$				
50 – 57	SR2 – g	7	$\overline{SI}SII_7\overline{SII_a}\overline{SIII}$				
10 – 17	SR2 – h	7	$\overline{SI}SII_8\overline{SII_a}\overline{SIII}$				

PIONEER - F / G MODE DEFINITIONS

The following table defines the bin energy ranges for which a MODE is valid under the FLUX PLOT program.

FOR P PROTON or P ALPHA

MODE	ENERGY
LS2	3.2 - 5.2 MeV
LS3	5.2 - 22.0 MeV
LP2	5.2 - 22.0 MeV
HS2	22.0 - 31.0 MeV
HS3	31.0 - 57.0 MeV
HPF	57.0 - 110.0 MeV
HPB	57.0 - 110.0 MeV
HPFB	110.0 + MeV

FOR P ELECTRON

HS3	1.0 - 8.0 MeV

VALID MODE 2 GENERATION IDs.

PIONEER-F PROTONS

PROTON

L52
L53
LP2 (REPLACES L53 POST JUPITER ENCOUNTER)
HS2
HS2 BG (background)
HS3
HPF
HPB
HPFB

PROTON2

HS2
HS2 BG
HS3
HPF
HPB
HPFB

(OVER FOR ALPHA)

PIONEER - F ALPHAS

ALPHA

L S 2
L S 3
L P 2 (REPLACES L S 3 POST-JUPITER ENCOUNTER)
H S 2
H S 2 B G
H S 3
H P F
H P B
H P F B

ALPHA2

H S 2
H S 2 B G
H S 3
H P F
H P B
H P F B

PIONEER - F ELECTRON

ELECTRON

H S 3

PIONEER-6 PROTON & ALPHA

PROTON

L52
L53
HS2
HS2 B6
HS3
HPF
HPB
HPFB

ALPHA

L52
L53
HS2
HS2 B6
HS3
HPF
HPB
HPFB

```
**** TSO FOREGROUND HARDCOPY ****
DSNAME=SB#HL.LIB.CNTL                                    (AMATRIX )

//MATGEN  EXEC  PGM=HBMATRIX,REGION=300K                                  00000010
//* CONSISTENCY CHECK USE OF MATRIX PROGRAM                               00000011
//*  ON P CARD    COL 22 =  T                                             00000012
//*               COL 66-71 SPECIFIES 'TOLERANCE' TRY 1.5 OR LESS         00000013
//*               COL 72    CONTINUATION                                  00000014
//*   CONTINUATION CARD : COL 30-71, 6 FIELDS, 7 COLUMNS EACH :           00000015
//*          FIELD # 1   POWER GAMMA IN R=E**GAMMA   TRY   1.75           00000016
//*                # 2   = (A THICK + B THICK) / (B THICK)                00000017
//*                # 3   = (A THICK) / (B THICK)                          00000018
//*                # 4   A MEV/CH  (HIGH GAIN OR LOW GAIN)                00000019
//*                # 5   B MEV/CH  (HIGH GAIN OR LOW GAIN)                00000020
//*                # 6   SUMC MEV/CH  (HIGH GAIN OR LOW GAIN)             00000021
//*   A -> D1   B -> D2    SUMC -> E  FOR THE LET DETECTOR                00000022
//*   MUST BE A 3 PARAM STOPPING PLOT FOR USE OF THE CHECK                00000023
//*                                                                       00000024
//*  FOR HET DETECTOR HELIOS-A                                            00000025
//*        A  =  .188  MEV/CHAN                                           00000026
//*        B  =  .204  MEV/CHAN                                           00000027
//*  CI+ CII  =  1.04  MEV/CHAN                                           00000028
//*                                                                       00000029
//*  FOR LET-1 DETECTOR HELIOS-A                                          00000030
//*        D1 = .2   MEV/CHAN                                             00000031
//*        D2 = .196 MEV/CHAN                                             00000032
//*        E  = 2.1  MEV/CHAN                                             00000033
//*                                                                       00000034
//STEPLIB   DD  DSN=SB#HL.HELIOS.LOAD,DISP=SHR                           00000035
//FT06F001  DD  SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265,          00000038
//  BUFNO=1)                                                             00000040
//FT07F001  DD  SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=3429,          00000050
//  BUFNO=1),SPACE=(CYL,(7,5))                                           00000060
//FT10F001  DD  DSN=HELFLUX,UNIT=(6250,,DEFER),VOL=SER=DUMFLX,           00000070
//  DISP=SHR,DCB=BUFNO=1                                                 00000080
//FT49F001  DD  UNIT=SYSDA,SPACE=(TRK,(5,5)),                            00000090
//  DISP=(NEW,DELETE,KEEP),DCB=BLKSIZE=1088                              00000100
//FT50F001  DD  DSN=SB#HL.FLUXCAT2.DATA,DISP=SHR                         00000110
//PLOTDATA  DD  UNIT=SYSDA,DISP=(NEW,DELETE),SPACE=(TRK,(60),,CONTIG)    00000120
//FLUXSAVE  DD  UNIT=SYSDA,DISP=(NEW,DELETE),SPACE=(TRK,(10),,CONTIG)    00000130
//MISSING   DD  UNIT=SYSDA,DISP=(NEW,DELETE),SPACE=(TRK,(10,5))          00000140
//OVERFLOW  DD  UNIT=SYSDA,DISP=(NEW,DELETE),SPACE=(TRK,(10,5))          00000150
//SYSUDUMP  DD  SYSOUT=A                                                 00000160
//ABNLDUMP  DD  DUMMY                                                    00000170
//CARDS  DD  *,DCB=BLKSIZE=800                                           00000180
```

pioneer/helios version.

see also SB#PR.LIB.CLIST (LIST26DY)

PIONEER MATRIX PROGRAM

SB#PR
To run the Pioneer MATRIX Program, JCL may be referenced from SBPIO.LIB.CNTL(AMATRIX) ~~ZBRXB.PMATRIX~~. This is not a procedure; no options are required, and only data cards need be changed.

Normally, three data cards are needed for the MATRIX Program. Their structure is as follows:

1. Satellite Card: Specifies satellite and averaging interval.

Column	Description
1	S for satellite card
3-11	Satellite ID (Pioneer-#)
16-19	Data Base Source
25-27	Number of days in averaging interval
29-30	Number of hours in averaging interval
32-33	Number of minutes in averaging interval
35-36	Number of seconds in averaging interval

2. Include Card: Specifies start and stop time of APLOT. You may use as many Include Cards as needed for a particular run:

Column	Description
1-2	SI for Include Card
11-18	Start Time Year/Month/Day
20-27	Start Time HR:MM:SS
29-36	Stop Time Year/Month/Day
38-45	Stop Time HR:MM:SS

Exclude Card: This card is not always required. If used, it specifies the time periods to be excluded. The time period to be excluded must lie entirely within time span on current Include Card (Character E in Column 2).

3. Particle Card: This card describes the detectors to be plotted, and must follow all Include and Exclude Cards.

Column	Description
1	P for particle
3-8	First plotted detector (Left Justified)
9-14	Second plotted detector (Left Justified)
16-19	Event Type*
22	Consistency Flag T for True, or Blank
54-55	Compression Factor
57-60	Lower limit of unplotted detector
61-64	Upper limit of unplotted detector

*Event types range from 0-3: TFFF=0
FTFF=1
FFTF=2
FFFT=3

P-10

CURRENT

26 Day Avg

Matrices — No Consistency Criteria

1.	DI DII	EV= 1	E ≦ 0,1	1X1
2	DI DII	EV= 0	E ≦ 0	4X4
3	DI DII	EV= 0	E ≦ 4096	4X4
4	DI DII	EV= 0	E ≦ 4096	8X8
5	A CICII	EV= 3	NO LIMITS ON B	4X4
6.	A CICII	EV= 2	NO LIMITS ON B	2X1
7.	B CIII	EV= 1	CI+CII ≦ 4095	1X1
8.	CI+CII CIII	EV= 1	NO LIMITS ON B	16X16
9	B CICII	EV=3	NO LIMITS ON A	4X4

These matricies are to be run each period as soon as the data for that 26 Day period is complete. Matricies are to be delivered to Dr. McDonald and then returned to the data room for filing.

P-10

26 Day Avg.

Flux Listings

Alphas / α		Protons / P	
22.01 & 29.01	HS2	30.67 – 56.35	HS3
30.67 – 56.35	HS3	290 (77) 128.20 – 155.00	HPFB
69.00 – 91.90	HPF	(77) 155.00 – 204.30	HPFB
91.90 – 110.00	HPF	(77) 204.30 – 307.00	HPFB
64.25 – 88.20	HPB		
88.20 – 106.70	HPB	Electrons / e	
112.70 – 182.00	HPFB		
182.00 – 272.60	HPFB	340 2 – 6	HS3
272.60 – 380.00	HPFB	26 DAY AVG	
380.00 – 453.00	HPFB		

Flux Listings and Plots

TO BE DETERMINED LATER

NEW TABLES . POST ENCOUNTER

α	P
LS2 78	LS3 78
LP2 REPLACES LS3	LS2 78
	HS2 78, BG

P-10

PARTICLE

$\alpha 2$ ALPHA2

Applicable modes are

HS2

HS3

HPF

HPB

HPFB

Also Regular standard rate plots are to be kept current

Hourly averages 10 days per frame.

P-11

26 DAY AVG

MATRICES

1.	DI	DII	EV= 1	$E \leq 0,1$	1 X 1
2	DI	E	EV= 1	NO LIMIT	1 X 1
3	DI	DII	EV= 0	$E \leq 0,1$	4 x 4
4	DI	E	EV= 0	NO LIMIT	4 X 4
5	DI	E	EV= 0	NO LIMIT	8 X 8
6	A	CI+CII	EV = 3	NO LIMIT	4 X 4
7	A	CI+CII	EV= 2	NO LIMIT	1 X 1
8	B	CIII	EV = 1	CI+CII $\leq 0,4095$	1 X 1

These matrices are to be run each period as soon as the data for that 26 Day period is complete. Matrices are to be delivered to Dr. McDonald and then returned to the data room for filing

P 11

26 DAY AVG

Flux Listings

Alphas/α			Protons/P		
10.17	21.22	LS3	10.17	21.2 550	LS3 (77)
22.02	29.02	HS2 (78) 380	30.67	56.18	HS3
30.67	56.18	HS3	125.6	162.0	HPFB (77)
70.60	87.0	HPF	162.0	233.0	↓ ↓
87.00	105.60	↓	233.0	300.6	
66.00	88.30	HPB			
88.30	102.40	↓	Electron/E		
108.60	209.00	HPFB			
209.4	324.0	↓	2 - 6	HS3	
324.0	480.0	↓			

NEW TABLES

α		P	
LS2	(78)	HS2	(78) OR(BG)
HS2	(78)		

P 11

FLUX PLOTS

1. 1 HR AVG OF D1(6) 10^{-2} — 10' (RATE PLOT)

2. 6 HR AVG OF 2.-6. ELECTRONS 10^{-3} — 10^{-2} (FLUX PLOT)
125 POINTS PER FRAM

Also Regular standard rate plots are to be kept current

Hourly averages 10 days per frame.

Leap Year

		Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1	32	61	92	122	153	183	214	245	275	306	336
2	2	33	62	93	123	154	184	215	246	276	307	337
3	3	34	63	94	124	155	185	216	247	277	308	338
4	4	35	64	95	125	156	186	217	248	278	309	339
5	5	6	65	96	126	157	187	218	249	279	310	340
6	6	37	66	97	127	158	188	219	250	280	311	341
7	7	38	67	98	128	159	189	220	251	281	312	342
8	8	39	68	99	129	160	190	221	252	282	313	343
9	9	40	69	100	130	161	191	222	253	283	314	344
10	10	41	70	101	131	162	192	223	254	284	315	345
11	11	42	71	102	132	163	193	224	255	285	316	346
12	12	43	72	103	133	164	194	225	256	286	317	347
13	13	44	73	104	134	165	195	226	257	287	318	348
14	14	45	74	105	135	166	196	227	258	288	319	349
15	15	46	75	106	136	167	197	228	259	289	320	350
16	16	47	76	107	137	168	198	229	260	290	321	351
17	17	48	77	108	138	169	199	230	261	291	322	352
18	18	49	78	109	139	170	200	231	262	292	323	353
19	19	50	79	110	140	171	201	232	263	293	324	354
20	20	51	80	111	141	172	202	233	264	294	325	355
21	21	52	81	112	142	173	203	234	265	295	326	356
22	22	53	82	113	143	174	204	235	266	296	327	357
23	23	54	83	114	144	175	205	236	267	297	328	358
24	24	55	84	115	145	176	206	237	268	298	329	359
25	25	56	85	116	146	177	207	238	269	299	330	360
26	26	57	86	117	147	178	208	239	270	300	331	361
27	27	58	87	118	148	179	209	240	271	301	332	362
28	28	59	88	119	149	180	210	241	272	302	333	363
29	29	60	89	120	150	181	211	242	273	303	334	364
30	30		90	121	151	182	212	243	274	304	335	365
31	31		91		152		213	244		305		366

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

PIONEER 26 DAY PERIODS FOR 26 DAY MATRICES AND FLUX

(NON-LEAP YEAR)

10D#	DAY NO.	CAL: MO/DY	DAY NO.	CAL: MO/DY
1	1	01/01	27	01/27
2	27	01/27	53	02/22
3	53	02/22	79	03/20
4	79	03/20	105	04/15
5	105	04/15	131	05/11
6	131	05/11	157	06/06
7	157	06/06	183	07/02
8	183	07/02	209	07/28
9	209	07/28	235	08/23
10	235	08/23	261	09/18
11	261	09/18	287	10/14
12	287	10/14	313	11/09
13	313	11/09	339	12/05
14	339	12/05	365	12/31

PIONEER 26 DAY PERIODS FOR 26 DAY MATRICES AND FLUX

(LEAP YEAR)

RIOD	DAY	CAL: MO/DY	DAY	CAL: MO/DY
1	1	01/01	27	01/27
2	27	01/27	53	02/22
3	53	02/22	79	03/19
4	79	03/19	105	04/14
5	105	04/14	131	05/10
6	131	05/10	157	06/05
7	157	06/05	183	07/01
8	183	07/01	209	07/27
9	209	07/27	235	08/22
10	235	08/22	261	09/17
11	261	09/17	287	10/13
12	287	10/13	313	11/08
13	313	11/08	339	12/04
14	339	12/04	365	12/30

RUNNING THE FLUCTUATION ANALYSIS ON PIONEER DATA

1) Change the JCL comment card to reflect the new rate. (This has no effect on the program operation.)

2) Change FT15F001 to specify (A) the proper start date and time of the data to be processed; (B) the end date and time of that data; and (C) the satellite identification (='F' or ='G').

3) Change FT05F001 to reflect the proper rate. Start in column 2 of the input line.

4) Change FT05F002 to reflect the proper analysis parameters.

   HSVEC — a 10 element vector of S values for the analysis.

   HSPLT — a 10 element vector of S values to be plotted. (HSPLT must be a subset or be equivalent to HSVEC.)

   CNTINT — the counting interval between readings (in seconds) for the specified rate.

   IPNTSR — the number of points to be included in a single calculation.

5) Change PLOTTAPE to specify the 7-track output tape for the Calcomp plots. Specify (A) the volume=serial number; and (B) the file number.

NOTES:

Only one rate can be run at a time.

Only one job can be executing at a time since the input tapes and/or the output tapes may be used by both jobs. Using the RELEASE function (to release the next job in a series from the hold queue) can facilitate submitting several jobs at once and having them run successively.

Line printer point-by-point plots are generated for each program execution. The Calcomp plots are optional.

SENAL.LIB.CNTL(FLUCRUN)

```
//SENALALL JOB (SP00123SCE,P,SA0001,H00H02),BF3
//*R4B P10
//CHECK1 EXEC SPCHDS,DSN='SENAL.LOAD2'
// EXEC PGM=IEF3SI4,COND=(0,EQ,CHECK1.SEARCH),REGION=20K
//D1 DD DSN=SENAL.LOAD2,VOL=SER=KBUSR8,UNIT=2314,DISP=(,CATLG),
//    SPACE=(TRK,(50,,1),PLSC)
// EXEC BACKUP,COND=(0,EQ,CHECK1.SEARCH),FUNC=RELOAD,TAPEDSN='FLUC',
//    TAPEVOL=NAL04,FILESEQ=2,LABEL=NL,LIBR='SENAL.LOAD2'
// EXEC PGM=FLUC,REGION=450K
//STEPLIB DD DSN=SENAL.LOAD2,DISP=SHR
//FT06F001 DD SYSOUT=8,SPACE=(CYL,(40)),
// DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265,BUFNO=1)
//FT09F001 DD DSN=PIORAT,UNIT=(160C,,DEFER),VOL=SER=RATEP,
// DISP=SHR,DCB=DEN=3
//FT11F001 DD UNIT=2314,SPACE=(TRK,(500)),
// DCB=(BLKSIZE=5952,BUFNO=1)
//FT12F001 DD SYSOUT=8,SPACE=(CYL,(40)),
// DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265,BUFNO=1)
//FT13F001 DD UNIT=2314,SPACE=(1488,100),DCB=BLKSIZE=1488
//FT14F001 DD SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=1600)
//FT20F001 DD DSN=KB.ZB2NL.SB001.PICFRTLT,DISP=SHR
//FT30F001 DD DSN=KB.ZB2NL.SB001.PICGRTLT,DISP=SHR
//FT40F001 DD DSN=KB.ZB5XB.SB001.PFREDCR1,DISP=SHR
//FT41F001 DD DSN=KB.ZB8XB.SB001.PFREDCR1,DISP=SHR
//FT42F001 DD DSN=KB.ZB8XB.SB001.PFREDCR2,DISP=SHR
//FT43F001 DD DSN=KB.ZB8XB.SB001.PFREDCR3,DISP=SHR
//FT44F001 DD DSN=KB.ZB8XB.SB001.PFREDLR4,DISP=SHR
//FT45F001 DD DSN=KB.ZBRXB.SB001.PGDRSCT0,DISP=SHR
//FT46F001 DD DSN=KB.ZBRXB.SB001.PGDRSCT1,DISP=SHR
//FT47F001 DD DSN=KB.ZBRXB.SB001.PGDRSCT2,DISP=SHR
//FT48F001 DD DSN=KB.ZBRXB.SB001.PGDRSCT3,DISP=SHR
//FT49F001 DD DSN=KB.ZBRXB.SB001.PGDRSCT4,DISP=SHR
//SC4060ZZ DD DSN=NULLFILE,UNIT=1600,LABEL=(1,NL),
// DCB=(RECFM=F,BLKSIZE=240,DEN=3),DISP=(NEW,KEEP),
// VOL=SER=SCRTCH
//SYSUDUMP DD SYSOUT=A
//FT15F001 DD *
 &PLOT HTB=73,11,27,00,00,HTE=73,12,06,24,00,QLIST=T,HID='F',
 QTRCHK=F                                                  &END
//FT05F001 DD *
 R4B
//FT05F002 DD *
 &SVEC HSVEC=1,2,8*0
 HSPLT=1,9*0
 &END
 &PARMS  CNTINT=24,IPNTSR=30,LIST='F'
 &END
//PLOTTAPE DD DSN=NULLFILE,DCB=(,DEN=1),LABEL=(3,NL,,OUT),
//      UNIT=(7TRACK,,DEFER),VOL=SER=SCRTCH
// EXEC NOTIFY
//
```

? PAS 9/83
Overview states that FLUC load module tape was lost. And that LIST option of FLUXPLOT is the way it done now.

APLTAP - User's Guide

5/22/78

GENERATION OF APL TAPES OF PIONEER DATA

1) Change the JCL comment card to reflect the proper rate. (This has no effect on the program operation.)

2) Change FT10F001 to reflect proper tape information: (A) the volume=serial number; (B) the file number; and (C) the disposition, i.e. whether this is a new file, or whether it should be appended to the existing file. disp=(,keep) specifies beginning of file. disp=(mod,keep) specifies appending to existing file.

3) Change FT15F001 to reflect the proper (A) start date and time of the data to be processed; (B) the end date and time of that data; and (C) the satellite identification (='F' or ='G').

4) Change FT05F001 to reflect the proper rate. (start in column 2 of the input line.)

NOTES:

Only one rate can be run at a time.

Only one job can be executing at a time since the input tape(s) and/or output tape(s) may be the same tapes for both jobs. Using the RELEASE function (to release the next job in a series from the hold queue) can facilitate submitting several jobs at once and having them run successively.

file section XYZ

SENAL.LIB.CNTL (APLRUN)

```
//SENALALL  JOB (SB0012356F,P,SA0001,007007),BF3,MSGLEVEL=1,TYPRUN=HOLD
//*
//*P10-R10F
//CHECK1 EXEC SRCHDS,DSN='SENAL.APLOAD'
// EXEC PGM=IEFBR14,COND=(0,EQ,CHECK1.SEARCH),REGION=20K
//D1 DD DSN=SENAL.APLOAD,VOL=SER=KDUSR8,UNIT=2314,DISP=(,CATLG),
//  SPACE=(TRK,(40,,1),RLSE)
// EXEC BACKUP,COND=(0,EQ,CHECK1.SEARCH),FUNC=RELOAD,TAPEDSN='APLTAP',
// TAPEVOL=NAL04,FILESEQ=7,LABEL=NL,LIB2='SENAL.APLOAD'
// EXEC PGM=APLTAP,REGION=300K
//STEPLIB DD DSN=SENAL.APLOAD,DISP=SHR
//FT06F001 DD SYSOUT=A,SPACE=(CYL,(40)),
// DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265,BUFNO=1)
//FT25F001 DD SYSOUT=A
//FT09F001 DD DSN=PICRAT,UNIT=(1600,,DEFER),VOL=SER=RATER,
// DISP=SHR,DCB=DEN=3
                                      (1)        (2)
//FT10F001 DD DSN=APLTPE,VOL=SER=DWR03,LABEL=(01,NL),
//    DISP=(3)(MOD,KEEP),UNIT=(1600,,DEFER),
//    DCB=(RECFM=VS,BLKSIZE=7298,DEN=3)
//FT11F001 DD UNIT=2314,SPACE=(TRK,(600)),
// DCB=(BLKSIZE=5952,BUFNO=1)
//FT12F001 DD SYSOUT=A,SPACE=(CYL,(40)),
// DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265,BUFNO=1)
//FT13F001 DD UNIT=2314,SPACE=(1688,100),DCB=BLKSIZE=1688
//FT14F001 DD SYSOUT=A,DCB=(RECFM=VBA,LRECL=137,BLKSIZE=1100)
//FT20F001 DD DSN=K3.ZB2NL.SD001.PIGFRTLT,DISP=SHR
//FT30F001 DD DSN=K3.ZB2NL.SD001.PIDGRTLT,DISP=SHR
//FT40F001 DD DSN=K3.ZBRXB.SB001.PFREDCRP,DISP=SHR
//FT41F001 DD DSN=K3.ZBRXB.SB001.PFREDCR1,DISP=SHR
//FT42F001 DD DSN=K3.ZBRXB.SB001.PFREDCR2,DISP=SHR
//FT43F001 DD DSN=K3.ZBRXB.SB001.PFREDCR3,DISP=SHR
//FT44F001 DD DSN=K3.ZBRXB.SB001.PFREDCR4,DISP=SHR
//FT45F001 DD DSN=K3.ZBRXB.SB001.PGDRSCTP,DISP=SHR
```

```
//FT46F001 DD DSN=K3.ZBRXB.SB001.PGDRSCT1,DISP=SHR
//FT47F001 DD DSN=K3.ZBRXB.SB001.PGDRSCT2,DISP=SHR
//FT48F001 DD DSN=K3.ZBRXB.SB001.PGDRSCT3,DISP=SHR
//FT49F001 DD DSN=K3.ZBRXB.SB001.PGDRSCT4,DISP=SHR
//SG4060ZZ DD DSN=NULLFILE,UNIT=1600,LABEL=(1,NL),
//  DCB=(RECFM=F,BLKSIZE=240,DEN=3),DISP=(NEW,KEEP),
//  VOL=SER=SCRTCH
//SYSUDUMP DD SYSOUT=A
//FT15F001 DD * (1)                 (2)                    (3)
 &PLOT  HTB=73,11,29,00,00,HTE=73,12,09,24,00,QLIST=T,HID='F',
 QTRCHK=F                                                &END
//FT05F001 DD *
 R10F
// EXEC NOTIFYTS
//
```

L. Shaw
8/16/73

PIONEER AVERAGE TAPE STRUCTURE

Record Number	Number of Words	Contents
1	20	NDAY, (CR(L), L=1, 6) for first day
2	1200	Minute averages of first 30 minutes of day
3	1200	Second 30 minutes
4	1200	Third 30 minutes
.	.	
.	.	
.	.	
49	1200	Last 30 minutes of day
50	1200	Hour and day averages for first day

Repeat 50 records for each of 7 days.
(We may eventually put 28 days on each average tape.)

The 14 averages are in the following order:

1. $\langle B_R \rangle$
2. $\langle B_T \rangle$
3. $\langle B_N \rangle$
4. $\langle B_R^2 \rangle$
5. $\langle B_R\ B_T \rangle$
6. $\langle B_R\ B_N \rangle$
7. $\langle B_T^2 \rangle$
8. $\langle B_T\ B_N \rangle$
9. $\langle B_N^2 \rangle$
10. $\langle \cos\alpha \rangle = \langle B_R/|B| \rangle$
11. $\langle \cos\beta \rangle = \langle B_T/|B| \rangle$
12. $\langle \cos\gamma \rangle = \langle B_N/|B| \rangle$
13. $\langle |B| \rangle$
14. $\langle |B|^2 \rangle$

The tape is 7-track, 800 BPI, even parity.
(No control words, BCD characters only, FORTRAN readable)

Code to read one day of data:

```
      Dimension CR(6), DTH(24), DTM(60), EVD(14), EVH(14, 24) EVM(14, 60)
      READ (6, 10) NDAY, (CR(L), L=1, 6)
10    FORMAT (2X, I3, 6E15.7, 25X)
      DO 100 I = 1, 24
      READ (6, 20) (DTM(J), (EVM(K, J), K=1, 14), J=1, 30)
100   READ (6, 20) (DTM(J), (EVM(K, J), K=1, 14), J=31, 60)
20    FORMAT (30 (8E15.7, 15X, 7E15.7))
      READ (6, 30) (DTH(J), (EVH(K, J), K=1, 14), J=1, 24), DTD,
           (EVD(L), L=1, 14)
30    FORMAT (25(8E15.7, 15X, 7E15.7), 10(12OX))
```

USER'S GUIDE FOR THE PIONEER-F/G SECTORED RATE DISPLAY PROGRAM

I. INTRODUCTION.

The sector display program provides printed summaries and/or microfilm plots of Pioneer-F/G sectored rates accumulated on either a time or readout basis. Rates tapes and parameter cards are input to the program, and a printed summary and/or an SD-4060 plot tape are the output. If a plot tape is produced, the number of frames generated is printed at the conclusion of the run.

The program currently (as of 4 April 1974) exists in two versions: The first (henceforth referred to as Version 6) plots 6 sector plots per frame. The second (Version 12) plots 12 sector plots per frame and, as an option, attempts to fit a function of the form

$$N = A_0 + A_1 \cos(\theta-\theta_1) + A_2 \cos(2\theta+\theta_2)$$

to the data. Differences between the use of the two versions will be noted in the following discussion.

When rates are accumulated by cycles, the actual number of readouts accumulated is determined by which rates are requested. The LET-II rate cycle requires 8 pages to complete, while the HET/LET-I cycle requires 4 pages to complete. Therefore, if only HET/LET-I or only LET-II rates are requested, one cycle consists of one readout of each rate. However, if both HET/LET-I and LET-II rates are requested, one cycle consists of one readout of each of the LET-II rates and two readouts of each of the HET/LET-I rates.

? PAS 9/83

Each set of parameter cards consists of a time card, an input tape card (optional), and a set of rate cards--one for each rate to be processed. If the tape card is omitted, the volume serial numbers for the input rates tapes will be obtained from the catalog defined by the JCL. Each set except the last one must be followed by an END card (a card with END in Columns 1-3). The parameter cards are described in detail in the following section.

II. TIME CARD.

Variable Name	Column(s)	Format	Description	
APC	1	A1	Spacecraft Name: = "F" for Pioneer F = "G" for Pioneer G	
NMM1	3-4	I2	Start Month	Date and time of start of period to be plotted.
NDD1	5-6	I2	Start Day	
NYY1	7-8	I2	Start Year (last 2 digits)	
NHH1	10-11	I2	Start Hour	
NMIN1	12-13	I2	Start Minute	
NMM2	15-16	I2	Stop Month	Date and time of end of period to be plotted.
NDD2	17-18	I2	Stop Day	
NYY2	19-20	I2	Stop Year	
NHH2	22-23	I2	Stop Hour	
HMIN2	24-25	I2	Stop Minute	
INT	27-31	I5	Length of accumulation Interval for each plot in seconds (QCYCLE=F) or Cycles (QCYCLE=T).	
QCYCLE	33	L1	Flag for Accumulating over cycles: = F to accumulate by Time (INT seconds) = T to accumulate by Cycles (INT cycles)	

Variable Name	Column(s)	Format	Description
QCPRT	34	L1	Flat for Printing Rate Summary: = F for No Printing. = T for Printing.
QCPLT	35	L1	Flag for Generating Plots: = F for No Plots. = T for Plots. (If QCPRT=F and QCPLT=F, no output will be produced.)
QTRNDR	36	L1	Trend Check Rejection Flag: = F to accumulate all data. = T to reject readouts that failed the trend check.
QTMREJ	37	L1	Flag for Accumulating Inhibit Mode Data: = F to only accumulate readouts for which sectoring is not inhibited (OA Mode). = T to only accumulate readouts for which sectoring is inhibited.
PCFULL	39-43	F5.2	Full Scale for Sectored Rate Plots (%). If 0, each plot will be scaled according to the maximum percentage of its sectors (either 25, 50 or 100%).
QTAPES	44	L1	Flag for using Input Tapes Specified on the Following Card (Tape Card): = F to obtain the volume serial numbers from the tape catalog. = T to read the next card as a tape card and to use the rates tapes specified thereon as input.
QFIT	45	L1	Flag for Suppressing Fit of Cosine Function to the Data (Version 12 only - Version 6 never performs FIT): = F (or Blank) to attempt to fit cosine function. = T to not fit cosine function.

Variable Name	Column(s)	Format	Description
IDEBUG	46	I1	Controls the printing of intermediate values in the cosine function fit subroutine (Version 12 only): = 0 for no debug printout. = 1 to print initial and final iterations. = 2 to print each iteration.

III. TAPE CARD (OPTIONAL).

Read only if QTAPES = T on previous Time Card. This card may contain the volume serial numbers of from 1 to 10 input rates tapes. The tapes must be in time sequential order and the volume serial numbers specified must exactly match those on the Rates Tapes' standard labels.

Name	Columns	Format	Description
DINTAP(1)	1-6	AG	Volume serial # of 1st Rates Tape.
DINTAP(2)	9-14	AG	Volume Serial # of 2nd Rates Tape.
DINTAP(3)	17-22	AG	Volume Serial # of 3rd Rates Tape.
DINTAP(4)	25-30	AG	Volume Serial # of 4th Rates Tape.
DINTAP(5)	33-38	AG	Volume Serial # of 5th Rates Tape.
DINTAP(6)	41-46	AG	Volume Serial # of 6th Rates Tape.
DINTAP(7)	49-54	AG	Volume Serial # of 7th Rates Tape.
DINTAP(8)	57-62	AG	Volume Serial # of 8th Rates Tape.
DINTAP(9)	65-70	AG	Volume Serial # of 9th Rates Tape.
DINTAP(10)	73-78	AG	Volume Serial # of 10th Rates Tape.

IV. RATE CARDS.

One Rate Card must be included for each rate to be processed. If a Tape Card is present, the Rate Cards must immediately follow it. Otherwise, they must immediately follow the Time Card. If

another set of parameter cards is to be read, the last Rate Card must be followed by an END Card. The following are the Rate Cards for each sectored rate:

	RATE	RATE CARD (column 1 ↓)
SR1-a	$A_1A_2BCIC\overline{III}$	A1 ¬A2 B CI CIII
SR1-b	$A_2BK_1\overline{CIII}$	A2 B K1 CIII
SR1-c	$DIDII\overline{F}$	DI DIII F
SR1-d	$DIDIIE_1\overline{F}$	DI DII E1 F
SR2-a	$SI_5\overline{SII}\ \overline{SII}_a\overline{SIII}$	SI5 ¬SII ¬SIIA ¬SIII
SR2-b	$SI_6\overline{SII}\ \overline{SII}_a\overline{SIII}$	SI6 ¬SII ¬SIIA ¬SIII
SR2-c	$SI_7\overline{SII}\ \overline{SII}_a\overline{SIII}$	SI7 ¬SII ¬SIIA ¬SIII
SR2-d	$SI_8\overline{SII}\ \overline{SII}_a\overline{SIII}$	SI8 ¬SII ¬SIIA ¬SIII
SR2-e	$SI\ \overline{SII}_5\overline{SII}_a\overline{SIII}$	¬SI SII5 ¬SIIA ¬SIII
SR2-f	$SI\ \overline{SII}_6\overline{SII}_a\overline{SIII}$	¬SI SII6 ¬SIIA ¬SIII
SR2-g	$SI\ \overline{SII}_7\overline{SII}_a\overline{SIII}$	¬SI SII7 ¬SIIA ¬SIII
SR2-h	$SI\ \overline{SII}_8\overline{SII}_a\overline{SIII}$	¬SI SII8 ¬SIIA ¬SIII

If a rate card does not match one of the above, a message will be printed and it will be skipped.

V. JCL FOR RUNNING VERSION 12.

VI. PLOT FORMAT (VERSION 6).

Each microfilm plot frame may contain up to 6 plots. If only one rate is being plotted, each frame will contain six plots for that rate--one for each of six intervals. The start and stop times on the frame will reflect the start time for the first plot interval and the stop time for the last plot interval, respectively.

If from 2 to 6 rates are being plotted, each frame will contain one plot for each of the rates for one interval. If more than 6 rates are being plotted, each plot interval will require two frames, the first containing the first six rates and the second containing the rest.

The placement of the rates is determined by the order in which the Rate Cards are read,

VII. PARAMETER CARD EXAMPLES (VERSION 6).

Example 1: Plot and print non-inhibit mode data for Pioneer-F for DI DII $\overline{F}$ for every readout from 00:00 to 2:00 on March 28, 1972. Use 25% full scale for all plots and accept all data regardless of trend check. Obtain tapes from catalog.

TIME CARD - F 032872 0000 032872 0200 00001 TTTFF 25.00

RATE CARD - DI DII F

Example 2: Plot and print non-inhibit mode data for Pioneer-F for DI DII $\overline{F}$, $A_1A_2\overline{B}$ CI $\overline{CII}$, and $\overline{SI}$ $\overline{SII_8}$ $\overline{SII_a}$ $\overline{SIII}$ for every half hour from 0100 on April 4, 1972 to 1400 on April 5, 1972. Scale each plot to maximum percentage and reject data that failed the trend check. Use tapes E00339 and E00340 for input. Also, plot and print inhibit mode data for Pioneer-F for DI DII $E_1\overline{F}$ and $A_2BK_1\overline{CIII}$ for every hour on April 10, 1972. Use 50% full scale for all plots and accept all data regardless of trend check. Obtain rates tapes from catalog.

TIME CARD - F 040472 0100 040572 1400 01800 FTTTF 00.00T

TAPE CARD - E00339 E00340

RATE CARDS - DI DII F
A1 A2 B CI CIII
SI SII8 SIIA SIII

END CARD - END

SET 1

TIME CARD - F 041072 0000 041072 2400 03600 FTTFT 50.00

RATE CARDS - DI DII E1 F
A2 B K1 CIII

SET 2

VIII. TIME ESTIMATES (VERSION 6).

The time required is a function of the length of the time period to be plotted, the number of rates to be plotted, and the length of the accumulation interval. The following table gives a few examples:

Length of Time Period (Hours)	No of Rates	Accumulation Interval	Execution Time (min.) CPU	Execution Time (min.) I/O	No. of Frames
6	7	10 cycles	.13	.12	13
6	3	1/2 hour	.14	.13	13
2	5	1 cycle	.16	.13	21
2	3	1 cycle	.13	.12	21
37	3	1/2 hour	1.05	.49	124
34	12	1 hour			

IX. MAGNETIC FIELD DATA DISPLAY OPTION FOR THE PIONEER-F/G SECTORED RATE DISPLAY PROGRAM.

As of 16 December 1974, an option has been added to Verson 12 of the Pioneer sector display program which allows magnetic field data to be merged and a dashed arrow to be displayed on each plot in the direction of the magnetic field in the plane of the plot. The angles of the magnetic field vector (as defined below) are printed with the rate summary (when QCPRT = T) and are displayed in the "cosmic function fit table" at the top of each frame (when QNFIT=F). In addition, whenever the cosine function fit has been successfully performed, an arrow is plotted in the direction of the first-order anisotropy with the length of the arrow being proportional to the

magnitude of the first order anisotropy (100% anisotropy = full scale on the plot). This anisotropy arrow is drawn regardless of whether or not the magnetic field data is being merged.

X. ADDITIONAL INPUT PARAMETERS FOR MAGNETIC FIELD DATA DISPLAY.

If magnetic field data is to be displayed, the volume-serial number of the magnetic field tape (only one may be used per time card) must be entered in Columns 48-53 (A6 format) of the time card.

A more complete listing of the magnetic field data used may be obtained by utilizing the "debug" flag (MAGDBG) in Column 55 (I1 format) of the time card.

MAGDBG=1 causes the header information for each day from the magnetic field tape to be listed and the sums of the (x,y,z) components in S-J coordinates to be printed for each plot accumulation interval.

MAGDBG=2 causes each magnetic field minute average to be printed for each plot accumulation interval in addition to the information provided by MAGDBG=1.

XI. JCL CHANGES.

As a result of the addition of the magnetic field display option, the following changes must be made to the MCL for Version 12:

(1) The following must be added after // DD DSN=SYS2.SD4060,... in the SYSLIB concatenation:

```
// DD DSN=K3.SBCID.ØHELIØSA,DISP=SHR
```

(2) The following must be added when magnetic field data is to be used:

```
//GØ.FTIOFOOl DD UNIT=(1600,,DEFER),DSN=PIØMAG,DISP=SHR,
//  LABEL=(,SL,,IN),VØL=SER=MAGTAP
```

An updated listing of the JCL required for Version 12 is given below:

(1) Not required if QCPLT=F on all time cards.
(2) Not required if magnetic field tape not specified on any time card.

Document:
81-11-002

Magnetic Field Data Base Generator

for the

Fourier Program

Jenny Jacques
Data Management and Programming Office
Code 664
Goddard Space Flight Center
November 1979
Modified: Veronica Kell, July 1981

7/21/81

Magnetic Field Data Base Generator for the Fourier Program

User's Guide

I. Purpose

The magnetic field data for PIONEER is converted to a Fourier Program compatable tape, with timing adjusted to S/C time. A listing may also be generated, even if no tape is desired.

II. Input Required

1. Magnetic Field Tape
   (See the system documentation of this program for the format)
2. Output 9-track, 1600 BPI, NL tape
3. Trajectory tape
4. User Namelist:

Parameters	Type	Default	Description
QVOLS(6,10)	10*A6	*'s	Up to 10 EBCDIC input magnetic field tapes to process
QODB(6,2)	2*A6	*'s	Up to 2 EBCDIC output tape names
INTRVL	I*4	0	Averaging interval desired, in seconds
QTAPE	L*1	F	T=create output data base
NFILE	I*4	1	Output tape start file:
QTRAJ(6)	A6	blanks	Trajectory tape EBCDIC name
ITRFIL(2)	I*4	1,1	Start, end file number of the trajectory tape data to correlate with the magnetic field data
QPRINT	L*1	T	A listing of the data is desired
IMODE	I*4	none - required parameter	Mode of Spacecraft: 0 = Cruise Mode 1 = Jupiter Encounter 2 = Saturn Encounter

Parameters	Type	Default	Description
SOLAR(3)	R*4	1,1,1	Coordinates of the solar spin axis Cruise Mode: Solar = 0.03252 0.12194 0.99200 Jupiter Encounter: Solar = -0.01447871 -0.03481712 0.99928882
JTPTYP	I*4	none - required parameter	Unit type of input Magnetic Field Tape 7 = 7 Track 9 = 9 Track

III. Output Generated

1. Listing of the magnetic field data
2. A Fourier Program compatible magnetic field data base tape.

IV. Error Handling

Messages or Return Code	Error and Recovery
7	The timing is in error. Check the times and the average interval input for validity.
'END OF PROGRAM DUE TO END OF TRAJECTORY TAPE'	More data was to be processed than was contained on the trajectory tape. Check the tape for contents.
1	User-input flags are inconsistent, QTAPE or QPRINT must be set.true.
'READ ERROR ON TRAJECTORY TAPE. RECORD SKIPPED'	Self-explanatory

V. JCL

1. Unit 8 is the output Fourier magnetic field data base.

```
//FT08F001 DD
```

Source : SEVAK.MAGDBG.FORT (MAGDBG)
jcl : SBP10.LIB.CNTL (SMAGDBG)
Load module : SBP10.MAGDBG.LOAD

Magnetic Field Processing for the Fourier Program

I. Purpose

The magnetic field data for PIONEER is to be used in the Fourier program for listing and plotting. A new data base will consist of the data averaged over a user-specified time interval which would be consistent with the "FLUX" tape which is used as input to the Fourier program. Data specific to the Fourier program's use is included, as well as the original data in the input magnetic field tape for processing by other programs. All values will be averaged with a resolution of one minute, with no interpolation. All values are average over the interval in a simple manner: $\langle X \rangle = \Sigma X_i/N$, where N = # of intervals included in the sum of X_i.

II. Description

Each input magnetic field tape is one output file. Because the volume of data is small, there will be no tape catalog, and the data most likely will be confined to one tape.

The generated data base tape will be of one averaging interval, with resolution of one minute, the resolution of the input tape. No interpolation will be done for averages of non-integral multiples of one minute due to the expected stability of the field. The times on the output tape will be event times, adjusted from the input tape ground receipt times. The program will be modular, so future changes to incorporate slightly different computations of output will be more easily made.

Input coordinate transformations will be performed depending on the mode of the input tape. If Saturn encounter, the input coordinates will not be transformed. If the input is Cruise Mode in Pioneer inertial coordinates, the transformation will be to Solar-Heliographic coordinates. If the input is Cruise Mode in Solar-Heliographic coordinates, the transformation will be to Pioneer inertial coordinates. If Jupiter encounter, the input coordinates will be transformed to Pioneer inertial coordinates.

NOTE: All cruise mode magnetic field data prior to and including 1976 is in Solar-Heliographic Coordinates.

All cruise mode magnetic field data post 1976 is in Pioneer inertial coordinates.

III. Formulas

A. Distance from S/C to Earth:

$$R = (R_1^2 + R_2^2 - 2R_1R_2(\cos(A)\cos(B)\cos(C) + \sin(A)\sin(B)))^{1/2}$$

where: R_1 = Distance from S/C to sun
R_2 = Distance from Earth to sun
A = Theta for S/C
B = Theta for Earth
C = Phi $_{s/c}$ - Phi$_{Earth}$

B. If u is the unit vector in the direction of B, and if x = $|\hat{u}|\cos\alpha$ and y = $|\hat{u}|\cos\beta$, and z = $|\hat{u}|\cos\gamma$, $|\hat{u}|$ = 1, then Phi, Theta are:

$$\text{Phi} = \phi = \text{ATAN2}\ (y/x) = \text{ATAN2}\left(\frac{\langle\cos\beta\rangle}{\langle\cos\alpha\rangle}\right)$$

$$\text{Theta} = \theta = 90 - \cos^{-1}z = 90 - \cos^{-1}(\langle\cos\gamma\rangle)$$

For PIONEER, -x=y' and y=x', x', y' are input.

C. Transformation Matrix

Used to transform Jupiter Encounter Coordinates and Solar-Heliographic coordinates to Pioneer Inertial Coordinates. The transpose of this matrix is used to transform Pioneer Inertial Coordinates to Solar-Heliographic Coordinates.

Let		denote	
	|| ||		magnitude
	X	"	vector product
	δsc	"	celestial latitude of the spacecraft
	λsc	"	celestial longitude of the spacecraft
	δE	"	celestial latitude of the Earth
	λE	"	celestial longitude of the Earth
	Rsc	"	Sun - Spacecraft distance
	Re	"	Sun - Earth distance

T = transform matrix
= U • V — where U,V, & T are all 3X3 matrices

to calculate the

U Matrix:

SOLAR(3) = solar spin coordinates
X1(3) = COS δsc cos λsc,
COS δsc sin λsc,
sin δsc

Y1(3) = (SOLAR X X1) ÷ || SOLAR X X1 ||

$$Z1(3) = X1 \times Y1$$

$$U(3,3) = \begin{bmatrix} X1(3) \\ Y1(3) \\ Z1(3) \end{bmatrix}$$

V Matrix:

$$P(1) = -Rsc \cos \delta sc \cos \lambda sc + Re \cos \delta e \cos \lambda e$$
$$P(2) = -Rsc \cos \delta sc \sin \lambda sc + Re \cos \delta e \sin \lambda e$$
$$P(3) = -Rsc \sin \delta sc + Re \sin \delta e$$

$$Z1(3) = P/||P||$$
$$X1(3) = [0\ 0\ 1] \times Z1$$
$$Y1(3) = Z1 \times X1$$

$$V(3,3) = [X1(3)\ Y1(3)\ Z1(3)]$$

T Matrix:

$$T = UV$$
$$\Longrightarrow t_{ij} = \sum_k U_{ik} V_{kj}$$

to transform the coordinates:

LET BX, BY, BZ denote the original coordinates

$$\text{new x coord.} = BX \cdot T(1,1) + BY \cdot T(2,1) + BZ \cdot T(3,1)$$
$$\text{new y coord.} = BX \cdot T(1,2) + BY \cdot T(2,2) + BZ \cdot T(3,2)$$
$$\text{new z coord.} = BX \cdot T(1,3) + BY \cdot T(2,3) + BZ \cdot T(3,3)$$

$$MAG = \text{magnitude} = \left[(\text{new x})^2 + (\text{new y})^2 + (\text{new z})^2\right]^{1/2}$$

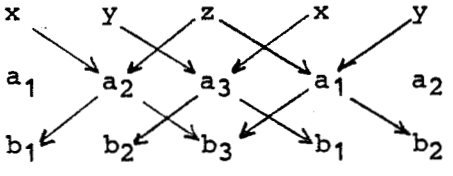
$$\cos \alpha = \text{new x}/MAG$$
$$\cos \beta = \text{new y}/MAG$$
$$\cos \gamma = \text{new z}/MAG$$

D. Vector Product

LET A = vector 1
B = vector 2

$$A \times B = (a_2b_3 - a_3b_2)\,x + (a_3b_1 - a_1b_3)\,y + (a_1b_2 - a_2b_1)\,z$$

which is the expanded form of the determinant



resulting vector is

$$V = \begin{bmatrix} (a_2b_3 - a_3b_2) \\ (a_3b_1 - a_1b_3) \\ (a_1b_2 - a_2b_1) \end{bmatrix}$$

$$||V|| = \left(V(1)^2 + V(2)^2 + V(3)^2\right)^{1/2}$$

IV. Contents

The tape will be fixed, blocked, with byte length of 160/record. It will be multi-filed with a new file beginning with each input magnetic field data tape. The following values will comprise the record:

Byte Field	Type	Description
1-4	I4	Year of start of interval
5-8	I4	Day of start of interval
9-12	I4	Seconds of day of start of interval
13-16	I4	Interval in seconds of the average
17-20	R4	Milliseconds of data in the interval
21-24	I4	Input tape flag: 0=cruise, 1=Jupiter,2=Saturn
25-28	R4	*<cosα> in S/C spin coordinates
29-32	R4	*<cosβ> in S/C spin coordinates
33-36	R4	*<cosγ> in S/C spin coordinates

Byte Field	Type		Description
37-60	24*L1		The Phi sector counts, 15° sectors
61-72	12*L1		The Theta sector counts, 15° sectors
73-76	R4	*	$\langle B_x \rangle$ in desired coordinate system
77-80	R4	*	$\langle B_y \rangle$ in desired coordinate system
81-84	R4	*	$\langle B_z \rangle$ in desired coordinate system
85-88	R4	**	$\langle B_x \rangle$ in input tape coordinates
89-92	R4	**	$\langle B_y \rangle$ in input tape coordinates
93-96	R4	**	$\langle B_z \rangle$ in input tape coordinates
97-100	R4		$\langle B_x^2 \rangle$ in input tape coordinates
101-104	R4		$\langle B_x B_y \rangle$ in input tape coordinates
105-108	R4		$\langle B_x B_z \rangle$ in input tape coordinates
109-112	R4		$\langle B_y^2 \rangle$ in input tape coordinates
113-116	R4		$\langle B_y B_z \rangle$ in input tape coordinates
117-120	R4		$\langle B_z^2 \rangle$ in input tape coordinates
121-124	R4	**	$\langle \cos\alpha \rangle = B_x/B$ in input tape coordinates
125-128	R4	**	$\langle \cos\beta \rangle = B_y/B$ in input tape coordinates
129-132	R4	**	$\langle \cos\gamma \rangle = B_z/B$ in input tape coordinates
133-136	R4		$\langle \lvert B \rvert \rangle$
137-140	R4		$\langle \lvert B^2 \rvert \rangle$
141-160	--		Spare bytes

* Always in PE coordinates

** If input data is cruise mode, post 1976, these values are in SH coordinates even though the input is in PE coordinates

V. Coordinate System

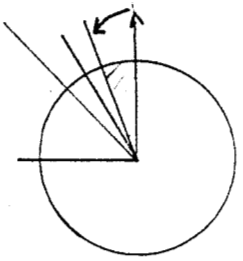
The coordinate system used for the Fourier input is a right-handed system using X axis as the reference direction. The X axis lies in the ecliptic plane, pointing toward the Sun. The Y axis lies in the ecliptic plane, ⊥ to X axis. The Z axis is zenith, perpendicular to the ecliptic plane.

The cosines are then defined as follows:

$$\langle \cos\alpha \rangle = \langle B_x/|B| \rangle$$
$$\langle \cos\beta \rangle = \langle B_y/|B| \rangle$$
$$\langle \cos\gamma \rangle = \langle B_z/|B| \rangle$$

where B_x, B_y, and B_z are the components of the magnetic field in S/C spin coordinates.

The Phi and Theta arrays are oriented to the reference direction such that 0° is the reference direction, and thus, Phi (1) for example, is the sector value averaged from 0° to 15° centered on 7.5° in the counter-clockwise direction from the reference direction:



VI. Common Blocks

The FTIO package will be used in creating the tape, with the following common used as output:

```
COMMON /MAGIN/MRY,MDAY,MSC,INTRVL,DMILLI,ISATRN,COSA,COSB,COSG,
     QPSECT(24),QTSECT(12),BX,BY,BZ,AVGS(14),SPARE(5)
```

where IMPLICIT REAL (A-H),INTEGER (I-N),LOGICAL*1 (Q)

Magnetic Field Tape Generator

I.

A. Overview

The magnetic field data for PIONEER is to be used in the Fourier Plot Program for listing and plotting. A new data base will consist of the data averaged over a user-specified time interval which would be consistent with the input data base to the Fourier program. Data specific to the Fourier program's use is included, as well as the original data in the input magnetic field tape for processing by other programs. All values will be averaged with a resolution of one minute, with no interpolation. All values are averaged over the interval in a simple manner: $\langle X \rangle = \Sigma X_i/N$, where N = # of intervals included in the sum of X_i.

The generated data base tape is made of one averaging interval, with resolution of one minute which is the resolution of the input tape. No interpolation will be done for averages of non-integral multiples of one minute due to the expected stability of the field. The times on the output tape will be event times, adjusted from the input tape ground receipt times.

B. Input Required

1. Input magnetic field tape, post 1976

The tape is multi-filed with each file containing one day's data. The data exists in three average periods: minute, hour, and day averages.

2. Structure

Header record: 1440 minute average records

24 hour average records
1 day average record
5 spare records

The data is read with FORTRAN formatted reads as follows:

Header record: (3X,I2,2X,F3,4X,A1,15X,6E15.7,30A4)

Variable	Format	Description
	3X	
IYR	I2	Last two digits of year
	2X	
IDAY	I3	Day of year
	4X	
ISC	A1	Spacecraft (F or G)
	15X	

Variable	Format	Description
HRANGP	E15.7	Distance of spacecraft from sun (km)
CELLTP	E15.7	Heliocentric celestial latitude of spacecraft (degrees)
CELLNP	E15.7	Heliocentric celestial longitude of spacecraft (degrees)
REARSU	E15.7	Distance of Earth from sun (km)
CELLTE	E15.7	Heliocentric celestial latitude of Earth (degrees)
CELLNE	E15.7	Heliocentric celestial longitude of Earth (degrees)
TEXT	30A4	Text describing the file

The above trajectory data is often filled with zeros, thus a trajectory tape is used to convert ground receipt times to event times.

Data records: (8E15.6,15X,7E15.6)

Variable	Format	Description
DT	E15.7	Number of milliseconds for which data exists in the period over which the average was taken
EV(1)	E15.7	$\langle B_x \rangle$
EV(2)	E15.7	$\langle B_y \rangle$
EV(3)	E15.7	$\langle B_z \rangle$
EV(4)	E15.7	$\langle B^2 \rangle$
EV(5)	E15.7	$\langle B_x B_y \rangle$
EV(6)	E15.7	$\langle B_x B_z \rangle$
EV(7)	E15.7	$\langle B_Y{}^2 \rangle$
	15X	
EV(8)	E15.7	$\langle B_y B_z \rangle$
EV(9)	E15.7	$\langle B_z{}^2 \rangle$
EV(10)	E15.7	$\langle \cos \alpha \rangle = \langle B_x/\lvert B \rvert \rangle$
EV(11)	E15.7	$\langle \cos \beta \rangle = \langle B_y/\lvert B \rvert \rangle$
EV(12)	E15.7	$\langle \cos \nu \rangle = \langle B_z/\lvert B \rvert \rangle$
EV(13)	E15.7	$\langle \lvert B \rvert \rangle$
EV(14)	E15.7	$\langle \lvert B \rvert^2 \rangle$

3. Input Magnetic Field Tape, 1976 and before

The text portion of the header record is not present.

The data is read with Fortran formatted reads as follows:

Header record: (3X,I2,2X,F3,4X,A1,15X,6E,15.7)

4. Trajectory Tape

Tape Characteristics

Blksze = 12640
Lrecl = 1264
Recfm = FB
Den = 4
Label = Sl
Track = 9-track

5. File Formats

Each file corresponds to a particular time period, not necessarily in chronological order. The records are read into a common block as follows:

Header record - skipped
Data records:

Variable	Type	Definition
DTSP50	R*8	Time (sec.) past 0^h Jan. 1, 1950
DJULDT	R*8	Julian date (days)
ITIME(6)	I*4	Year, month, day, hour, min. second
DEC2(153)	R*4	Element #8 = distance of S/C from earth (km) Element #11 = sun-earth distance (km) Element #17 = sun-spacecraft distance (km) Element #20 = celestial latitude of S/C (deg) Element #21 = celestial longitude of S/C (deg) Element #22 = celestial latitude of earth (deg) Element #23 = celestial longitude of earth (deg)

C. Output Generated

1. Fourier Magnetic Field Data Base

This tape is an option in case only a listing is desired.

Tape Characteristics

Blksize = 7200
Lrecl = 160
Recfm = FB
Den = 3
Label = NL
Track = 9-track

2. File Format

Each file is one imput magnetic field tape of about one week of data. It is read into a common block called /MAGN/ (see Common Block Definitions).

There are no file headers.

Byte Field	Type		Description
1-4	I4		Year of start of interval
5-8	I4		Day of start of interval
9-12	I4		Seconds of day of start of interval
13-16	I4		Interval in seconds of the average
17-20	R4		Milliseconds of data in the interval
21-24	I4		Input tape flag: 0=cruise, 1=Jupiter, 2=Saturn
25-28	R4	*	$\langle\cos\alpha\rangle$ in S/C spin coordinates
29-32	R4	*	$\langle\cos\beta\rangle$ in S/C spin coordinates
33-36	R4	*	$\langle\cos\gamma\rangle$ in S/C spin coordinates
37-60	24*L1		The Phi sector counts, 15° sectors
61-72	12*L1		The Theta sector counts, 15° sectors
73-76	R4	*	$\langle B_X\rangle$ in desired coordinate system

Byte Field	Type		Description
77-80	R4	*	$\langle B_y \rangle$ in desired coordinate system
81-84	R4	*	$\langle B_z \rangle$ in desired coordinate system
85-88	R4	**	$\langle B_x \rangle$ in input tape coordinates
89-92	R4	**	$\langle B_y \rangle$ in input tape coordinates
93-96	R4	**	$\langle B_z \rangle$ in input tape coordinates
97-100	R4		$\langle B_x^2 \rangle$ in input tape coordinates
101-104	R4		$\langle B_x B_y \rangle$ in input tape coordinates
105-108	R4		$\langle B_x B_z \rangle$ in input tape coordinates
109-112	R4		$\langle B_y^2 \rangle$ in input tape coordinates
113-116	R4		$\langle B_y B_z \rangle$ in input tape coordinates
117-120	R4		$\langle B_z^2 \rangle$ in input tape coordinates
121-124	R4	**	$\langle \cos\alpha \rangle = B_x/B$ in input tape coordinates
125-128	R4	**	$\langle \cos\beta \rangle = B_y/B$ in input tape coordinates
129-132	R4	**	$\langle \cos\gamma \rangle = B_y/B$ in input tape coordinates
133-136	R4		$\langle \lvert B \rvert \rangle$
137-140	R4		$\langle \lvert B^2 \rvert \rangle$
141-160	--		Spare bytes

* Always in PE coordinates

** If input data is Cruse Mode, post 1976, these values will be in Solar-Heliographics coordinates even though the input is in Pioneer inertial coordinates.

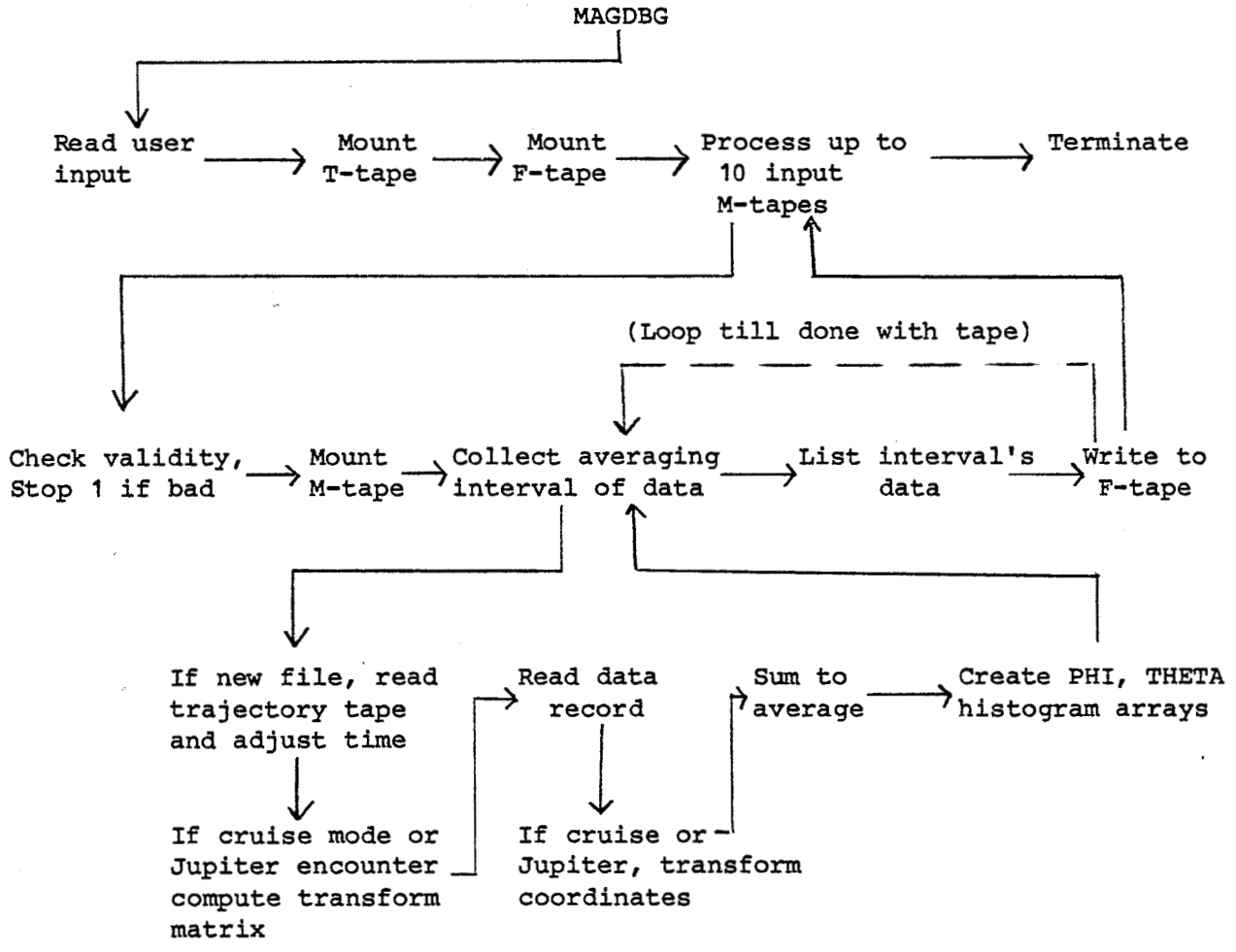
3. Listing

A listing of the times and above data is generated at user's options.

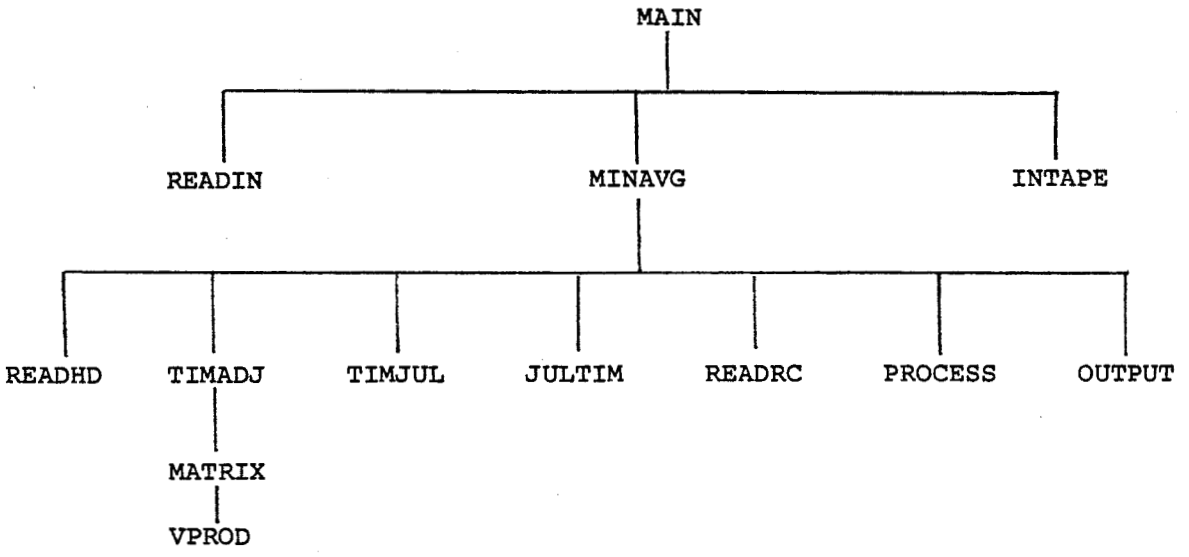
II. Program Documentation

A. Design Flow

M-Tape = input magnetic field tape
F-Tape = output Fourier data base tape
T-Tape = Trajectory tape



B. Block Diagram



C. Module Definition

Module	Purpose
MAIN	Controls program flow
INTAPE	Mounts and positions proper input magnetic field tape
JULTIM	Converts modified Julian time (epoch 1972) to year, month, day, hour, minute, second
TIMJUL	Reverses order of JULTIM, converting to modified Julian time (epoch 1972)
TIMADJ	Reads the trajector tape and returns the difference in seconds of ground receipt time and S/C event time
MATRIX	Calculates the transform maxtrix used to transform Cruise Mode (SH) and Jupiter encounter coordinates into Pioneer inertial coordinates, and Cruise Mode (PE) coordinates into Solar-Heliographic coordinates
VPROD	Calculates the vector product of two vectors
MINAVG	Collects the averaging intervals and processes them from the minute averages of the magnetic field tape
PROCES	Collects the histrograms for PHI and THETA and sends the current data into the average
OUTPUT	Prepares the data for output and lists it if desired
READIN	Reads in and prints out user parameters
READHD	Reads the header record of either a 7-track or 9-track tape
READRC	Reads in a 7200 byte block of data and returns 240 bytes of data to the program

D. Common Blocks

1. Common/TAPE/NVOL,NFILE,ITRFIL(2),QVOLS(6,10),QODB(6,2),QNDB (6,2),QTRAJ(6)

Holds all tape information.

Variable	Type	Description
NVOL	I*4	Number of input tapes used so for this run
NFILE	I*4	The Fourier data base file #
ITRFIL(2)	I*4	Trajectory tape start, end files
QVOLS(6,10)	L*1	100 6-character names of input magnetic field tapes
QODB(6,2)	L*1	2 6-character names of the old data base
QNDB(6,2)	L*1	2 6-character names of the new data base
QTRAJ(6)	L*1	Trajectory tape name

2. Common /FLAGS/QNEW,QTAPE,QPRINT

Holds flags for processing.

Variable	Type	Description
QNEW	L*1	T = first time through program
QTAPE	L*1	T = add the data to the Fourier magnetic field data base
QPRINT	L*1	T = list the data on the line printer

3. COMMON

/MAGN/HYR,MDAY,MSC,INTRVL,DMILLI,ISATRN,COSA,COSB,COSG,QPSECT(24) QTSECT(12),BX,BY,BZ,AVGS(14),SPARE(5)

The output common for the Fourier data base.

The values corresponds to the Fourier data base system records, with the variable types as follows: IMPLICIT REAL (A-H),INTEGER(I-N),LOGICAL*1(Q)

4. COMMON /CRZMOD/AVGS2(6),SOLAR(3)

Holds arrays needed for coordinate transformation.

Variable	Type	Description
AVGS2(6)	R*4	Sums the transformed coordinate values and cosine values for averaging
SOLAR(3)	R*4	Coordinates of the solar spin axis

E. Formulas

1. Distance from S/C to Earth:

$$R = (R_1^2 + R_2^2 - 2R_1R_2(\cos(A)\cos(B),\cos(C) + \sin(A)\sin(B)))^{1/2}$$

where: R_1 = Distance from S/C to sun
R_2 = Distance from Earth to sun
A = Theta for S/C
B = Theta for Earth
C = Phi $_{S/C}$ - Phi$_{Earth}$

2. If u is the unit vector in the direction of B, and if x = $|u|\cos\alpha$ and y = $|u|\cos\beta$, and z = $|u|\cos\gamma$, $|u|$ = 1, then Phi, Theta are:

$$\text{Phi} = \phi = \text{ATAN2 } (y/x) = \text{ATAN2 } \left(\frac{\langle\cos\beta\rangle}{\langle\cos\alpha\rangle}\right)$$

$$\text{Theta} = \theta = 90 - \cos^{-1} z = 90 - \cos^{-1} (\langle\cos\gamma\rangle)$$

For PIONEER, x =- y' and y = x', x',y' are from the input tape.

3. Transformation Matrix:

Used to transform Jupiter Encounter coordinates to Pioneer Inertial coordinates. The transpose of this matrix is used to transform Pioneer Inertial coordinates to Solar-Heliograpic coordinates.

LET: || || denote magnitude
X denote vector product
δsc " celestial latitude of the spacecraft
λsc " " longitude of the spacecraft
δE " " latitude of the Earth
λE " " longitude of the Earth
Rsc " Sun-spacecraft distance
RE " Sun-Earth distance

T = transform Matrix
= U • V where U,V, & T are all 3X3 matrices

to calculate the:

U Matrix: SOLAR(3) = SOLAR SPIN COORDINATES
X1(3) = cos δsc cos λsc, cos δsc sin λsc, sin δsc
Y1(3) = (SOLAR X X1) ÷ || SOLAR X X1 ||
Z1(3) = X1 X Y1
U(3,3) = $\begin{bmatrix} X1(3) \\ Y1(3) \\ Z1(3) \end{bmatrix}$

V Matrix: $P(1) = -R_{sc} \cos \delta_{sc} \cos \lambda_{sc} + R_E \cos \delta_E \cos \lambda_E$
$P(2) = -R_{sc} \cos \delta_{sc} \sin \lambda_{sc} + R_E \cos \delta_E \sin \lambda_E$
$P(3) = -R_{sc} \sin \delta_{sc} + R_E \sin \lambda_E$

Z1(3) = P/||P||
X1(3) = [0 0 1] X Z1
Y1(3) = Z1 x X1
V(3,3) = [X1(3) Y1(3) Z1(3)]

T Matrix: T = UV

$$\Longrightarrow t_{ij} = \sum_k U_{ik} V_{kj} \qquad \text{where} \quad \begin{matrix} i = 1,2,3 \\ j = 1,2,3 \\ k = 1,2,3 \end{matrix}$$

to transform the coordinates:

LET BX, BY, BZ denote the original coordinates.

new x coord. = BX • T(1,1) + BY • T(2,1) + BZ • T(3,1)
new y coord. = BX • T(1,2) + BY • T(2,2) + BZ • T(3,2)
new z coord. = BX • T(1,3) + BY • T(2,3) + BZ • T(3,3)

MAG = magnitude = $\left((\text{new x})^2 + (\text{new y})^2 + (\text{new z})^2\right)^{1/2}$

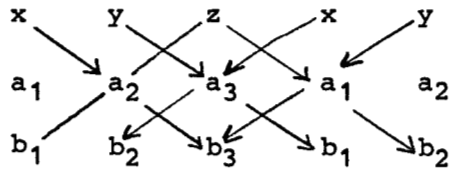
cos α = new x/MAG
cos β = new y/MAG
cos γ = new z/MAG

4. Vector Product:

LET A = vector 1
B = vector 2

A X B = $(a_2b_3 - a_3b_2)x + (a_3b_1 - a_1b_3)y + (a_1b_2 - a_2b_1)z$

which is the expanded form of the determinant



resulting vector is

$$V = \begin{bmatrix} (a_2b_3 - a_3b_2) \\ (a_3b_1 - a_1b_3) \\ (a_1b_2 - a_2b_1) \end{bmatrix}$$

$$|| V || = \left(V(1)^2 + V(2)^2 + V(3)^2\right)^{1/2}$$

F. Coordinate System

The coordinate system used for the Fourier input is a right handed system, using X axis as the reference direction. The X axis lies in the ecliptic plane, pointing toward the Sun. The Y axis lies in the ecliptic plane, perpendicular to X axis. The Z axis is zenith, perpendicular to the ecliptic plane.

The cosines are then defined as follows:

$$\langle\cos\alpha\rangle = \langle B_x/|B|\rangle$$
$$\langle\cos\beta\rangle = \langle B_y/|B|\rangle$$
$$\langle\cos\gamma\rangle = \langle B_z/|B|\rangle$$

where B_x, B_y, and B_z are the components of the magnetic field in S/C spin coordinates.

The Phi and Theta arrays are oriented to the reference direction such that 0° is the reference direction, and thus Phi(1) for example is the sector value averaged from 0° to 15° centered on 7.5° in the counter-clockwise direction from the reference direction:

G. Module Documentation

All modules were designed, coded, and tested by Jenny Jacques, Code 664, November 1979. MATRIX, VPROD,READHD, and READRC were defined, coded, and tested by Ronnie Kell, Code 664, July 1981.

1. Module: MAIN

   a. Purpose: Controls program flow

   b. Calls: READIN,INTAPE,MINAVG

c. Commons:

Common	Variable	I/O
TRAJ	none used	
TAPE	ITRFIL	I
		QODBI
		NFILEI
		QTRAJI
FLAGS	QTAPE	I

d. Local Variables:

Name	Type	Description
QDONE	L*1	T = end of processing
MODE	I*4	Mode of spacecraft:
		0=cruise
		1=Jupiter
		2=Saturn
ITPTYP	I*4	Type of input tape:
		7=7-track
		9=9-track

e. Algorithm:

The necessary tapes are mounted, then the data is collected with MINAVG which returns when finished with the entire tape. If no more input tapes are required, the program ends.

2. Module: INTAPE

a. Purpose: Mounts a new magnetic field input tape

b. Arguments:

Name	Type	I/O	Description
QDONE	L*1	O	T = no more tapes to mount
ITPTYP	I*4	I	Type of track:
			7=7-track
			9=9-track

c. Called by: MAIN

d. Commons:

Common	Variable	I/O
FLAGS	QNEW	I
	QTAPE	I
TAPE	NVOL	I,O
	NFILE	I,O
	QVOLS	I

e. Local Variables:

Name	Type	Description
QASTR	L*1	'*', which means no more entries in the name array.
LUN	I*4	Logical unit number - used to determine which unit to read, depending on ITPTYP

f. Algorithm:

The name array is checked to see if there are any more input tapes to mount. If not, QDONE is set to .true. and INTAPE returns. If there is another tape, it is mounted, and an EOF is placed on the Fourier data base.

3. Module: JULTIM

a. Purpose: Convert modified Julian time to year, day, seconds of day.

b. Arguments:

Name	Type	I/O	Description
IYR	I*4	O	Last two digits of year
IDAY	I*4	O	Day of year
ISECC	I*4	O	Seconds of day
LTIME	I*4	I	Modified Julian day

c. Called by: MINAVG

d. Commons:

Name	Variable	I/O
MAGN	INTRVL	I

e. Local Variables:

Name	Type	Description
RDYCN	R*4	Number of intervals per day
JDAY	I*4	Days since epoch day 1972
JAVGS	I*4	Number of intervals of day
LEAP	I*4	1=not leap year, 2=leap year
IDAYS(16)	I*4	Days since epoch for each year

f. Algorithm:

The number of days since epoch day Jan. 0, 1972 is found, and the number of intervals in the day is calculated. Then the year, day, and seconds are found by simple calculation using a pre-defined array.

4. Module: MINAVG

a. Purpose: To collect minute averages from the magnetic field tape and process them onto the output data base.

b. Arguments:

Name	Type	I/O	Description
MODE	I*4	I	Mode of spacecraft
ITPTYP	I*4	I	Tape type

c. Called by: MAIN

d. Calls: TIMADJ,OUTPUT,JULTIM,TIMJUL,PROCES,READHD,READRC,MATRIX

e. Commons:

Name	Variable	I/O
FLAGS	all	I
MAGN	MYR,MDAY,MSC, DMILLI,COSA to end	O

f. Local Variables:

Name	Type	Description
DATA(14)	R*4	Input data from magnetic field tape, summed into AVGS(14)
T(3,3)	R*4	Transformation MATRIX
IBLOCK	I*4	Counter for the blocks of input data processed. There are 48 blocks of data per day
TRAJ(6)	R*4	Input trajectory data from tape
JYR		Year, day, seconds of day,
JDAY		
JSC	I*4	and coverted time of the
JTIME		current data
ITOT	I*4	Number of input averages read in for the interval
QDONE	L*1	T=done with the input tape processing

Name	Type	Description
ITIMER	I*4	The averaging interval times, in epoch time
MINUTS	I*4	Counter for the minutes processed in the input tape data block
NUMAVG	I*4	Subset of ITOT; number of input averages accepted into the interval's sums
RMILLI	I*4	Milliseconds of data in the current record

g. Algorithm:

The flags and pointers are initialized, and the header to the day data is read. The time from the header is adjusted so that the time is S/C time instead of ground receipt time. Then the minute averages from the tape are processed as follows:

1. Average read in
2. Check for end of interval. If end, write it to the data base tape
3. Process the day through several steps in PROCES, summing it into the interval

After all the minutes for the day have been processed, the hour and day averages on the tape are skipped and the next day is processed as described above.

5. Module: OUTPUT

a. Purpose: To prepare data for output to data base tape, listing it if desired.

b. Arguments:

Name	Type	I/O	Description
NUMAVG	I*4	I	# averages summed into the data
QPRINT	L*1	I	T=print the data
ITOT	I*4	I	# averages read from the tape for this interval
MODE	I*4	I	Mode for the spacecraft
ITPTYP	I*4	I	Tape type

c. Called by: MINAVG

d. Commons:

Name	Variable	I/O
MAGN	all but TIMES	I,O
TRNSFM	AVGS2(6)	I

e. Local Variables:

Name	Type	Description
IP	I*4	Pointer to Phi sector with the maximum counts
OUT(6)	R*4	Used to store data which is to be printed out
PHI	R*4	Sector degrees, for calculating the deviation in Phi
THETA	R*4	Sector, degrees for calculating the deviation in Theta
HOLD(6)	R*4	Array used to hold values when interchanging input and output coordinates

f. Algorithm:

Divide the summed values by the number of intervals. If print is desired, calculate the angles Phi and Theta, and their deviations. The Phi deviation is derived using the maximum counts sector as the middle sector of the formula.

g. Formulas:

The angles are created as:

$$PHI = \left(\tan^{-1} \left(\frac{\cos\beta}{\cos A}\right) \right)^{1/2} \quad (\text{modulus } 360^{\circ})$$

$$THETA = 90 - \cos^{-1} (COSG)$$

The deviations of Phi and Theta are:

$$\left| \frac{\sum_{i=1}^{n} C_i \theta_i^2}{\sum_{i=1}^{n} C_i} - \frac{\left(\sum_{i=1}^{n} C_i \theta_i\right)^2}{\left(\sum_{i=1}^{n} C_i\right)^2} \right|$$

where n=24 sectors for Phi, and
n=12 sectors for Theta

6. Module: PROCES

a. Purpose: To analyze each input average interval and to transform the coordinates into Pioneer inertial coordinates if the data is in cruise mode or from the Jupiter encounter.

b. Arguments:

Name	Type	I/O	Description
T(3,3)	R*4	I	Transformatin Matrix
RMILLI	R*4	I	Milliseconds of data of the average interval
ITPTYP	I*4	I	Tape type
DATA(14)	R*4	I	Data from input current interval
MODE	I*4	O	Mode of spacecraft

c. Called by: MINAVG

d. Commons:

Name	Variables	I/O
MAGN	AVGS,DMILLI, QTSECT,QPSECT	I,O
TRNSFM	AVGS2(6)	0

e. Local Variables:

Name	Type	Description
ANGL	R*4	Steps through the angles of Phi and Theta to collect the QTSECT and QPSECT arrays
PHI	R*4	The Phi angle for this average
THETA	R*4	The Theta angle for this average
TRANS(6)	R*4	The transformed coordinates and their cosine values
BMAG	R*4	Magnitude of the vector of transformed coordinates

f. Algorithm:

The input record data is summed to the collecting variables. Then the Phi and Theta histogram arrays are added to by the current interval's Phi and Theta.

g. Formulas:

$$\text{Phi} = \tan^{-1}\left(\frac{y}{x}\right) \text{ , modulus } 360^{\circ}$$

where y=input x*(-1)
x=input y

Coordinate transformation:

x coordinate: TRANS(1)=BX * T(1,1) + BY * T(2,1) + BZ * T(3,1)
y coordinate: TRANS(2)=BX * T(1,2) + BY * T(2,2) + BZ * T(3,2)
z coordinate: TRANS(3)=BX * T(1,3) + BY * T(2,3) + BZ * T(3,3)

where BX,BY, & BZ are the original coordinates.

$$BMAG = \left((TRANS(1))^2 + (TRANS(2))^2 + (TRANS(3))^2\right)^{1/2}$$

$\cos \alpha$ = TRANS(1)/BMAG
$\cos \beta$ = TRANS(2)/BMAG
$\cos \gamma$ = TRANS(3)/BMAG

7. Module: READIN

a. Purpose: To read in user input options

b. Arguments:

Name	Type	I/O	Description
MODE	I*4	O	Mode of spacecraft 0=Cruise Mode 1=Jupiter 2=Saturn
ITPTYP	I*4	O	Tape type 7=7-track 9=9-track

c. Called by: MAIN

d. Commons:

Common	Variables	I/O
FLAGS	all	O
MAGN	INTRVL	O
TAPE	all	O
TRNSFM	SOLAR(3)	O

e. Local Variables: None

f. Algorithm:

Initialize the arrays with asterisks to signal end. Then read in the data via namelist and perform simple validity checks.

8. Module: TIMADJ

a. Purpose: To read the trajectory tape and find the time elapsed between the S/C and ground receipt times, adjusting the time from the data to be S/C time.

b. Arguments:

Name	Type	I/O	Description
IYR			Year, day, and seconds of
IDY	I*4	I,O	day of the current magnetic
ISC			field data
QDONE	L*1	O	T=end of trajectory tape usage
QNEW	L*1	I	T=first time in routine, skip file header

c. Called by: MINAVG

d. Commons:

Name	Variable	I/O
TRAJ	all	O
TAPE	ITRFIL	I,O

e. Local Variables:

Name	Type	Description
IDAY	I*4	Day of year
LEAP	I*4	1=not leap year, 2=leap year
QEOV	L*1	T=end of trajectory file reached
IDIFF	I*4	Seconds differences between ground receipt time (GRT) and S/C time
IMAGT	I*4	Time created from input time to compare with trajectory tape
ITRAJT	I*4	Time created from trajectory record to compare with input time

f. Algorithm:

A trajectory tape record is read and its time compared to the input time to be adjusted. If less, then the next record is read. When a record is found which has a time greater or equal, calculate the distance, hence time, between the earth and the S/C. Add this into the time to be adjusted. If an end of file is encountered, check to see if another file is allowed. If so, then continue. If not, return with flag set to end program.

g. Formulas:

$$\text{Difference in time} = \frac{R_{es}}{299792.5}$$

where R_{es} = distance from earth to S/C, km.

9. Module: TIMJUL

a. Purpose: Converts year, day, and seconds of day into one number for future time comparisons.

b. Arguments:

Name	Type	I/O	Description
IYR IDAY ISEC	I*4	I	Input time to convert
INTRVL	I*4	I	Averaging interval in seconds
JTIME	I*4	O	Converted time, # intervals since launch

c. Called by: MINAVG

d. Commons: none

e. Local Variables: none

f. Algorithm:

The time is converted using an array which contains the days elapsed since launch Jan. 0, 1972.

g. Formulas:

$$\text{Time} = \frac{\text{days since launch}}{\frac{\text{days}}{\text{interval}}} + \frac{\text{Seconds of day}}{\frac{\text{seconds}}{\text{interval}}}$$

10. Module: MATRIX

a. Purpose: To build a transform MATRIX, T, used to transfrom Cruise Mode (SH coordinates) and Jupiter encunter coordinates into Pioneer inertial coordinates. If the input is Cruise Mode (PE coordinates), then the transpose of the Matrix, T, is used to transform the data into Solar-Heliographic coordinates.

b. Arguments:

Name	Type	I/O	Description
MODE	I*4	I	Mode of spacecraft 0=Cruise Mode 1=Jupiter 2=Saturn
T(3,3)	R*4	O	Transformation MATRIX
ITPTYP	I*4	I	Tape type 7=7-track 9=9-track

c. Called by: MINAVG

d. Calls: VPROD

e. Commons:

Name	Variable	I/O	Description
TRAJ	DEC2(11)	I	Sun-Earth Distance
	DEC2(17)	I	Sun-Spacecraft Distance
	DEC2(20)	I	Celestial latitude of S/C
	DEC2(21)	I	Celestial longitude of S/C
	DEC2(22)	I	Celestial latitude of Earth
	DEC2(23)	I	Celestial longitude of Earth
TRNSFRM	SOLAR(3)	I	Coordinates of the Solar-spin axis

f. Local Variables:

Name	Type	Description
X1(3)	R*4	x transform-vector
Y1(3)	R*4	y transform-vector
Z1(3)	R*4	x transform-vector
P(3)	R*4	z transform-vector of the V matrix before normalization
U(3,3)	R*4	U matrix
V(3,3)	R*4	V matrix
T(3,3)	R*4	Transformation matrix
VECTOR(3)	R*4	Vector of vector products passed from subroutine VPROD
A(3)	R*4	Vector with elements [0 0 1]
DTRAJ(6)	R*4	Array containing the trajectory values expressed in radians
SIGN	R*4	1.0 if Cruise mode -1.0 if Jupiter encounter

g. Algorithm:

The trajectory values are converted from degrees to radians. If the input data is Jupiter encounter data, sign is changed to -1.0. The U matrix is calculated. The V matrix is calculated. The product of U and V is the transformation matrix, T.

If the transformation is from Pioneer Inertial to Solar Heliographic coordinates, the transformation matrix is the transpose of the matrix T.

h. Formulas:

U Matrix: SOLAR(3) = SOLAR SPIN COORDINATES

$X1(3) = \cos \delta sc \cos \lambda sc, \cos \delta sc \sin \lambda sc, \sin \delta sc$

$Y1(3) = (SOLAR \times X1) \div || SOLAR \times X1 ||$

$Z1(3) = X1 \times Y1$

$$U(3,3) = \begin{bmatrix} X1(3) \\ Y1(3) \\ Z1(3) \end{bmatrix}$$

NOTE: || || denotes magnitude
X denotes vector product
δsc " celestial latitude of S/C
λsc " " longitude of S/C
δE " " latitude of Earth
λE " " longitude of Earth
Rsc " Sun-S/C distance
RE " Sun-Earth

V Matrix:

$P(1) = -R_{sc} \cos \delta_{sc} \cos \lambda_{sc} + R_E \cos \delta_E \cos \lambda_E$

$P(2) = -R_{sc} \cos \delta_{sc} \sin \lambda_{sc} + R_E \cos \delta_E \sin \lambda_E$

$P(3) = -R_{sc} \sin \delta_{sc} + R_E \sin \lambda_E$

$Z1(3) = P/||P||$

$X1(3) = [0\ 0\ 1] \times Z1$

$Y1(3) = Z1 \times X1$

$V(3,3) = [X1(3)\ \ Y1(3)\ \ Z1(3)]$

T Matrix:

$t = UV$

$$\Longrightarrow t_{ij} = \sum_k U_{ik} V_{kj} \qquad \text{where } i = 1,2,3;\ j = 1,2,3;\ k = 1,2,3$$

T^t:

$$t_{ij} = t_{ji} \qquad j=1,2,3;\ i=1,2,3$$

11. Module: VPROD

a. Purpose: To perform vector product calculations and return the three coefficients as a three-element vector, together with the magnitude of this vector.

b. Arguments:

Name	Type	I/O	Description
VECTR1(3)	R*4	I	First vector of vector product
VECTR2(3)	R*4	I	Second vector of vector product
VECTR(3)	R*4	O	Vector of coefficients of vector product
VMAG	R*4	0	Magnitude of vector

c. Called by: MATRIX

d. Calls: none

e. Commons: none

f. Local Variables: none

g. Algorithm:

Calculate one coefficient of the vector product at a time and store in a three-element vector. Calculate the magnitude of this resulting vector.

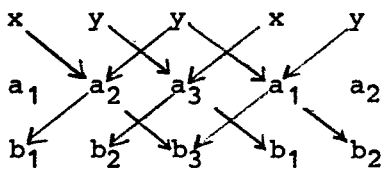
h. Formulas:

Vector product

let A = vector 1
B = vector 2

$$A \times B = (a_2b_3 - a_3b_2)x + (a_3b_1 - a_1b_3)y + (a_1b_2 - a_2b_1)z$$

which is the expanded form of the determinant



$$\text{VECTR} = \begin{bmatrix} (a_2b_3 - a_3b_2) \\ (a_3b_1 - a_1b_3) \\ (a_1b_2 - a_2b_1) \end{bmatrix}$$

magnitude:

$$|| \text{ VECTR } || = \left(\text{VECTR}(1)^2 + \text{VECTR}(2)^2 + \text{VECTR}(3)^2\right)^{1/2}$$

12. Module: READHD

a. Purpose: To read the daily header record of either a 7-track or 9-track tape.

b. Arguments:

Name	Type	I/O	Description
JYR	I*4	O	Year
JDAY	I*4	O	Day
QFLG	L*1	O	Spacecraft identifier F=Pioneer 10 G=Pioneer 11
TRAJ(6)	R*4	O	Input trajectory values (could be equal to zeroes)
ITPTYP	I*4	I	Tape type 7=7-track 9=9-track
QDONE	L*1	O	Flag indicating the end of data on the input tape

c. Called by: MINAVG

d. Calls: none

e. Commons: none

f. Local Variables:

Name	Type	Description
TEXT(30)	R*4	Input text portion of the header record of a 9-track tape

g. Algorithm:

Set the done flag to false unless end-of-file. If the input tape is 7-track, read from unit 9. If the input tape is 9-track, read from unit 10.

h. Formulas: none

13. Module: READRC

a. Purpose: To read a block of data from either a 7-track or 9-track tape and to return one record. (Each 7200 byte block contains 30 240 byte records)

b. Arguments:

Name	Type	I/O	Description
RMILLI	R*4	O	Milliseconds of data in the current record
DATA(14)	R*4	O	Input data from magnetic field tape
ITYTYP	I*4	I	Tape type 7=7-track 9=9-track
MINUTS	I*4	I	Counter for the minuts processed in the input tape data block. Used to calculate the current word of the block being processed
QDONE	L*1	O	Flag indicating the end of data on the input tape

c. Called by: MINAVG

d. Calls: none

e. Commons: none

f. Local Variables:

Name	Type	Description
RECORD(450)	R*4	Table of the input values read in one block of data. (30 records each containing 15 values=450)
IX	I*4	Index into the table Record
IZ	I*4	Last Record entry per day
J	I*4	Counts positions of the table Data

g. Algorithm:

If not end-of-file, done flag is set to false. If MINUTS=1, read a block of data. Return the number of milliseconds of data and the 14 data values.

h. Formulas: none

Document:
81-11-003

Magnetic Field Data Plots

(MAGPLT)

User's Guide

Veronica Kell
Data Management and Programming Office
Code 664
Goddard Space Flight Center
July 1981

MAGPLT
USER'S GUIDE

I. Purpose:

This program produces a CALCOMP plot tape of β, λ, and δ in one hour averages from PIONEER 15 minute average magnetic field data in either Solar-Heliographic or Pioneer Inertial coordinates. It is capable of plotting points from 1 DAY/PLOT to 31 DAYS/PLOT.

II. Input Required:

A. Magnetic Field Tape:

(generated from the MAGNETIC FIELD DATA BASE GENERATOR for the FOURIER program with INTRVL=900)

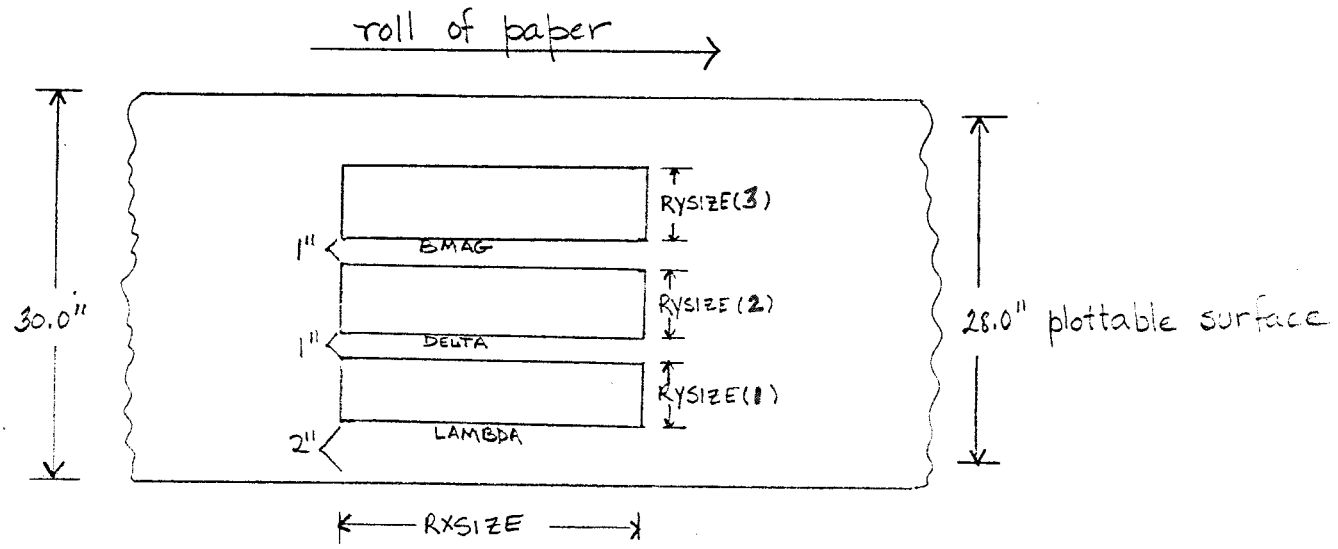
B. User NAMELIST:

Parameter	Type	Default	Description
INDATE(3)	3(I*4)	none required	YR,MONTH,DAY (separated by commas)
NDAYS	I*4	none required	Number of DAYS/PLOT
NUMPLT	I*4	1	Number of plot frames to be generated.

(NOTE: 1 plot frame consists of 3 plots β, λ, δ, and covers NDAYS days)

ICORDS	I*4	0	Desired coordinate system: 0=PIONEER INERTIAL 1=SOLAR HELIOGRAPHIC 2=JUPITER ENCOUNTER
RXSIZE	R*4	11.0	Length of x-axis in inches
RYSIZE(3)	R*4	1.25 2.25 2.25	Length of y-axis for plots of Lambda, Delta, and B Magnitude, respectively, in inches. $\sum_{I=1}^{3}$ RYSIZE(i) + 4.0 in $\leq$ 28.0 in 4.0 inches spacing for labels. 28.0 inches physical restraint on amount of paper to be used.

DIAGRAM OF PLOTS *



* NOT TO SCALE

III. Output Generated:

1. CALCOMP Plot Tape
2. Listing that echoes the input parameters

IV. Error Handling:

Message	Error and Recovery
1. 'NUMBER OF DAYS PER PLOT GREATER THAN 31. 31 ASSUMED.'	NDAYS specified as being greater than 31. NDAYS will be set equal to 31, and processing will continue.
2. 'FREAD ERROR. PROCESSING TERMINATED'	READ ERROR. Any data generated will be plotted. Processing terminated. Check input tape for errors.

V. JCL:

1. Unit 10 is the input magnetic field tape //FT10F001 DD
2. PLOTTAPE is the output CALCOMP plot tape //PLOTTAPE DD

Source: SEVAK.MAGDBG.FORT (MAGPLT)
_____ (TRIPLT)
_____ (JDATEG)

jcl: SBP10.LIB.CNTL(SMAGPLT)

FORMAT OF PIONEER 10, 11 AVERAGE DATA RECORD: VECTOR HELIUM MAGNETOMETER

The Pioneer VHM Average Data Record (ADR) tapes are written on 7-track tape units at 800 bpi. The data are written on the tape in (even parity) BCD format. Each tape contains a single data set (file).

A data set contains an integral number (usually four or five) of weeks of data. Each of the seven days in a week consists of fifty blocks (physical records). The first block for a day is a single logical record of 132 tape characters. The remaining blocks for a day each consist of 30 logical records of 240 tape characters each.

The first logical record for a day is a header. The next 1440 logical records contain minute averages. The next 24 logical records contain hour averages. The next logical record contains day averages. The last 5 logical records for the day contain blanks.

Table 1 - [illegible]er Record

[illegible]	Format	Description
	3X	
[illegible]	I2	Last two digits of year
	2X	
[illegible]AY	I3	Day of year
	4X	
ISC	A1	Spacecraft (F or G)
	15X	
[illegible]	E15.7	Distance of spacecraft from sun (km)
[illegible]	E15.7	Heliocentric celestial latitude of spacecraft (degrees)
[illegible]	E15.7	Heliocentric celestial longitude of spacecraft (degrees)
[illegible]	E15.7	Distance of Earth from sun (km)
[illegible]	E15.7	Heliocentric celestial latitude of Earth (degrees)
[illegible]	E15.7	Heliocentric celestial longitude of Earth (degrees)

Table 2 – Average Records

Variable	Format	Description
DT	E15.7	Number of millisec[illegible] data exists in the [illegible] which the average [illegible]
EV(1)	E15.7	$\langle B_R \rangle$
EV(2)	E15.7	$\langle B_T \rangle$
EV(3)	E15.7	$\langle B_N \rangle$
EV(4)	E15.7	$\langle B_R^2 \rangle$
EV(5)	E15.7	$\langle B_R B_T \rangle$
EV(6)	E15.7	$\langle B_R B_N \rangle$
EV(7)	E15.7	$\langle B_T^2 \rangle$
	15X	
EV(8)	E15.7	$\langle B_T B_N \rangle$
EV(9)	E15.7	$\langle B_N^2 \rangle$
EV(10)	E15.7	$\langle \cos \alpha \rangle = \langle B_R/\|B\| \rangle$
EV(11)	E15.7	$\langle \cos \beta \rangle = \langle B_T/\|B\| \rangle$
EV(12)	E15.7	$\langle \cos \gamma \rangle = \langle B_N/\|B\| \rangle$
EV(13)	E15.7	$\langle \|B\| \rangle$
EV(14)	E15.7	$\langle \|B\|^2 \rangle$

JET PROPULSION LABORATORY

INTEROFFICE MEMORANDUM

January 16, 1979

TO: Distribution

FROM: Joyce Wolf

SUBJECT: TAPE FORMAT: Vector Helium Magnetometer Data Averages

The tapes are 9-track, 1600 bpi, odd parity, written in ASCII format. Each tape contains a single file.

Each file contains an integral number of days of data. There are 50 blocks (physical records) per day. The first block is a header record 240 bytes long. Each of the remaining 49 blocks is 7200 bytes long, and consists of 30 logical records of 240 bytes. The 1440 logical records of blocks 2-49 contain averages for the 1440 minutes of the day. In block 50, the first 24 logical records contain hour averages; the 25th contains day averages, and the last 5 contain blanks.

Each logical record contains 15 quantities in the format (8E15.6, 15X, 7E15.6). The first quantity is the number of milliseconds for which data exists in the period over which the average was taken; the next 14 are the data averages in the coordinate system identified in the text portion of the header record, as follows:

1. $\langle B_x \rangle$
2. $\langle B_y \rangle$
3. $\langle B_z \rangle$
4. $\langle B_x^2 \rangle$
5. $\langle B_x B_y \rangle$
6. $\langle B_x B_z \rangle$
7. $\langle B_y^2 \rangle$
8. $\langle B_y B_z \rangle$
9. $\langle B_z^2 \rangle$
10. $\langle \cos \alpha \rangle = \langle B_x / |B| \rangle$
11. $\langle \cos \beta \rangle = \langle B_y / |B| \rangle$
12. $\langle \cos \gamma \rangle = \langle B_z / |B| \rangle$
13. $\langle |B| \rangle$
14. $\langle |B|^2 \rangle$

JW:ydj

Attachments

ATTACHMENT #1

Structure of Header Record

Variable	Format	Meaning
IYR	3X,I2	Last two digits of year
IDAY	2X,I3	Day of year
ISC	4X,A1	Spacecraft Identifier (F = Pioneer 10, G = Pioneer 11, 3 = ISEE-3)
TRAJ(I),I=1,6	15X,6E15.6	Trajectory parameters May be filled with zeros.
TEXT(I), I=1,30	30A4	Identifying text

For the Pioneer spacecraft, the trajectory parameters have the following meanings:

TRAJ (1) = Distance of spacecraft from sun (km.).

TRAJ (2) = Heliocentric celestial latitude of spacecraft (deg.).

TRAJ (3) = Heliocentric celestial longitude of spacecraft (deg.).

TRAJ (4) = Distance of Earth from sun (km.).

TRAJ (5) = Heliocentric celestial latitude of Earth (deg.).

TRAJ (6) = Heliocentric celestial longitude of Earth (deg.).

For the ISEE-3 spacecraft, the trajectory parameters are as follows:

TRAJ (1) = Geocentric solar ecliptic (GSE) x-coordinate of spacecraft position at start of day's data.

TRAJ (2) = GSE y-coordinate of spacecraft position.

TRAJ (3) = GSE z-coordinate of spacecraft position.

TRAJ (4) = TRAJ (5) = TRAJ (6) = 0.

John -

In case you ever want to see the contents of the Flux data catalog, I have a program which shows the time ranges for anything in there. It is interactive on 75 (high region) or 91.

```
READY
*
ALLOC DA(*) F(FT06F001)
ALLOC DA('SBCID.PIONEER.FLUX.CATALOG.DATA')
LOADGO 'SEJSS.MULTISAT.FOURIER(FLXCAT)' LIB('SYS1.FORTLIB' 'SYS2.FORTLIB')
(Enter satellite ID etc)
XXXXXXXXXXXX XXXX
ex. PIONEER-S  CRSN
```

input → ALLOC DA(*) F(FT06F001)
→ ALLOC DA('SBCID.PIONEER.FLUX.CATALOG.DATA')
→ LOADGO 'SEJSS.MULTISAT.FOURIER(FLXCAT)' LIB('SYS1.FORTLIB' 'SYS2.FORTLIB')
response of computer → (Enter satellite ID etc)
XXXXXXXXXXXX XXXX
ex. PIONEER-S CRSN

FT30F001

If you enter * in either satID or source, all of that type will be listed. But you must space over to the last X before carriage return.