RATES SUMMARY (INPUT) NAMELIST

6.2 PROGRAM INPUT

All input to the program is read using the NAMELIST convention of FORTRAN IV.

There are two different NAMELISTs in the Rates Summary Program, NAMELIST INIT and NAMELIST PERIOD. When initializing a new rates summary data set, both NAMELISTs must be present and NAMELIST PERIOD input must precede NAMELIST INIT. When updating a rate summary, neither NAMELIST need necessarily be present,[1] and the NAMELIST INIT should not be present.

6.2.1 NAMELIST PERIOD Input[2]

The first card of the NAMELIST PERIOD input stream must contain the character string &PERIOD in columns 2 through 8, followed by a blank. The blank is followed by data items separated by commas. The end of the NAMELIST input stream is indicated by the character &END.

The following items may be specified in NAMELIST PERIOD:

- DRTAPE--The labels of rates tapes containing the data to be summarized. Each tape label must be enclosed in single quotes (') and separated from the previous one by a comma. Up to 10 labels may be listed. It is recommended that this option be used only when necessary, i.e., only when the data cannot be obtained through the DRS catalog.

---

[1] It is recommended that both be omitted, if possible.

[2] Column 1 of all cards must be blank.

- NINT--An integer specifying the number of consecutive summary intervals to be processed.

  Default: 10000 (Note that processing will end when rates data is exhausted.)

- QSPEC--Logical variable

  = T, status information is to be read from logical unit 32
  = F, status information is to be read from logical unit 8

  Default: F

- NTPMAX--An integer specifying the maximum number of rates tapes from the DRS catalog that may be mounted for input. Program will terminate after processing NTPMAX tapes. This input is ignored if rates tapes were specified by the DRTAPE parameter above.

  Default: 20

- NCATP--If the DRS catalog pointer data set is not to be read, then the user should input here an integer between -1 and -4, whose absolute value will become the DRS catalog pointer.

  Default: 0 and the DRS pointer is read from the pointer data set.

- HTB--Up to six two-digit integers, separated by commas, specifying the year, month, day, hour, minute, and second, respectively, for the start of the first summary interval of the summary. This parameter is meaningless when not creating a new summary.

  Default: The summary is started with the earliest available data.

- SOURCE--'SOLDPS', 'SDR', or 'BUFOP'. Input must be one of these three parameters, or should be omitted entirely. Note that both the DRS catalogs (if specified) and the rates summary to be

24 x 30
720 x 5
3600

updated must contain only data from the source specified. Any mismatch results in a error and program termination.

= 'BUFOP', origin of data is BUFOP tapes

= 'SDR', origin of data is SDR tapes

= 'SOLDPS', origin of data is SOLDPS tapes

If data is from standard EDR tapes, the source parameter should be omitted.

6.2.2 NAMELIST INIT Input[1]

NAMELIST INIT is used only when the user wishes to create a new rates summary.

Card 1 must contain &INIT in columns 2 through 6 followed by a blank and then the following data items:

- DTAPES--The label of a blank tape to contain the rates summary. This label must be input, and should be enclosed in single quotes (').
- QTRCHK--Logical variable

  = T, readouts that failed trend check will not be included in the summary

  = F, readouts that failed trend check will be included in summary

  Default: T
- INTHR--Integer; number of whole hours to be contained in one summary interval.

  Default: 1

[1] Column 1 of all cards must be blank.

- INTMIN--Integer; number of additional whole minutes to be contained in summary.

  Default: 0

- INTSEC--Integer; number of additional seconds to be contained in summary.

  Default: 0

- HID--Logical variable

  = 'F', rates summary is to contain data only for Pioneer-F
  = 'G', rates summary is to contain data only for Pioneer-G

  Default: F

6.3 ABNORMAL PROGRAM MESSAGES

Following is a list of program messages with appropriate user response.

1. *** INVALID CATALOG POINTER. GIVEN VALUE WAS XX
   RUN TERMINATED.

   Cause: NCATP was specified incorrectly on the PERIOD card with a value of less than -4.

   User Response: If NCATP is to be specified, it must be an integer in the range -1 to -4, whose absolute value will become the catalog pointer.

2. NO DATA ON THE GIVEN TAPE XXXXXXXX SINCE THIS IS THE FIRST OF THE GIVEN RATES TAPES. THIS RUN IS TERMINATED.

   Cause: The first rates tape mounted for input contained no input.

   User Response: If the user specified a rates tape, the wrong tape was specified.

3. SPACECRAFT ID'S DO NOT MATCH X X X.

Cause: The spacecraft ID on the DRS pointer data set does not match the spacecraft ID on the DRS catalog, or does not match the spacecraft ID on the summary status record. The IDs are printed in the following order: summary status ID, pointer ID, DRS catalog ID.

User Response: The wrong summary data set was specified on the FT08F001 or FT32F001 DD card, or the wrong combination of FT20F001 - FT24F001 DD cards is being used, or the user has specified NCATP for a G summary, which cannot be done. If a G catalog not pointed to by the pointer must be used, renumber the FT21F001 - FT24F001 DD cards so that the desired DRS catalog is pointed to.

4. END OF FILE ON THE CATALOG UNIT. ERROR CONDITION.

Cause: An end of file was hit reading the DRS catalog.

User Response: Correct the DRS pointer data set if not valid. If inputing NCATP, check that the data set pointed to has been written on.

5. END OF FILE ENCOUNTERED WHILE READING THE STATUS DATA SET.

Causes: DATA SET NOT INITIALIZED, OR A BAD DD STATEMENT.

User Response: Either correct the status data set DD statement (FT08 or FT32) or perform an initialization run for this data set.

6. NO VOLUME-SERIAL NUMBER FOR THE SUMMARY TAPE WAS GIVEN. RUN TERMINATED.

Cause: In creating a new data set, the user failed to specify the label of the tape to contain the rates summary.

User Response: Input tape label using the DTAPES parameter in NAMELIST INIT.

7. I/O ERROR DETECTED WHILE READING THE

{STATUS DATA SET
DRS CATALOG
RECORD XXXXX OF RATES TAPE XXXXX}

RUN TERMINATED. DESCRIPTION OF ERROR FOLLOWS:
(Message from FTIO is printed.)

Cause: As described.

User Response: Consult with the FTIO Manual for interpretation of the printed error description.

8. ERROR - INPUT ON PERIOD CARD INDICATED THAT DATA SOURCE WAS XXXXXX, HOWEVER, THE GO.FTXXF001 DD CARD CONTAINED THE DSNAME OF THE XXXXXX DRS CATALOG. RUN TERMINATED.

Cause: The user-specified source does not match the source indicated by at least one of the DRS catalog DD cards.

User Response: Input the source parameter on NAMELIST PERIOD card.

9. ERROR - SOURCE SPECIFIED WAS XXXXXXXX, THIS MAKES NO SENSE. RUN HALTING.

Cause: The user-specified source does not match the source indicated by at least one of the DRS catalog DD cards.

User Response: Input the source parameter on NAMELIST PERIOD card.

10. ERROR - THE PERIOD CARD INDICATED A DATA SOURCE OF XXXXXX, BUT THE STATUS RECORD WAS FOR A SOURCE OF XXXXXX. EXECUTION TERMINATING.

Cause: While the specified source was compatible with the DRS catalog DSNAME, the rates summary status record indicates that the data on the summary tape is from some other source.

User Response: Either the status record DD statement (FT08 or FT32) must be changed, or the DRS catalog DD cards and the source parameter or NAMELIST PERIOD card must be changed.

6.4 DATA SETS REFERENCED

The program references the following data sets (by DDNAMES).

Data Set	Description
FT08F001	Defines rates summary status data set if QSPEC = F or QSPEC is not specified on a period card. If cataloged, only DSNAME and DISP parameters must be specified; otherwise, UNIT and VOL parameters must also be specified
FT09F001	Defines rates tapes data set. A seven-track tape drive (UNIT = 2400-7) with deferred mounting and a dummy volume serial number should be specified. The user must also specify DSN = PIORAT, DISP = SHR
FT10F001	Defines rates summary data set. A dummy volume serial number should be specified. Following parameters should be specified exactly as given: UNIT = (2400-9,,DEFER) DISP = (MOD, KEEP, KEEP) DSN = PIOFRSUM (for Pioneer-F) DSN = PIOGRSUM (for Pioneer-G)

Rali Summary Merge

SECTION 7 - PIONEER RATES SUMMARY TAPE MERGE PROGRAM USER'S GUIDE

7.1 INTRODUCTION

The Pioneer Rates Summary Tape Merge Program is designed to merge two rates summary data sets with like attributes. Each rates summary data set must be in the same format as the data sets produced by the Pioneer Rates Summary Program, and must have a rates summary status data set (RSSDS) associated with it.

The need for this program arises from the following two circumstances:

1. The rates summary data set has one record for each summary interval (time period over which data is accumulated), regardless of whether any data is found on the rates tape, or not.

2. At the time the rates summary data set is either created or updated, rates data may not exist for certain time periods.

To insert new data, or to replace existing data, in the rates summary data set, a separate (special) rates summary must be created using the Pioneer Rates Summary Program, and then merge the two rates summary data sets using the Pioneer Rates Summary Tape Merge Program.

The program obtains the serial numbers of the volumes on which the two summaries reside from their respective RSSDSs, places the merged data set on the volume whose serial number is provided as input to the program, and enters the status of the merged data set in the RSSDS associated with the old (standard) master rates summary.

7.2 LOCATION

The main control section for this program resides in the data set K3.ZB2NL.SB001.OPIOFRAT, under the member name PFRSTM. Subroutines also required by the program are as follows:

Subroutine	Data Set
MSTOT, RMJDD, DRMJD	K3.ZB2NL.SB001.OPIOFRAT
IBCOM#, FREAD, MOUNT, FWRITE, REWIND, UNLOAD	SYSTEM FORTRAN LIBRARIES SYS1.FORTLIB SYS2.FORTLIB
FMOVE	K3.SBCID.SB001.OPIONEER

The JCL statements shown in Figure 7-1 may be used to link edit and execute the load module.

Suppose that the standard rates summary tape (pointed to by the standard RSSDS) does not include data for one day, because it was not available when the rates summary was created or updated and data later than this day has already been summarized. To insert this data, one needs first to summarize the fresh data using the Rates Summary Program, specifying initialization and QSPEC =. TRUE. The Merge Program is then executed. A sample JCL set up might look like that in Figure 7-1.

```
//    EXEC LINKGO, REGION.GO = 200K
//*  INSERT LIBRARY DESCRIPTION IN SYSLIB
//LINK.SYSLIB  DD  DSN=K3.ZB2NL.SB001.OPIOFRAT,DISP=SHR
//             DD  DSN=K3.SBCID.SB001.OPIONEER,DISP=SHR
//LINK.SYSLIN  DD  *
  INCLUDE SYSLIB(PFRSTM)
/*
//*  FT06F001 IS PART OF THE PROC
//*FOR FT08F001 THE DATASET FOR STANDARD SUMMARY
//GO.FT08F001  DD  DSN=PIOFRSUM,UNIT=(9TRACK,,DEFER),
//    VOL=SER=OLD,DISP=SHR,DCB=BUFNO=1
//*  FT09F001 - SPECIAL SUMMARY DD CARD
//GO.FT09F001  DD  DSN=PIOFRSUM,UNIT=(9TRACK,,DEFER),
//    VOL=SER=SPECIAL,DISP=SHR,DCB=BUFNO=1
//*  FT10F001 - MERGED TAPE---DISP=NEW
//GO.FT10F001  DD  DSN=PIOFRSUM,UNIT=(9TRACK,,DEFER)
//    VOL=SER=MERGE,DISP=SHR,
//    DCB=(RECFM=FB,LRECL=1340,BLKSIZE=32160,BUFNO=1)
//*  STANDARD STATUS DATA SET
//GO.FT20F001  DD  DSN=K3.ZB2NL.SB001.DPIOFRST,DISP=OLD
//GO.FT21F001  DD  DSN=K3.ZB2NL.SB001.DPIOFRSP,DISP=SHR
//GO.DATA5     DD  *
E00325
/*
```

Figure 7-1. Sample Deck Set Up

If this run executes successfully (return code 0), the standard status data set will point to tape E00325. The old standard tape, the special status data set, and the special summary tape are free.

The program requires approximately 200K of main storage when all rates summary data sets are opened with single buffering, and requires approximately 1 minute of CPU and 1 minute of I/O time. In addition, three 9-track tape drives are required.

7.3 DATA SETS REFERENCED

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

Data Set	Description
FT06F001	Defines message data set, usually directed to a line printer (SYSOUT). A message will appear on this data set only if one condition described under 'ABNORMAL CONDITIONS' is satisfied (OUTPUT)
FT08F001	Defines standard rates summary data set, and must contain DSNAME, UNIT, VOL=SER and DISP parameters. A 9-track tape drive with deferred mounting must be specified. DISP may be described as OLD or SHR. If more core than 200K is available, DCB parameter need not be specified; otherwise, DCB=BUFNO=1 should be coded (INPUT)
FT09F001	Defines special rate summary data set. Definition here is identical to that of FT08F001 (INPUT)
FT10F001	Defines merge summary data set (new master), and must specify, in addition to DSNAME, UNIT, VOL=SER, and DISP parameters, following DCB subfields: RECFM=FB, LRECL=1340, BLKSIZE=32160. For program to execute in less than 200K, BUFNO=1 should be specified. Code DISP=(NEW,KEEP) (OUTPUT)
FT21F001	Defines rates summary status data set associated with standard (old master) data set. If cataloged, only DSNAME and DISP parameters must be specified; otherwise, UNIT and VOL parameters must also be specified. This data set usually resides on disk (UNIT=2314), but could be made to reside on magnetic tape, in which case UNIT and VOL parameters must specify appropriate unit and volume serial numbers (INPUT and OUTPUT)

Data Set	Description
FT22F001	Defines rates summary status data set associated with special (containing data to be inserted or replaced) data set. Comments made for FT21F001 apply here, also (INPUT)
FT05F001	Defines instream card input data set (DD *). One card is required on this data set, which must contain serial number of standard-labeled tape volume on which merged (new master) data set is to reside, left justified, in columns 1 through 6

7.4 ABNORMAL PROGRAM MESSAGES

Following is a list of program error messages with appropriate user responses.

1. END OF FILE ENCOUNTERED ON THE CATALOG UNIT. RUN TERMINATED.

   Cause: An end of file was reached attempting to read either the standard (FT21F001) or special (FT22F001) rates summary catalog.

   User Response: Check both catalogs. Make sure both are correctly defined and have been written to.

2. AN I/O ERROR OCCURRED. RUN TERMINATED. DESCRIPTION OF THE ERROR FOLLOWS: (Message from FTIO is printed)

   Cause: The I/O error occurred reading either the standard or special catalog, or reading the standard or special summary tape.

   User Response: The message from FTIO will give the unit number (and other information) where the I/O error occurred. See the FTIO manual for format of this message. Try resubmitting the job; if the same error recurs, data in affected areas will have to be recreated.

3. RUN TERMINATED BECAUSE EITHER THE VOL SER NUMBER OF THE MERGE TAPE WAS NOT SPECIFIED ON THE INPUT CARD OR, IF A MERGE TAPE WAS SPECIFIED, IT WAS THE SAME AS ONE OF THE TAPES TO BE MERGED.

   STANDARD, SPECIAL, AND MERGE TAPES ARE RESPECTIVELY, XXXXXX XXXXXX XXXXXX

   Cause: As stated.

   User Response: Make sure input card is non-blank and specifies a tape label other than one of those in the standard or special catalogs.

4. TREND CHECK OPTIONS ON THE TWO TAPES DO NOT MATCH. RUN TERMINATED.

QCHKST = X (Trend check option of standard tape)	QCHKSP = X (Trend check option of special tape)

   Cause: N/A

   User Response: N/A

5. SATELLITE ID'S DO NOT MATCH.

HSIDST = X (Spacecraft ID of standard tape)	HSIDSP = X (Spacecraft ID of special tape)

   Cause: N/A

   User Response: N/A

6. SUMMARY INTERVAL FOR THE TWO TAPES IS NOT THE SAME.

INTT = XXXXXXXXX (Standard tape summary intervals in msecs)	INTP = XXXXXXXXX (Special tape summary interval in msecs)

Cause: The standard and special summary catalogs are not compatible with each other.

User Response: The user must be sure that the summaries desired to merge have the same attributes (spacecraft ID, trend check, and summary interval) since it is these attributes that actually define the summary.

RATES PLOT NAMELIST

(PIODRS). These tapes are 9-track, odd parity and the recording density is 1600 BPI. The tapes contain standard OS/360 labels and the data set name is PIOPHA. The records are variable length blocked records with a maximum logical record length of 1524 bytes and a maximum physical record length of 7624 bytes.

The second type is the PHA Summary tape that is created and read by PPHASP. These tapes are also 9-track, odd parity and the recording density is 1600 BPI. The tapes contain standard OS/360 labels and the data set name is PIOSUM. The records are unblocked with a fixed length of 7280 bytes.

For a detailed format description of either type of tape, refer to section 5 of this document.

6.1.3.2 Cards

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

a. Option (OPT) group of cards

b. Summary (SUM) group of cards.

All cards are read using the NAMELIST convention of FORTRAN IV. The first column in each card must be blank. The next five columns of the first card of a group of cards must contain the type of card (OPT/SUM) preceded by an ampersand (&) and followed by a blank. The blank is followed by data items separated by commas. (A comma after the last item is optional.) The end of a group of cards is signaled by the characters "&END".

There must be 1 (and only 1) OPT group of cards followed by 1 or more SUM group of cards. Six parameters may be supplied to

PPHASP via the OPT group of cards. The form of the data items within this group is given below. The underlined keywords and equal sign must be written exactly as shown.

SPEC= T If special processing is to be used.

F If standard processing is to be used.

(Default = F)

LSTALL= T If all three sections of the PHA Summary Catalog are to be printed at the end of the run.

F If only the updated section (standard/special) is to be printed.

(Default = F)

ABEND= T If the run is to be abendend when an I/O error is encounted reading a PHA tape, a PHA Summary tape or a PHA Summary stored temporarily on disk.

F If the complete Summary is to be deleted, but processing of other summaries is to continue. This should only be used if an error is persistent and there is no other means to circumvent the error.

(Default = T)

CALIB= T If only calibrated data is to be used during this run.

F If no calibrated data is to be used during this run.

(Default = F)

NCAT= The sequence number of the PHA Summary Catalog to be read. This number +30 is the FORTRAN logical unit from which the Catalog will be read.

(Default - The Catalog will be read from the last unit on which the Catalog was written by PPHASP or PSUMCM. This Catalog is pointed to by the PHA Summary Catalog Pointer on disk.)

TAPES= Labels of PHA tapes that are to be used during processing. If labels are supplied, then the DRS tape catalog will not be searched for the tapes covering the desired time interval. A maximum of 10 tape labels may be supplied. Each tape label must be enclosed in apostraphes and be separated from the previous one by a comma. The tapes must be in time order.

(Default - The DRS tape catalog will be searched for the tapes to be processed for each summary interval.)

One or more SUM group of cards must follow the OPT group of cards. Nine parameters, describing a summary interval, may be supplied to PPHASP via the SUM group of cards. The first five provide the start time of the interval, the next three describe the length of the interval, and the last one provides the number of consecutive summary intervals. For the first summary interval, the length parameters are added to the start time to determine the stop time. The stop time of the first interval then becomes the start time of the next interval and again the length parameters are added to the second start time to determine the second stop time. This is done for each consecutive interval requested. The default value of the first eight parameters on the first SUM group of cards is zero and the value of the last parameter is one. For each succeeding SUM group of cards, all the default values remain unchanged from the previous SUM group of cards.

The form of the data items within a group is given below. The underlined keywords and equal sign must be written exactly as shown.

SYR= The last two digits of the start year.

SMON= The start month.

SDY= The start day of month (if SMON=Ø, then SDY is the start day of year).

SHR= The start hour.

SMIN= The start minute.

DDY= The number of full days in the summary interval. DDY=0

DHR= The remaining number of full hours in the summary interval.
For hourly summary DHR=1 always.

DMIN= The remaining number of full minutes in the summary interval.

NS= The number of consecutive summary intervals desired.

6.1.3.3 Printed Reports

PPHASP provides two types of printed reports at the end of each production run; a Processing Messages Report and a 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. Year and julian day of production run
d. Page number.

6.1.3.3.1 Processing Messages Report

The Processing Messages Report provides a history of all abnormal conditions encountered during processing and provides a group of statistics for each summary generated. Each message is written in a standard format (reading left to right on the page) as follows:

a. Time the message was generated (hhmmss)
b. Label of the PHA tape being processed
c. Sequence number of the PHA record being processed
d. Sequence number of the summary interval being processed
e. Message content.

All messages are self explanatory except possibly for the following:

a. I/O ERROR OCCURRED--JOB TERMINATED OR SUMMARY SKIPPED (STATUS INFORMATION GIVEN BELOW)

This message indicates that an error occured during a read operation and the summary is skipped if ABEND=F on the OPT group of cards. Otherwise the job is terminated with a dump. The status information that is provided in the next two lines of printout is described in the I/O Errors section of the "IBM SYSTEM/360 General I/O Package" written by Alan R. Thompson.

b. A PHA SUMMARY HAS BEEN GENERATED--PROCESSING INFORMATION IS GIVEN BELOW

This message indicates that a new PHA Summary was created and the next six lines of printout provide statistics about the summary. The time interval that was requested by the user and the actual time interval used (i.e., the requested time interval rounded to the nearest page of data) make up the first two lines. The percentage of the actual time interval that PHA events were padded, missing, or discarded is printed next. A complete record will be discarded if the data is not in the requested mode (calibrate/non-calibrate). The remaining lines of printout for this message are self explanatory.

c. NO DATA EXISTS ON PHA TAPES FOR THIS SUMMARY

This message indicates that either the available PHA tapes contain no PHA data for the requested summary interval or that there is no good PHA data in the required mode (calibrate/non-calibrate) for the requested summary interval.

6.1.3.3.2 Current Status Report

A Current Status Report provides the current status of all tapes maintained in the PHA Summary Catalog. The report is divided into four sections. The first section contains general information about the Catalog. The next three sections provide the absolute file number, the tape label, the file sequence number within the tape, and the start and end time for each summary produced. The first section contains a list of

Summarizer Program (PPHASP) and the Pioneer F PHA Summary Merge Program (PMERGE). These tapes are 9-track, odd parity and the recording density is 1600 BPI. The tapes contain standard OS/360 labels and the data set name is PIOSUM. The records are unblocked with a fixed length of 7280 bytes.

The second type is the PHA Summary Catalog tape which is written and read only by PSUMCM. This tape is also 9-track, odd parity and the recording density is 1600 BPI. The tape contains standard OS/360 labels and the data set name is PFPSCATS. The tape contains one data record which is unblocked with a fixed length of 7272 bytes. The format of the data record is identical to the PHA Summary Catalog stored on disk.

For a detailed format description of either type of tape, refer to section 5 of this document.

6.2.3.2 Cards

Parameter 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 four columns of the first card must contain the characters "&OPT", followed by a blank. The blank is followed by data items separated by commas. (A comma after the last item is optional.) The end of a group of cards is signaled by the characters "&END". Only one group of cards is permitted per run.

Five parameters may be supplied to PSUMCM via a group of parameter cards. The form of the data items within a group is given below. The underlined keywords and special characters must be written exactly as shown.

FUNCT= 'INIT' If a PHA Summary catalog is to be initialized at the beginning of a production sequence.

'SAVE' If a PHA Summary Catalog is to be saved on tape.

'REST' If a PHA Summary Catalog is to be restored from tape.

'LIST' If a PHA Summary Catalog is to be printed.

'ADDB' If labels of blank tapes are to be added to the blank tape que in a PHA Summary Catalog.

'DELT' If labels of PHA Summary tapes or blank tapes are to be deleted from a PHA Summary Catalog.

'DELF' If a file is to be deleted from a PHA Summary tape and from a PHA Summary Catalog.

(Default - 'LIST' is assumed.)

TAPES= (1) Label of a tape to be used during a 'SAVE' or 'REST' operation.

(2) Labels of blank tapes to be added during an 'ADDB' operation.

(3) Labels of tapes to be deleted during a 'DELT' operation.

Each tape label must be enclosed in apostraphes and separated from the previous one by a comma. A maximum of 10 tapes lables may be supplied.

(Default - If no tape labels are supplied the 'LIST' option is assumed.)

FILE= The absolute file number of the file to be deleted during a 'DELF' operation. The absolute file number must be equal to the sequential location of the file (to be deleted) in the PHA Summary Catalog that will be used as input. The absolute file number must not be confused with the file sequence number which is the sequential location of the file on a PHA Summary tape.

(Default - None.)

ID= 'F' If the 'INIT' operation is to be performed for the Pioneer F satellite.

'G' If the 'INIT' operation is to be performed for the Pioneer G satellite.

(Default - Pioneer F is assumed.)

NCAT= • The sequence number of the PHA Summary Catalog to be initialized or restored to during an 'INIT' or 'REST' operation respectively. This number +30 is the FORTRAN logical unit on which the Catalog will be written.

• (Default - Catalog 1 will be initialized/restored.)

The sequence number of the PHA Summary Catalog to be read during any operation other then 'INIT' or 'REST'. This number +30 is the FORTRAN logical unit from which the catalog will be read.

(Default - The Catalog will be read from the last unit on which the Catalog was written by PPHASP or PSUMCM. This Catalog is pointed to by the PHA Summary Catalog Pointer on disk.)

6.2.3.3 Printed Reports

PSUMCM provides two types of printed reports at the end of each production run; a Processing Messages Report and a 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. Year and julian day of production run

d. Page number.

6.2.3.3.1 Processing Messages Report

The Processing Messages Report provides a history of all abnormal conditions encountered during processing. Each message is written

SECTION 2 - PIONEER RATES SUMMARY PROGRAM

2.1 INTRODUCTION

The Pioneer Rates Summary Program is designed to generate the data base for the Pioneer Rates Display Program.

The inputs to Rates Summary Program are the rates tapes generated by the Pioneer Data Reduction Program (PIODRP). The output of the program is a rates summary tape, which consists of a time-ordered series of records, each covering a constant length of time, called the summary interval. Each summary record contains total counts and total accumulation time during the summary interval for each rates register. The precise format of the record is described in Section .

A rates summary data set has four attributes that uniquely define it. They are:

1. Satellite ID (F or G)
2. Length of summary interval
3. Source of data
4. The disposition of those readouts on the rates tape that have been marked by PIODRP to have failed trend-check (i.e., such readouts may be either included in the summary or ignored)

Each of these attributes is specified as an input to the Rates Summary Program at the time the rates summary data set is created. These attributes remain unchanged for all future updates or uses of the data set.

The rates summary records reside on 9-track tape. They are fixed-length, blocked records with a blocksize of 32160 bytes, and a logical record length of 1340 bytes. There is only one file on each tape.

Associated with each rates summary data set is a rates summary status data set. In addition to the four attributes defining the rates summary, the status data set contains the following information:

1. Volume serial number of the tape containing the rates summary
2. Start time of (the first record on) the rates summary tape
3. End time of (the last record on) the rates summary tape
4. Expected time for the next page of rates data to be summarized
5. Sectored sequence ID of the last page of rates data processed

The status data set is created by the rates summary program when the rates summary is created, and is revised whenever the rates summary is updated. The status data set normally resides on disk.

2.2 MAIN PROGRAM (PFRSUM)

The main program for the Pioneer Rates Summary Program is called PFRSUM. Subroutines called are: INITS, to read data and set default values; PROCS, to process the rates records; MUZERO, to initialize each summary record; and SETTIM, to set the time for the next interval. Also used are two general-purpose subroutines: MSTOT, to convert milliseconds to hours, minutes, and seconds; and RMJDD, to convert modified Julian day to year, month, and day.

2.2.1 PFRSUM

Processing in PFRSUM can be divided into three sections: initialization, rate processing, and final processing. The initialization section reads input, sets default values and program constants, checks consistency of specified data and data sets, and mounts correct input and output tapes. The processing section reads the rates tapes, accumulates data for each summary interval, and writes rates summary records on the output tape. The final section closes data sets, writes messages to the user, and updates the status data set.

These three sections will be described in the following subsections. In this text, the term "next time" means the start time of the next summary interval, i.e., the interval immediately following the current one. "Expected time" is the time, contained in each rate record, of the first page of data expected to immediately follow the last page in this record. "Required time" is the time of the earliest data that may be included for the current summary interval.

2.2.1.1 Initialization

Initialization is the first process of the program. At the start of PFRSUM, subroutine INITS is called, which sets default values for inputs and program constants, reads user inputs, and takes an alternate return if a new rates summary is being created. Initialization processing is then performed.

If an old rates summary is being updated, initialization proceeds as follows:

1. The rates summary status data set is read from logical unit .
2. The user-specified or default source parameter is compared to the source parameters of the DRS catalog and the rate summary status data set. If the three do not match, the program terminates in an error condition.
3. The status data set is rewound and the rates summary tape is mounted for output.
4. If the user did not specify rates tapes to be processed, the DRS catalog is read using either a user input catalog pointer or one read from the catalog pointer data set. The input/default satellite IDs are compared to those of the status data set and the DRS catalog. If the three do not match, the program terminates with an error condition. The DRS catalog is then searched for the earliest rates tape whose end time is later than the required time.
5. If the user specified rates tapes, the first tape specified is mounted. Otherwise, the tape obtained from the DRS catalog search is mounted.

If a new rates summary is being created, an alternate return is taken from INITS and initialization proceeds as follows:

1. The user-specified output tape is mounted. If none was specified, the program terminates with an error condition.
2. If the user did not specify rates tapes, the DRS catalog is read and searched.
3. If no start time was specified, the first rates tape is mounted and the summary interval which contains the first time on the tape is the first interval in the summary. Otherwise, the required time

and the time of the current (first) summary interval are set equal to the user-specified start time, and the first rates tape is mounted for input.

2.2.1.2 Rates Processing

Rates processing begins once the proper input and output tapes are mounted.

If a new rates tape has just been mounted for input, rates records are read until one is found whose page one time is equal to or later than the required time. Processing of this and each subsequent rates record then proceeds as follows:

1. If the rates record contains data for the current summary interval, proceed with step 3; otherwise, proceed with step 2.

2. Compute the missing time for the current interval; write the summary record on the output tape; call SETTIM to update time of current and next summaries intervals; set the required time to start time of current interval; and call MVZERO to initialize the counts and accumulation times to zero for the current summary interval. If no more summary intervals are to be processed, branch to final processing. Otherwise, repeat step 1 for the new current summary interval.

3. Compute the page numbers of the first and last pages of the rates record needed for this interval. Call PROCS to process these pages into the current summary interval. If this summary interval is now complete, proceed with step 5.

4. If the summary record of step 3 is not complete, set required time equal to the time of the next summary interval, read the next rates record, and repeat step 1.

5. Write the current summary record to the output tape; call SETTIM to update the time of the current and next intervals; and call MVZERO to initialize to zero counts and accumulation times in the new summary interval. If all of the pages of the current rates record were included in the last summary interval, proceed with step 4. Otherwise, repeat step 3, processing the remaining page or pages into the new summary interval.

6. When an end of tape is reached on the input tape, and if all desired rates tapes have been processed, then final processing is done. Otherwise, the next rates tape is mounted, the first record is read, and step 1 is executed.

2.2.1.3 Final Processing

In final processing, a message is written on logical unit 6 describing the reasons for program termination. This may explain an error condition or one of the modes of normal termination. The updated status data set is then stored to disk and its content printed on logical unit 6.

2.2.2 Subroutine INITS

INITS sets default values for user-specified variables and reads user inputs. An alternate return is taken when a new summary is to be created.

Calling Sequence

```
CALL INITS (&ALT)
```

where ALT is the statement number to be branched to when creating a new summary.

Procedure

Subroutine INITS calls MVZERO to set all counts and accumulation times to zero in the rates summary COMMON area SUMREC. The default values for input variables and the values of some COMMON area constants are then set. For default input values, see Section . Other significant values that are set are:

Variable	Default Value	Description
HLSID	0	Last sector processed rate sequence ID
NUR	9	Logical unit number from which rates tapes are read
NUSTAT[1]	8	Logical unit number from which rates summary status data set is read

[1] If a period card was read, and QSPEC = .TRUE. was specified, then NUSTAT is set equal to 32. If a PERIOD card was present, INITS next attempts to read another NAMELIST record from logical unit 5 with the name INIT. If no INIT card is present, control returns to the main program (and a summary update is assumed). If an INIT card was read, then QINIT is reset to .TRUE. and a new summary is initiated.

Variable	Default Value	Description
NUS[2]	10	Logical unit number on which summary tape is mounted for output
QINIT	.FALSE.	Logical variable = .TRUE., new summary is being created = .FALSE., old summary is being updated
MSINT	3600000.	Length of summary interval (milliseconds)

The program then attempts to read a record from logical unit 5 under the FORTRAN NAMELIST convention with the name PERIOD. If no such data is present, control returns to the main program (and a summary update is assumed).

After computing the value of MSINT for this summary, an alternate return is taken.

[2]NUS is set equal to 16 rather than 10. While logical units 16 and 10 define the same data set, the DD card for logical unit 16 has a DISP parameter of NEW, i.e., a new file will be started at the beginning of the tape. For updating a previous summary, however, logical unit 10 has a DISP parameter of MOD, i.e., new summary records will be written contiguously after any that were already there.

2.2.3 Subroutine PROCS

PROCS processes the current rate record and updates the accumulated data for the current summary interval in COMMON area SUMREC.

Calling Sequence

CALL PROCS (N1, N2)

where N1 is the first page of data to be processed, and N2 is the last page of data to be processed.

Dimensioned Local Variables

- TACCU(8,4)--TACCU(J,K) contains the unsectored rate accumulation time for a rate record whose bit rate index is J and whose format index is K.
- TACCS(8)--TACCS(J) contains sectored rate accumulation time for bit rate J.
- HIND(16,8)--HIND(J,K) is a pointer to the location in the summary array (IUR) of the J rate for unsectored rate sequence ID K.
- IA1(6), IA2(6), ..., IA12(6) and IB1(6), IB2(6), ..., IB12(6) contain pointers to start locations in the rate record for subcom information and rate sequence IDs for formats A and B, respectively, for each of six pages possible. The constants are all set in data statements.

Procedure

With the use of these arrays, processing is very straightforward, and begins by establishing the sectored and unsectored accumulation times.

Processing of each page begins by extracting rate sequence IDs and start locations for the page in the rate record. The counts from each rate register are

then added to the count already accumulated in the summary location corresponding to that register.

If QTRCHK is true, readouts with negative values are ignored. Otherwise, only padded data is ignored and the absolute value of the count is added to the accumulated value.

2.2.4 Subroutine MSTOT

MSTOT is a general subroutine for converting milliseconds of day to hours, minutes, seconds, and milliseconds. MSTOT is coded in IBM S/360 ALC.

Calling Sequence

CALL MSTOT (HHR, HMIN, HSEC, HMS, MSEC)

Variable	Type	Description
Input		
MSEC	I*4	Time of day in milliseconds
Output		
HHR	I*2	Time of day in hours
HMIN	I*2	Time of day in minutes
HSEC	I*2	Time of day in seconds
HMS	I*2	Time of day in milliseconds

Procedure

The conversion is made using the following algorithm:

1. The number of seconds is computed

   PARM1 = MSEC/1000

   and converted to an integer

   NPARM1 = PARM1

2. The number of minutes is computed

   PARM2 = NPARM1/60

   and converted to an integer

   NPARM2 = PARM2

3. The integer number of hours is

$$HHR = NPARM2/60$$

4. The remaining minutes, seconds, and milliseconds are computed

$$HMIN = NPARM2 - 60*HHR$$

$$HSEC = NPARM1 - 60*NPARM2$$

$$HMS = MSEC - 1000*NPARM1$$

2.2.5 Subroutine MVZERO

MVZERO initializes the current summary interval to contain zero counts and zero accumulation times. It is coded in IBM S/360 ALC.

Calling Sequence

```
CALL MVZERO
```

Procedure

A string of zeroes is moved into all locations of COMMON block SUMREC starting with variable MSTIME.

Next, the value of MSECN is incremented by MSINT, the number of milliseconds in an interval. If the result exceeds the number of milliseconds in a day, HMDAYN is incremented by one, and MSECN is decremented by the number of milliseconds in a day.

2.2.6 Subroutine SETTIM

SETTIM is used to update values of current time and next time when starting a new interval.

Calling Sequence

CALL SETTIM (HMDAYN, MSECN)

Variable	Type	Input/ Output	Description
HMDAYN	I*2	I/O	Modified Julian day of start of next interval
MSECN	I*4	I/O	Time of day in milliseconds for start of next interval

Procedure

The input values of HMDAYN and MSECN are used to compute new values of HYRC, HMONC, HDAYC, HRRC, HMINC, and HSECC is COMMON area SUMREC. Subroutines RMJDD and MSTOT are used for these computations. Thus, the value of current time has been updated.

2.2.7 Subroutine RMJDD and DRMJD

RMJDD converts modified Julian day to year, month, and day. Entry point DRMJD converts year, month, and day to modified Julian day.

Calling Sequence

CALL RMJDD (HYR, HMON, HDAY, HMJD)

CALL DRMJD (HYR, HMON, HDAY, HMJD)

Variable	Type	Input/Output RMJDD	Input/Output DRMJD	Description
HYR	I*2	O	I	Last two digits of year
HMON	I*2	O	I	Month of year
HDAY	I*2	O	I	Day of month
HMJD	I*2	I	O	Modified Julian day

Procedure

- HD(12,15)--HD(I, J) contains the modified Julian day of the last day of month I of year 1971 + J.
- RMJDD (restriction)--The conversion will not work for HMJD < 1 or HMJD > 5479. An attempt at such a conversion will cause an abend with a return code of 999. Using HD(12, I) for I = 1, 15, the appropriate year is located. Each month for this day in the HD array is scanned to compute the month. The day of month is computed by subtracting the modified Julian day of the last day of the previous month from the input HMJD.
- DRMJD (restriction)--The conversion will not work for a date earlier than January 1, 1972, or later than December 31, 1986. An attempt at such a conversion will cause an abend with a return code of 999.

1. If the year is not 1972, skip to step 2. Otherwise, if HMON = 1, HMJD = HDAY; if HMON > 1, HMJD = HD(HMON-1, 1) + HDAY.

2. If HMON = 1, HMJD = HD(12, HYR-72) + HDAY. If HMON > 1, HMJD = HD(HMON-1, HYR-71) + HDAY.

2.2.8 COMMON Area STAREC

STAREC is the area in core where the rates summary status data set is stored.

Variable	Type	Description
DTAPES	R*8	Contains volume serial number of rates summary in EBCDIC
HSID	I*2	Contains satellite ID (F or G) in EBCDIC
HLSID	I*2	Sectored sequence ID for last set of sectored rates processed
QTRCHK	L*4	= TRUE, ignore data flagged by PIODRP as having failed trend check = FALSE, do not ignore data flagged by PIODRP
MSINT	I*4	Length of a summary interval (milliseconds)
HYRF	I*2	Start time of summary (year, month, day, hour, minute, and second)
HMONF	I*2	
HDAYF	I*2	
HHRF	I*2	
HMINF	I*2	
HSECF	I*2	
H09	I*2	Code indicating source of data = 0, standard EDR tapes = 1, SOLDOPS tapes = 2, SDR tapes = 3, BUFOPS tapes
HMDAYF	I*2	Start time of summary (modified Julian day and milliseconds of day)
MSECF	I*4	
HYRL	I*2	Time of last summary interval (year, month, day, hour, minute, and second)
HMONL	I*2	
HDAYL	I*2	
HHRL	I*2	
HMINL	I*2	
HSECL	I*2	

Variable	Type	Description
H10	I*2	Spare
HMDAYL	I*2	Time of last summary interval (modified Julian day and megacycles)
MSECL	I*4	
HLTAPE	I*2	Unused
HMDEXP	I*2	Earliest data acceptable for next summary interval to be added to tape (modified Julian day and milliseconds of day)
MSEXP	I*2	

2.2.9 COMMON Area SUMREC

SUMREC contains data for the current rates summary interval in core.

Variable	Type	Description
HYRC	I*2	Start time of this interval (year, month, day, hour, minute, and second)
HMONC	I*2	
HDAYC	I*2	
HHRC	I*2	
HMINC	I*2	
HSECC	I*2	
H11	I*2	Spare
HMDAYC	I*2	Start time of current summary interval (modified Julian day and milliseconds of day)
MSECC	I*4	
MSTIME	I*4	Missing time (milliseconds) (i.e., total time during total interval for which there was no data)
ISRI(9,4)	I*4	Accumulated counts for sectored rates SRIA, SRIB, SRIC, and SRID (Table 2-1)
ISR2(9,8)	I*4	Accumulated counts for sectored rates SR2A, SR2B, SR2C, SR2D, SR2E, SR2F, SR2G, and SR2H (Table 2-1)
IUR(49)	I*4	Accumulated counts for unsectored rates (Table 2-1)
SSCOM1(4)	R*4	Sum of readouts for first subcom data
ISCOM2(6)	I*4	Sum of readouts for second subcom data
TSR1(9,4)	R*4	Total accumulation time for this interval corresponding to each count in array ISR1
TSR2(9,8)	R*4	Total accumulation time for this interval corresponding to each count in array ISR2
TUR(49)	R*4	Total accumulation time for this interval corresponding to each count in array IUR

Table 2-1. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (1 of 3)

Table 2-1 (1 of 3)

RATE SEQUENCE ID		UNSECTORED OR SECTORED RATE
UNSECTORED	SECTORED	
XX	0	SECTORED RATE S1A (1 OF 2)-A_1 A_2 B CI CIII (1-8) SECTORED RATE S2A (1 OF 1)-SI_5 SII SII_a SIII (1-8)
0	XX	UNSECTORED RATE R1 (1 OF 8)-(A_2 K_1 + A_1 CI) B CIII UNSECTORED RATE R2A (1 OF 4)-A_1 A_2 B CIII UNSECTORED RATE R3A (1 OF 4)-A_2 B CIII UNSECTORED RATE R4A (1 OF 4)-A_2 BK_2 CI CII UNSECTORED RATE R5A (1 OF 4)-A_2 BK_2 CI CII CIII UNSECTORED RATE R6A (1 OF 4)-A_1 A_2 B CI UNSECTORED RATE R7A (1 OF 4)-A_1 A_2 B CI CII CIII UNSECTORED RATE R8A (1 OF 4)-A_2 BK_1 CI CII UNSECTORED RATE R9A (1 OF 2)-B UNSECTORED RATE R10A (1 OF 1)-DI_1 UNSECTORED RATE R11A (1 OF 4)-DI DII F UNSECTORED RATE R12A (1 OF 4)-DI DII E_1 F UNSECTORED RATE R13A (1 OF 4)-DI DII E_2 F UNSECTORED RATE R14A (1 OF 1)-DI UNSECTORED RATE R15A (1 OF 2)-SI_1 SII SII_a SIII UNSECTORED RATE R16A (1 OF 2)-SI SII_1 SII_a SIII
XX	1	SECTORED RATE S1B (1 OF 2)-A_2 BI_1 CIII (1-8) SECTORED RATE S2B (1 OF 1)-SI_6 SII SII_a SIII (1-8)
1	SS	UNSECTORED RATE R1 (2 OF 8) UNSECTORED RATE R2B (1 OF 4)-A_1 BK_2 CIII UNSECTORED RATE R3B (1 OF 4)-A_2 BK_2 CI UNSECTORED RATE R4B (1 OF 4)-A_1 UNSECTORED RATE R5B (1 OF 4)-A_2 BK_2 CI CII CIII UNSECTORED RATE R6B (1 OF 4)-A_1 A_2 B CI CII UNSECTORED RATE R7B (1 OF 4)-A_2 BK_1 CI UNSECTORED RATE R8B (1 OF 4)-A_2 BK_1 CI CII CIII UNSECTORED RATE R9B (1 OF 2)-CI UNSECTORED RATE R10B (1 OF 1)-DI_2 UNSECTORED RATE R11B (1 OF 4)-DI DII Σ D F UNSECTORED RATE R12B (1 OF 4)-DI DII Σ DE_3 F

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table 2-1
(2 of 3)

RATE SEQUENCE ID		UNSECTORED OR SECTORED RATE
UNSECTORED	SECTORED	
		UNSECTORED RATE R13B (1 OF 4)-DI DII Σ D E_4 F UNSECTORED RATE R14B (1 OF 1)-DII UNSECTORED RATE R15B (1 OF 2)-SI_2 SII SII_a SIII UNSECTORED RATE R16B (1 OF 2)-SI SII_2 SII_a SIII
XX	2	SECTORED RATE S1C (1 OF 2)-DU DUU F (1-8) SECTORED RATE S2C (1 OF 1)-SI_7 SII SII_a SIII (1-8)
2	XX	UNSECTORED RATE R1 (3 OF 8) UNSECTORED RATES R2A-R8A (2 OF 4) UNSECTORED RATE R9C (1 OF 2)-CII UNSECTORED RATE R10C (1 OF 1)-DI_3 UNSECTORED RATES R11A-R13A (2 OF 4) UNSECTORED RATE R14C (1 OF 1)-E_1 UNSECTORED RATE R15C (1 OF 2)-SI_3 SII SII_a SIII UNSECTORED RATE R16C (1 OF 2)-SI SII_3 SII_a SIII
XX	3	SECTORED RATE S1D (1 OF 2)-DI DII E_1 F (1-8) SECTORED RATE S2D (1 OF 1)-SI_8 SII SII_a SIII (1-8)
3	XX	UNSECTORED RATE R1 (4 OF 8) UNSECTORED RATES R2B-R8B (2 OF 4) UNSECTORED RATE R9D (1 OF 2)-CIII UNSECTORED RATE R10D (1 OF 1)-DI_4 UNSECTORED RATES R11B-R13B (2 OF 4) UNSECTORED RATE R14D (1 OF 1)-F UNSECTORED RATE R15D (1 OF 2)-SI_4 SII SII_a SIII UNSECTORED RATE R16D (1 OF 2)-SI SII_4 SII_a SIII
XX	4	SECTORED RATE S1A (2 OF 2) (1-8) SECTORED RATE S2E (1 OF 1)-SI SII_5 SII_a SIII (1-8)
4	XX	UNSECTORED RATE R1 (5 OF 8) UNSECTORED RATES R2A-R8A (3 OF 4) UNSECTORED RATE R9A (2 OF 2) UNSECTORED RATE R10E (1 OF 1)-DI_5

table 2-1
(3 of 3)

RATE SEQUENCE ID		UNSECTORED OR SECTORED RATE
UNSECTORED	SECTORED	
		UNSECTORED RATES R11A-R13A (3 OF 4) UNSECTORED RATE R14E (1 OF 1)-SI UNSECTORED RATE R15A-R16A (2 OF 2)
XX	5	SECTORED RATE S1B (2 OF 2) (1-8) SECTORED RATE S2F (1 OF 1)-SI SII_6 SII_a SIII (1-8)
5	XX	UNSECTORED RATE R1 (6 OF 8) UNSECTORED RATE R2B-R8B (3 OF 4) UNSECTORED RATE R9B (2 OF 2) UNSECTORED RATE R10F (1 OF 1)-DI_6 UNSECTORED RATES R11B-R13B (3 OF 4) UNSECTORED RATE R14F (1 OF 1)-SII UNSECTORED RATE R15B-R16B (2 OF 2)
XX	6	SECTORED RATE S1C (2 OF 2) (1-8) SECTORED RATE S2G (1 OF 1)-SI SII_7 SII_a SIII (1-8)
6	XX	UNSECTORED RATE R1 (7 OF 8) UNSECTORED RATES R2A-R8A (4 OF 4) UNSECTORED RATE R9C (2 OF 2) UNSECTORED RATE R10G (1 OF 1)-DI_7 UNSECTORED RATES R11A-R13A (4 OF 4) UNSECTORED RATE R14G (1 OF 1)-SIII UNSECTORED RATES R15C-R16C (2 OF 2)
XX	7	SECTORED RATE S1D (2 OF 2) (1-8) SECTORED RATE S2H (1 OF 1)-SI SII_8 SII_a SIII (1-8)
7	XX	UNSECTORED RATE R1 (8 OF 8) UNSECTORED RATES R2B-R8B (4 OF 4) UNSECTORED RATE R9D (2 OF 2) UNSECTORED RATE R10H (1 OF 1)-DI_8 UNSECTORED RATES R11B-R13B (4 OF 4) UNSECTORED RATE R14H (1 OF 1)-SII_a UNSECTORED RATES R15D-R16D (2 OF 2)

Table 2-1. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (2 of 3)

Table 2-1. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (3 of 3)

S 1

Variable	Type	Description
HSCOM1(4)	I*2	Total number of readouts corresponding to each sum in array SSCOM1
HSCOM2(6)	I*2	Total number of readouts corresponding to each sum in array ISCOM2

2.2.10 COMMON Area RATREC

RATREC is the area in core containing data from one rates record.

Variable	Type	Description
MSPG1	I*4	Time of day (milliseconds) for first page contained in record
MSNXT	I*4	Time of day (milliseconds) for page which is expected to immediately follow last page in record
HMDPG1	I*2	Day (relative modified Julian day) for first page contained in record
HMDNXT	I*2	Day (relative modified Julian day) for page which is expected to immediately follow last page in record
HFILE	I*2	Absolute file number
HTFLAG	I*2	Time correction flag = 0, no correction = 7, suspect time or corrected time
HPAGE	I*2	Number of pages (one-quarter experiment cycle) included in record (maximum of six for format A and five for format B)
HBITRT	I*2	Bit rate (1-16, 2-32, 3-64, 4-128, 5-256, 6-512, 7-1024, 8-2048)
HFMT	I*2	Format (1-A, 2-A/D, 3-B, 4-B/D)
HMODE	I*2	Mode = 0 or 1, real time = 2 or 3, memory readout = 4 or 5, telemetry store
HDSSIS	I*2	DSS identification
HESCID	I*2	Extended frame counter (ESC subcom ID)
HRAT	I*2	RAT flag (roll attitude timer) = 0, good value = 1, old value = 2, missing value = 3, corrected value

Variable	Type	Description
HASPNP	I*2	ASPNPDC flag (spin period) (for description, see RAT)
HSPF	I*2	SPF flag (spin period) (for description, see RAT)
HRIDPH	I*2	HRIPPHEC flag--roll pulse/roll index pulse phase error (for description, see RAT)
RAT	R*4	Roll attitude timer (RAT)
ASPNPD	R*4	Spin period (ASPNPDC)
ARIPPH	R*4	Roll pulse/roll index pulse phase error (ARIPPHEC)
HSPGR	I*2	Spin period sector generator (SPSG) roll reference = 0, 0 degrees = 1, 180 degrees
HSPGM	I*2	Spin period sector generator (SPSG) mode = 0, non-spin averaging = 1, ACS = 2, spin averaging
MSRAT	I*4	Roll attitude time (milliseconds of RAT)
SCOM1(4)	R*4	DC bus voltage
	R*4	DC bus current
	R*4	Spacecraft platform temperature
	R*4	Signal-to-noise ratio
SPARE1	I*4	Spare (currently set to zero)
SPARE2	I*4	Spare (currently set to zero)

Variable	Type	Description
ICOUNT(414)		All subcom data associated with first page of data contained in record. Refer to Tables 2-2 and 2-3 for a description of subcom data for format A and format B, respectively. All rates data associated with first page of data contained in record. Each page consists of four sets (two sectored and two unsectored) of 16 rates which are uniquely identified by the corresponding rate sequence IDs appearing in associated set of subcom data. Rates data associated with each page appears in 64 consecutive words as follows: 1 - Sectored rate (first set) SR1 (1-8) SR2 (1-8) 16 - Sectored rate (first set) 17 - Unsectored rate (first set) R1-R8 R9-R16 32 - Unsectored rate (first set) 33 - Sectored rate (second set) SR1 < 1-8 SR2 < 1-8 48 - Sectored rate (second set) 49 - Unsectored rate (second set) R1-R8 R9-R16 64 - Unsectored rate (second set) Refer to Table 2-1 to determine rates data associated with each unsectored and sectored rate sequence ID Note that redundant sectored rates data occurs whenever corresponding sectored rate sequence ID is not updated from previous value

table 2-2

MNEMONIC	DESCRIPTION[1]
BILEVEL	BILEVEL (E-1, 24)
ELEC TEMP	ELECT. TEMP. (E-1, 25)
HOUSEKEEP	HOUSEKEEPING (E-1, 26)
CAL VOLT	CALIBRATION VOLTAGE (E-1, 27)
DET TEMP	DETECTOR TEMPERATURE (E-1, 28)
SEC VOLT	SEC. VOLTAGE (E-1, 29)
USRSID	UNSECTORED RATE SEQUENCE ID (IDENTIFIES FIRST SET OF UNSECTORED RATES FOR PAGE)
SSRSID	SECTORED RATE SEQUENCE ID (IDENTIFIES FIRST SET OF SECTORED RATES FOR PAGE)
	UNSECTORED RATE SEQUENCE ID (IDENTIFIES SECOND SET OF UNSECTORED RATES FOR PAGE)[2]
	SECTORED RATE SEQUENCE ID (IDENTIFIES SECOND SET OF SECTORED RATES FOR PAGE)[2]

[1]PADDED DATA IS INDICATED BY A NEGATIVE ONE (-1) FOR A PARTICULAR SUBCOM WORD. HOWEVER, THE UNSECTORED AND SECTORED RATE SEQUENCE IDs WILL ALWAYS BE PRESENT.

[2]THE UNSECTORED AND SECTORED RATE SEQUENCE IDs FOR THE SECOND SET OF RATES DATA CONTAINED IN A PAGE FOR FORMAT A ARE NOT READ OUT BY THE GSFC/CRT EXPERIMENT. HOWEVER, THEY ARE PROVIDED BY THE D.R.S. TO IDENTIFY THE RATES DATA CONTAINED IN EACH PAGE OF DATA ON THE RATES TAPE. THEY ARE NOT INCLUDED WITH THE SUBCOM DATA ON THE PHA TAPE.

Table 2-2. Subcom Data for Format A

table 2-3

MNEMONIC		DESCRIPTION[1]
SUBCOM1	BILEVEL	BILEVEL (E-1, 24)
	ELEC TEMP	ELECT. TEMP. (E-1, 25)
	HOUSEKEEP	HOUSEKEEPING (E-1, 26)
	CAL VOLT	CALIBRATION VOLTAGE (E-1, 27)
	DET TEMP	DETECTOR TEMPERATURE (E-1, 28)
	SEC VOLT	SEC. VOLTAGE (E-1, 29)
	USRSID	UNSECTORED RATE SEQUENCE ID (IDENTIFIES FIRST SET OF UNSECTORED RATES FOR PAGE)
	SSRSID	SECTORED RATE SEQUENCE ID (IDENTIFIES FIRST SET OF SECTORED RATES FOR PAGE)
SUBCOM2	BILEVEL	BILEVEL (E-1, 24)
	ELEC TEMP	ELECT. TEMP. (E-1, 25)
	HOUSEKEEP	HOUSEKEEPING (E-1, 26)
	CAL VOLT	CALIBRATION VOLTAGE (E-1, 27)
	DET TEP	DETECTOR TEMPERATURE (E-1, 28)
	SEC VOLT	SEC. VOLTAGE (E-1, 29)
	USRSID	UNSECTORED RATE SEQUENCE ID (IDENTIFIES SECOND SET OF UNSECTORED RATES FOR PAGE)
	SSRSID	SECTORED RATE SEQUENCE ID (IDENTIFIES SECOND SET OF SECTORED RATES FOR PAGE)

[1]PADDED DATA IS INDICATED BY A NEGATIVE ONE (–1) FOR A PARTICULAR SUBCOM WORD. HOWEVER, THE UNSECTORED AND SECTORED RATE SEQUENCE IDs WILL ALWAYS BE PRESENT.

Table 2-3. Subcom Data for Format B

2.2.11 COMMON Area DRSTAP

DRSTAP contains data read from DRS catalog.

Variable	Type	Description
HIDSPC	I*2	Spacecraft ID (F or G)
HSPAR	I*2	Not used
HPHATP	I*2	Not used
HRATTP	I*2	Number of rates tapes in catalog
IDUM1(550)	I*4	Not used
DRATTP(100)	R*8	Volume serial numbers of rates tapes
MSRATS(100)	I*4	Time of day (milliseconds) of start of each rates tape
MSRATE(100)	I*4	Time of day (milliseconds) of last data on each rates tape
HDRATS(100)	I*2	Modified Julian day of start of each rates tape
HDRATE(100)	I*2	Modified Julian day of end of each rates tape
IDUM2(334)	I*2	Not used

2.2.12 COMMON Area OPT

OPT contains user input/default data.

Variable	Type	Description
DRTAPE(10)	R*8	Volume serial numbers of rates tapes to be used this run
NINT	I*4	Number of summary intervals to be processed this run
NRECR	I*4	Number of rates records to be processed this run
NTPMAX	I*4	Maximum number of tape mounts this run
NCATP	I*4	DRS catalog pointer/flag
HYRS	I*2	Summary start time (year, month, day, hour, minute, and second)
HMONS	I*2	
HDAYS	I*2	
HHRS	I*2	
HMINS	I*2	
HSECS	I*2	
QINIT	L*4	TRUE, initializes new summary
NUR	I*4	Logical unit number for reading rates tapes
NUS	I*4	Logical unit number for writing summary tape
NUSTAT	I*4	Logical unit number for rate summary status data set
NDUM1	I*4	Not used
SOURCE	R*8	Source of data

2.2.13 COMMON Area PAGET

Variable	Type	Description
MSPAGE(8,4)	I*4	MSPAGE(J, K) is number of milliseconds per page for bit rate code J and format code K
MSDAY	I*4	Number of milliseconds per day

2.2.14 COMMON Area FERMSG

See FTIO Manual.

SECTION 6 - PIONEER RATES SUMMARY PROGRAM USER'S GUIDE

6.1 INTRODUCTION

The Pioneer Rates Summary Program is designed to create (or update an existing) Pioneer rates summary data set. The program records the status of the summary, as well as the volume on which it resides in a rate summary status data set.

When a rates summary data set ("summary," for short) is created, the attributes of the summary are described to the program. The attributes of a summary are:

- Satellite ID (F orG)
- Summary interval
- Source of data
- Disposition of those readouts on rates tape that have been marked by PIODRP to have failed trend check

The program records the attributes of the summary in the status data set.

The process of updating a summary involves writing additional record in the summary. The program determines which rates data record is the next to be processed, using the information in the status data set.

If processing is terminated by the program because of some error condition having occurred, or when requested processing has been completed, the status data set is updated to show the current status of the summary.

If processing is terminated by the system, the present version of this program requires programmer intervention.

Data Set	Description
FT16F001	With FT10F001, defines rates summary data set when a new one is being created. A dummy volume serial number should be specified. Following parameters must be stated exactly as given: UNIT = AFF = FT10F001 DISP = (NEW, KEEP, KEEP) DCB = (RECFM=FB, LRECL=1340, BLKSIZE=32160, BUFNO=1) DSN = PIOFRSUM (for Pioneer-G) DSN = PIOGRSUM (for Pioneer-F)
FT20F001	Defines DSR catalog pointer data set. If cataloged, only DSNAME and DISP parameters must be specified; otherwise, VOL and UNIT parameters must also be specified
FT21F001 FT22F001 FT23F001 FT24F001	Define DRS catalog numbers 1, 2, 3, and 4, respectively. If cataloged, only DSNAME and DISP parameters must be specified; otherwise, VOL and UNIT parameters must also be specified
FT32F001	Defines rates summary status data set whenever QSPEC = T on a period card. If cataloged, only DSNAME and DISP parameters must be specified; otherwise, VOL and UNIT parameters must also be specified.
FT05F001	Defines card data set to contain NAMELISTs INIT and PERIOD input groups

SECTION 3 - PIONEER RATES SUMMARY TAPE MERGE PROGRAM

3.1 INTRODUCTION

The Pioneer Rates Summary Tape Merge Program is designed to merge two rates summary data sets with like attributes (spacecraft ID, trend check option, source of data, and length of summary interval).

The program takes as inputs the two rates summary data sets, and outputs a new rate summary data set, containing for each summary interval the most complete data available on either of the input summaries.

The need for this program arises from the confluence of the following two circumstances:

1. The rates summary data set has one record for each summary interval (time period over which data is accumulated), regardless of whether any data is found on the rates tape or not.

2. At the time the rates summary data set is created, or updated, rates data may not exist for certain time periods.

To insert new data, or to replace existing data in the rates summary data set, a separate (special) rates summary must first be created using the Pioneer Rates Summary Program, and then the two rates summary data sets must be merged using the Pioneer Rates Summary Tape Merge Program.

The program obtains the serial numbers of the volumes on which the two summaries reside from their respective RSSDSs, and places the merged data set on the volume whose serial number is provided as input to the program, and enters the status of the merged data set in the RSSDS associated with the old master (standard) rates summary.

3.2 MAIN PROGRAM (PFRSTM)

The main program for the Pioneer Rates Summary Tape Merge Program is called PFRSTM. Other than FTIO, the subroutines used are: RMJDD, to convert the day to date; and MSTOT, to convert milliseconds to time.

3.2.1 PFRSTM

Processing in PFRSTM can be divided into three sections: initialization, merge processing, and status data set update. The initialization section mounts input and output tapes and checks the consistency of data set attributes. The merge processing section reads the input tapes, selects for each summary interval the summary record with least missing time, and writes it to the output tape. Finally, if the merge was successful, the status of the new (merged) rates summary is written on the standard rates summary status data set.

These three sections will be described in the following subsections.

3.2.1.1 Initialization

Initialization begins by reading the standard status data set from logical unit 21 into COMMON area SRECST, and the special status data set from logical unit 22 into COMMON area SRECSP.

The attributes of the two rates summaries are then compared. If any of the four attributes do not match, the program terminates with an error message. Otherwise, the user input card, with the volume serial number of the merge (output) tape, is read. If this tape number is not supplied, or if it is the same as one of the input tapes, the program terminates. Otherwise, the two input tapes and the output tape are mounted.

3.2.1.2 Merge Processing

Merge processing begins by reading the first record of each input tape. Standard records are read from logical unit 8 into COMMON area RECST. Records

from the special tape are read from logical unit 9 into COMMON area RECSP. Merge processing proceeds as follows:

1. If the records from both tapes are for the same summary interval, proceed with step 2. If the time of the record from the standard tape is earlier than the one from the special tape, write the standard record on the output tape. Continue to read the standard summary and copy it to the output tape until the standard summary interval having the same time as the first special summary interval is reached. Then proceed with step 2. If the end of the standard tape is reached before the times match, proceed with step 4.

2. Read records from both input tapes for each summary interval. Write to the output tape the record with the least missing time. Continue until an end of file is reached on one of the input tapes. Then proceed with step 3.

3. Copy all records of the remaining tape to the output tape, then proceed with the catalog update process.

4. Construct a dummy summary record in place of the record from the standard summary tape. The dummy interval has zero counts and accumulation times, and has a missing time equal to the summary interval. Write a dummy record on the output tape for each summary interval in the gap between the last interval on the standard tape and the first interval on the special summary tape. Then complete the merge by copying all records of the special summary to the output tape.

   NOTE: If, in step 1, the time of the record from the special summary is earlier than that of the standard summary, then the roles of the standard and special summary are reversed for the remainder of step 1 and all of step 4.

3.2.1.3 Status Data Set Update

Status data set update is done after the merge is successfully completed.

The time of the first summary interval is the earlier of the two first times on the standard and special status data sets. The time of the last interval is the later of the two last times on the standard and special status data sets. Also, the last sectored sequence ID is set equal to that of the summary whose last time was used. Also entered into the status information is the volume serial number of the merge tape. This status record is then written on the standard rates summary status data set via logical unit 21.

3.2.2 COMMON Areas RECST and RECSP

RECST and RECSP are used to contain standard and special rate summary intervals, respectively.

Variable			
RECST	RECSP	Type	Description
HYRST	HYRSP	I*2	Start time of interval (year, month, day, hour, minute, and second)
HMONST	HMONSP	I*2	
HDAYST	HDAYSP	I*2	
HHRST	HHRSP	I*2	
HMINST	HMINSP	I*2	
HSECST	HSECSP	I*2	
HST	HSP	I*2	Not used
HMJDST	HMJDSP	I*2	Modified Julian day for start of interval
MSECST	MSECSP	I*4	Time of day (milliseconds) at start of summary interval
MSTST	MSTSP	I*4	Amount of missing time (milliseconds)
IST(329)	ISP(329)	I*4	Total counts and accumulation times for interval

3.2.3 COMMON Areas SRECST and SRECSP

SRECST and SRECSP contain the standard and special status data sets, respectively.

Variable SRECST	Variable SRECSP	Type	Description
DTPST	DTPSP	R*8	Volume serial number of tape containing summary
HSIDST	HSIDSP	I*2	Spacecraft ID (F or G)
HLIDST	HLIDSP	I*2	Last sectored sequence ID processed
QCHKST	QCHKSP	L*4	Trend check flag
INTT	INTP	I*4	Length of summary interval (milliseconds)
HYRFT	HYRFP	I*2	Start time of first interval (year, month, day, hour, minute, and second)
HMONFT	HMONFP	I*2	
HDAYFT	HDAYFP	I*2	
HHRFT	HHRFP	I*2	
HMINFT	HMINFP	I*2	
HSECFT	HSECFP	I*2	
H13	H15	I*2	Coded source flag
HMJDFT	HMJDFP	I*2	Modified Julian day of start of first interval
MSECFT	MSECFP	I*4	Time of day (milliseconds) of start of first interval
HYRLT	HYRLP	I*2	Time of start of last summary interval in year, month, day, hour, minute, and second
HMONLT	HMONLP	I*2	
HDAYLT	HDAYLP	I*2	
HHRLT	HHRLP	I*2	
HMINLT	HMINLP	I*2	
HSECLT	HSECLP	I*2	
HI4	H 16	I*2	Not used
HMJDLT	HMJDLP	I*2	Modified Julian day of start of last summary interval

Variable		Type	Description
SRECST	SRECSP		
MSECLT	MSECLP	I*4	Time of day (milliseconds) of start of last summary interval
HLTPT	HLTPP	I*2	Not used
HEXPT	HEXPP	I*2	Modified Julian day of start of next summary after last one on tape
MSEXPT	MSEXPP	I*4	Time of day (milliseconds) of start of next summary after last one on tape

SECTION 4 - PIONEER RATES TAPE LIST PROGRAM

See sec 8-1

4.1 INTRODUCTION

The Pioneer Rates Tape List Program is designed to generate a formatted dump of Pioneer rates tapes. Either all or selected portions of a tape or tapes may be listed. The user may request a listing of certain records of a specific tape (record option) or a listing of all records lying within a specified time interval (time option).

4.2 MAIN PROGRAM (PFRTPL)

The main program for the Pioneer Rates Tape List Program is called PFRTPL. Subroutines called are: DRMJD, to convert the date to modified Julian day; and WRITER, to list each rate record.

4.2.1 PFRTPL

PFRTPL begins reading the first input card. If the spacecraft ID was not input, it is set to 'F'. Processing of the program can be divided into two sections: time option processing and record option processing. If the option was not specified correctly by the user, an error message is printed and the input card is ignored.

These two processing options will be described in the following subsections.

4.2.1.1 Time Option Processing

Time option processing begins with an examination of user input. If the start time is not specified and the tape label is not specified, an error message is written and the request is ignored. If the start time is not specified, logical variable QBEGIN is set equal to .TRUE., indicating that processing begins at the start of tape. Similarly, no end time specification causes QEND to be set .TRUE., indicating processing ends with an end of tape.

If start and/or end times are specified, they are next converted to modified Julian day and milliseconds. If the tape label was specified, no more preprocessing is needed, and step 1 of the following processing loop is initiated. Otherwise, the DRS catalog is read into core (if not done previously), and the spacecraft IDs of the catalog, the catalog pointer, and the user request are compared. If they do not agree, an error message is printed and the run is finished.

Next, the DRS catalog is searched for the label of the rates tape containing data for the start time. If it is not found, an error message is printed and the request is ignored; otherwise, processing continues as follows.

1. Mount the desired rates tape and position to the first record. If QBEGIN = .TRUE. (processing to begin at start of tape), proceed with step 4.
2. If QBEGIN $\neq$ .TRUE., read a record from the tape.
3. If the record contains the start time, call WRITER to print the record and continue with step 4; otherwise, repeat step 2.
4. Read a record and call WRITER to print its contents. Proceed with step 6 if an end of file is reached.
5. If QEND = .TRUE. or the end time was not reached, repeat step 4; otherwise, read the next user request.
6. If QEND = .TRUE., get the next user request, or, if this was the last rates tape in the catalog, read the next input. Otherwise, set QBEGIN = .TRUE., get the label of the next rates tape from the DRS catalog, and proceed with step 1.

4.2.1.2 Record Option Processing

Record option processing begins by examing the user input data. If the volume serial number of the tape to be listed is not specified, an error message is

printed and the request is ignored. If a begin record was not specified, QBEGIN = .TRUE. is set to indicate the start of processing at the first record. If an end record was not specified, QEND = .TRUE. indicates that the listing will end with the last record of the rates tape. Processing continues as follows.

1. Mount the desired rates tape and position to the first record. If QBEGIN = .TRUE., proceed with step 3.

2. If QBEGIN $\neq$ .TRUE., skip the records on the tape until the next record to be read is the first one desired on the listing.

3. Read the next record on the rates tape. If end of file is reached, read the next user request. Otherwise, increment the record index counter, and call WRITER to print the record.

4. If QEND = .TRUE., repeat step 3. If the record index is less than the last one to be processed, repeat step 3; otherwise, read the next user request.

4.2.2 Subroutine WRITER

WRITER prints the contents of COMMON area RATREC, which contains the data from one rates record.

Calling Sequence

```
CALL WRITER
```

Procedure

After printing the subcom data for the record, the program branches to one of two sections of code, one for format A data and one for format B data. Each page of data is then printed separately and labeled according to page number and rate sequence IDs.

4.2.3 COMMON Area DRSTAP

DRSTAP contains the DRS tape catalog.

Variable	Type	Description
HIDSPC	I*2	Spacecraft ID (F or G)
HSPAR	I*2	Not used
HPATP	I*2	Not used
HRATTP	I*2	Number of rates tapes currently in catalog
IDUM1(550)	I*4	Not used
DRATTP(100)	R*8	Volume serial numbers of current rates tapes
MSRATS(100)	I*4	Start time of day (milliseconds) of each rate tape
MSRATE(100)	I*4	End time of day (milliseconds) of each rate tape
HDRATS(100)	I*2	Modified Julian day of start of each rates tape
HDRATE(100)	I*2	Modified Julian day of end of each rate tape
IDUM2(334)	I*4	Not used

4.2.4 COMMON Area RATREC

RATREC is used for core storage of the current rates record being processed.

Variable	Type	Description
MSPG1	I*4	Time of day (milliseconds) for first page contained in record
MSNXT	I*4	Time of day (milliseconds) for page which is expected to immediately follow last page in record
HMDPG1	I*2	Modified Julian day for first page contained in record
HMDNXT	I*2	Modified Julian day for page which is expected to immediately follow last page in record
ICOUNT(431)	I*4	Remaining subcom data and counts for record. See Pioneer Data Reduction Program documentation for the exact order of this data

SECTION 8 - PIONEER RATES TAPE LIST PROGRAM

Use of the Rates Tape List Program is identical to that of the PHA Tape List Program. All input formats and output messages are the same.

Figure 8-1 shows the JCL and typical inputs to the Rates Tape List Program. Note that all data sets are the same as for the PHA Tape List Program, except that there is no FT10F001, and the following is added:

Data Set	Description
FT09F001	Defines input unit for rates tapes. A 7-track tape drive (UNIT=2400-7) with deferred mounting should be specified along with a dummy volume serial number. User must also specify DSN=PIORAT, DISP=SHR

```
//LINKGO  EXEC  LINKGO,REGION,GO=150K
//LINK.SYSLIB  DD  DSN=K3.ZB2NL.SB001.OPIONEER,DISP=SHR
//     DD DSN=K3.ZB2NL.SB001.OPIOFRAT,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=(2400-7,,DEFER),DISP=SHR,
// VOL=SER=DUM1
//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
//*      1         2         3         4         5         6         7
//*4567890123456789012345678901234567890123456789012345678901234567890123456789012
//GO.DATAS  DD  *
TIME                    731204030000731204050000
RECORD      E01112          1         5
```

Figure 8-1. JCL and Input to Rates Tape List Program

year	mo	dd	HH	MM	SS
		start			

SECTION 5 - PIONEER PHA TAPE LIST PROGRAM see Sec 9-1

5.1 INTRODUCTION

The Pioneer PHA Tape List Program is designed to generate a formatted dump of Pioneer PHA tapes. Either all or selected portions of a tape or tapes may be listed. The user may request a listing of records of a specific tape (record option) of a listing of all records lying within a specified time interval (time option).

5.2 MAIN PROGRAM (PRNPHA)

The main program of the PHA Tape List Program is called PRNPHA. Subroutines called are: DRMJD, to convert the date to modified Julian day; and PHAPRT, to list each record.

5.2.1 PRNPHA

PRNPHA begins by reading the first user input card. If the satellite ID was not specified, it is set to 'F'. The program then branches to one of two main processing sections: time mode processing and record mode processing. If the option was not specified, or was incorrectly specified, an error message is written and the input card is ignored.

5.2.1.1 Time Mode Processing

Time mode processing begins with a detailed examination of user input. If the start time and tape label are not specified, an error message is printed and this request is ignored. If no start time is requested, flag QBEGIN is set. If no end time is specified, flag QEND is set. Otherwise, the start and/or end times are converted to modified Julian day and milliseconds. If not already in core, the DRS catalog for the desired satellite ID is read. If the ID is on the catalog, or the catalog pointer and the user request do not agree, an error message is printed and the run is terminated.

Next, the DRS catalog is searched for the label of the tape containing the start time data. If it is not found, an error message is printed and the request is ignored; otherwise, processing proceeds as follows:

1. Mount the desired PHA tape and position it to the first record.
2. If QBEGIN = .TRUE. (processing to begin at start of tape), proceed with step 4. Otherwise, read a record from the tape.
3. If the record contains the start time, call PHAPRT to print the record and then proceed with step 4; otherwise, repeat step 2.
4. Read a record and call PHAPRT to print its contents. If an end of file was reached, proceed with step 6.
5. If the QEND flag is set, repeat step 4. If the desired end time was not reached, repeat step 4; otherwise, read the next user request.
6. If QEND flag was set, read the next user input. If this was the last PHA tape in the catalog, read the next user input. Otherwise, set the QBEGIN flag, get the label of the next PHA tape from the catalog, and proceed with step 1.

5.2.1.2 Record Mode Processing

Record mode processing begins by examining the user request in detail. If the volume serial number of the tape to be listed is not specified, an error message is printed and the request is ignored. If the begin record was not specified, QBEGIN = .TRUE. is set to indicate the listing to start with the first record on the tape. Similarly, if the end record was not specified, QEND = .TRUE.

is to indicate the listing will end with the last record of the tape. Processing proceeds as follows:

1. Mount the desired tape and position it to the first record.

2. If QBEGIN = .TRUE., proceed with step 3. Otherwise, skip the records on the tape until the next record to be read is the first one desired in the listing.

3. Read the next record on the PHA tape, increment the record index counter, and call PHAPRT to print the record.

4. If processing is to end with the last record on tape, repeat step 3. If the record index is less than last one to be listed, repeat step 3; otherwise, read the next user request.

5.2.2 Subroutine PHAPRT

PHAPRT prints the contents of COMMON area PHAREC, which contains the data from one record from the PHA tape.

Calling Sequence

```
CALL PHAPRT
```

Procedure

UNPACK is called to unpack all the PHA entries for this record. Each unpack entry occupies 11 halfwords. The data for each page is then printed on logical unit 6. There are separate print sections for format A and format B output.

5.2.3 Subroutine UNPACK

UNPACK unpacks all the PHA entries in one record of the PHA tape.

Calling Sequence

CALL UNPACK (HW, HE)

where HW is a halfword array containing one PHA record, and HE is the output array of consecutive sets of 11 halfwords, one set for each PHA event.

Procedure

The data for each PHA event is unpacked into 11 halfwords, one for each field in the halfword triad comprising a PHA event. (See the PHA tape format for a description of the 11 fields.) The function HGROUP(H, I, J) is used to unpack each halfword, where HGROUP takes on the value of the J bits that start at bit I of halfword H.

The actual processing is very straightforward. The PHA entries are located based on the format of the record. Then, for each page of data, 12 calls to HGROUP are used to unpack each PHA entry.

5.2.4 COMMON Area DRSTAP

DRSTAP contains the DRS tape catalog.

Variable	Type	Description
HIDSPC	I*2	Spacecraft ID (F or G)
HSPAR	I*2	Not used
HPHATP	I*2	Number of PHA tapes in DRS catalog
HRATTP	I*2	Not used
DPHATP(100)	R*8	Volume serial numbers of PHA tapes in catalog
MSPHAS(100)	I*4	Time of day (milliseconds) of first data on each PHA tape
MSPHAE(100)	I*4	Time of day (milliseconds) of last data on each PHA tape
HDPHAS(100)	I*2	Modified Julian day of start data of each PHA tape
HDPHAE(100)	I*2	Modified Julian day of end data of each PHA tape
IDUM(884)	I*4	Not used

5.2.5 COMMON Area PHAREC

PHAREC contains the data from one PHA record. See the Pioneer Data Reduction Program documentation for a detailed description of the contents of the record.

Variable	Type	Description
MSPG1	I*4	Time of day (milliseconds) for first page contained in record
MSNXT	I*4	Time of day (milliseconds) for page which is expected to immediately follow last page in record
HMDPG1	I*2	Modified Julian day for first page contained in record
HMDNXT	I*2	Modified Julian day for page which is expected to immediately follow last page in record
ICOUNT(377)	I*4	All remaining data from PHA record

SECTION 9 - PIONEER PHA TAPE LIST PROGRAM USER'S GUIDE

9.1 INTRODUCTION

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 start 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.

9.2 INPUT CARD FORMAT (RECORD OPTION)

Card Columns	Description
1-6	Should 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)

9.3 INPUT CARD FORMAT (TIME OPTION)

Card Columns	Description
1-4	Should 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

Card Columns	Description
26-27	Two-digit year for start of processing:
28-29	Start month
30-31	Start day
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

9.4 ABNORMAL PROGRAM MESSAGES

Following is a list of program error 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 XXXXXXXX. 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 (UNIT XX)--X - DOES NOT AGREE WITH THE ID DESIRED (X). RUN TERMINATED.

Cause: Either FT20F001 is defining a 'G' catalog pointer, or FT30F001 is defining an 'F' catalog pointer.

User Response: Make sure that the FT20F001 DD card defines a Pioneer-F catalog pointer, and that the FT30F001 DD card defines a Pioneer-G catalog pointer.

6. *** ERROR S/C ID READ FROM THE CATALOG POINTER DATASET (X), DOES NOT MATCH ID READ FROM 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.

7. *** 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.

8. 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

9. *** I/O ERROR DETECTED ON TAPE XXXXXX AT RECORD XXXXX. 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 running the job again.

10. ---- 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.

9.5 DATA SETS REFERENCED

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=2400-9) 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
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

Data Set	Description
FT05F001	Defines card input data set to contain request for listing of PHA tapes by time and record option

Figure 9-1 shows the JCL and typical inputs to the PHA Tape List Program.

```
//LINKGO  EXEC  LINKGO,REGION.GO=150K
//LINK.SYSLIB  DD  DSN=K3.ZB2NL.SB001.OPIONEER,DISP=SHR
//       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=(2400-7,,DEFER),DISP=SHR,
//  VOL=SER=DUM1
//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
//*      1         2         3         4         5         6         7
//*456789012345678901234567890123456789012345678901234567890123456789012
//GO.DATA5  DD  *
TIME     G    E01167                    731204050000
RECORD        E01112
```

Figure 9-1. JCL and Input to PHA Tape List Program

APPENDIX A - RATES AND PHA TAPE FORMATS FOR THE PIONEER DATA REDUCTION SYSTEM

A.1 RATES TAPE

A.1.1 Description

The rates tapes are 7-track, 800 bpi tapes with standard OS/360 labels written in the binary mode and odd parity with conversion. They contain variable length, blocked records with a maximum buffer length (BLKSIZE) of 8704 bytes and a maximum logical record length (LRECL) of 1740 bytes. These tapes contain the time-ordered Pioneer GSFC/CRT events per second (rates) data and related spacecraft information. Each logical record contains selected spacecraft information and all the rates data for one or more pages (each page represents one fourth of an experiment cycle). All rates which fail the trend check will be indicated by a negative rate value. Whenever a rate with the value of zero fails the trend check, it will be indicated by a negative one (-1). Padded rates data will be indicated by the value -20000000.

A.1.2 Logical Record Format

Mnemonic	Description
MSPAG1	Time of day (milliseconds) for first page contained in record
MSNEXT	Time of day (milliseconds) for page which is expected to immediately follow last page in record
RMJDP1	Day (relative modified Julian day) for first page contained in record
RMJDEX	Day (relative modified Julian day) for page which is expected to immediately follow last page in record
ABFILE	Absolute file number

Mnemonic	Description
TCFLAG	Time correction flag = 0, no correction = 7, suspect time or corrected time
NPAGES	Number of pages (one-quarter experiment cycle) included in record (maximum of six for format A and five for format B)
BITRAT	Bit rate (1-16, 2-32, 3-64, 4-128, 5-256, 6-512, 7-1024, 8-2048)
FORMAT	Format (1-A, 2-A/D, 3-B, 4-B/D)
MODE	Mode = 0 or 1, real time = 2 or 3, memory readout = 4 or 5, telemetry store
DSSID	DSS identification
ESCID	Extended frame counter (ESC subcom ID)
RATFLG	RAT flag (roll attitude timer) = 0, good value = 1, old value = 2, missing value = 3, corrected value
SPNFLG	ASPNPDC flag (spin period)
SPFFLG	SPF flag (spin period flag)
RIPFLG	HRIPPHEC flag--roll pulse/roll index pulse phase error
ROLLAT	Roll attitude timer (RAT)
SPNPDC	Spin period (ASPNPDC)
RIPPEC	Roll pulse/roll index pulse phase error (ARIPPHEC)
SPSGRR	Spin period sector generator (SPSG) roll reference = 0, 0 degrees = 1, 180 degrees

Mnemonic	Description
SPSGMD	Spin period sector generator (SPSG) mode = 0, non-spin averaging = 1, ACS = 2, spin averaging
MSRAT	Roll attitude time (milliseconds of RAT)
DCVOLT	DC bus voltage
DCCURR	DC bus current
SPTEMP	Spacecraft platform temperature
SNR	Signal-to-noise ratio
SPARE1	Spare (currently set to zero)
SPARE2	Spare (currently set to zero)
N1	All subcom data associated with first page of data contained in record. Refer to Tables A-1 and A-2 for a description of subcom data for format A and format B, respectively All rates data associated with first page of data contained in record. Each page consists of four sets (two sectored and two unsectored) of 16 rates which are uniquely identified by corresponding rate sequence IDs appearing in associated set of subcom data. Rates data associated with each page appears in 64 consecutive words as follows: 1 - Sectored rate (first set) SR1(1-8) SR2(1-8) 16 - Sectored rate (first set) 17 - Unsectored rate (first set) R1-R8 R9-R16 32 - Unsectored rate (first set) 33 - Sectored rate (second set) SR1(1-8) SR2(1-8) 48 - Sectored rate (second set) 49 - Unsectored rate (second set)

Table A-1. Subcom Data for Format A

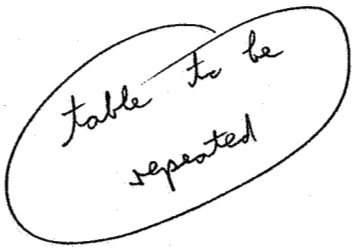
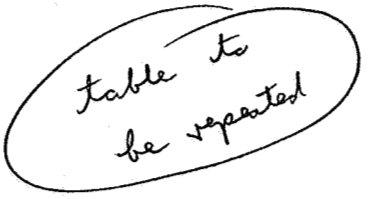


Table A-2. Subcom Data for Format B



Mnemonic	Description
N1 (Cont'd)	R1-R8 R9-R16 64 - Unsectored rate (second set) Refer to Table A-3 to determine rates data associated with each unsectored and sectored rate sequence ID Note that redundant sectored rates data occurs whenever corresponding sectored rate sequence ID is not updated from previous value = 100, format A = 112, format B
N2	All subcom and rates data for second page of data contained in record (see description of first page) = 356, format A = 368, format B
N3	Third page of data = 632, format A = 656, format B
N4	Fourth page of data = 908, format A = 944, format B
N5	Fifth page of data = 1184, format A = 1232, format B
1460	Sixth page of data (format A only)

A.2 PHA TAPE

A.2.1 Description

The PHA tapes are 9-track, 1600 BPI tapes with standard OS/360 labels written in the binary mode and odd parity. They contain variable length, blocked records with a maximum buffer length (BLKSIZE) of 7624 bytes and a maximum logical record length (LRECL) of 1524 bytes. These tapes contain the

Table A-3. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (1 of 3)

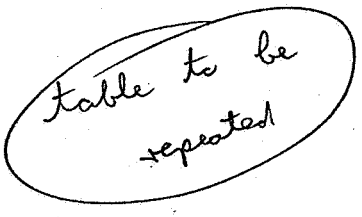


Table A-3. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (2 of 3)

Table A-3. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (3 of 3)

time-ordered Pioneer GSFC/CRT Pulse Height Analysis (PHA) data, corresponding events per second (rates) data and related spacecraft information. Each logical record contains selected spacecraft information and all the PHA data and associated rates data for one or more pages (each page represents a fourth of an experiment cycle). Each PHA event for the HET and LET requires three halfwords (48 bits), and these bits are organized in the three halfwords for the HET and LET events as follows:

	0 (MSB) 15 (LSB)
Halfword 1	METTAAAAAAAAAAAA
Halfword 2	BBBBBBBBBBBBCCCC
Halfword 3	CCCCCCCCRSSSQPPN

where M = 0, good data
= 1, missing/padded data

E = 0, LET event
= 1, HET event

TT = 00, $A_1\overline{A_2}BCIII$(HET)/$DIDII\Sigma D\overline{F}$(LET)
= 01, A_2BCIII(HET)/$DIDII\overline{F}$(LET)
= 10, $(A_2K_1 + A_1CI)B\overline{CIII}$(HET)
= 11, $A_1BK_2\overline{CIII}$(HET)

A, B, C = amplitudes from detectors A, B, and C, respectively

R = 0, CII threshold not exceeded
= 1, CII threshold is exceeded
} HET only

SSS = 0-7, sectors 1-8, respectively

Q = 0, priority indicators valid
= 1, priority indicators questionable

PP = 0-3, priorities 1-4 (HET)/1-2 (LET)

N = 0, good event
= 1, null event

1.2.2 Logical Record Format

Mnemonic	Description
MSPAG1	Time of day (milliseconds) for first page contained in record
MSNEXT	Time of day (milliseconds) for page which is expected to immediately follow last page in record
RMJDP1	Day (relative modified Julian day) for first page contained in record
RMJDEX	Day (relative modified Julian day) for page which is expected to immediately follow last page in record
ABFILE	Absolute file number
TCFLAG	Time correction flag = 0, no correction = 7, suspect time or corrected time
NPAGES	Number of pages (one-quarter experiment cycle) included in record (maximum of six for format A and five for format B)
BITRAT	Bit rate (1-16, 2-32, 3-64, 4-128, 5-266, 6-512, 7-1024, 8-2048)
FORMAT	Format (1-A, 2-A/D, 3-B, 4-B/D)
MODE	Mode = 0 or 1, real time = 2 or 3, memory readout = 4 or 5, telemetry store
DSSID	DSS identification
ESCID	Extended frame counter (ESC subcom ID)
RATFLG	RAT flag (roll attitude timer) = 0, good value = 1, old value = 2, missing value = 3, corrected value
SPNFLG	ASPNPDC flag (spin period)
SPFFLG	SPF flag (spin period flag)

Mnemonic	Description
RIPFLG	HRIPPHEC flag - roll pulse/roll index pulse phase error
ROLLAT	Roll attitude timer (RAT)
SPNPDC	Spin period (ASPNPDC)
RIPPEC	Roll pulse/roll index pulse phase error (ARIPPHEC)
SPSGRR	Spin period sector generator (SPSG) roll reference = 0, 0 degrees = 1, 180 degrees
SPSGMD	Spin period sector generator (SPSG) mode = 0, non-spin averaging = 1, ACS = 2, spin averaging
MSRAT	Roll attitude time (milliseconds of RAT)
DCVOLT	DC bus voltage
DCCURR	DC bus current
SPTEMP	Spacecraft platform temperature
SNR	Signal-to-noise ratio
SPARE1	Spare (currently set to zero)
SPARE2	Spare (currently set to zero)
N1	All subcom data associated with first page of data contained in the record. Refer to Tables A-1 and A-2 for a description of subcom data for format A and format B, respectively. All rates data associated with first page of data contained in record. Rates data associated with each page appears in eight consecutive words as follows: (1) HET rate R1 - $(A_2K_1 + A_1CI)\ B\overline{CIII}$ (2) HET rate R1 - $(A_2K_1 + A_1CI)\ B\overline{CIII}$ (3) HET rate R2A - $A_1\overline{A_2}BCIII$ (4) HET rate R2B - $A_1BK_2\overline{CIII}$ (5) HET rate R3A - A_2BCIII (6) LET rate R11A - DI DII $\overline{F}$

Mnemonic	Description
N1 (Cont'd)	(7) LET rate R11B - DI DII$\Sigma\overline{DF}$ (8) Computed HET rate R1 - (R6A + R7A + R7B + R8A + R8B) All rates which fail trend check will be indicated by a negative rate value. Whenever a rate with value of zero fails trend check, it will be indicated by a negative one (-1). Padded rates will be indicated by value -20000000. = 96, format A = 112, format B
N2	All PHA data associated with first page of data contained in record. Each PHA entry, comprised of a HET and LET event, has a unique time associated with it and appears in three consecutive words as follows: 0 (MSB) 31 (LSB) (1) |HET - 1 | HET - 2| (2) |HET - 3 | LET - 1| (3) |LET - 2 | LET - 3| Padded data is indicated by a negative first halfword for an HET or LET event. There are 16 PHA entries (comprised of an HET and LET event) per page for format A, and 8 PHA entries per page for format B. = 128, format A = 144, format B
N3	All subcom, rates, and PHA data for second page of data contained in record (see description of first page) = 320, format A = 240, format B
N4	Third page of data = 560, format A = 400, format B

SECTION 1 - PROGRAM OVERVIEW

1.1 INTRODUCTION

The Pioneer Ratio Display Program is designed to display time histories of requested rates, averaged over an integral number of summary intervals. The word "rates" will be used to define two distinct entities. One of these is the several coincidence conditions (rate equations). Events satisfying the same coincidence condition are counted in the same rate counter. Thus, a rate, as defined above, may be identified by: the rate counter in which the events satisfying the rate equation (corresponding to the rate) were registered; or the rate equation itself. The rate equations, in turn, correspond to a region in the composite (energy, mass, charge) space. The other entity that the term rate will denote is the number of counts per second. The ambiguity can be resolved with a reference to the context in which the term rate is used.

The interval over which rates are averaged will be referred to as the plot interval, and the time span over which time histories are to be displayed will be called the plot period. The summary interval is the period of time over which rates were summarized on the rates summary tape from which the requisite data is to be obtained. The plot interval must be an integral multiple of the summary interval. A group (or rate group) is a collection of up to three rates which, for the purpose of comparison, are displayed together (i.e., on the same sheet of paper or on the same frame of microfilm).

1.2 DESCRIPTION OF DISPLAYS

Any (or all) of the following may be requested in an execution of the program.

1.2.1 Formatted Listings

Ratio and errors for all the rates in a group are printed. Each frame of listing (= 2 pages of printer paper) starts with a description of rates in the group being

listed. Following the header, the following information (one plot interval per line) is printed:

- Start time of plot interval
- Rate followed by error for each of the rates in the group

Padded rates are identified by an asterisk (*) between the rate and corresponding error (both the rate and error will have values of zero in this case).

When more than one group of rates is to be listed, under normal operation, up to 28 frames of listings for one group will be produced consecutively, before listing of the next group begins. The program can be required to generate listings in a different order, i.e., the first frames for all the groups, followed by the second frames for all the groups, etc.

1.2.2 Printer Plots

Rates and errors for all the rates in a group are plotted. Each frame (= 2 pages of printer paper) contains data covering 120 plot intervals. As many frames are produced as are necessary for plotting all the data included in the plot period. Each frame has a header which identifies the satellite and the rates plotted as well as the time period included in the frame. An explanation of symbols used in the plot is also given. Following the plot, approximate round-trip light time for the period included in the frame is listed.

Padded rates are not plotted. The program may be required to scale the ordinate based on the values of rates in a frame, or be given upper and lower limits for each of the groups being plotted. The former feature is referred to as auto scaling. The use of auto scaling greatly enhances resolution over relatively quiet periods, but a fixed reference frame is lost.

Although printer plots do not have a high resolution, the quick turn-around may make them attractive at certain times.

1.2.3 Microfilm Plots (SD4060 Plots)

Using the SD4060 package, the program generates a tape from which microfilm (or hardcopy) plots can be made. Plots on four different abscissa scales can be produced. Features common to all four types are:

- Identical ordinate scaling
- Frames labeled in the same manner (the descriptive information on the plots is the same as on printer plots)

1.3 TYPES OF 4060 PLOTS

1. Plots With 120 or 124 Plot Intervals Per Frame--These plots have the best abscissa resolution. A symbol corresponding to one plot interval does not overlap with one corresponding to the next plot interval. Since this plot has the same number of plot intervals as the printer plot, printer plots can be generated in the same pass as plots of this type.

   One hundred and twenty-four plot intervals per frame is a special case. If the plot interval equals 6 hours, and it is desired to begin each month on a new frame, the purpose can be accomplished by providing several plot periods, each 1 month long.

2. Plots With 240 Plot Intervals Per Frame--The abscissa scaling on these plots is chosen in such a way that, for plot interval = 1 hour, on hardcopy the scale is 1 inch = 1 day. This is the agreed-upon scale for all the Pioneer experiments.

3. Plots With 168 Plot Intervals Per Frame (IMP 7-Day Scale)--The abscissa scaling on these plots is chosen to correspond (for plot interval = 1 hour) to IMP 7-day plots. This scale is useful when data is to be compared with IMP data and the latter is on the 7-day scale.

4. Plots With 240 Plot Intervals Per Frame (IMP 10-Day Scale)--The abscissa scaling on these plots is chosen to correspond (for plot interval = 1 hour) to IMP 10-day plots. This scale is useful when data is to be compared with IMP data and the latter is on the 10-day scale.

The remarks concerning the order in which listings frames are generated are applicable to all four types of plots above.

1.4 PROGRAM DESIGN

1.4.1 Input Information

In addition to input information regarding which groups of rates are to be plotted and/or listed per plot period, the program needs the rate summary data set. The location of this data set is pointed to by the specified rate summary status data set. While a detailed description of these data sets appears in Section , for the purpose of the immediate discussion it suffices to know that (1) the status data set contains information as to the first and last summary intervals on the rate summary data set pointed to; (2) there is a record corresponding to each summary interval including the first and last; and (3) the structure of the rate summary record is as follows:

TIME LABEL	MISSING TIME	TABLE OF ACCUMULATED COUNTS, C_i	TABLE OF CORRESPONDING ACCUMULATION TIME, T_i

1.4.2 Processing

1. The rate (counts per second) for the ith rate (rate equation) = C_i/T_i error (standard deviation) in the rate = $\sqrt{C_i/T_i}$.

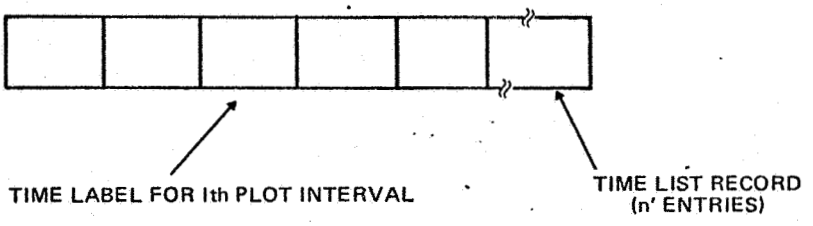
Suppose that p plot intervals have to be processed for g groups of rates. Let n be the number of plot intervals for which data can be stored in core. (In general, $n << p$.) Suppose, further, that one would like to have the time history plot of as many plot intervals as possible (for a given group of rates) appear contiguously on microfilm. Two possible implementations are as follows:

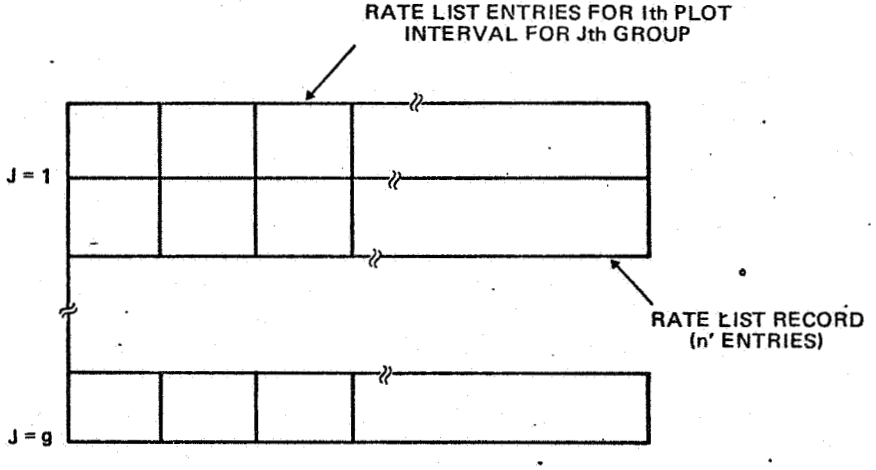
A. Extract data for a single group in one pass through the rate summary data. When the plot intervals to be included in one frame of microfilm output have been processed, plot this data. When all the data for this group has been processed, begin the next group.

B. Extract data for all groups in one pass through the rate summary data. When an appropriately chosen number (n') of plot intervals has been processed, save the data on secondary storage, and continue extraction of data in this manner until t * n' plot intervals have been processed, or the end of the plot period has been reached. The stored data is then plotted, such that tn'/n_f (where n_f = number of plot intervals per frame) contiguous frames of microfilm display a group of rates, followed by the same number of contiguous frames for the next group, and so on.

Approach B has been chosen for this program, not only because it is faster, but also because it is possible to display more than 3000 plot intervals for a group on contiguous frames with modest outlay in secondary storage. Approach A can be simulated in approach B by providing the program with a single rate group at a time. The limit on the number of contiguous frames is primarily determined by direct access space considerations, and can be increased if so desired.

The procedure is as follows: Extract data for all the groups for a plot interval, store the time label of the plot interval in the time list, and store the extracted rates and error in the rate list in core.





When n' plot intervals have been processed, write one record of time list and g rate list records. After t time list records have been written, data is plotted. For this purpose, rate list records are retrieved by groups. All records of group 1 are obtained and plots for group 1 constructed before processing group 2 data.

The following choices are made:

$g \leq 15$

$n' = 120$

$= 124$ for 6-hourly averages (plot interval = 6 hours)

$t = 28$ except for plot interval = 144 seconds (the choice $t = 28$ results in an integral number of frames in all modes for hourly plots)

$= 25$ for plot interval = 144 seconds

2. Since lists, printer plots, and 4060 plots are displaying the same data, rate list entries are chosen to satisfy the lowest level request. Values of rates and errors are needed if a list is to be generated, or if auto scaling is requested. If, however, auto scaling is suppressed and printer plots and 4060 plots are requested, logarithmic displacements of the ordinates are stored in the rate list. Finally, if auto scaling is suppressed and only 4060 plots are to be generated, absolute raster coordinates of the upper end of the error bar, the lower end of the error bar, the rate, and the plot character are stored in the rate list.

3. Minimal use is made of the routines in the SD4060 package in order that calculations made for printer plots need not be repeated and that flexibility may be retained. The only routines used are the initialization (MODESG) and termination (EXITG) routines, one that draws a line from a given absolute raster coordinate to another absolute raster coordinate (SEGMTG), and one that writes a character or a string of characters (LEGNDG).

4. Use of multiple-indexed arrays is avoided as far as possible. This circumstance necessitates somewhat unorthodox initial displacements. An attempt is made to explain, where explanation seemed justified, in subroutine documentation.

1.5 ADDITIONAL FEATURES

1. Up to 15 groups of rates can be plotted and/or listed in a run.
2. A rate may appear in more than one group.
3. Sum of rates in a group (and the associated error) can be plotted and/or listed.
4. Ratio of the first two rates in a group (and the associated error) can be plotted and/or listed.
5. Selected subcom data can be plotted and/or listed.

1.6 LIMITATIONS

1. No more than 28 frames can be produced consecutively for any group. Note that this does not constitute a limitation on the plot period, but only on the order in which the plot or list frames are generated.

2. Plotting cannot be coerced to begin before the first summary interval or a plot interval boundary. One may want to do this for aesthetic reasons, i.e., start with the first of a month. But if the first summary interval on a plot interval boundary is in the middle of the desired month, the first frame will start with the first summary interval on a plot interval boundary.

3. While the data for the same rate groups can be plotted and/or listed for as many plot periods as desired, the data for a different set of rate groups cannot be plotted either for the same plot period, or for a different plot period.

SECTION 2 - MAIN PROGRAM (PRDISP)

PRDISP is the main control section of the Rates Display Program. This routine performs the following functions:

1. Performs one-time initialization functions (INITIALIZATION)
2. Calls the routine that analyzes plot information and rates information
3. Calls the routine that extracts data to be plotted
4. Calls the routine that plots the data
5. Performs end-of-job processing

2.1 INTERFACE

2.1.1 Input

- Via I/O Operations

  If necessary, a number of logical records are read from the rate summary data set (logical unit 10) in order to position the summary tape at the desired record.

2.1.2 Output

- Via I/O Operations

  Frame counts and termination messages are written on logical unit 14.

2.1.3 Subroutines Called

NOSTAE	FREAD
PRDPIA	PRDXPD
PRDRIA	PRDPLT
MOUNT	EXITG
REWIND	

2.2 PROCEDURE

1. Perform one-time initializing functions.

   A. Assign units:

      Logical unit 10 assigned to the rates summary data set

      Logical unit 11 assigned to the temporary data set which is to contain the rates list

      Logical unit 13 assigned to the temporary data set which is to contain the time list

   B. Arrays N406, XINC, CONV, NPT1, and IXTNT in the COMMON area PLOT are initialized. These arrays contain information that is used often, and that does not change during the execution of the program.

Array	Description
N406(I)	Number of points per frame of 4060 plots of Ith type
XINC(I)	Increment in absolute rasters from one point to next for 4060 plots of Ith type
CONV(I)	XINC(I)/XINC(1)
NPT1(I)	1 + N406(I)
IXTNT(I)	Extent (absolute rasters) of abscissa of 4060 plot of Ith type (=XINC(I)*N406(I))

      For a description of the plots and considerations leading to the choice of values of N406, see Section .

   C. Logical flag QOPEN is set to .FALSE. to indicate that the 4060-plot data set (DDNAME = SC4060ZZ) has not been opened yet.

D. Real*8 variable DSTPON is set equal to variable DBLANK to indicate that no summary tape has been mounted.

2. Call PRDPIA to read and analyze the current plot request.

PRDPIA is called to perform the following functions:

A. Reads in the plot request. If there are no more requests, takes an alternate return (RETURN 1).

B. Reads in the round-trip-light times corresponding to the desired satellite ID.

C. Reads the status of the rates summary where data to be plotted will be found.

D. Verifies that input information regarding the plot period is sufficient to continue processing.

E. Determines the range of the summary records to be processed to honor the current plot request.

If conditions exist such that processing cannot continue, an error return (RETURN 2) is taken. (For a description of these conditions, see Section .)

The results of processing by PRDPIA are contained in COMMON areas RTRIPT and PLOT. The information provided by PRDPIA and used by this program is described below.

Variable	Type	COMMON Area	Disp (Hex)	Description
DTAPES	R*8	PLOT	A40	Volume serial number of rate summary tape on which data to be plotted resides
NRECB	I*4	PLOT	AB4	Ordinal number of record with which processing of summary records is to begin

Variable	Type	*COMMON Area	Disp (Hex)	Description
NRECE	I*4	PLOT	AB8	Ordinal number of last record to be processed for this plot interval
LOOP	I*4	PLOT	ACC	Number of summary intervals to be included in a plot interval

3. LOOP is decremented by one (for use by subroutine PRDXPD) such that it now represents the number of records to be read after the first record for a given plot interval has been read.

4. If rate descriptions have not been read in yet (i.e., NGROUP = 0), call PRDRIA to read and analyze the rate descriptions.

   PRDRIA performs the following functions:

   A. Reads rate descriptors, and edits and checks the input for consistency.

   B. Determines the locations of the desired rate descriptors in the table of descriptors, and stores indices for use by other routines. The rate descriptors are stored (in both register and rate-equation formats) for use by other routines to label plots and lists.

   C. Scans to determine whether ratio or sum of rates within a given group of rates is required.

   If no rate discriptors are found in the rate descriptor data set, an error return (RETURN 1) is taken.

   On normal return, the number of groups of rates to be plotted and/or listed is returned in variable NGROUP in COMMON area PLOT.

5. Mount the rates summary tape if it is not already mounted. Variable LAST denotes the ordinal number of the last record processed. When the tape is mounted, LAST is set equal to zero.

6. Decide whether the summary tape needs to be removed.

   If the first record desired follows the last record read, then an appropriate number of records is skipped (read in locate mode) so as to position the summary tape at the desired record. If the desired record is to be found before the last record read, the summary tape is rewound and, if necessary, an appropriate number of records is skipped. Variables NRECB and LAST are used to make this decision.

   Since PRDRIA has already verified that an overlap exists between the period requested, and the period for which data exists on the rates summary tape, an end-of-file condition should not be encountered while skipping records. If an I/O error is detected while skipping records, execution is terminated.

7. Position the summary tape at the first record to be processed.

   Before calling subroutine PRDXPD (which will extract the data corresponding to desired rate equations, compute rates and errors, and write these as well as the corresponding time labels on the temporary data sets), certain initialization functions are performed.

   IREC is the counter for number of six-half-word time label entries (i.e., the number of plot intervals processed). When IREC = NPTMAX, the rate list and time list records are written out by PRDXPD. The counter is set to zero.

   JREC is the ordinal number of the record just preceding the record with which data extraction is to begin. As records are read by

PRDXPD, this counter is incremented and checked against NRECE, the ordinal number of the last record to be processed.

8. Call PRDXPD to process rate summary data in the range of records required. When the processing has been completed, a normal return is taken. If MAXBLK records have been written on the time list data set, an alternate return (RETURN 1) is taken. In this case, the logical switch QMORES is set to .TRUE. to indicate that more summary data needs to be processed for this plot request.

   While a detailed description of what PRDXPD does is provided in Section , it is appropriate to mention here that it writes:

   A. Rates and errors (ratio or sum of rates and errors in the ratio or sum) if either list of rates or auto scaling is required

   B. Logarithmic coordinates (relative to the origin) if printer plots are desired

   C. Absolute raster coordinates

9. Call PRDPLT to plot the data that has been saved by PRDXPD. The arguments for this call are:

Variable	Type	Description
QOPEN	L*4	Informs PRDPLT whether 4060 output data set is open
24060	L*4	Variable returned to this program. It determines whether any 4060 plots were generated for this plot period

PRDPLT obtains information regarding plots and lists from COMMON area PLOT. If an I/O error is encountered while reading rate list or time list data, an alternate return is taken by PRDPLT.

When all the requested plots have been done for a plot period, a message giving the count of frames generated for this period is printed on logical unit 14.

When all the plot periods requested have been processed, a message giving the count of frames generated for this job is printed on logical unit 14.

If an I/O error is encountered while reading rate list or time list data (RETURN 1) from PRDPLT, a message is written on logical unit 14, and the rest of the data is ignored.

SECTION 3 - SUBROUTINE DESCRIPTIONS

3.1 SUBROUTINE PRDPIA

PRDPIA is called by PRDISP to perform the following functions:

1. Reads in a plot request from logical unit 15 via NAMELIST PLOT.
2. Formats and writes on logical unit 14 specified or implied values of parameters in NAMELIST PLOT.
3. Obtains round trip light times corresponding to the desired ID.
4. Reads the status of the summary where data to be plotted will be found.
5. Interprets the requested plots for use in the program.
6. Verifies that requested plots can be produced by the program.
7. If the requested plots, or a subset thereof, can be produced, computes the range of summary records to be processed and determines the number of summary intervals contained in a plot interval.

Calling Sequence

```
CALL PRDPIA (&ALT1, @ALT2)
```

ALT1 is the return to be executed when an end of file is encountered on logical unit 15, and when at least one plot request has been processed (information return). ALT2 is the return to be executed when conditions exist such that processing cannot continue (error return). For a description of these conditions, see Section .

Interface

Input

- Program Variables

  On entry, variable NGROUP in COMMON area PLOT is zero on the first call, and a nonzero positive number on all subsequent calls.

- Data Sets (DDNAMES Referenced)

Data Set	Description
FT15F001	NAMELIST PLOT, which describes a plot request, is read from this data set
FT20F001	Round trip light times are read from this data set if specified satellite ID is 'F'
FT30F001	Round trip light times are read from this data set if specified satellite ID is 'G'
FT08F001	Status of rate summary if satellite ID is 'F' and standard summary data is desired
FT09F001	Status of rate summary if satellite ID is 'F' and special summary data is desired
FT18F001	Status of rate summary if satellite ID is 'G' and standard summary data is desired
FT19F001	Status of rate summary if satellite ID is 'G' and special summary data is desired

These data sets are created by the Rate Summary Program (for format, see the Rate Summary Program). The status record is read into the area beginning with variable DTAPES (in COMMON area PLOT). The fields of this record used in this program are described in the following subsection.

Output

- Program Variables

The results of processing by this subroutine are communicated through the following variables via COMMON area PLOT.

Variable	Type	Disp (Hex)	Description
DTAPES	A8	A40	Serial number of volume on which rate summary data resides
HSID	A2	A48	Satellite ID appropriate to current request
QTRCHK	L*4	A4C	Logical variable containing trend check attribute of summary data set
MSINT	I*4	-	Summary interval (milliseconds)
HF	I*2	-	Seventh element of this array contains code = 1, source of RATES data was SOLDPS tape = 2, source of RATES data was SDR tape = 3, source of RATES data was BUFOP tape = 0, source of RATES data was EDR tape Any number except 1, 2, or 3 implies EDR
INTHR	I*4	A8C	For descriptions, see Section 4
INTMIN	I*4	A90	
INTSEC	I*4	A94	
QSCALE	L*4	AA0	
QLIST	L*4	AAC	
QPRNTR	L*4	AB0	
NRECB	I*4	AB4	Ordinal number of record with which processing of rate summary data is to begin
NRECE	I*4	AB8	Ordinal number of record with which processing of rate summary data is to end
NPTMAX	I*4	AC8	Number of entries in a time list record
LOOP	I*4	ACC	Number of summary intervals contained in plot interval

Variable	Type	Disp (Hex)	Description
N406	I*4	AD4	Second element of these arrays is set, depending on whether plot interval is less than 15 minutes or not, when type 2 plots are requested
NPT1	I*4	AE4	
XINC	R*4	AF4	
CONV	R*4	B14	
JFRAME	I*4	B28	Count of frames for this plot period (set to 0)
NFRAME	I*4	B2C	Line count for listing of frame summary (set to 58)
RHI	R*4	B30	For descriptions, see Section 4
RLO	R*4	B6C	
NUMDIV	I*4	BA8	
MODES	I*4	BE4	An array dimensioned 5 which describes types of plots to be produced for this plot period
NPLOT	I*4	BF8	Describes how many types of plots are to be generated for this plot period

- Via COMMON Area RTRIPT

Variable	Type	Description
HSATID	I*2	Satellite ID character F or G in high-order byte, character blank in low-order byte
HDSTAR	I*2	See description of RTLT
RTLT	R*4	Round trip light time for relative modified Julian day (I + HDSTAR)

- DDNAMES Referenced

  FT14F001 - Informational messages and error messages are written to this data set.

Subroutines Called

Subroutine	Description
MSTOT	Converts milliseconds of day to hour, minute, second of day
DRMJD	Converts year, month, day to modified Julian day
RMJDD	Converts modified Julian day to year, month, day
FREAD	-
UNLOAD	-

Procedure

1. Default values are assigned to the NAMELIST variables.
2. A plot request is read via NAMELIST PLOT from logical unit 15.
3. If read was successful, the following processing is performed:
   A. Specified or implied description of the request is formatted and written on logical unit 14.
   B. Round trip light times are read from the logical unit appropriate to satellite ID. If an unexpected end of file or an I/O error is encountered, an error return is taken.
   C. Array MODES is set up, for which the following considerations apply:
      (1) Listing of rates and errors can be accomplished along with any types of 4060 plots.
      (2) Printer plots can be produced only during the first pass through the plot data. Therefore, if printer plots are requested, and type 1 4060 plots are not requested, the first element of array MODES is set equal to zero.

(In mode 0, no 4060 plots are generated.) If neither 4060 plots nor printer plots are requested, but a listing is to be generated, again the first element of array MODES is set equal to zero.

D. Status of the rate summary is read, and it is verified that the requested plot interval is an integral multiple of the summary interval. If it is not an exact multiple, the current request is ignored.

E. Ordinal number of the first record (on the summary tape) on plot interval boundary as well as the ordinal number of the last record that completes a plot interval is computed.

F. Requested begin time is examined. If this time is earlier than the first record on plot interval boundary (computed above), begin time is set equal to the time of this record. The ordinal number of the first record to be processed is computed.

G. Requested end time is examined. If this time is later than the last record that completes a plot interval (computed above), end time is set equal to the time of this record. The ordinal number of the last record to be processed is computed.

4. On end file on logical unit 15. If variable NGROUP is zero, indicating that this is the first time the routine was called, error return (RETURN 2) is executed; otherwise; informational return (RETURN 1) is executed.

3.2 ANALYZING INPUT INFORMATION AS TO RATES

The remainder of this section describes the subroutines used to identify the rates to be plotted and/or listed. These rates are input to the program on FORTRAN logical unit 5 (DDNAME - FT05F001) in a manner described in Section 4. The purpose of the subroutines to be described is to:

1. Verify that mnemonics input correspond to some mnemonic in the table of mnemonics (Section).
2. Determine the displacement corresponding to the rate described by a mnemonic
3. Determine the number of rates in each group
4. Determine whether the ratio of rates in a group is to be plotted and/or listed, rather than the rates themselves
5. Determine whether the sum of rates in a group is to be plotted and/or listed, rather than the rates themselves

This segment of the program is invoked once during an execution of the program.

3.3 SUBROUTINE PRDRIA

Calling Sequence

CALL PRDRIA (&ALT1)

Interface

Input

- Via COMMON Area PLOT

Variable	Type	Description
HSID	I*2	Satellite ID used to identify output listing on logical unit 14

- Via Logical Unit 5

Records describing groups of rates are read from this unit, until an end of file is reached or until 15 groups of rates have been validated. The format of input records is described in Section 4.

Output

- Via COMMON Area PLOT

Variable	Type	Description
DD	R*8	Array dimensioned (3, 3, 15). (DD(I, J, K), I=1, 3) contains rate equation corresponding to Jth rate in Kth group
D	R*8	Array dimensioned (3, 15). D(J, K) contains mnenomic corresponding to Jth rate in Kth group
IND	I*4	Array dimensioned (3, 15). IND(J, K) contains index (in table of rates) corresponding to Jth rate in Kth group

Note that DD, D, and IND are three different representatives of the same information. Thus, given that IND(I, J) = L, D(I, J) is the ℓth 8-byte entry in table RTAB and (DD(M, I, J), M=1, 3) is the Lth 24-byte entry in table DTAB.

Variable	Type	Description
NMAX	I*4	Array dimensioned (15). NMAX(K) contains number of rates in Kth group
NGROUP	I*4	Number of groups of rates
QRATIO	L*4	Array dimensioned (15). QRATIO(K) is .TRUE. if ratio of first two rates (rather than rates themselves) in Kth group are to be plotted and/or listed. QRATIO(K) is .FALSE. if rates are to be plotted, or sum of rates is to be plotted
QSUM	L*4	Array dimensioned (15). QSUM(K) is .TRUE. if sum of rates in Kth group is to be plotted and/or listed. QSUM(K) is .FALSE. if rates are to be plotted, or ratio of rates is to be plotted

- Via Alternate Return

Return	Description
1	Return is taken if an end of file is detected on logical unit 5 before at least one group of rates has been validated

- Via Logical Unit 14

  Formatted listing of input data and image of any card that may be in error are printed on this unit.

Subroutines Called

Subroutine SCANA is called to examine bytes 2 through 80 of the input card image and to return rate equation descriptions, nmemonics, and displacements (as indices).

Procedure

1. Arrays QRATIO and QSUM are initialized to .FALSE. The group counter IA is initialized, and variable IMAX is assigned the value 167, which is the number of entries in the tables searched by SCANA.

2. Until either an end of file is reached or 15 groups have been accepted, the following process is performed:

   A. Read a card.

   B. Call SCANA to examine bytes 2 through 80 of the card image and return in variables DFIRST, DSECON, and DTHIRD the rate equation description of rates; in variables I, J, and K the ordinal number of the entries corresponding to rates in the tables RTAB and DTAB; and in variables DA, DB, and DC the mnemonics corresponding to the rates.

   C. Examine variables I, J, and K in turn to determine the validity of input information and, in case the input is valid, the number of rates in the group.

   D. If there is an error, ignore card and write a message.

   E. If no errors are detected, examine the first byte to determine whether the ratio was indicated. If so, set appropriate element of QRATIO to .TRUE. If the ratio was not indicated, examine the first byte to determine if sum of rates was indicated.

3. If no input card was accepted, take an alternate return; otherwise, store the number of groups accepted in variable NGROUP and return.

3.4 SUBROUTINE SCANA

SCANA is an ALC CSECT. It is invoked by PRDRIA to scan bytes 2 through 80 of an input 80-byte field containing the rate descriptors in one of the following three formats:

1. Mnemonics (register descriptors)
2. Rate equations
3. Indices in tables RTAB and DTAB

It returns all three descriptions of the rates to PRDRIA.

Calling Sequence

CALL SCANA (DCARD, DFIRST, DSECON, DTHIRD, I, J, K, DA, DB, DC)

Interface

Input

- Via Arguments in Call

Variable	Description
DCARD	Eighty-byte area, of which bytes 2 through 80 contain rate descriptors

Output

- Via Arguments in Call

Variable	Description
DFIRST	Rate equation descriptor of first rate Twenty-four bytes of blanks if no rates in DCARD Unpredictable if rate not found in table
DSECON	Rate equation descriptor of second rate Twenty-four bytes of blanks if less than two rates Unpredictable if rate not found in table

Variable	Description
DTHIRD	Rate equation descriptor of third rate Twenty-four bytes of blanks if less than three rates Unpredictable if rate not found in table
I	Index corresponding to first rate 0 if no rates in DCARD 168 if rate not found in table
J	Index corresponding to second rate 0 if less than two rates 168 if second rate not in table
K	Index corresponding to third rate 0 if less than three rates 168 if third rate not in table

Subroutines Called

CSECTS RTAB and DTAB contain the mnemonics and rate equation descriptors. These tables are searched to find the rate specified. COMMON areas RTAB and DTAB are coded as separate ALC CSECTs. RTAB consists of 167 8-byte entries shown in column 2 of Table 3-1, and DTAB contains 167 24-byte entries shown in column 1 of Table 3-1.

Procedures

1. Initialize output variables, the EBCDIC fields to blanks, and integer fields to zero.
2. Squeeze out blanks and separate fields using comma as a delimiter.
3. Determine format by examing the first field.
4. If format 1, convert EBCDIC numbers to binary integer format and store in I, J, and K.
5. If format 2, search table RTAB to determine indices.

Table 3-1. Entries of RTAB and DTAB (1 of 6)

A1.¬A2.B.C1.¬C3(1)	SR1A(1)
A1.¬A2.B.C1.¬C3(2)	SR1A(2)
A1.¬A2.B.C1.¬C3(3)	SR1A(3)
A1.¬A2.B.C1.¬C3(4)	SR1A(4)
A1.¬A2.B.C1.¬C3(5)	SR1A(5)
A1.¬A2.B.C1.¬C3(6)	SR1A(6)
A1.¬A2.B.C1.¬C3(7)	SR1A(7)
A1.¬A2.B.C1.¬C3(8)	SR1A(8)
A1.¬A2.B.C1.¬C3(9)	SR1A(9)
A2.B.K1.¬C3(1)	SR1B(1)
A2.B.K1.¬C3(2)	SR1B(2)
A2.B.K1.¬C3(3)	SR1B(3)
A2.B.K1.¬C3(4)	SR1B(4)
A2.B.K1.¬C3(5)	SR1B(5)
A2.B.K1.¬C3(6)	SR1B(6)
A2.B.K1.¬C3(7)	SR1B(7)
A2.B.K1.¬C3(8)	SR1B(8)
A2.B.K1.¬C3(9)	SR1B(9)
D1.D2.¬F(1)	SR1C(1)
D1.D2.¬F(2)	SR1C(2)
D1.D2.¬F(3)	SR1C(3)
D1.D2.¬F(4)	SR1C(4)
D1.D2.¬F(5)	SR1C(5)
D1.D2.¬F(6)	SR1C(6)
D1.D2.¬F(7)	SR1C(7)
D1.D2.¬F(8)	SR1C(8)
D1.D2.¬F(9)	SR1C(9)
D1.D2.L1.¬F(1)	SR1D(1)
D1.D2.L1.¬F(2)	SR1D(2)

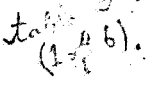


Table 3-1. Entries of RTAB and DTAB (2 of 6)

D1•D2•E1•¬F(3)

D1•D2•E1•¬F(4)

D1•D2•E1•¬F(5)

D1•D2•E1•¬F(6)

D1•D2•E1•¬F(7)

D1•D2•E1•¬F(8)

D1•D2•E1•¬F(9)

S1(5)•¬S2•¬S2(A)•¬S3(1)

S1(5)•¬S2•¬S2(A)•¬S3(2)

S1(5)•¬S2•¬S2(A)•¬S3(3)

S1(5)•¬S2•¬S2(A)•¬S3(4)

S1(5)•¬S2•¬S2(A)•¬S3(5)

S1(5)•¬S2•¬S2(A)•¬S3(6)

S1(5)•¬S2•¬S2(A)•¬S3(7)

S1(5)•¬S2•¬S2(A)•¬S3(8)

S1(5)•¬S2•¬S2(A)•¬S3(9)

S1(6)•¬S2•¬S2(A)•¬S3(1)

S1(6)•¬S2•¬S2(A)•¬S3(2)

S1(6)•¬S2•¬S2(A)•¬S3(3)

S1(6)•¬S2•¬S2(A)•¬S3(4)

S1(6)•¬S2•¬S2(A)•¬S3(5)

S1(6)•¬S2•¬S2(A)•¬S3(6)

S1(6)•¬S2•¬S2(A)•¬S3(7)

S1(6)•¬S2•¬S2(A)•¬S3(8)

S1(6)•¬S2•¬S2(A)•¬S3(9)

S1(7)•¬S2•¬S2(A)•¬S3(1)

S1(7)•¬S2•¬S2(A)•¬S3(2)

S1(7)•¬S2•¬S2(A)•¬S3(3)

S1(7)•¬S2•¬S2(A)•¬S3(4)

S1(7)•¬S2•¬S2(A)•¬S3(5)

S1(7)•¬S2•¬S2(A)•¬S3(6)

SR1D(3)

SR1D(4)

SR1D(5)

SR1D(6)

SR1D(7)

SR1D(8)

SR1D(9)

SR2A(1)

SR2A(2)

SR2A(3)

SR2A(4)

SR2A(5)

SR2A(6)

SR2A(7)

SR2A(8)

SR2A(9)

SR2B(1)

SR2B(2)

SR2B(3)

SR2B(4)

SR2B(5)

SR2B(6)

SR2B(7)

SR2B(8)

SR2B(9)

SR2C(1)

SR2C(2)

SR2C(3)

SR2C(4)

SR2C(5)

SR2C(6)

Table 3-1. Entries of RTAB and DTAB (3 of 6)

S1(7).¬S2.¬S2(A).¬S3(8)	SR2C(8)
S1(7).¬S2.¬S2(A).¬S3(9)	SR2C(9)
S1(8).¬S2.¬S2(A).¬S3(1)	SR2D(1)
S1(8).¬S2.¬S2(A).¬S3(2)	SR2D(2)
S1(8).¬S2.¬S2(A).¬S3(3)	SR2D(3)
S1(8).¬S2.¬S2(A).¬S3(4)	SR2D(4)
S1(8).¬S2.¬S2(A).¬S3(5)	SR2D(5)
S1(8).¬S2.¬S2(A).¬S3(6)	SR2D(6)
S1(8).¬S2.¬S2(A).¬S3(7)	SR2D(7)
S1(8).¬S2.¬S2(A).¬S3(8)	SR2D(8)
S1(8).¬S2.¬S2(A).¬S3(9)	SR2D(9)
¬S1.S2(5).¬S2(A).¬S3(1)	SR2E(1)
¬S1.S2(5).¬S2(A).¬S3(2)	SR2E(2)
¬S1.S2(5).¬S2(A).¬S3(3)	SR2E(3)
¬S1.S2(5).¬S2(A).¬S3(4)	SR2E(4)
¬S1.S2(5).¬S2(A).¬S3(5)	SR2E(5)
¬S1.S2(5).¬S2(A).¬S3(6)	SR2E(6)
¬S1.S2(5).¬S2(A).¬S3(7)	SR2E(7)
¬S1.S2(5).¬S2(A).¬S3(8)	SR2E(8)
¬S1.S2(5).¬S2(A).¬S3(9)	SR2E(9)
¬S1.S2(6).¬S2(A).¬S3(1)	SR2F(1)
¬S1.S2(6).¬S2(A).¬S3(2)	SR2F(2)
¬S1.S2(6).¬S2(A).¬S3(3)	SR2F(3)
¬S1.S2(6).¬S2(A).¬S3(4)	SR2F(4)
¬S1.S2(6).¬S2(A).¬S3(5)	SR2F(5)
¬S1.S2(6).¬S2(A).¬S3(6)	SR2F(6)
¬S1.S2(6).¬S2(A).¬S3(7)	SR2F(7)
¬S1.S [illegible] 3(8)	[illegible]
¬S1.[illegible]	[illegible]
¬S1.S[illegible]	[illegible]

task 3-1

Table 3-1. Entries of RTAB and DTAB (4 of 6)

¬S1•S2(7)•¬S2(A)•¬S3(2)	SR2G(2)
¬S1•S2(7)•¬S2(A)•¬S3(3)	SR2G(3)
¬S1•S2(7)•¬S2(A)•¬S3(4)	SR2G(4)
¬S1•S2(7)•¬S2(A)•¬S3(5)	SR2G(5)
¬S1•S2(7)•¬S2(A)•¬S3(6)	SR2G(6)
¬S1•S2(7)•¬S2(A)•¬S3(7)	SR2G(7)
¬S1•S2(7)•¬S2(A)•¬S3(8)	SR2G(8)
¬S1•S2(7)•¬S2(A)•¬S3(9)	SR2G(9)
¬S1•S2(8)•¬S2(A)•¬S3(1)	SR2H(1)
¬S1•S2(8)•¬S2(A)•¬S3(2)	SR2H(2)
¬S1•S2(8)•¬S2(A)•¬S3(3)	SR2H(3)
¬S1•S2(8)•¬S2(A)•¬S3(4)	SR2H(4)
¬S1•S2(8)•¬S2(A)•¬S3(5)	SR2H(5)
¬S1•S2(8)•¬S2(A)•¬S3(6)	SR2H(6)
¬S1•S2(8)•¬S2(A)•¬S3(7)	SR2H(7)
¬S1•S2(8)•¬S2(A)•¬S3(8)	SR2H(8)
¬S1•S2(8)•¬S2(A)•¬S3(9)	SR2H(9)
(A2•K1+A1•C1)•B•¬C2	R1
A1•¬A2•B•C3	R2A
A2•B•C3	R3A
A2•B•K2•C1•¬C2	R4A
A2•B•K2•C1•C2•¬C3	R5A
A1•¬A2•B•¬C1	R6A
A1•¬A2•B•C1•C2•¬C3	R7A
A2•B•K1•C1•¬C2	R8A
B	R9A
D1(1)	R10A
D1•D2•¬F	R11A
D1•D2•E1•¬F	R12A
D1•D2•E2•¬F	R13A
D1	R14A

Table 3-1. Entries of RTAB and DTAB (5 of 6)

S1•S2(1)•¬S2(A)•¬S3	R16A
A1•B•K2•¬C3	R2B
A2•B•K2•¬C1	R3B
A1	R4B
A2	R5B
A1•¬A2•B•C1•¬C2	R6B
A2•B•K1•¬C1	R7B
A2•B•K1•C1•C2•¬C3	R8B
C1	R9B
D1(2)	R10B
D1•D2•SIGMA-D•¬F	R11B
D1•D2•SIGMA-D•E3•¬F	R12B
D1•D2•SIGMA-D•E4•¬F	R13B
D2	R14B
S1(2)•¬S2•¬S2(A)•¬S3	R15B
S1•S2(2)•¬S2(A)•¬S3	R16B
C2	R9C
D1(3)	R10C
E1	R14C
S1(3)•¬S2•¬S2(A)•¬S3	R15C
S1•S2(3)•¬S2(A)•¬S3	R16C
C3	R9D
D1(4)	R10D
F	R14D
S1(4)•¬S2•¬S2(A)•¬S3	R15D
S1•S2(4)•¬S2(A)•¬S3	R16D
D1(5)	R10E
S1	R14E
D1(6)	R10F
S2	R14F

Table 3-1. Entries of RTAB and DTAB (6 of 6)

D1(7)	R10G
S3	R14G
D1(8)	R10H
S2(A)	R14H
DC.BUS.VOLTAGE	BUSVOL
DC.BUS.CURRENT	BUSCUR
S/C.PLATFORM.TEMP	S/CPTEMP
SIGNAL.TO.NOISE.RATIO	S/NRATIO
BILEVEL	BILEVEL
ELECT.TEMP.	EL.TEMP
HOUSEKEEPING	HSKPNG
CALIBRATION.VOLTAGE	CALIBVOL
DETECTOR.TEMPERATURE	DETTEMP
SEC.VOLTAGE	SECTORV

Table 3-1
(b + c)

6. If format 3, search table DTAB to determine indices.
7. Retrieve information corresponding to all three formats.
8. Move results into calling parameters, and return.

3.5 SUBROUTINE PRDXPD

PRDXPD is called by PRDISP to perform the following functions:

1. For all desired rates, computes rates and errors averaged over the plot interval until the plot period is exhausted, or until the allocated direct access space has all been used up (whichever comes earlier).
2. Scales the rates and errors according to specified options.
3. Creates the time list and rate list. The lists are written on direct access data sets and consist of logical records of fixed size.

Calling Sequence

```
CALL PRDXPD (&ALT)
```

where ALT is the return to be executed when a specified number of time list records have been written.

Interface

Input

This subroutine obtains processing information from COMMON area PLOT.

Variable	Type	Description
IND	I*4	Array dimensioned (3, 15), of which (I, J) element gives an index corresponding to Ith rate in Jth group. Index points to an entry in table of counts and accumulation times. Two tables are parts of a rate summary record
NMAX	I*4	Array dimensioned (15), of which Ith element gives number of rates in Ith group
NGROUP	I*4	Number of groups
QRATIO	L*4	Array dimensioned (15), of which Ith element indicates whether ratio of first two rates in Ith group is desired

Variable	Type	Description
QSUM	L*4	Array dimensioned (15), of which Ith element indicates whether sum of rates in Ith group is desired
NUS	I*4	Logical unit from which rates summary records are read
NUPLOT	I*4	Logical unit to which rate list records are written
NUTIME	I*4	Logical unit to which time list records are written
MSINT	I*4	Summary interval (milliseconds)
NLAST	I*4	Number of entries in last time list record
INDEX	I*4	Number of time list records written

Procedure

1. NLAST is initialized to the maximum number of entries allowed for a time list record. The latter number is given by NPTMAX.

2. Until the desired number of records have been processed the following processes are performed:

   A. Read a summary record.

   B. Examine NLOOP, the number of additional records needed to complete the plot interval. If more records are needed, call ADDREC. ADDREC performs addition of counts and accumulation times for all the rates and subcom values over NLOOP records.

   C. Increment IREC, the number of entries currently in the time list. If IREC = 1 (i.e., fresh time list and rate list records

are to begin), call PRDIRA to initialize the rate list area, RATE. The area RATE can be thought of as the four-dimensioned array:

RATE(4, 3, 124, 15)

where 4 is the word entry
3 is the relative index within a group
124 is the IREC entry number in the record
15 is the group index

The structure of the four-word entry is as follows:

Word	Type	Description
1	R*4	Rate.
2	R*4	Error
3	-	Reserved for later use
4, bytes 0-2	-	Zero
byte 3		Plot character

On return from PRDIRA, the area for NGROUP number of groups is initialized such that the first three words of the four-word entry are zero, the three most significant bytes of the fourth word are zero, and the least significant byte contains the plot character. Thus, each 12-word entry has the following structure:

Word	Description
1-3	0
4	000000,'*'
5-7	0

Word	Description
8	000000,'$'
9-11	0
12	000000,'@'

D. Move the time fields into the array HTIME.

E. For each rate within each group, the following are performed:

(1) Obtain the index from the array IND.

(2) If the index < 157 (i.e., the entity is a rate), check if the number of counts is zero. If the number of counts is zero, but the accumulation time is nonzero, the corresponding entry in the array RATE need not be modified. If, however, the number of counts and accumulation times are both zero, this is the case of missing/padded data. Indicate this condition by setting the fourth word of the entry equal to the variable QBLANK. If the number of counts is nonzero, compute the rate and error, and store these in the first and second word of the entry.

(3) If the index lies between 158 and 161, the entity belongs to the first subcom set. Process it in a manner similar to that above, except there is no error associated with subcom information.

(4) If the index lies between 162 and 167, the entity belongs to the second subcom set. This case is similar to that of the first subcom set.

F. If the entry count, IREC, equals the maximum number allowed (i.e., NPTMAX), call PRDSAV to write out the rate list and time list records, and to set the entry count to zero.

3. If any entries were accumulated since the last records were written (i.e., IREC > 0), call PRDSAV to write out data currently in core, save the number of entries in the variable NLAST, and return.

4. On end of file: Write the message, perform terminal processing outlined in the previous section, and return.

5. On I/O error: Write the message, perform terminal processing described in item 3, and return.

6. When allocated direct-access space has been used up, take an alternate return to signal this condition.

NOTE: For an array dimensioned (4, 3, 124, 15), the equivalent one dimensional index for the element (1, 0, 0, 0) is -1503. The equivalent one dimensional index jumps by 1488 for a change of one in the last index.

3.6 SUBROUTINE PRDIRA

PRDIRA is called by PRDXPD to initialize a specified portion of the array RATE.

Calling Sequence

```
CALL PRDIRA (RATE, NGROUP, NENTRY)
```

where RATE is a full-word array dimensioned (explicitly or otherwise) (4, 3, 124, N), aligned on double-word boundary.

Perhaps the best way to define parameters NGROUP and NENTRY is through a FORTRAN-equivalent description of what this routine does. The processing of this routine is equivalent to the following sequence:

```
      DO 10 I=1, NGROUP
      DO 10 J=1, NENTRY
      DO 10 K=1, 3
      DO  9 L=1, 3
      RATE(L, K, J, I)=0
    9 CONTINUE
      RATE(4, K, J, I)=WORD(K)
   10 CONTINUE
```

where WORD(1) = Z0000005C

WORD(2) = Z0000005B

WORD(3) = Z0000007C

Clearly, NENTRY ≤ 124 and NGROUP ≤ N.

Interface

Input

Contents of array RATE are immaterial.

Output

The structure of the array RATE on return is as shown above.

Procedure

The subroutine used double-word store instruction to accomplish the purpose described above.

3.7 SUBROUTINE PRDSAV

PRDSAV is called by PRDXPD to write the time list and the rate list records currently in core. PRDSAV performs the following functions:

1. Writes out the time list record.
2. Performs appropriate conversions on rate and error values stored in the array rate.
3. Writes out the rate list record.
4. Determines whether the allocated direct access space has all been used up.

Calling Sequence

CALL PRDSAV (HTIME, &ALT)

Interface

Input

- Via Arguments in Call

Variable	Type	Description
HTIME	I*2	Array containing current time list record

- Via COMMON Area RATE

Variable	Type	Description
RATE	Mixed	For description, see PRDXPD

- Via COMMON Area PLOT

Variable	Type	Description
NUPLOT	I*4	Logical unit number for rate list data set
NUTIME	I*4	Logical unit number for time list data set

Variable	Type	Description
INDEX	I*4	Ordinal number of time list record to be written
NLAST	I*4	Number of time list entries in array HTIME
IRECNO	I*4	Ordinal number of last rate list record written
NGROUP	I*4	For description, see PRDPIA
QRATIO	L*4	
QSUM	L*4	
QLIST	L*4	
QSCALE	L*4	
MAXIND	I*4	Maximum number of time list records that may be written

Output

- Via COMMON Area PLOT

Variable	Description
IRECNO	Updated to reflect rate list records written

- Via I/O Operations

Logical unit NUTIME: A time list record is written every time the subroutine is called. Time list records have a fixed length (1488 bytes). The first 12*NLAST bytes contain NLAST time list entries. Each 12-byte entry has the following structure:

Half-Word	Description
1	Two-digit year
2	Month of year
3	Day of month
4	Hour of day

Half-Word	Description
5	Minute of hour
6	Second of minute

Logical unit NUPLOT: NGROUP rate list records are written to this data set. There is one record for each group of rates. Rate list records have a fixed length (5952 bytes). The first 48*NLAST bytes of each record contain NLAST rate list entries. The structure of each 48-byte entry is the same within a record, and is determined by processing options (i.e., QLIST, QSCALE, or QPRNTR) which affect all records in the same manner, and by group options (i.e., QRATIO or QSUM).

Subroutines Called

Subroutine	Description
DWRITE	Writes a record on direct access data set (part of DAIO package)
PRDCSR	Computes sum of rates in a group and error associated with sum
PROCRR	Computes ratio of first two rates in a group and error associated with ratio
PRDCPC	Computes from rates and errors either (1) logarithmic displacement from origin of rate + error, rate - error, and rate, or (2) absolute raster coordinates of rate + error, rate - error, and rate

Procedure

1. Call DWRITE to write out the time list record. INDEX is the ordinal number of the record being written in the direct access data set, referenced by logical unit NUTIME.

2. For each of the NGROUP groups, the following processes are performed:

   A. Locate the beginning of the rate list record for this group. This implies finding the one dimensional array equivalent index for the location RATE(1, 1, 1, I), where I is the group index and array RATE is dimensioned RATE(4, 3, 124, 15).

   B. Compute the ordinal number of the record to be written in the direct access data set referenced by logical unit NUPLOT (IRECNO).

   C. If the sum of rates was desired for this group, call PRDCSR to compute the sum of rates and the error associated with the sum. Arguments for this call are IDISK (the index in the array rate which corresponds to the beginning of rate-list record for this group) and NLAST (which denotes the number of entries to be processed).

   D. If the ratio of rates was desired for this group (QRATIO(I) = .TRUE.), call PRDCRR to compute the ratio of the first two rates and the error associated with the ratio. Arguments for call to PRDCRR are the same as those for call to PRDCSR.

   E. If neither a formatted listing of rates was requested (i.e., QLIST = F) nor auto scaling was specified (QSCALE = F), then call PRDCPC to compute plot coordinates. The computed plot coordinates are returned by PRDCPC in the same area, i.e., the NLAST 12-word entries beginning with the word RATE(IDISK) in the format shown in the following text.

   F. Call DWRITE to write out the rate list record for this group.

3. If INDEX equals the maximum number of records allowed (MAXIND), then signal this condition by taking alternate return (RETURN1); otherwise, return normally.

Hierarchy Chart

Logical Condition	Hierarchy
QLIST|QSCALE	0
¬QLIST∧¬QSCALE∧QPRNTR	1
¬QLIST∧¬QSCALE∧¬QPRNTR	2

1. Structure of 12-word entry in the rate list in hierarchy 0:

Word	Type	Description
1	R*4	Rate (counts/second) for first rate in group if ¬QRATIO∧¬QSUM Sum of rates in group if QSUM Ratio of first two rates in group if QRATIO 0. if missing or padded data
2	R*4	Error associated with first rate in group (¬QRATIO∧¬QSUM) Error associated with sum of rates (QSUM) Error associated with ratio of first two rates (QRATIO) 0. if missing or padded data
3	R*4	0.
4	(4)L*1	Bytes 1 through 3, .FALSE. Byte 4, character asterisk (*) character X'60' (if missing or padded data)
5	R*4	If group contains more than one rate Rate (counts/second) for second rate in group 0. if missing or padded data 0. if group consists of only one rate
6	R*4	If group contains more than one rate Error associated with second rate in group 0. if missing or padded data 0. if group consists of only one rate

Word	Type	Description
7	R*4	0.
8	(4)L*1	Bytes 1 through 3, .FALSE. Byte 4, character $ (if word 5 > 0) character blank (-) (if word 5 = 0)
9	R*4	If group contains more than two rates Rate (counts/second) for third rate in group 0. if missing or padded data for third rate 0. if group consists of less than three rates
10	R*4	If group contains more than two rates Error associated with third rate in group 0. if missing or padded data for third rate 0. if group consists of less than three rates
11	R*4	0.
12	(4)L*1	Bytes 1 through 3, .FALSE. Byte 4, character @

2. Structure of 12-word entry in the rate list record in hierarchy 1:

Word	Type	Description
1	R*4	Logarithmic displacement (LDWRTO) of upper end of error bar for first rate in group (¬QRATIO∧¬QSUM) LDWRTO of upper end of error bar for sum of rates in group (QSUM) LDWRTO of upper end of error bar for ratio of first two rates in group (QRATIO) 0. if missing or padded data
2	R*4	LDWRTO of lower end of error bar for first rate in group (¬QRATIO∧¬QSUM) LDWRTO of lower end of error bar for sum of rates in group (QSUM) LDWRTO of lower end of error bar for ratio of first two rates in group (QRATIO) 0. if missing or padded data
3	R*4	LDWRTO of rate (counts/second) for first rate in group (¬QRATIO∧¬QSUM) LDWRTO of sum of rates in group (QSUM)

Word	Type	Description
3 (Cont'd)		LDWRTO of ratio of first two rates (QRATIO) 0. if missing or padded data
4	(4)L*1	Same as in hierarchy 0

The remaining two four-word entries refer to the second and third rate in the group.

3. Structure of 12-word entry in the rate list record in hierarchy 2:

Word	Type	Description
1	I*4	Absolute integer raster ordinate (AIRO) of upper end of error bar for first rate in group (¬QRATIO∧¬QSUM) AIRO of upper end of error bar for sum of rates in group (QSUM) AIRO of upper end of error bar for ratio of first two rates in group AIRO of origin of plot if missing or padded data
2	I*4	AIRO of lower end of error bar for first rate in group (¬QRATIO∧¬QSUM) AIRO of lower end of error bar for sum of rates in group (QSUM) AIRO of lower end of error bar for ratio of first two rates in group (QRATIO) AIRO of origin of plot if missing or padded data
3	I*4	AIRO of rate (counts/second) for first rate in group (¬QRATIO∧¬QSUM) AIRO of sum of rates for rates in group (QSUM) AIRO of ratio of rates for first two rates in group (QRATIO) AIRO of origin of plot if missing or padded data
4	(4)L*1	Same as in hierarchy 0

The remaining two four-word entries refer to the second and third rate in the group.

3.8 SUBROUTINE PRDCSR

PRDCSR is an entry point in the control section PRDCRR, and is called by PRDSAV to compute the sum of rates on a group and the error associated with the sum.

Let r_i be the rate for the ith rate in the group, and let e_i be the associated error; then the error associated with

$$\sum_i r_i$$

(summation extends over the number of rates in the group) is given by

$$\sqrt{\sum_i e_i^2}$$

Calling Sequence

CALL PRDCSR (IRST, NPOINT)

Interface

Input

- Via Arguments

Variable	Description
IRST	Index in array RATE (COMMON area RATE) corresponding to 12-word entry for first plot interval for which sum of rates is to be computed
NPOINT	Number of plot intervals for which sum of rates are to be computed

- Via COMMON Area RATE

  The NPOINT 12-word entries in the array RATE beginning with RATE(IRST) are assumed to have the hierarchy 0 structure for the case QRATIO = .FALSE. and QSUM = .FALSE.

- Via COMMON Area PLOT

Variable	Description
MGROUP	Index of group being processed
NMAX(MGROUP)	Number of rates in group being processed

Output

- Via COMMON Area RATE

  The NPOINT 12-word entries in the array RATE beginning with RATE(IRST) will have the hierarchy 0 structure appropriate to QSUM = .TRUE.

Procedure

1. JMAX, the number of rates to be summed, is obtained from NMAX(MGROUP).
2. For NPOINT plot intervals, the following processes are performed:
   A. JMAX rates are added together, and the sum of squares of errors is obtained.
   B. If at least one of the rates was nonzero, an asterisk (*) replaces the existing plot character.
   C. Sum of rates is stored in place of the first rate, and the error associated with the sum is stored in place of first error.

3.9 SUBROUTINE PRDCRR

PRDCRR is called by PRDSAV to compute the ratio of the first two rates in a group, and the error associated with the ratio.

Let r_i be the rate for the ith rate in the group, and let e_i be the associated error; then the error associated with the ratio r_1/r_2 is given by

$$\frac{r_1}{r_2} \cdot \sqrt{\left(\frac{e_1}{r_1}\right)^2 + \left(\frac{e_2}{r_2}\right)^2}$$

Calling Sequence

CALL PRDCRR (IRST, NPOINT)

Interface

Input

- Via Arguments

Variable	Description
IRST	Index in array RATE (COMMON area RATE) corresponding to 12-word entry for first plot interval for which ratio of rates is to be computed
NPOINT	Number of plot intervals for which ratio of rates in group is to be computed

- Via COMMON Area RATE

  The NPOINT 12-word entries in the array RATE beginning with RATE(IRST) are assumed to have the hierarchy 0 structure for the case (QRATIO = .FALSE. ∧ QSUM = .FALSE.).

- Via COMMON Area.PLOT

Variable	Description
MGROUP	Index of group being processed
RHI(MGROUP)	Upper limit for ordinate scaling for plots of this group. If second rate is zero, then ratio is undefined and is set equal to this value

Procedure

1. Store RHI(MGROUP) in the local variable RHIGH.
2. For NPOINT plot intervals, the following processes are performed:

   A. If the first rate is zero, nothing needs to be done.

   B. If the second rate is zero, then the ratio is not defined. Store the value RHI into the word corresponding to first rate. If the second rate was padded, indicate the padded ratio by moving the flag (fourth word of the second four-word entry) corresponding to the second rate into the fourth word of the first four-word entry.

   C. If neither the first rate nor the second rate is zero, then compute the ratio and error. Replace the first rate by the ratio and the first error by the error in the ratio.

3.10 SUBROUTINE PRDCPC

PRDCPC is called by PRDSAV and PRDPLT to convert a specified number of rate list entries belonging to a group from the hierarchy 0 format to the hierarchy 1 or hierarchy 2 format.

Calling Sequence

CALL PRDCPC (IR, NPOINT)

Interface

Input

- Via Arguments

Variable	Description
IR	Index in array RATE (COMMON area RATE) corresponding to first 12-word entry to be converted
NPOINT	Number of consecutive entries to be converted

- Via COMMON Area RATE

  The array RATE (COMMON area RATE) contains NPOINT 12-word entries in hierarchy 0 format, beginning with the entry of RATE(IR).

- Via COMMON Area PLOT

  The following variables in COMMON area PLOT determine the type of scaling, and control the actions of the routine.

Variable	Type	Description
MGROUP	I*4	Index of group to which entries to be converted belong
RHI(MGROUP)	R*4	Upper limit of ordinate scale
RLO(MGROUP)	R*4	Lower limit of ordinate scale

Variable	Type	Description
NMAX(MGROUP)	I*4	Number of rates in group
QRATIO(MGROUP) .OR. QSUM(MGROUP)	L*4 L*4	If .TRUE., only first four-word subentry of each 12-word entry will be converted
QSCALE	L*4	If .TRUE., data will be scaled based on maximum and minimum values of data to be converted; otherwise, scaling is determined by RHI(MGROUP) and RLO(MGROUP)
QPRNTR	L*4	If .TRUE., conversion is made to hierarchy 1 format; otherwise, conversion is to hierarchy 2 format

Output

- Via COMMON Area RATE

  Beginning with the entry at RATE(IR) in COMMON area RATE, the NPOINT 12-word entries will be in hierarchy 1 format if QPRNTR = .TRUE., and in hierarchy 2 format otherwise.

  If QSCALE = .TRUE., RMAX (COMMON area PLOT) contains the upper limit according to which scaling was performed by this subroutine and RMIN (COMMON area PLOT) contains the lower limit according to which scaling was performed.

Subroutines Called

PRDCPC calls ALOG10 (FORTRAN library) to compute logarithmic displacements relative to the origin.

Procedure

1. Variable JMAX, the last four-word subentry to be processed, is obtained from the number of rates in the group, and is set equal to 1 if QRATIO or QSUM were true.

2. Auto scaling (QSCALE = .TRUE.):

   A. Initialize RMAX and RMIN.

   B. Initialize IZ, the counter for four-word subentries where the rate entry equals zero, and IE, the counter for four-word subentries where the rate equals error (i.e., the rate was derived from 1 counts).

   C. For each of the NPOINT 12-word rate list entries, the following processes are performed:

      (1) Examine JMAX four-word subentries.

      (2) If rate field (word 1) is zero, increment zero rate counter and save the index of this entry in the array IZERO.

      (3) If rate field (word 1) is nonzero, store $\log_{10}$ (rate + error) in the first word of the entry, and $\log_{10}$ (rate) in the third word of the entry. Compare rate + error with current maximum value RMAX. Reset RMAX if necessary.

      (4) If error < rate, store $\log_{10}$ (rate error) in the second word of the entry. Compare the rate error with the current minimum value, RMIN. Reset RMIN if necessary.

      (5) If error = rate, the increment rate equals the error counter, IE; store the index of the second word in array IEQUAL.

   D. If RMIN was not set, set RMIN equal to the preassigned value RLO(I).

E. If RMAX was not set, set RMAX equal to the preassigned value RHI(I).

F. Determine IRMAX and IRMIN, such that:

(1) IRMIN is the largest integer, $10^{IRMIN} \leq$ RMIN.

(2) IRMAX is the smallest integer, $10^{IRMAX} \geq$ RMAX.

G. Set RMAX = 10^{IRMAX} and RMIN = 10^{IRMIN}.

H. Set the first three words of these entries which correspond to rate = 0 equal to $\log_{10}$(RMIN).

I. Set the second word of these entries for which rate = error equal to $\log_{10}$(RMIN).

3. No auto scaling (QSCALE = .FALSE.):

A. Set RMAX and RMIN equal to the specified values RHI(MGROUP) and RLO(MGROUP), respectively.

B. For each of the NPOINT 12-word rate list entries, the following processes are performed:

(1) Examine JMAX four-word subentries.

(2) If the rate is zero, set the first three words of the subentry equal to $\log_{10}$(RMIN).

(3) If the rate is nonzero, then:

(A) The first word is set equal to $\log_{10}$(rate + error), if RMIN ≤ rate + error ≤ RMAX.

(B) Log_{10}(RMAX), if rate + error > RMAX.

(C) Log_{10}(RMIN), if rate + error < RMIN.

(D) The second word is set to $\log_{10}$(rate - error), RMIN ≤ rate - error ≤ RMAX.

(E) Log_{10}(RMAX), if rate error > RMAX.

(F) Log_{10}(RMIN), if rate error < RMIN.

(G) The third word is set equal to:

Log_{10}(rate), if RMIN ≤ rate ≤ RMAX
Log_{10}(RMAX), if rate > RMAX
Log_{10}(RMIN), if rate < RMIN

4. Printer plots required (QPRNTR = .TRUE.): convert coordinates into logarithmic displacements relative to RMIN (hierarchy 1).

5. Printer plots not required (QPRNTR = .FALSE.): convert coordinates into absolute integer raster coordinates, using ARAST, the ordinate of the origin, and EXTENT, the extent of the ordinate.

6. Return.

3.11 SUBROUTINE ADDREC

ADDREC is called by PRDXPD to add counts and accumulation times from a specified number of records to corresponding fields in COMMON area SUMREC.

Calling Sequence

CALL ADDREC (HYRC, NREC, MSINT, &ALT1, &ALT2)

Interface

Input

- Via Arguments

Variable	Description
HYRC	Start of an area where a rate summary record currently exists
NREC	Number of records from which counts and accumulation times are to be extracted and added to corresponding fields in area beginning with HYRC
MSINT	Interval spanned by each rate summary record

- Via COMMON Area SUMREC

Variable	Type	Description
ICOUNT(18)	I*4	Array containing counts for 157 rates
ACTIME(2B4)	R*4	Array containing accumulation times for 157 rates

- Via I/O Operations

  LOOP rate summary records are read from logical unit 10. Should the logical unit number for the rate summary data set be changed, a corresponding change will have to be made in this routine.

Output

- Via Alternate Returns

Return	Description
1	End of file on summary tape
2	I/O error on summary tape

- Via COMMON Area SUMREC

Variable	Description
ICOUNT	Array updated by addition of counts
ACTIME	Array updated by addition of accumulation times

Subroutines Called

ADDREC calls FREAD to read records from the rate summary data set.

Procedure

The following sequence is executed LOOP times:

1. A record is read. If an end of file or an I/O error is encountered, an appropriate alternate return is taken.
2. If the missing time in the record read (the full word field at a displacement 20 bytes from the beginning of the record) is equal to the summary interval, MSINT, no processing is done.
3. If the missing time is not equal to MSINT, counts and accumulation times in the record are added to corresponding fields of arrays ICOUNT and ACTIME.

   NOTE: Macro ADD is used to expand the process of adding counts and accumulation times, thus avoiding a significant amount of coding, while at the same time obviating the necessity of using branching.

3.12 PLOT SEGMENT

This segment of the program has the responsibility for generating formatted listings, printer plots, and all the requested 4060 plots. The primary input to this segment are the rates list and time list generated by the data extraction segment. Information regarding scaling, the rates being plotted, and how much data is to be plotted is obtained from COMMON area PLOT.

The main program for this segment is PRDPLT, which is invoked by PRDISP when the data-extraction segment has processed all the requested data, or when the direct-access space allocated for the time list has been used up.

3.13 SUBROUTINE PRDPLT

Calling Sequence

CALL PRDPLT (QOPEN, Q4060)

Interface

Input

- Via Calling Parameters

Variable	Type	Description
QOPEN	L*4	Informs PRDPLT whether SD-4060 data set (DDNAME SC4060ZZ) is open

- Via COMMON Area PLOT

Variable	Type	Description
NGROUP	I*4	Number of groups to be plotted and/or listed
NUPLOT	I*4	Logical unit number for rate list data set
NUTIME	I*4	Logical unit number for time list data set
NLAST	I*4	Number of time list entries in last time list record
INDEX	I*4	Number of time list records
QSCALE	L*4	Indicates whether plots are to be scaled according to values plotted (QSCALE = T)
QLIST	L*4	Indicates whether formatted listings of rates are to be generated
QPRNTR	L*4	Indicates whether printer plots are to be generated
NPTMAX	I*4	Number of time list entries in records other than last time list record
N406	I*4	Array that contains number of plot intervals per frame for plot of modes 1 through 4

Variable	Type	Description
MODES	I*4	Array that contains modes for which plots are to be generated
NPLOT	I*4	Number of elements in array MODES

- Via I/O Operations

Logical Unit	Description
NUPLOT	Rate list records are read from this unit (for format description, see PRDSAV)
NUTIME	Time list records are read from this unit (for format description, see PRDSAV)

Subroutines Called

Subroutine	Description
DREAD	Reads time list and rate list records
PRDLG	Generates formatted listings of rates
PRDLAB	Computes location of Y-axis labels and generates labels for printer plots and 4060 plots of type 1
PRDCPC	Computes plot coordinates
PRDSDG	Generates 4060 plots
PRDPPG	Prepares and writes out printer plots
FMOVE	Moves data

COMMON Area Interface With Called Programs

- Via COMMON Area RATE

Variable	Type	Description
RATE	-	Array containing RATE list data in one of three formats described in Section
HTIME	I*2	Array containing time list data

- Via COMMON Area PLOT

Variable	Type	Description
MGROUP	I*4	Index of group currently being plotted

Output

- Via Calling Parameters

Variable	Type	Description
Q4060	L*4	Indicates whether any 4060 plots were generated

Procedure

1. Determine format of rate list entries by examining QLIST and QSCALE.

2. For each of the NPLOT modes in the array MODES, the following processes are performed:

   A. If a listing of rates is desired, it can only be produced during the first pass through this loop. For this purpose, define the local logical variable QLIS.

   B. Define the MODE to be the type of plots currently being processed.

   C. Determine if the 4060 plots can be generated during current execution of the loop, and set variable Q4060 accordingly. N4060 contains the number of plot intervals per frame for the current MODE.

      If MODE = 0, then no 4060 plots are produced during the current execution of the loop. In this case, N4060 is set equal to the number of plot intervals per frame for the first 4060 plot

type (i.e., MODE = 1). The number of plot intervals per frame of listing and printer plots is always equal to the number of plot intervals per frame for MODE = 1.

If MODE > 0, N4060 is obtained from the appropriate element of array N406 (COMMON area PLOT). The logical variable QOPEN is examined to determine if the SD4060 output data set is open. If not, it is opened by a call to the initializing routine MODESG, and mode set 14 is used to inform the 4060 package that the coordinates used in calls to 4060 routines are in integer absolute raster units.

D. The first NPTMAX entries of time list records are read into array HTIME contiguously. Thus, array HTIME has the structure HTIME(6, NPTMAX, INDEX).

E. For each group, process INDEX rate list records, starting with the Ith record in the rate list data set, where I is the group index. The records processed are
Ith, (NGROUP + I)th, ..., (NGROUP*(INDEX - 1) + I)th .

(1) Read a record.

(2) If a listing is required, call PRDLG to generate the list. The arguments in call to PRDLG are:

Variable	Description
IRLIST	Index in array RATE where this record begins
ITLIST	Index in array HTIME which corresponds to plot interval corresponding to rate list entry beginning at RATE(IRLIST)

(3) If plots are required, determine if there are N4060 rate list entries currently in core. If not, read the next

record. If there are enough rate list entries in core, the following processes are performed:

(A) If the rate list entries are in hierarchy 0 format (i.e., QLIST.OR.QSCALE = .TRUE.), call PRDCPC to convert the first N4060 rate list entries into hierarchy 1 or 2. The arguments for the call are the index (in array RATE) of the first entry, and the number of entries to be converted.

(B) Call PRDLAB to generate Y-axis labels, location of grid lines, labels for printer plots, and 4060 plots of types 1, 3, and 4.

(C) Call PRDSDG to generate 4060 plots, if Q4060 is .TRUE.

(D) Call PRDPPG to generate a printer plot, if QPRINT = .TRUE.

(E) If there are rate list entries currently in core, which have not been plotted, move these to the front of array RATE, and continue.

3.14 SUBROUTINE PRDLG

PRDLG is called by PRDPLT to format and list the rates and errors from the rate list data currently in core.

Calling Sequence

CALL PRDLG (IRLIST, ITLIST)

Interface

Input

- Via Arguments

Variable	Description
IRLIST	Index in array RATE (COMMON area RATE) corresponding to rate list entry for first plot period to be listed
ITLIST	Index in array HTIME (COMMON area RATE) corresponding to first plot period to be listed

- Via COMMON Area RATE

Variable	Type	Description
RATE	Mixed	Array in hierarchy 0 rate list format
HTIME	I*2	Array containing time list entries

- Via COMMON Area PLOT

Variable	Type	Description
DD	R*8	Array containing rate equation description of rates (for a description, see PRDRIA)
D	R*8	Array containing mnemonic description of rates (for a description, see PRDRIA)
NMAX(MGROUP)	I*4	Number of rates in group to be listed

Variable	Type	Description
QRATIO(MGROUP)	I*4	Determines whether it is ratio of rates in this group that is to be listed
QSUM(MGROUP)	L*4	Determines whether it is sum of rates in this group that will be listed
HSID	I*2	Satellite ID
NLAST	I*4	Number of rate list entries in last record for each group
INDEX	I*4	Ordinal number of last time list record; also, number of rate list records for each group
INTHR	I*4	Describe plot interval used to label lists
INTMIN	I*4	
INTSEC	I*4	
MINDEX	I*4	Ordinal number of time list record corresponding to data to be listed
MGROUP	I*4	Index of group whose data will be listed
NPTMAX	I*4	Maximum number of plot intervals per frame of listing

Output

- Via Logical Unit 12

  1. Formatted listing of rates and errors if (¬QRATIO(MGROUP)∧¬QSUM(MGROUP)).
  2. Formatted listing of sum of rates and the error associated with the sum if (QSUM(MGROUP)).
  3. Formatted listing of ratio of first two rates and the error associated with the ratio if (QRATIO(MGROUP)).
  4. If, for any rate, data was missing or padded, an asterisk (*) appears between the rate value and error.

Procedure

Depending on QRATIO(MGROUP), QSUM(MGROUP), and NMAX(MGROUP), an appropriate label is constructed. Rates and errors are listed, one line for every plot interval. Each line begins with the plot interval identification which is followed by as many rates and errors as appropriate.

3.15 SUBROUTINE PRDLAB

PRLAB is called by PRDPLT to perform the following functions:

1. Computes the locations of ordinate labels and generates the EBCDIC labels. (Positions are calculated for printer plots, but can be easily scaled to 4060 plots.)
2. Generates abscissa labels for general-purpose scales for 4060 plots, and abscissa labels for printer plots.

Calling Sequence

CALL PRDLAB (ITB, NPOINT, MODE)

Interface

Input

- Via Arguments

Variable	Type	Description
ITB	I*4	Index in array HTIME (COMMON area RATE) corresponding to first plot interval to be plotted
NPOINT	I*4	Number of plot intervals to be plotted
MODE	I*4	Plot mode

- Via COMMON Area RATE

Variable	Type	Description
HTIME	I*2	Array containing time list entries

- Via COMMON Area PLOT

Variable	Type	Description
CONV(MODE)	-	-
NPT1(MODE)	I*4	Number of plot intervals per frame for this mode plus one

Variable	Type	Description
NUMDIV(MGROUP)	I*4	Number of divisions per cycle for this group
QSCALE	L*4	Determines whether auto scaling is in effect
RHI(MGROUP)	R*4	Upper limit of ordinate for plots of this group (QSCALE = .FALSE.)
RLO(MGROUP)	R*4	Lower limit of ordinate for plots of this group (QSCALE = .FALSE.)
RMAX	R*4	Upper limit of ordinate for this frame (QSCALE = .TRUE.)
RMIN	R*4	Lower limit of ordinate for this frame (QSCALE = .TRUE.)
INTHR	I*4	Describe plot interval (see PRDPIA). Used to determine locations of grid lines and tick marks
INTMIN	I*4	
INTSEC	I*4	

Output

- Via COMMON Area RATE

Variable	Type	Description
IX	I*4	Array of which first element contains number of horizontal grid lines to be drawn. Next IX(1) elements contain ordinate of grid lines on printer plot (extent 0 through 120)
IY	I*4	Array of which first element contains number of vertical grid lines to be drawn. Next IY(1) elements contain abscissa of grid lines on printer plots
NYLAB	I*4	Number of ordinate labels
YLAB	R*4	Contains locations of labels (on printer plot scale)

Variable	Type	Description
QPAGE	C*1	Contains image of printer plot. This area is filled with blanks (if QPRNTR = .TRUE.) except for following locations which are used by 4060 routines, also: QPAGE(2,122) - QPAGE(133,122) QPAGE(2,123) - QPAGE(133,123) Contain abscissa QPAGE(2,124) - QPAGE(133,124) labels plots QPAGE(2,125) - QPAGE(133,125) QPAGE(2,I) → QPAGE(7,I), where I is equivalent printer plot coordinate. YLAB(J) contains labels appropriate to ordinate YLAB(J). NYLAB sets such six-character elements

Subroutines Called

Subroutine	Description
INCORE	Called to convert fixed and floating point numbers to EBCDIC characters. For a description of INCORE, see Section 4
ALOGIO	–

Procedure

1. Number of plot intervals per frame is obtained from the array NPT1. If MODE is 1, the number of points per frame is given by NPTMAX.
2. The abscissa compression factor relative to MODE 1 is obtained from the array CONV.
3. The index (in array HTIME) corresponding to last plot interval is obtained.
4. If QSCALE = .TRUE., then the limits of the ordinate are given by RMAX and RMIN; otherwise, they are set to RHI(MGROUP) and RLO(MGROUP).

5. Knowing RMAX and RMIN, the number of cycles in the plots is obtained. Using the given number of divisions per cycle or a default, the location of abscissa labels in subject space is computed.

6. The location of abscissa labels is saved for use by routine PRDSDG, and the labels are placed in appropriate locations in the printer plot array QPAGE. The ordinates in the array QPAGE are inverted, because the (1, 1) element of the array is on top left of the page, whereas the origin is in the bottom left-hand corner. The location of horizontal grid lines is saved in the array IX for use both by the printer plot routine and by the 4060 plot routines.

7. Depending on the plot interval (specified by variables INTHR, INTMIN, and INTSEC), abscissa labels are constructed in MODE 1 (printer plot) coordinates. The labels are stored in the sections of array QPAGE described above.

3.16 SUBROUTINE PRDPPG

PRDPPG is called by PRDPLT and is responsible for the following functions:

1. Calculates printer plot coordinates from rate list entries in hierarchy 1.
2. Prepares and prints labeled plots.

Calling Sequence

CALL PRDPPG

A call to PRDLAB must precede a call to PRDPPG.

Interface

Input

PRDPPG is an entry point in subroutine PRDLAB.

- Via COMMON Area RATE

Variable	Type	Description
RATE	Mixed	Array containing rate list entries in hierarchy 1 format. First NPOINT entries are destroyed by this routine
HTIME	I*2	Array containing time list entries

- Via COMMON Area PLOT

Variable	Description
DD D NMAX(MGROUP) QRATIO(MGROUP) QSUM(MGROUP) HSID	For descriptions, see PRDLG

Output

- Via Logical Unit 6

  The printer plot is printed on this logical unit.

Subroutines Called

PRPLOT is called to prepare an image of the plot in core.

Procedure

1. The logarithmic displacements contained in array RATE are converted to integer printer coordinates.
2. Appropriate header labels are constructed and written out on the printer plot unit.
3. Subroutine PRPLOT is called to prepare the plot in area QPAGE.
4. The completed plot and abscissa labels are written out.

3.17 SUBROUTINE PRPLOT

PRPLOT is called by PRDPPG to prepare an image of the plot in core.

Calling Sequence

CALL PRPLOT (IRATE, NPOINT, NRATE, IX, IY, QPAGE, MODE)

Interface

Input

Variable	Type	Description
IRATE	Mixed	Array containing plot coordinates. Structure is similar to hierarchy 2 format, with important difference that ordinate is for printer plot (object space ordinate extent is 0 through 120). This array is computed by PRDPPG
NPOINT	I*4	Number of plot intervals to be plotted
NRATE	I*4	Number of rates to be plotted
IX	I*4	IX(1) - number of horizontal grid lines to be drawn. IX(1) elements following first element contain ordinate where grid lines are drawn
IY	I*4	IY(1) - number of vertical grid lines to be drawn. IY(1) elements following first element contain abscissa where grid lines are drawn
QPAGE	L*1	Contains image of plot
MODE	I*4	= 0, prepare plot = 1, fill array QPAGE with blanks (x'40')

The array QPAGE is constructed such that the first element of the array corresponds to the top left-hand corner of the plot.

Procedure

1. If MODE $\neq$ 0, initialize the array QPAGE to blanks, and return.
2. If MODE = 0, the following processes are performed:

   A. Draw vertical grid lines.

   B. Obtain ordinate values for horizontal grid lines, invert the ordinate (120-plot ordinate), and move in horizontal grid lines.

   C. For NPOINT plot intervals (and NRATE rates), the following processes are performed:

      (1) Obtain the value of the upper end of the error bar and invert it.

      (2) Obtain the value of the lower end of the error bar and invert it.

      (3) At the current value of the abscissa, starting with the upper end of the error bar, plot the error bar (character 1) up to the lower end of the error bar.

      (4) Plot the character contained in the least significant byte of the four-word entry (in array IRATE) at the value of the rate of the third word in the entry.

Plotting Characters

To enhance the information contained in a plot, the character plotted is determined by the character that existed in the plot location before, as well as the character that would have been plotted had there been no plot character in the location. Thus if, at some location, the current character is an asterisk (*) and one would like to plot the character $, the character that replaces the asterisk is the character A. The subroutine accomplishes this by maintaining

a translation table (Table 3-2). Whenever a character is to be plotted in a location, the binary representation of this character is exclusive-ored with the binary representation of character at the location; the result of this operation gives displacement in the translate table, which is used to find the character to be put in the location. Table 3-2 represents the relationship of the character put in the plot array to the character to be plotted and the character currently in the location.

Table 3-2. Translation Table

CHARACTER TO BE PLOTTED	CHARACTER ALREADY PRESENT						
	b	.	1	*	$	A
1	1	1	1	*	$	A
b'			.	*	$.	A
*			*			
$			$	A		
@			@	B	C	D

NOTE: SHADED AREAS OF THE TABLE ARE NOT NEEDED AS A CONSEQUENCE OF THE ORDER IN WHICH DATA IS PLOTTED.

LEGEND:

b — BLANK (X'40'
b' — X'80' (NOT PRINTABLE)

3.18 SUBROUTINE PRDSDG

PRDSDG is called by PRDPLT to plot data for one 4060 frame.

Calling Sequence

CALL PRDSDG (ITB, NPOINT, MODE)

Interface

Input

- Via Calling Arguments

Variable	Type	Description
ITB	I*4	Index in array HTIME (COMMON area RATE) corresponding to first plot interval to be plotted
NPOINT	I*4	Number of plot intervals to be plotted
MODE	I*4	Mode of plot = 1, 120/124 plot intervals per frame = 2, 240/250 plot intervals per frame = 3, 168 plot intervals per frame = 4, 240 plot intervals per frame

- Via COMMON Area RATE

Variable	Type	Description
RATE	Mixed	Array containing NPOINT rate list entries: Hierarchy 1 format, if QPRNTR = .TRUE. Hierarchy 2 format, if QPRNTR = .FALSE.
HTIME	I*2	Array containing time list entries. NPOINT entries beginning with HTIME(1TB) contain time list entries corresponding to plot intervals to be plotted

Variable	Type	Description
IX	I*4	For description, see PRDLAB
IY	I*4	
QPAGE	L*1	
MTWLB	I*4	Number of labels along ordinate
ZBMTW	R*4	Array containing floating point printer plot ordinates for labels

- Via COMMON Area PLOT

Variable	Type	Description
AMODE	R*4	Mode set array for calls to 4060 package
NMAX(MGROUP)	I*4	NMAX(MGROUP) is number of rates in this group to which data to be plotted belongs
QRATIO(MGROUP)	L*4	Determines whether it is ratio of rates that is being plotted
QSUM(MGROUP)	L*4	Determines whether it is sum of rates that is being plotted
RMAX	R*4	Upper limit of ordinate when QSCALE = .TRUE.
RMIN	R*4	Lower limit of ordinate when QSCALE = .TRUE.
MGROUP	I*4	Index of group to which data to be plotted belongs
QSCALE	L*4	Determines whether data was auto scaled
QPRNTR	L*4	Determines format of rate list entries
NPTMAX	I*4	Number of plot intervals per frame for MODE 1
XINC(MODE)	R*4	Raster increment corresponding to plot interval (along abscissa)
IXTNT(MODE)	I*4	Extent (along abscissa) (integer raster units)

Variable	Type	Description
IFRAME	I*4	Frame counter for this job
JFRAME	I*4	Frame counter for this plot period
NFRAME	I*4	Line counter for plot summary
RHI(MGROUP)	R*4	Upper limit of ordinate (QSCALE = .FALSE.)
RLO(MGROUP)	R*4	Lower limit of ordinate (QSCALE = .FALSE.)

Output

- Via COMMON Area PLOT

Variable	Type	Description
IFRAME	I*4	Updated overall frame count
JFRAME	_	Updated frame count for current plot period

- Via I/O Operations

  Logical unit 14--Title is generated for summary of plots listing.

Subroutines Called

FMOVE	SDGLAB
LEGNDG	PAGEG
SEGMTG	ALOG10
INCORE	

Procedure

1. Variable MTWLB and array ABMTW are moved into local variables, since the area corresponding to these variables will be overwritten.

2. Frame counters are advanced, and a title for the frame summary is written on logical unit 14, if necessary.

3. The extent along the abscissa, and the increment in the abscissa corresponding to a plot interval, is obtained.

4. The index corresponding to the time list entry for the last plot interval is computed. JMAX is set equal to the number of rates in the group.

5. If the rate list format is hierarchy 2, coordinates are obtained from array IRATE. The abscissa are saved in array IXER, the upper end of the error bar in array IYUP and the lower end in IYLO, while the characters are plotted. The arrays IXER, IYUP, and IYLO will be required later; saving these here obviates the necessity of having to call SEGMTG for each data point. If the rate list format is hierarchy 1, then raster coordinates are computed from logarithmic displacements and the above procedure is followed.

6. Horizontal grid lines are drawn. The equivalent printer coordinates in the array IY are used to determine the ordinate where these lines are drawn. The ordinate is labeled using labels stored in array QPAGE.

7. Vertical grid lines are drawn and the abscissa is labeled. The following categories are treated separately:

   MODE = 1 $\wedge$ INTHR = 24

   MODE = 1 $\wedge$ $\neg$(INTHR = 24)

   MODE = 2 $\wedge$ (INTHR = 1 $\mid$ (INTHR = 0 $\wedge$ INTMIN = 30 $\wedge$ INTSEC = 0))

   MODE = 2 $\wedge$ (INTHR = 0, INTMIN = 2, INTSEC = 24)

   MODE = 3 $\mid$ MODE = 4

8. SDGLAB is called to prepare and write titles on the plot, and to write out round trip light times.

9. PAGEG is called to advance the frame, and control is returned to the calling program.

Data Constants and Literals

Variable	Type	Description
XMONTH	12CL4	Array containing EBCDIC month label
ARAST	R*4	Ordinate of origin (rasters)
BLANK	R*4	Value of fourth word of four-word subentry in rate list if corresponding data was padded or missing
Q1	c	Characters for constructing middle of month
Q5	c	Label
IXORG	236	Raster coordinates of origin of plot
IYORG	300	
IXEND	-	Abscissa of right-most grid line
2700	-	Ordinate of top-most grid line
11	-	Number of vertical grid lines (MODE = 2)
51	-	Number of tick marks along abscissa (MODE = 2, INTHR = 0, INTMIN = 2, INTSEC = 24)
41	-	Number of tick marks along abscissa
24	-	Number of plot intervals between tick marks
25	-	-

3.19 SUBROUTINE SDGLAB

SDGLAB is called by PRDSDG to create and put titles on the 4060 plot.

Calling Sequence

CALL SDGLAB (ITB, ITE, JMAX)

Interface

Input

- Via Arguments in Call

Variable	Type	Description
ITB	I*4	Index in array HTIME (COMMON area RATE) corresponding to start time of frame
ITE	I*4	Index in array HTIME corresponding to end time of frame
JMAX	I*4	Number of rates plotted on this frame

- Via COMMON Area PLOT

Variable	Type	Description
DD	R*8	Array containing rate equation description of rates
D	R*8	Array containing mnemonics of rates
QRATIO(MGROUP)	L*4	-
QSUM(MGROUP)	L*4	-
HSID	I*2	-
QTRCHK	L*4	-
HF(7)	I*2	-
INTHR	I*4	-
INTMIN	I*4	-
INTSEC	I*4	-

Variable	Type	Description
MGROUP	I*4	-
IFRAME	I*4	-

- Via COMMON Area RTRIPT

Variable	Type	Description
HDSTAR	I*2	-
RTLT	R*4	Array of which Ith element contains round trip light time for RMJD (HDSTAR + I)

- Via COMMON Area RATE

Variable	Type	Description
HTIME	I*2	Array containing time list entries

Output

- Via I/O Operations

  LEGNDG is called to create meta-language instructions and to write to the 4060 output data set (DDNAME SC4060Z2).

Subroutines Called

INCORE	DRMJD
FMOVE	LEGNDG

SECTION 4 - PIONEER RATES DISPLAY PROGRAM USER'S GUIDE

4.1 INTRODUCTION

The main control section for the Pioneer Rates Display Program resides in the data set K3.ZB2NL.SB001.PIORDISP, under the member name PRDISP. An executable load module can be created by explicitly including PRDISP, and resolving other references by automatic library search. For this purpose, the following data sets need to be concatenated on the ddname SYSLIB:

K3.ZB2NL.SB001.PIORDISP
SYS2.SC4060
SYS1.FORTLIB
SYS2.FORTLIB

The JCL setup shown in Figure 4-1 may be used to link-edit and execute the load module, using the GSFC-cataloged procedure LINKGO. Figure 4-1 shows the setup for creating an executable load module and saving it in data sets SYS2.LOADLIB (on the IBM S/360-75) and HMLOAD (on the IBM S/360-91). It also shows the setup required to run from the executable load module.

4.2 RESOURCES REQUIRED

When all options are utilized (i.e., listings, printer plots, and 4060 plots are requested), the program requires approximately 300K of main storage. One nine-track tape drive is always required. When 4060 plots are required, a seven-track tape drive capable of recording at 556 bpi is needed. In addition, approximately 500 tracks of direct-access space is required for secondary storage.

The link-editing requires a little over one-half minute of I/O time. It is desirable, therefore, to have a copy of the executable load module. The execution time depends on which options were requested, plot period, and the number of groups to be plotted. If 4060 plots for one type only are requested, then up to

```
//*            JCL SETUP TO RUN RATES DISPLAY PROGRAM
//*   IF YOU ARE RUNNING FROM AN EXECUTABLE LOADMODULE RESIDING
//*   IN LOADLIB UNDER THE NAME XXXXXABC, USE THE FOLLOWING
//*   CARDS
//GO          EXEC  PGM=XXXXXABC,REGION=300K                          100
                  FOR RUNNING ON THE 360/91 USE
//STEPLIB     DD    DSN=MMLOAD,DISP=SHR                               110
//*                 FOR RUNNING ON THE 360/75 USE
//STEPLIB     DD    DSN=SYS2.LOADLIB,DISP=SHR                         110
//FT05F001    DD    DDNAME=DATA5                                      120
//*   TO LINK AND GO USE THE FOLLOWING INSTEAD OF CARDS 100-120
//            EXEC  LINKGO,REGION.GO=300K
//LINK.SYSLIB DD    DSN=K3.ZB2NL.SB001.PIORDISP,DISP=SHR              100
//                  DSN=SYS2.~~SC4060~~ WOLFPLOT,DISP=SHR             110
//LINK.SYSLIN DD    *                                                 115
  INCLUDE SYSLIB(PRDISP)                                            120
//*           JCL STATEMENTS COMMON TO ALL OF                         130
//*                 THE ABOVE                                         140
//GO.FT06F001 DD    SYSOUT=A,                                         150
//  DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265,BUFNO=1)                    160
//GO.FT08F001 DD    DSN=K3.ZB2NL.SB00I.DPIOFRST,DISP=SHR              170
//GO.FT09F001 DD    DSN=K3.ZB2NL.SB00I.DPIOFRSP,DISP=SHR              180
//*   ABOVE CARD NOT NEEDED FOR THE SAMPLE RUN                        190
//GO.FT10F001 DD    DSN=DONTKNOW,UNIT=(9TRACK,,DEFER),                200
//  DISP=SHR,VOL=SER=DONTCARE,DCB=BURNO=1                             210
//GO.FT11F001 DD    UNIT=2314,SPACE=(5952,420),DCB=BLKSIZE=5952       220
//FO.FT12F001 DD    SYSOUT=A,DCB=*.FT06F001                           230
//GO.FT13F001 DD    UNIT=2314,SPACE=(1488,28),DCB=BLKSIZE=1488        240
//GO.FT14F001 DD    SYSOUT=A,                                         250
//  DCB=(RECFM=VBA,LRECL=137,BLKSIZE=1100,BUFNO=1)                    260
//GO.FT18F001 DD
//GO.FT19F001 DD
//GO.FT20F001
//GO.FT30F001
//GO.FT15F001 DD    *
      [Plot-type cards go here]

//GO.DATA5    DD    *
      [Rate descriptor cards go here]
```

fig. 4-1

Figure 4-1. JCL for the Pioneer Rates Display Program

6 months of data for two or three groups can be plotted in 1 minute of CPU and 1 minute of I/O time.

4.3 DATA SETS REFERENCED

The following is a brief description of data sets referenced by the program, organized by DDNAMES.

Data Set	Description
FT06F001	Defines printer plot output data set, normally a line printer (SYSOUT = A). Messages from SC4060 package also appear on this data set. Following DCB parameters must be specified: RECFM = VBA, LRECL = 137, BLKSIZE = N, BUFNO = 1. When printer plots are requested, N should be 7265. A BLKSIZE as low as 278 may be specified when printer plots are not requested
FT08F001	Defines rate summary status data set, whose satellite ID attribute is F . This data set is referenced when there is at least one request for plots from standard summary for Pioneer-F. This data set must have been created by Rates Summary Program or Rates Summary Tape Merge Program. If data set is cataloged, one need specify only data set name and DISP = OLD or DISP = SHR. Otherwise, UNIT and VOL parameters are required (INPUT)
FT09F001	Defines rate summary status data set, whose satellite ID attribute is F . This data set is referenced when there is at least one request for plots from special summary for Pioneer-F. Comments made under FT08F001, regarding creation and information required to define that data set, apply here (INPUT)
FT10F001	Defines rate summary data set. Following information should be specified: UNIT = 9TRACK,,DEFER), DSNAME = anyname 1, VOL = SER = anyname 2, DISP = SHR, DCB = BUFNO = 1. Anyname 1 and anyname 2 are overridden by program, and replaced by names appropriate to plot requests (INPUT)

Data Set	Description
FT11F001	Defines direct-access data set used by program for temporary storage. Following information is required: UNIT = 2314, SPACE = (5952,420), DCB = BLKSIZE = 5952 (DA)
FT12F001	Defines output data set for formatted listing of rates. If no formatted listings are requested, this data set is not required. If required, following should be coded: SYSOUT = A, DCB = *.FT06F001
FT13F001	Defines direct-access data set used by program for temporary storage. Following information must be provided: UNIT = 2314, SPACE = (1488,28), DCB = BLKSIZE = 1488 (DA)
FT14F001	Defines output message data sets, normally directed to line printer (SYSOUT = A). Program processing and error messages appear on this data set. Following DCB parameters should be specified: RECFM = VBA, LRECL = 137, BLKSIZE = 1100, BUFNO = 1 (a larger block-size may be specified, if core is available)
FT15F001	Defines input data set, which contains plot requests; usually input stream (DD *). For a description of input formats, see Section 4.4.1
FT18F001	Defines rate summary status data set, whose satellite ID attribute is G. This data set is referenced when there is at least one request for plots from standard summary for Pioneer-G (see also description of FT08F001)
FT19F001	Defines rate summary status data set, whose satellite ID attribute is G. This data set is referenced when there is at least one request for plots from special summary for Pioneer-G (see also description of FT08F001)
FT20F001	Defines round-trip-light-times data set for Pioneer-F. This data set is created by Pioneer Round-Trip-Light-Times Generator Program

Data Set	Description
FT30F001	Defines round-trip-light-times data set for Pioneer-G. This data set is created by Pioneer Round-Trip-Light-Times Generator Program
SC4060ZZ	Defines output tape data set that contains plots coded for representation on SD4060 microfilm plot apparatus. This data set is not required, if no 4060 plots are requested. In this event, code: DUMMY. If 4060 plots are requested, following information is needed: UNIT = 1600 ~~9-TRACK~~, LABEL=(,SL), DISP = (NEW, KEEP), DCB = (DEN = 3, ~~TRTCH = C~~, RECFM = F, BLKSIZE = 240), VOL=? Volume specified should be non-labeled (NL) and LABEL parameters should specify NL or BLP
FT05F001	Defines input data set which describes rates to be plotted and/or listed in this execution of program. This is usually included in input stream (DD *). See Section 4.4.2

4.4 PARAMETER CARDS

4.4.1 Describing Required Plots

The plot period, plot interval, and the attributes of the rates summary where data to be plotted resides, as well as the scaling parameters for the plots required, are described to the program via NAMELIST PLOT on FORTRAN logical unit 15 (DDNAME FT15F001).

The first column of each card in this data set must be blank. Specification of each request begins on a new card which must contain the sequence of characters &PLOT in columns 2 through 6. This sequence of characters must be followed by at least one blank, followed by data items separated by commas. As many cards as are necessary to specify a request may be used. The end of a request specification is indicated by the character string &END. The form of data items is given below. The underlined keywords and equal signs (=) must be written as shown.

4.4.1.1 Plot Interval

The plot interval (averaging time) is specified by the following data items:

INTHR = inthr, where inthr is an integer equal to number of whole hours contained in a plot interval (defaults to 1)

INTMIN = intmin, where intmin is an integer equal to number of whole minutes in plot interval-inthr (defaults to 0)

INTSEC = intsec, where intsec is an integer equal to number of seconds in plot interval-inthr hours-intmin minutes (defaults to 0)

The interval specified must be an exact multiple of the summary interval of the summary specified by parameters HID and QSPEC.

4.4.1.2 Plot Period

The plot period, or the time span for which plots are to be produced, is specified by the following data items:

$$\underline{\text{HTB}} = \begin{cases} \text{iyr, imon, iday} \\ \text{iyr, imon, iday, ihr} \\ \text{iyr, imon, iday, ihr, imin} \\ \text{iyr, imon, iday, ihr, imin, isec} \end{cases}$$

where iyr = two-digit year of first plot interval to be processed

imon = integer equal to month of first plot interval to be processed

iday = integer equal to day of month of first plot interval to be processed

ihr = integer equal to hour of day corresponding to first plot interval to be processed

imin = integer equal to minute of hour corresponding to first plot interval to be processed

isec = integer equal to second of hour corresponding to first plot interval to be processed

Any one of the four forms above can be used to specify begin time. ihr, imin, and isec default to 0.

The following data items specify the time of the plot interval up to which processing is to continue, i.e., the processing is to stop after the plot interval immediately preceding the processed time specified by HTE:

$$\underline{\text{HTE}} = \begin{cases} \text{iyr, imon, iday} \\ \text{iyr, imon, iday, ihr} \\ \text{iyr, imon, iday, ihr, imin} \\ \text{iyr, imon, iday, ihr, imin, isec} \end{cases}$$

where the definitions of iyr, imon, iday, ihr, imin, and isec are identical to those described above.

4.4.1.3 Summary Attributes

The following data items describe the attributes of the summary from which summary data is to be obtained. These attributes point to a status data set which points to the summary from which data is to be obtained:

HID = 'F', QSPEC = .TRUE. points to status data set defined by ddname FT09F001. (Pioneer-F data from special summary required.)

HID = 'F' or HID = 'F', QSPEC = .FALSE. points to status data set defined by ddname FT08F001. (Pioneer-F data from standard summary required.)

HID = 'G', QSPEC = .TRUE. points to status data set defined by ddname FT19F001. (Pioneer-G data from special summary required.)

HID = 'G' or HID = 'G', QSPEC = .FALSE. points to status data set defined by ddname FT18F001. (Pioneer-G data from standard summary required.)

NOTE: If HID is omitted, it defaults to 'F' for the first request and to the HID specified or assumed for the request immediately preceding this request.

4.4.1.4 Displays

Formatted Listings--If formatted listings of rates are desired, specify QLIST = .TRUE.. If QLIST specification is omitted, no listings are produced.

Printer Plots--If printer plots are desired for this plot period, QPRNTR = .TRUE. should be specified. If QPRNTR specification is omitted, or QPRNTR = .FALSE. is specified, no printer plots will be generated.

4060 Plots--Types of 4060 plots to be produced are specified through data item QTYPE. Any of the following may be specified:

$$\underline{\text{QTYPE}} = 4 * .\text{TRUE.}$$

$$\underline{\text{QTYPE}} = \begin{Bmatrix} \text{T} \\ \text{F} \end{Bmatrix}\left[,\begin{Bmatrix} \text{T} \\ \text{F} \end{Bmatrix}\right]\left[,\begin{Bmatrix} \text{T} \\ \text{F} \end{Bmatrix}\right]\left[,\begin{Bmatrix} \text{T} \\ \text{F} \end{Bmatrix}\right]$$

$$\underline{\text{QTYPE}}\ (\text{ind}) = \begin{Bmatrix} \text{T} \\ \text{F} \end{Bmatrix}$$

If ith type plots are required, QTYPE(i) = .TRUE. must be specified. The four types of plots that can be requested are described in Section 1.3. QTYPE = 4*.FALSE. is the default. See Table 4-1 for appropriate combinations of plot interval and QTYPE.

4.4.1.5 Plot Ordinate Scaling

The ordinate scaling of plots can be specified by the following data items:

QSCALE = .TRUE. specifies that auto scaling is to be in effect for this plot period. Ordinate scale will be determined from maximum and minimum values in each frame.

Table 4-1. Guide To Select Plot Interval - Plot Type Combinations

PLOT INTERVAL \ PLOT TYPE (QTYPE)		1	2	3	4
144 SEC	INTHR = 0 INTMIN = 2 INTSEC = 24		1 INCH = 1 HOUR. 10 HOURS PER FRAME		
30 MIN	INTHR = 0 INTMIN = 30 INTSEC = 0		5 DAYS PER FRAME		
1 HR	INTHR = 1 INTMIN = 0 INTSEC = 0	5 DAYS PER FRAME (1 DAY = 2 INCHES)	10 DAYS PER FRAME	7 DAYS PER FRAME	10-DAY IMP SCALE
6 HR	INTHR = 6 INTMIN = 0 INTSEC = 0	1 MONTH PER FRAME (OR 31 DAYS)[1]			
1 DAY	INTHR = 24 INTMIN = 0	4 MONTHS PER FRAME[1]	8 MONTHS PER FRAME[1]		

[1] IF IT IS DESIRED THAT PLOTS END AND BEGIN ON MONTH BOUNDARIES, A SEPARATER PERIOD CARD SHOULD BE SUBMITTED FOR EACH FRAME DESIRED.

QSCALE = .FALSE. specifies that plots will be scaled along ordinate according to maximum and minimum values specified for group through RHI and RLO data items.

RHI = R1, R2, R3, ..., R15 or
RHI = n*R or
RHI(I) = R

} R, R_1, ..., R_{15} real numbers

n used to specify upper limit of ordinate axis for plots to be generated. RHI(i) specifies upper limit to be used for plots of ith group. Second form is an abbreviated version of first form and specifies same value for first n groups. Last form is used to specify value to be used for ith group. If RHI(i) is not specified, it defaults to 1.0E05.

RLO = R1, R2, ..., R15
RLO = n*R
RLO(i) = R

Used to specify lower limit of ordinate axis for plots to be generated. RLO(I) specifies lower limit to be used for plots of ith group. If RLO(I) is not specified, it defaults to 1.0E-03.

4.4.2 Specifying Rates To Be Plotted

The rates to be plotted are described on logical unit 5 (DDNAME DATA5). Each group of rates is described on a separate card. As many as 15 groups of rates may be specified. A group definition card has the following representation:

$$\begin{Bmatrix} b \\ R \\ S \end{Bmatrix} \text{rate}\left[,\text{rate}\left[,\text{rate}\right]\right]$$

where B represents a blank, R is the character R , S is the character S , and rate is one of the mnemonics listed in column 2 of Table .

Thus, if the rates are to be plotted, the first column should be blank; if the sum of rates is to be plotted, column 1 should contain the character S ; and if the ratio of the first two rates in the group is to be plotted, column 1 should contain the character R .

Columns 2 through 80 of Table are read in free format.[1] These fields are scanned by the program to squeeze out blanks. The comma is used as the delimiter to separate individual rates in the group. Since all 80 columns are read, care must be taken to make sure that there are no sequence numbers in columns 73 through 80.

When an invalid mnemonic is specified, the card is ignored. A message to this effect is printed by the program, along with the image of the card in error.

[1] Blanks are permitted to allow for ease in reading while entering the input.

New Modifications for Rates plot added is:

1. Rates ~~[illegible]~~ multiplied by a constant value and ploted
2. Difference of 2 rates is taken and plotted

~~and the [illegible] list for the~~

3. Ratios of two rates.
4. Sum of two rates

} these were already [illegible]

~~//6~~
~~//60. DATAS DD *~~

```
  1 2 3 4 5 6 7 8 9 10 11 12 13 14
 //60. DATAS    DD    *.
   R10C,R10E    ---->  2 Rates are ploted on one frame.
 R R10C,R10E    ---->  Ratio of 2 Rates
 S R10C,R10E    ---->  SUM  "   "
 C R10C,R10E    ---->  2 Rates multiplied by a constant and ploted
  &INCON ~~B~~ CONVAL= 2. ,   &END
 D R10C,R10E    ---->  Diference of two Rates ~~[illegible]~~.
```

SECTION 5 - PROGRAM ERROR MESSAGES

Following is a brief description of error messages from the Pioneer Rates Display Program, with likely causes and appropriate corrective measures listed:

1. END OF FILE DETECTED WHILE SKIPPING SUMMARY RECORDS OF SUMMARY TAPE XXXXXX, PROGRAM ERROR INDICATED.

   Cause: As stated.

   User Response: Save program output. Consult with a programmer.

2. AN I/O ERROR DETECTED WHILE SKIPPING RECORDS OF SUMMARY TAPE XXXXXX RUN TERMINATED. MESSAGE FOLLOWS. (Message from FTIO printed here.)

   Cause: As stated.

   User response: Run job again. If error recurs, check FTIO manual and message printed to locate error. Tape will have to be copied replacing lost data.

3. I/O ERROR DETECTED WHILE READING PLOT DATA. PROCESSING FOR THIS REQUEST TERMINATED.

   Cause: The I/O error was on a temporary direct access data set.

   User Response: Run job again for desired data.

4. NO RATE DESCRIPTIONS ON THE INPUT DATA SET.

   Cause: Either the user did not specify any rates to be plotted on FT05F001, or all the cards input were found to be in error.

   User Response: Check printout on logical unit 4 (FT04F001) for details of why cards were rejected. Make corrections indicated.

5. RTLT DATASET (UNIT XX) SHOULD HAVE BEEN APPROPRIATE TO THE ID X, BUT INSTEAD CORRESPONDS TO ID X. JOB TERMINATED.

Course: As stated.

User Response: Make sure that FT20F001 is F RTLT data set, and/or that FT30F001 is G RTLT data set.

6. END OF FILE DETECTED WHILE READING RTLT DATASET (UNIT XX). JOB TERMINATED.

Course: Data set specified a DD card has not been written to.

User Response: Make corrections to DD card for specified unit. Make sure data set specified has been written to.

7. I/O ERROR DETECTED WHILE READING RTLT DATASET (UNIT XX). JOB TERMINATED.

Cause: As stated.

User Response: Rerun job. If error recurs, RTLT data set must be recreated.

8. STATUS DATASET DOES NOT CORRESPOND TO DESIRED S/C ID. DESIRED ID WAS X, WHILE THE STATUS DATASET CORRESPONDS TO X. JOB TERMINATED.

Cause: As stated.

User Response: If desired ID was F, make corrections to FT08F001 and/or FT09F001 so that they define status for Pioneer-F. If desired ID was G, make corrections to FT18F001 and/or FT19F001 so that they define status data set for Pioneer-G.

9. BEGIN YEAR WAS NOT SPECIFIED. RUN IS TERMINATED.

Cause: As stated.

User Response: Correct period NAMELIST input card to specify HTB (start time).

10. END YEAR WAS NOT SPECIFIED. RUN IS TERMINATED.

Cause: As stated.

User Response: Correct period NAMELIST input card to specify HTE (end time).

11. BEGIN TIME IS LATER THAN END TIME. RUN IS TERMINATED.

Cause: As stated.

User Response: Make corrections to Plot card.

12. AN I/O ERROR WAS DETECTED WHILE READING THE STATUS DATASET ON UNIT XX. RUN TERMINATED. (Message from FTIO printed here.)

Cause: As stated.

User Response: Rerun job. If data set was correctly specified and error recurs, status data must be recreated.

13. NO PERIOD CARD. JOB TERMINATED.

Cause: As stated.

User Response: Use NAMELIST PLOT to supply plot types desired and plot period to program.

14. THE GIVEN INTERVAL IS NOT AN EXACT MULTIPLE OF THE INTERVAL ON THE SUMMARY TAPE. REQUEST IGNORED.

Cause: The requested plot interval (the time between data points on the plot grid) is not an integral multiple of the summary intervals; or QSPEC = T was desired but not specified on the PLOT card or was specified when not desired and hence the wrong status data set was referenced.

User Response: Make correction to requested plot interval, or, if already correct, change rates summary data set to one appropriate for this interval. The plot interval as specified on the NAMELIST PLOT card (INTHR, INTMIN, INTSEC) must be an exact multiple of the summary interval on the rates summary tape. For example, if the summary interval is 1 hour, the plot period specified must be at least 1 hour and may be any integral number of hours. Conversely, if the desired plot interval is 1 hour, the summary interval can be no greater than 1 hour, and must divide 1 hour.

15. END OF TAPE WHILE READING THE SUMMARY TAPE. PROBABLE PROGRAM ERROR, OR AN ERROR ON TAPE INDICATED. EXECUTION CONTINUING.

Cause: As stated.

User Response: Make sure JCL has a card saying //GO.SYSUDUMP DD SYSOUT=A, adjust program jobname to obtain a dump, and consult with a programmer.

16. I/O ERROR (message from FTIO printed here).

Cause: An I/O error was detected while reading the rates summary tape. Job is terminated.

User Response: Run job again. If error recurs, check FTIO manual for location of error and recreate bad record on tape.

17. *** ERROR CARD IGNORED (followed by card image).

Cause: A card containing other than valid rate descriptors was read on FT05F001.

User Response: Carefully check all rates specified on card against those allowable.

18. END OF FILE DETECTED WHILE READING THE STATUS DATA-SET ON UNIT XX. RUN TERMINATED.

Cause: As stated.

User Response: Unless error was in specification of DSNAME, status data set must be recreated.

SECTION 6 - EXAMPLE USES OF PIONEER RATES DISPLAY PROGRAM

Suppose that (1) six-hourly averages as well as hourly averages are to be plotted for Pioneer-F over the period October 1, 1973, to December 15, 1973 (inclusive), for the following rate group:

Group 1 SR2A(9), R13A, R15A

and the ratio SR2A(9)/R15A is to be plotted for the same time period; (2) same plots for the same time period are required for Pioneer-G, along with the printed listings for six-hourly averages, and listings and printer plots for hourly averages; (3) default limits for ordinate scaling are acceptable for the rates in group 1, but for the ratio the ordinate is to be scaled between 10^{-2} and 10^{1}; (4) for both Pioneer-F and Pioneer-G there exist summaries (standard) with summary interval = 1 hour; and (5) six-hour-average plots have frames beginning at the beginning of the month.

The FT05F001 input for these plots is as follows:

```
b     SR2A(9), R13A, R15A
R     SR2A(9), R15A
```

Next, set up the first plot descriptor cards for logical unit 15:

```
b&PLOT   HTB=73,10,1, HTE=73,12,16, HID='F', QTYPE(2)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END
```

Now, (1) since the plot interval is 1 hour, it need not be specified; (2) since the data resides on standard summary, QSPEC is omitted; (3) for hourly averages, the second type of abscissa scale is chosen; and (4) the values of RHI and RLO for the second rate group are specified.

The next plot descriptor cards are as follows:

```
b&PLOT   INTHR=6, HTB=73,10,1, HTE=73,11,1, QTYPE(1)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END

b&PLOT   INTHR=6, HTB=73,11,1, HTE=73,12,1, QTYPE(1)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END

b&PLOT   INTHR=6, HTB=73,12,1, HTE=73,12,16, QTYPE(1)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END
```

Had it not required that each frame begin with the first of the month, only one set of input would have been needed. Since the satellite ID is the same as that of the last request, it did not need to be specified.

Now, Pioneer-G plots are as follows:

```
b&PLOT   HTB=73,10,1, HTE=73,12,16, HID='G', QTYPE(2)=.TRUE.,
         QLIST=.TRUE., RHI(2)=1.E01, RLO(2)=1.E-2, &END

b&PLOT   INTHR=6, HTB=73,10,1, HTE=73,11,1, QTYPE(1)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END

b&PLOT   INTHR=6, HTB=73,11,1, HTE=73,12,1, QTYPE(1)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END

b&PLOT   INTHR=6, HTB=73,12,1, HTE=73,12,16, QTYPE(1)=.TRUE.,
         RHI(2)=1.E01, RLO(2)=1.E-2, &END
```

The plot-type cards are inserted following the FT15F001 ddcard and the rate descriptor cards following the DATA5 ddcard in the following JCL setup.

RATE TO BE PLOTTED/LISTED	ACC. REGISTER (F05F001 INPUT)
A1.¬A2.B.C1.¬C3(1)	SR1A(1)
).¬A2.B.C1.¬C3(2)	SR1A(2)
A1.¬A2.B.C1.¬C3(3)	SR1A(3)
A1.¬A2.B.C1.¬C3(4)	SR1A(4)
A1.¬A2.B.C1.¬C3(5)	SR1A(5)
A1.¬A2.B.C1.¬C3(6)	SR1A(6)
A1.¬A2.B.C1.¬C3(7)	SR1A(7)
A1.¬A2.B.C1.¬C3(8)	SR1A(8)
A1.¬A2.B.C1.¬C3(9)	SR1A(9)
A2.B.K1.¬C3(1)	SR1B(1)
A2.B.K1.¬C3(2)	SR1B(2)
A2.B.K1.¬C3(3)	SR1B(3)
A2.B.K1.¬C3(4)	SR1B(4)
A2.B.K1.¬C3(5)	SR1B(5)
A2.B.K1.¬C3(6)	SR1B(6)
A2.B.K1.¬C3(7)	SR1B(7)
A2.B.K1.¬C3(8)	SR1B(8)
A2.B.K1.¬C3(9)	SR1B(9)
D1.D2.¬F(1)	SR1C(1)
D1.D2.¬F(2)	SR1C(2)
D1.D2.¬F(3)	SR1C(3)
D1.D2.¬F(4)	SP1C(4)
D1.D2.¬F(5)	SP1C(5)
D1.D2.¬F(6)	SR1C(6)
D1.D2.¬F(7)	SR1C(7)
D1.D2.¬F(8)	SP1C(8)
D1.D2.¬F(9)	SR1C(9)
D1.D2.E1.¬F(1)	SR1D(1)
D1.D2.E1.¬F(2)	SR1D(2)
D1.D2.E1.¬F(3)	SR1D(3)
D1.D2.E1.¬F(4)	SR1D(4)

For following "out" / need to know:
1) where insert
2) callout in text
3) title/number

D1.D2.E1.¬F(5)	SR1D(5)
D1.D2.E1.¬F(6)	SR1D(6)
D1.D2.E1.¬F(7)	SR1D(7)
.D2.E1.¬F(8)	SR1D(8)
D1.D2.E1.¬F(9)	SR1D(9)
S1(5).¬S2.¬S2(A).¬S3(1)	SR2A(1)
S1(5).¬S2.¬S2(A).¬S3(2)	SR2A(2)
S1(5).¬S2.¬S2(A).¬S3(3)	SR2A(3)
S1(5).¬S2.¬S2(A).¬S3(4)	SR2A(4)
S1(5).¬S2.¬S2(A).¬S3(5)	SR2A(5)
S1(5).¬S2.¬S2(A).¬S3(6)	SR2A(6)
S1(5).¬S2.¬S2(A).¬S3(7)	SR2A(7)
S1(5).¬S2.¬S2(A).¬S3(8)	SR2A(8)
S1(5).¬S2.¬S2(A).¬S3(9)	SR2A(9)
S1(6).¬S2.¬S2(A).¬S3(1)	SR2B(1)
S1(6).¬S2.¬S2(A).¬S3(2)	SR2B(2)
S1(6).¬S2.¬S2(A).¬S3(3)	SR2B(3)
S1(6).¬S2.¬S2(A).¬S3(4)	SR2B(4)
S1(6).¬S2.¬S2(A).¬S3(5)	SR2B(5)
S1(6).¬S2.¬S2(A).¬S3(6)	SR2B(6)
S1(6).¬S2.¬S2(A).¬S3(7)	SR2B(7)
S1(6).¬S2.¬S2(A).¬S3(8)	SR2B(8)
S1(6).¬S2.¬S2(A).¬S3(9)	SR2B(9)
S1(7).¬S2.¬S2(A).¬S3(1)	SR2C(1)
S1(7).¬S2.¬S2(A).¬S3(2)	SR2C(2)
S1(7).¬S2.¬S2(A).¬S3(3)	SR2C(3)
S1(7).¬S2.¬S2(A).¬S3(4)	SR2C(4)
S1(7).¬S2.¬S2(A).¬S3(5)	SR2C(5)
S1(7).¬S2.¬S2(A).¬S3(6)	SR2C(6)
S1(7).¬S2.¬S2(A).¬S3(7)	SR2C(7)
S1(7).¬S2.¬S2(A).¬S3(8)	SR2C(8)
S1(7).¬S2.¬S2(A).¬S3(9)	SR2C(9)

S1(8).¬S2.¬S2(A).¬S3(2)	SR2D(2)
S1(8).¬S2.¬S2(A).¬S3(3)	SR2D(3)
S1(8).¬S2.¬S2(A).¬S3(4)	SR2D(4)
S1(8).¬S2.¬S2(A).¬S3(5)	SR2D(5)
S1(8).¬S2.¬S2(A).¬S3(6)	SR2D(6)
S1(8).¬S2.¬S2(A).¬S3(7)	SR2D(7)
S1(8).¬S2.¬S2(A).¬S3(8)	SR2D(8)
S1(8).¬S2.¬S2(A).¬S3(9)	SR2D(9)
¬S1.S2(5).¬S2(A).¬S3(1)	SR2E(1)
¬S1.S2(5).¬S2(A).¬S3(2)	SR2E(2)
¬S1.S2(5).¬S2(A).¬S3(3)	SR2E(3)
¬S1.S2(5).¬S2(A).¬S3(4)	SR2E(4)
¬S1.S2(5).¬S2(A).¬S3(5)	SR2E(5)
¬S1.S2(5).¬S2(A).¬S3(6)	SR2E(6)
¬S1.S2(5).¬S2(A).¬S3(7)	SR2E(7)
¬S1.S2(5).¬S2(A).¬S3(8)	SR2E(8)
¬S1.S2(5).¬S2(A).¬S3(9)	SR2E(9)
¬S1.S2(6).¬S2(A).¬S3(1)	SR2F(1)
¬S1.S2(6).¬S2(A).¬S3(2)	SR2F(2)
¬S1.S2(6).¬S2(A).¬S3(3)	SR2F(3)
¬S1.S2(6).¬S2(A).¬S3(4)	SR2F(4)
¬S1.S2(6).¬S2(A).¬S3(5)	SR2F(5)
¬S1.S2(6).¬S2(A).¬S3(6)	SR2F(6)
¬S1.S2(6).¬S2(A).¬S3(7)	SR2F(7)
¬S1.S2(6).¬S2(A).¬S3(8)	SR2F(8)
¬S1.S2(6).¬S2(A).¬S3(9)	SR2F(9)
¬S1.S2(7).¬S2(A).¬S3(1)	SR2G(1)
¬S1.S2(7).¬S2(A).¬S3(2)	SR2G(2)
¬S1.S2(7).¬S2(A).¬S3(3)	SR2G(3)
¬S1.S2(7).¬S2(A).¬S3(4)	SR2G(4)
¬S1.S2(7).¬S2(A).¬S3(5)	SR2G(5)
¬S1.S2(7).¬S2(A).¬S3(6)	SR2G(6)
¬S1.S2(7).¬S2(A).¬S3(7)	SR2G(7)

¬S1•S2(7)•¬S2(A)•¬S3(8)	SR2G(8)	
¬S1•S2(7)•¬S2(A)•¬S3(9)	SR2G(9)	
¬S1•S2(8)•¬S2(A)•¬S3(1)	SR2H(1)	
S1•S2(8)•¬S2(A)•¬S3(2)	SR2H(2)	
¬S1•S2(8)•¬S2(A)•¬S3(3)	SR2H(3)	
¬S1•S2(8)•¬S2(A)•¬S3(4)	SR2H(4)	
¬S1•S2(8)•¬S2(A)•¬S3(5)	SR2H(5)	
¬S1•S2(8)•¬S2(A)•¬S3(6)	SR2H(6)	
¬S1•S2(8)•¬S2(A)•¬S3(7)	SR2H(7)	
¬S1•S2(8)•¬S2(A)•¬S3(8)	SR2H(8)	
¬S1•S2(8)•¬S2(A)•¬S3(9)	SR2H(9)	
(A2•K1+A1•C1)•B•¬C3	R1	1
A1•¬A2•B•C3	R2A	2
A2•B•C3	R3A	3
A2•B•K2•C1•¬C2	R4A	4
A2•B•K2•C1•C2•¬C3	R5A	5
A1•¬A2•B•¬C1	R6A	6
A1•¬A2•B•C1•C2•¬C3	R7A	7
A2•B•K1•C1•¬C2	R8A	8
B	R9A	9
D1(1)	R10A	10
D1•D2•¬F	R11A	11
D1•D2•E1•¬F	R12A	12
D1•D2•E2•¬F	R13A	13
D1	R14A	14
S1(1)•¬S2•¬S2(A)•¬S3	R15A	15
S1•S2(1)•¬S2(A)•¬S3	R16A	16
A1•B•K2•¬C3	R2B	17
A2•B•K2•¬C1	R3B	18
A1	R4B	19
A2	R5B	20
A1•¬A2•B•C1•¬C2	R6B	21
A2•B•K1•¬C1	R7B	22

A2•B•K1•C1•C2•¬C3	R8B	23
C1	R9B	24
D1(2)	R10B	25
1•D2•SIGMA-D•¬F	R11B	26
D1•D2•SIGMA-D•E3•¬F	R12B	27
D1•D2•SIGMA-D•E4•¬F	R13B	28
D2	R14B	29
S1(2)•¬S2•¬S2(A)•¬S3	R15B	30
S1•S2(2)•¬S2(A)•¬S3	R16B	31
C2	R9C	32
D1(3)	R10C	33
E1	R14C	34
S1(3)•¬S2•¬S2(A)•¬S3	R15C	35
S1•S2(3)•¬S2(A)•¬S3	R16C	36
C3	R9D	37
D1(4)	R10D	38
	R14D	39
S1(4)•¬S2•¬S2(A)•¬S3	R15D	40
S1•S2(4)•¬S2(A)•¬S3	R16D	41
D1(5)	R10E	42
S1	R14E	43
D1(6)	R10F	44
S2	R14F	45
D1(7)	R10G	46
S3	R14G	47
D1(8)	R10H	48
S2(A)	R14H	49
DC•BUS•VOLTAGE	BUSVOL	
DC•BUS•CURRENT	BUSCUR	
S/C•PLATFORM•TEMP	S/CPTEMP	
SIGNAL•TO•NOISE•RATIO	S/NRATIO	
BILEVEL	BILEVEL	
ELECT•TEMP•	EL•TEMP	

HOUSEKEEPING	HSKPNG
CALIBRATION.VOLTAGE	CALIBVOL
DETECTOR.TEMPEPATURE	DETTEMP
SEC.VOLTAGE	SECTORV

RATE INPUT		RATE	DS2 A/B	DS3 SEQ1	DS4 SEQ2
R1	a	$(A_2 K_1 + A_1 CI)\ B\ C\ \overline{III}$			
R2	a	$A_1 \overline{A_2}\ BC\ III$	Ø		
	b	$A_1 B K_2 \overline{C\ III}$	1		
R3	a	$A_2 BC\ III$	Ø		
	b	$A_2 B K_2 \overline{CI}$	1		
R4	a	$A_2 B K_2 CI\ \overline{CII}$	Ø		
	b	A_1	1		
R5	a	$A_2 B K_2 CI\ CII\ \overline{CIII}$	Ø		
	b	A_2	1		
R6	a	$A_1 \overline{A_2}\ B\ \overline{CI}$	Ø		
	b	$A_1 \overline{A_2}\ BCI\ \overline{CII}$	1		
R7	a	$A_1 \overline{A_2}\ BCI\ CII\ \overline{CIII}$	Ø		
	b	$A_2 B K_1\ \overline{CI}$	1		
R8	a	$A_2 B K_1 CI\ \overline{CII}$	Ø		
	b	$A_2 B K_1 CI\ CII\ \overline{CIII}$	1		
R9	a	$SI\ SII\ SII_a\ SIII$	Ø		
	b	$SI\ SII\ SII_a\ SIII$	1		
R10	a	DI_1	Ø	Ø	Ø
	b	DI_2	1	Ø	Ø
	C	DI_3	Ø	1	Ø
	D	DI_4	1	1	Ø
	E	DI_5	Ø	Ø	1
	F	DI_6	1	Ø	1
	G	DI_7	Ø	1	1
	H	DI_8	1	1	1
R11	a	$DI\ DII\ \bar{F}$	Ø		
	b	$DI\ DII\ \Sigma D\bar{F}$	1		
R12	a	$DI\ DII\ E_1 \bar{F}$	Ø		
	b	$DI\ DII\ \Sigma D E_3 \bar{F}$	1		
R13	a	$DI\ DII\ E_2\ \bar{F}$	Ø		
	b	$DI\ DII\ \Sigma D E_4\ \bar{F}$	1		
R14	a	DI	Ø	Ø	
	b	DII	1	Ø	
	C	E_1	Ø	1	
	d	F	1	1	
	e	B	Ø	Ø	1
	f	CI	1	Ø	1
	g	CII	Ø	1	1
	h	CIII	1	1	1

RATE INPUT		RATE	DS2 A/B	DS3 SEQ1	DS4 SEQ2
R15		$SI, \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	Φ	Φ	
		$SI_2\ \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	1	Φ	
		$SI_3\ \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	Φ	1	
		$SI_4\ \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	1	1	
R16	a	$SI\ SII,\ \overline{SII_a}\ \overline{SIII}$	Φ	Φ	
	b	$SI\ SII_2\ \overline{SII_a}\ \overline{SIII}$	1	Φ	
	c	$SI\ SII_3\ \overline{SII_a}\ \overline{SIII}$	Φ	1	
	d	$SI\ SII_4\ \overline{SII_a}\ \overline{SIII}$	1	1	
R17	a	SI	Φ	Φ	Φ
	b	SII	1	Φ	Φ
	c	SII_a	Φ	1	Φ
	d	SIII	1	1	Φ
	e	SI	Φ	Φ	1
	f	SII	1	Φ	1
	g	SII_a	Φ	1	1
	h	SIII	1	1	1
R18	a	$SI, \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	Φ	Φ	
	b	$SI_2\ \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	1	Φ	
	c	$SI_3\ \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	Φ	1	
	d	$SI_4\ \overline{SII}\ \overline{SII_a}\ \overline{SIII}$	[illegible]	1	
R19	a	$SI\ SII,\ \overline{SII_a}\ \overline{SIII}$	Φ	Φ	
	b	$SI\ SII_2\ \overline{SII_a}\ \overline{SIII}$	1	Φ	
	c	$SI\ SII_3\ \overline{SII_a}\ \overline{SIII}$	Φ	1	
	d	$SI\ SII_4\ \overline{SII_a}\ \overline{SIII}$	1	1	
R2Φ	a	USXR			

Sectored Rates - each rate have 8 sectors and

SR 1	a	$A_1\ \overline{A_2}\ B\ C\ I\ \overline{C\ III}$
	b	$A_2\ B\ K_1\ \overline{C\ III}$
	c	$D\ I\ D\ II\ \overline{F}$
	d	$D\ I\ D\ II\ E_1\ \overline{F}$

SR2	A	SI_5	$\overline{S\,II}$	$\overline{S\,II_a}$	$\overline{S\,III}$
	B	SI_6	$\overline{S\,II}$	$\overline{S\,II_a}$	$\overline{S\,III}$
	C	SI_7	$\overline{S\,II}$	$\overline{S\,II_a}$	$\overline{S\,III}$
	D	SI_8	$\overline{S\,II}$	$\overline{S\,II_a}$	$\overline{S\,III}$
	E	$\overline{S\,I}$	$S\,II_5$	$\overline{S\,II_a}$	$\overline{S\,III}$
	F	$\overline{S\,I}$	$S\,II_6$	$\overline{S\,II_a}$	$\overline{S\,III}$
	G	$\overline{S\,I}$	$S\,II_7$	$\overline{S\,II_a}$	$\overline{S\,III}$
	H	$\overline{S\,I}$	$S\,II_8$	$\overline{S\,II_a}$	$\overline{S\,III}$

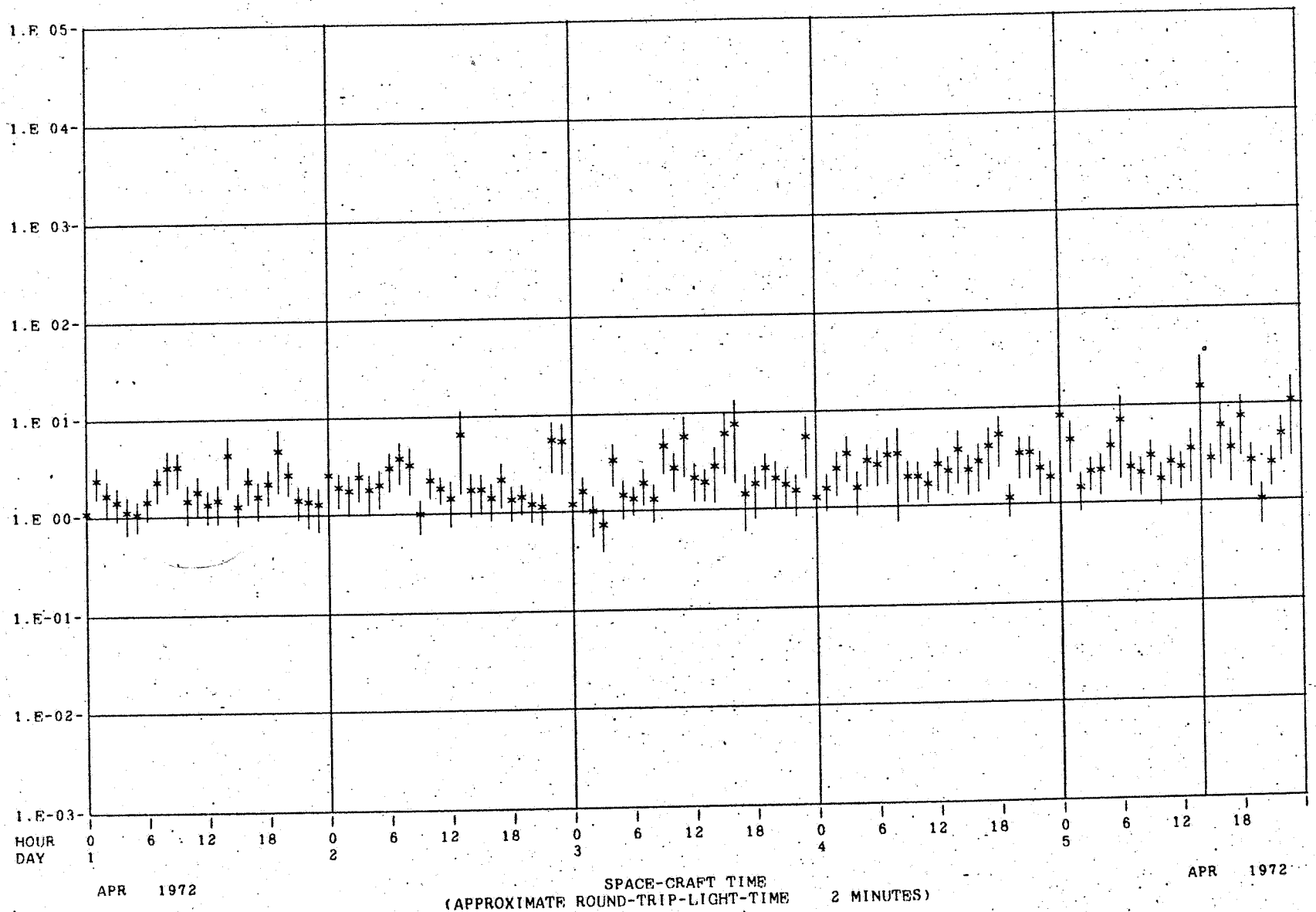
VL

SR3	A	SI_5	$\overline{S\,II}$	$S\,II_a$	$\overline{S\,III}$
	B				
	C				
	D				
	E				
	F				
	G				
	H				

same as SR2 A
1
1
1

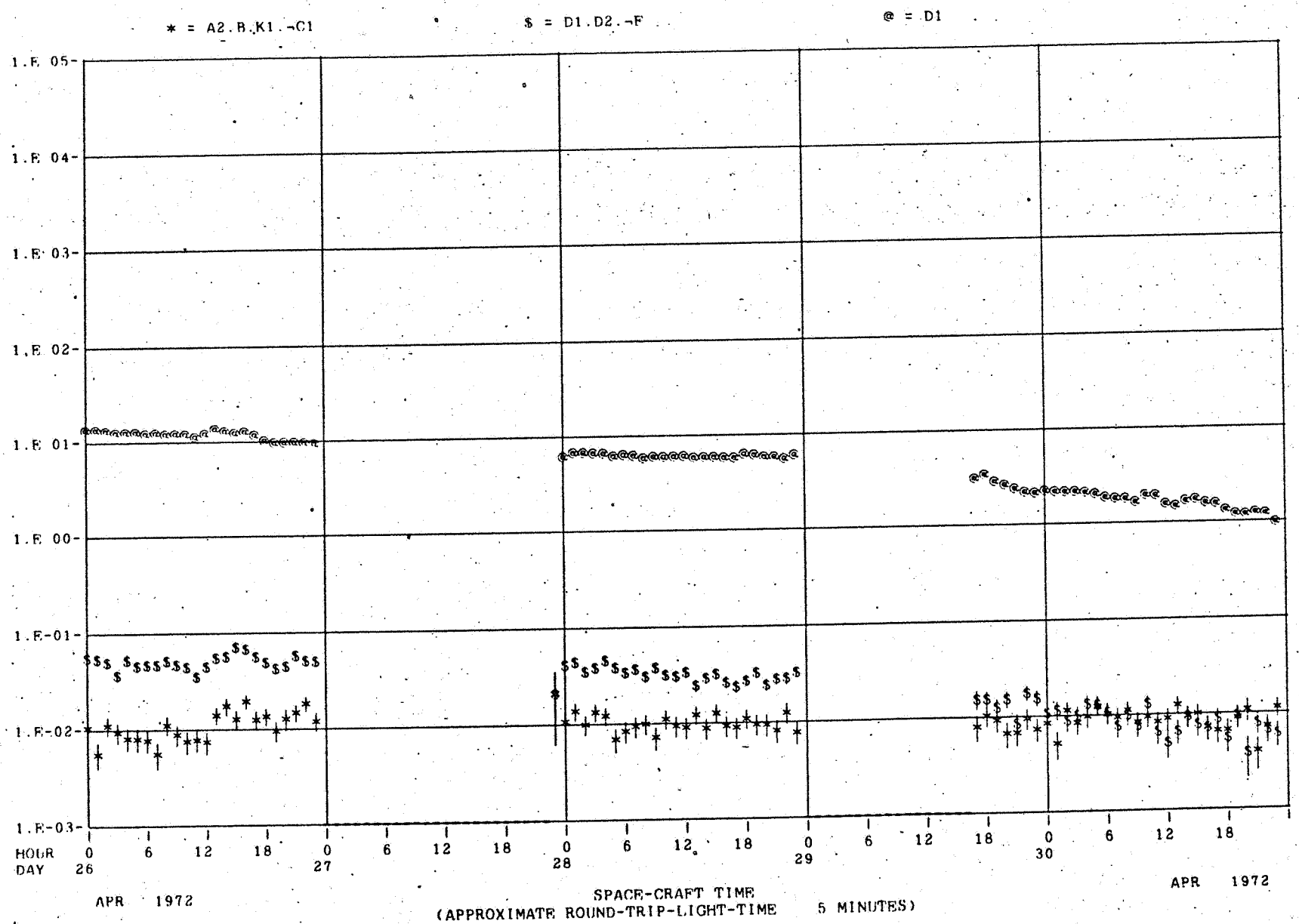
PIONEER-F (GSFC/CRT) TIME-HISTORY OF RATIO (R7B / R11A) FOR THE PERIOD 4/ 1/72 0: 0: 0 TO 4/ 5/72 23: 0: 0
(ACCUMULATION INTERVAL 1HR 0MIN 0SEC)

R7B = A2.B.K1.¬C1 R11A = D1.D2.¬F



SPACE-CRAFT TIME
(APPROXIMATE ROUND-TRIP-LIGHT-TIME 2 MINUTES)

PIONEER-F (GSFC/CRT) TIME-HISTORY OF RATES R7B , R11A AND R14A FOR THE PERIOD 4/26/72 0: 0: 0 TO 4/30/72 23: 0: 0
(ACCUMULATION INTERVAL 1HR 0MIN 0SEC)



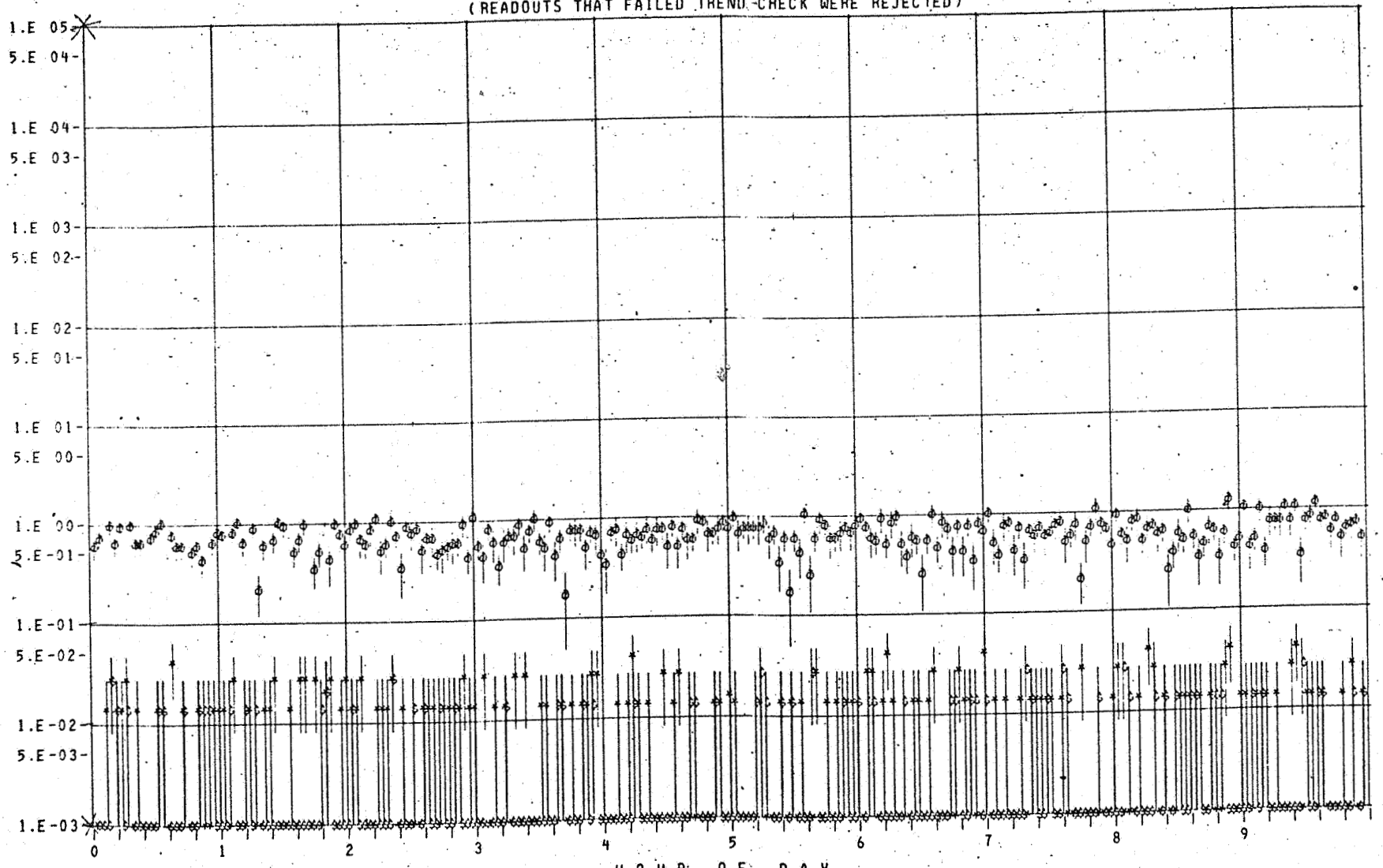
PIONEER-F (GSFC/CRT) TIME-HISTORY OF RATES H7B , H11A AND H19A FOR THE PERIOD 11/24/73 0: 0: 0 TO 11/24/73

SOURCE: SDR

(ACCUMULATION INTERVAL 0HR 2MIN24SEC)

* = A2.B.K1.¬C1 $ = D1.D2.¬F @ = D1

(READOUTS THAT FAILED TREND-CHECK WERE REJECTED)



H O U R O F D A Y

SPACE-CRAFT TIME

(APPROXIMATE ROUND-TRIP-LIGHT-TIME 88 MINUTES)

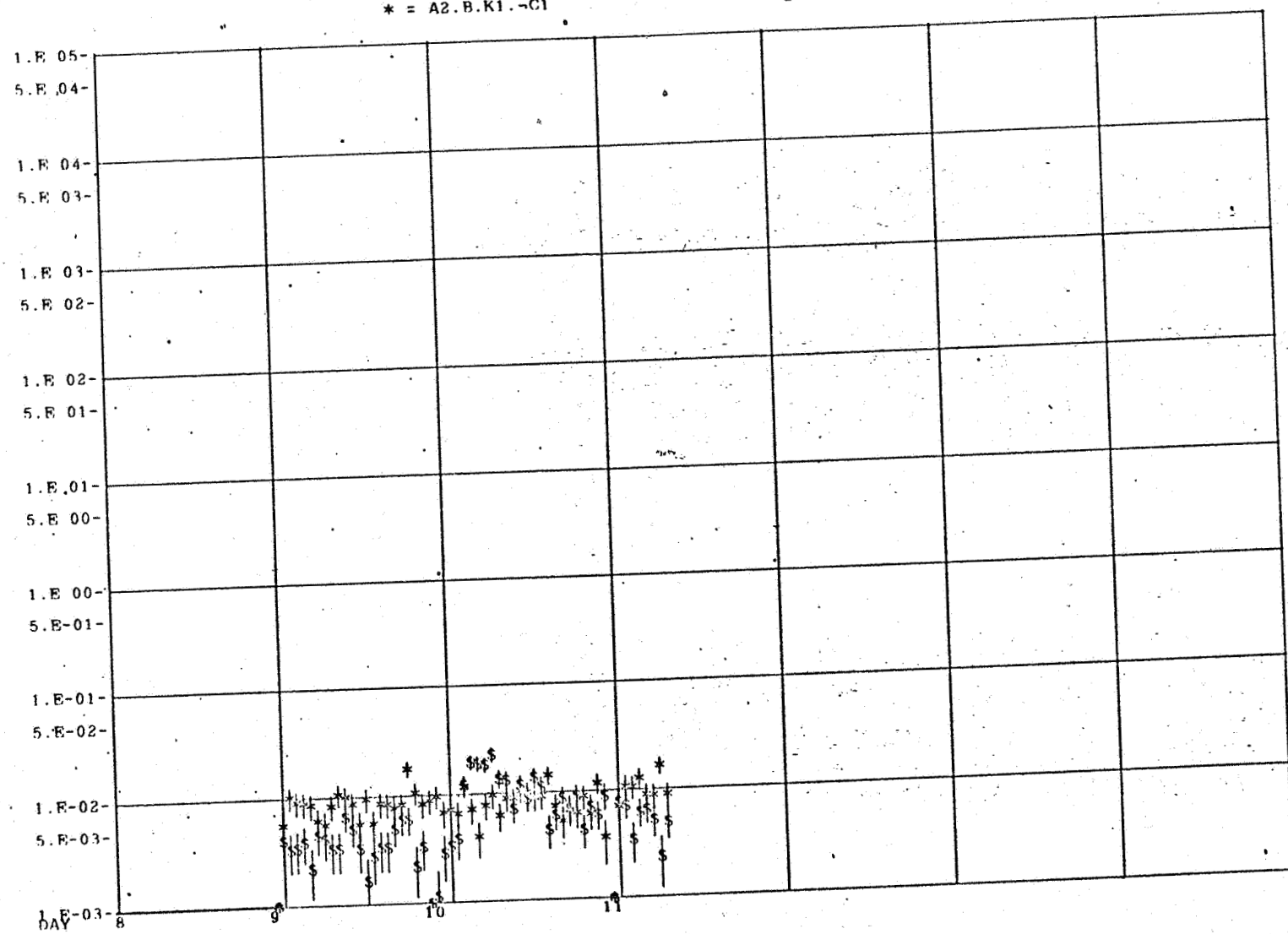
NOV 24, 1973

NOV 24, 1973

PIONEER-F (GSFC/CRT) TIME-HISTORY OF RATES R7B AND R11A FOR THE PERIOD 4/ 8/72 0: 0: 0 TO 4/11/72 7: 0: 0
(ACCUMULATION INTERVAL 1HR 0MIN 0SEC)

TMP-7 Day scale

QTYPE(3)=.TRUE.



APR 1972

SPACE-CRAFT TIME
(APPROXIMATE ROUND-TRIP-LIGHT-TIME 3 MINUTES)

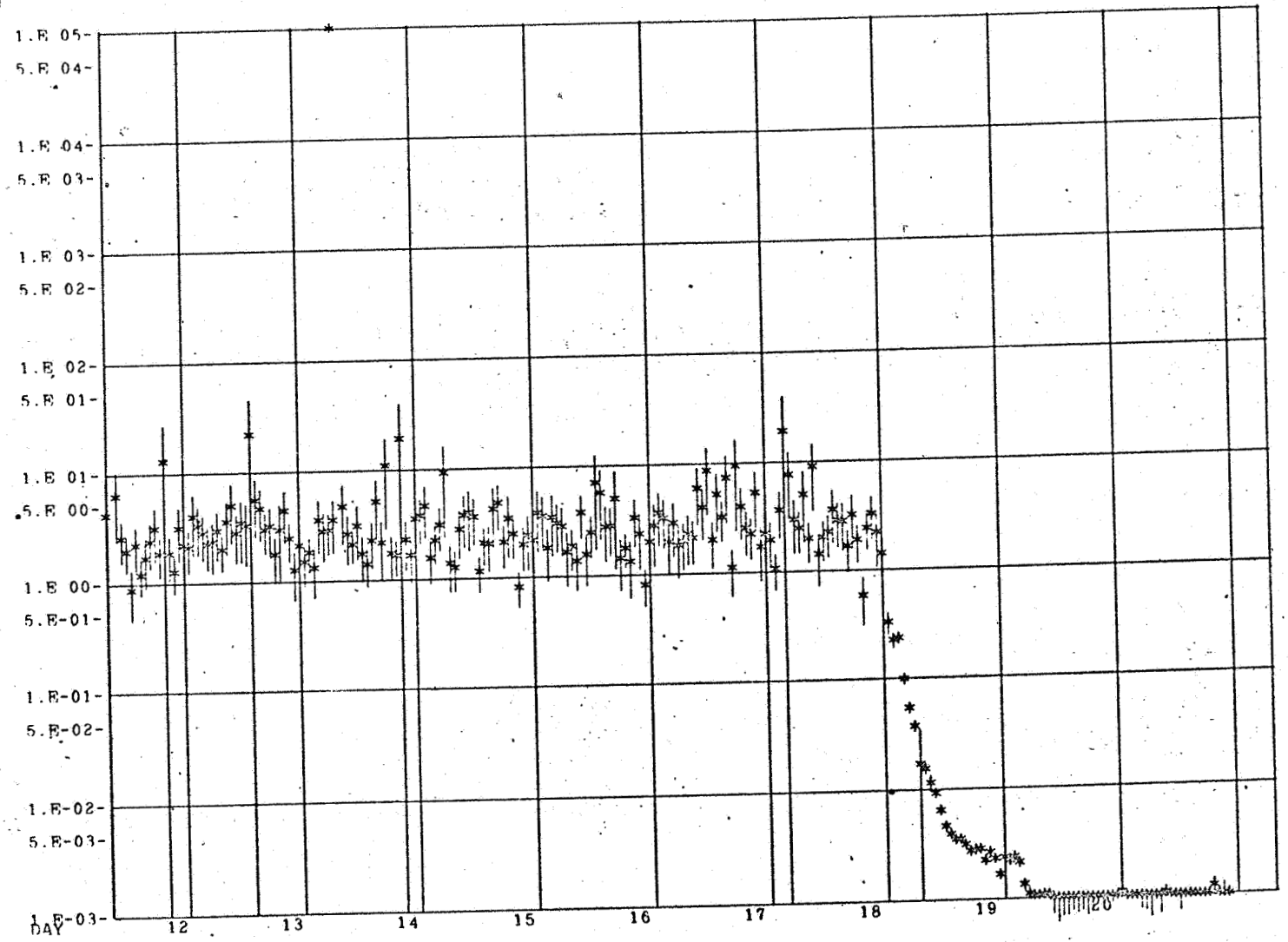
APR 1972

PIONEER-F (GSFC/CRT) TIME-HISTORY OF RATIO (R7B / R11A) FOR THE PERIOD 4/11/72 8: 0: 0 TO 4/20/72 22: 0: 0
(ACCUMULATION INTERVAL 1HR 0MIN 0SEC)

R7B = A2.B.K1.¬C1 R11A = D1.D2.¬F

IMP - 10 Day scale

QTYPE(4)= .TRUE.



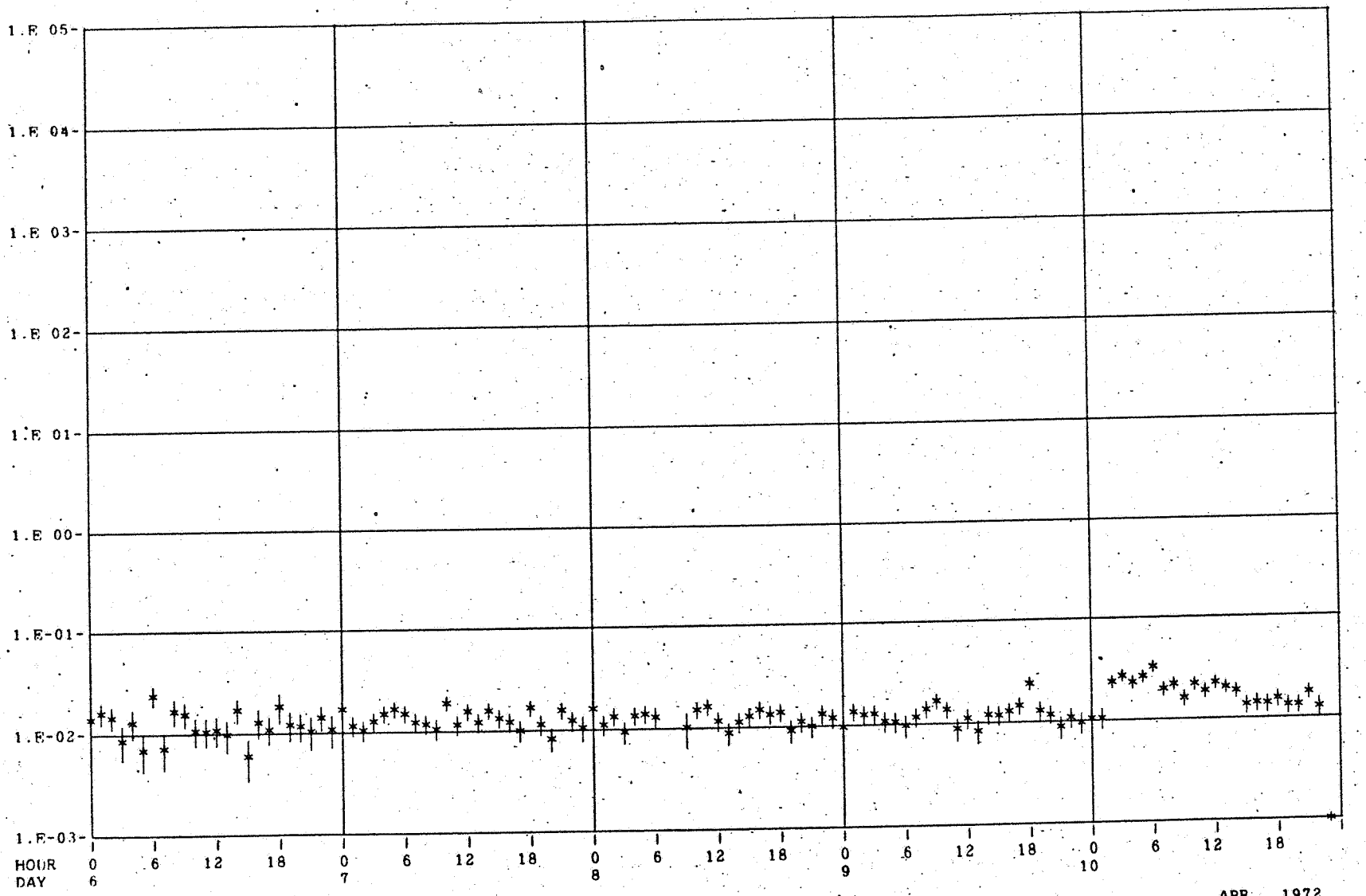
APR 1972

SPACE-CRAFT TIME
(APPROXIMATE ROUND-TRIP-LIGHT-TIME 3 MINUTES)

APR 1972

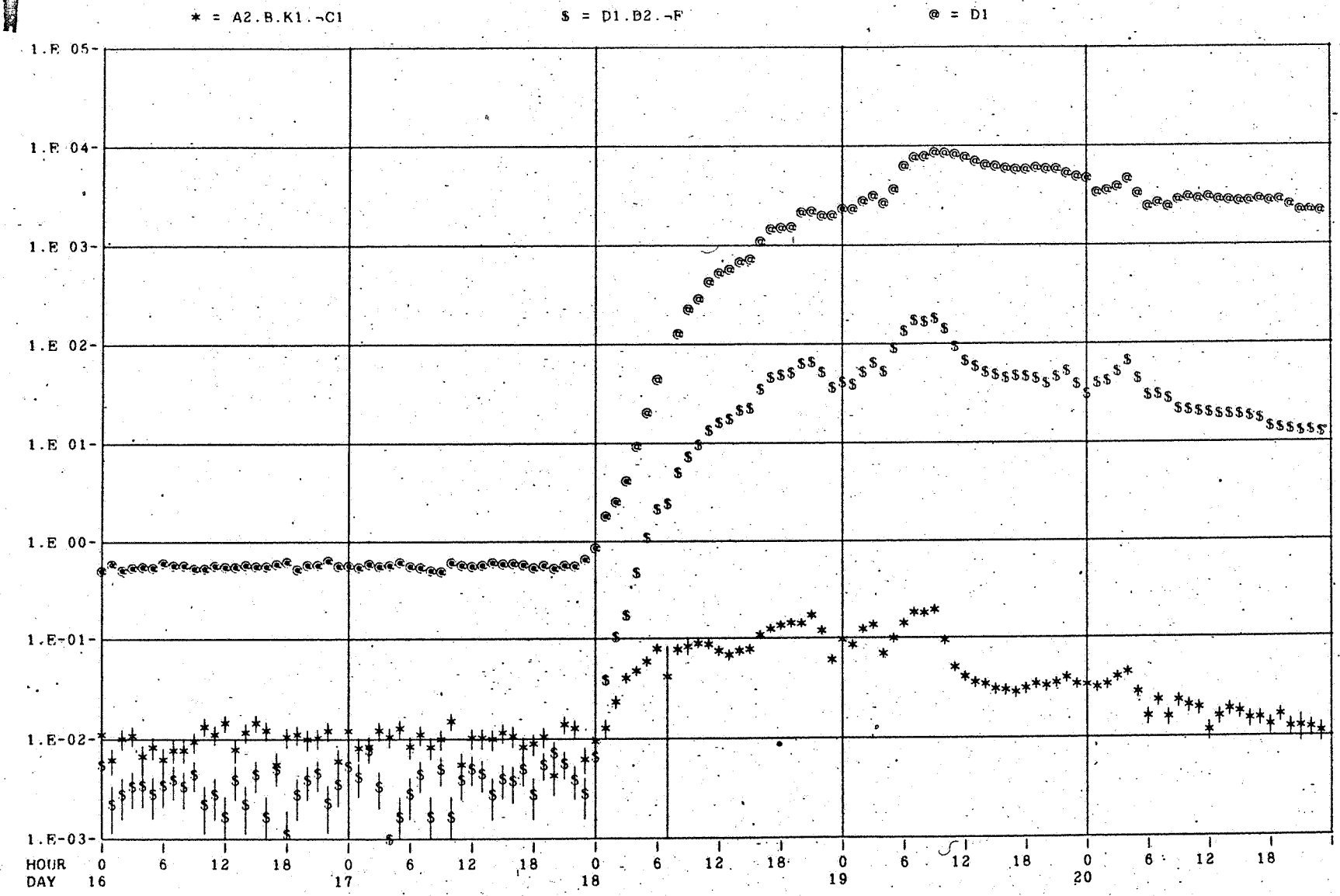
PIONEER-F (GSFC/CRT) TIME-HISTORY OF THE SUM (R7B +R11A) FOR THE PERIOD 4/ 6/72 0: 0: 0 TO 4/10/72 23: 0: 0
(ACCUMULATION INTERVAL 1HR 0MIN 0SEC)

R7B = A2.B.K1.¬C1 R11A = D1.D2.¬F



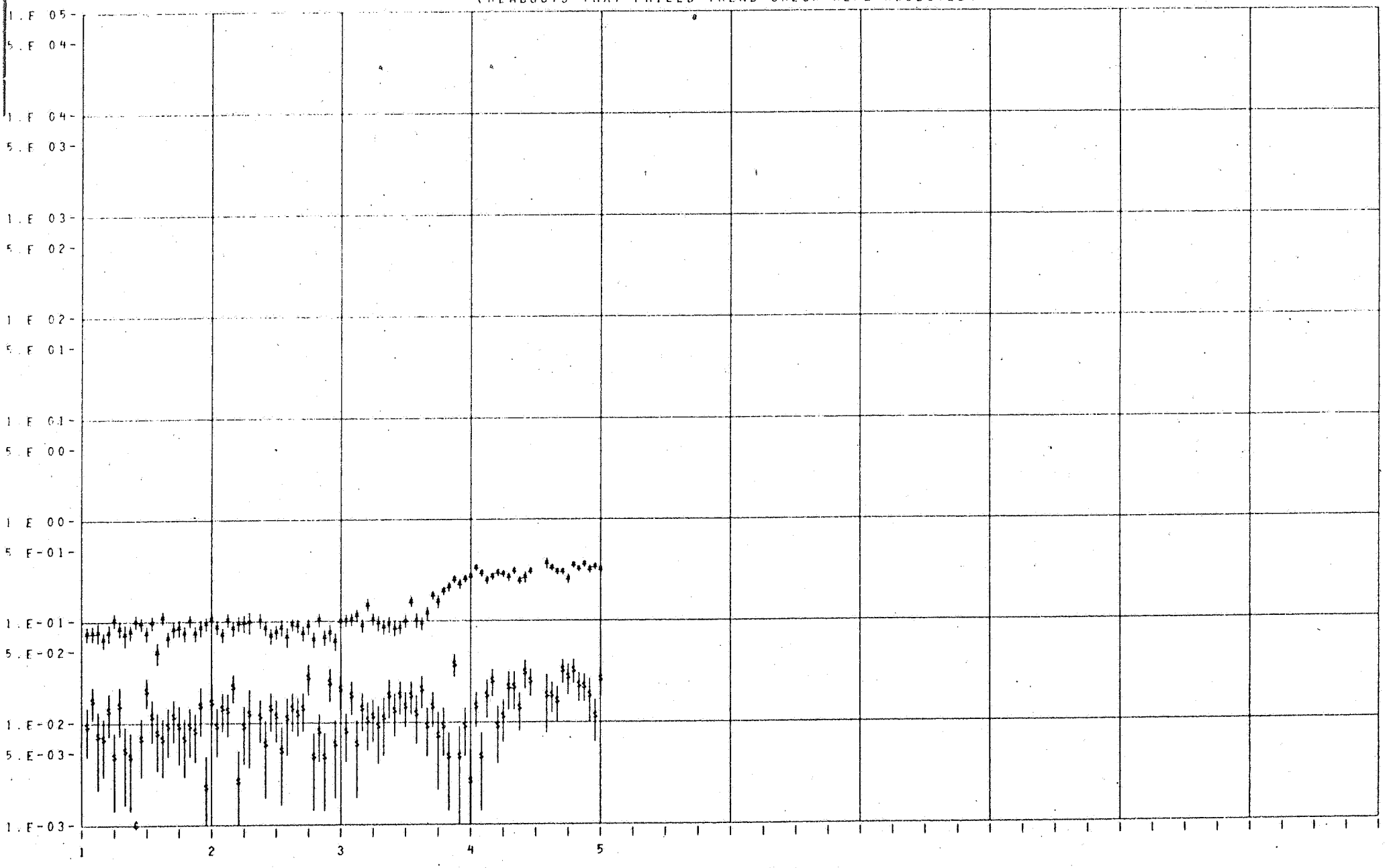
SPACE-CRAFT TIME
(APPROXIMATE ROUND-TRIP-LIGHT-TIME 3 MINUTES)

PIONEER-F (GSFC/CRT) TIME-HISTORY OF RATES R7B , R11A AND R14A FOR THE PERIOD 4/16/72 0: 0: 0 TO 4/20/72 23: 0: 0
(ACCUMULATION INTERVAL 1HR 0MIN 0SEC)



HELIOS-A (GSFC/CRT) TIME-HISTORY OF RATES R10C AND R10E FOR THE PERIOD 1/ 1/75 0: 0: 0 TO 1/ 5/75 0: 0: 0
(ACCUMULATION INTERVAL 1 HR 0 MIN 0 SEC)

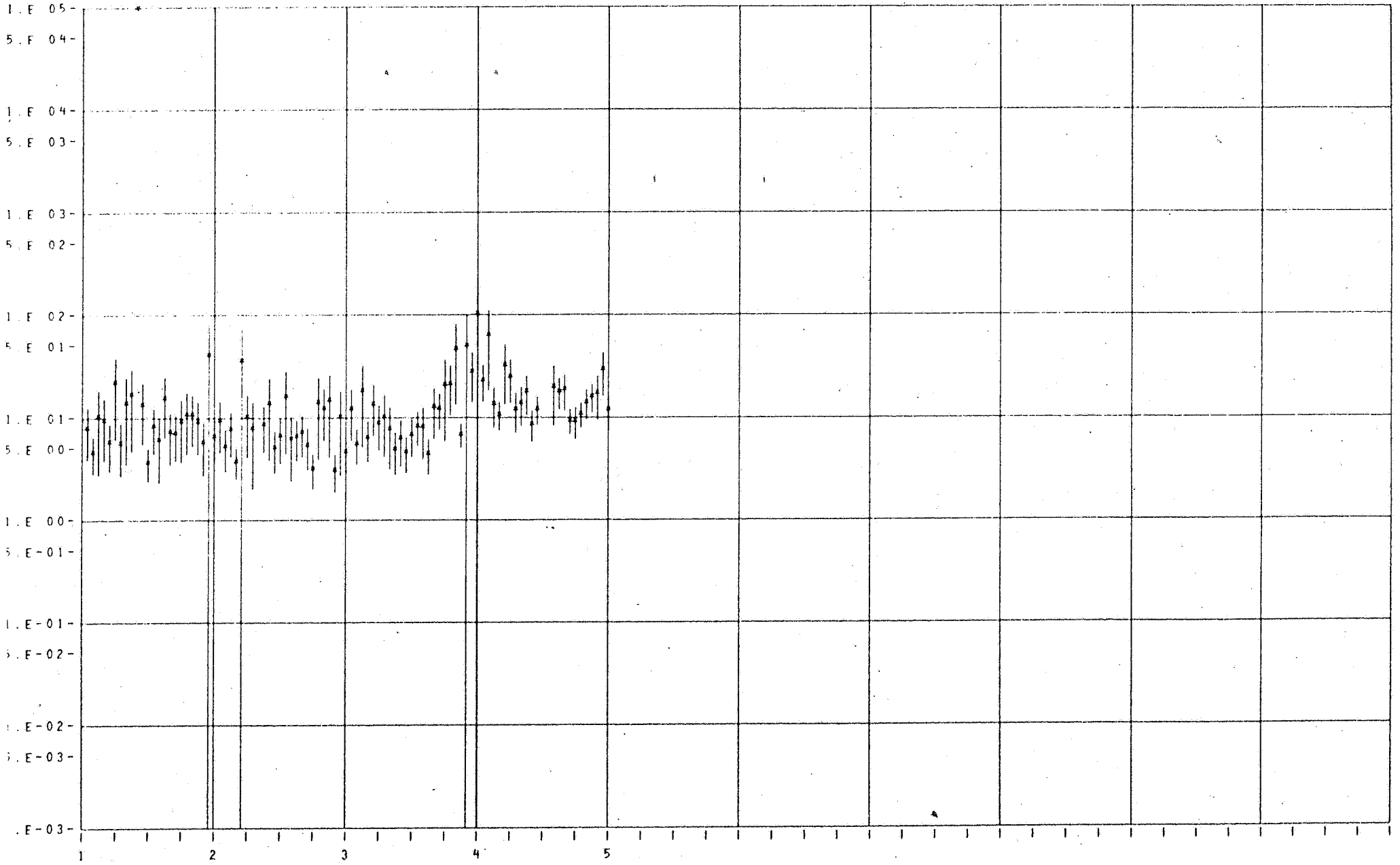
* = D1(3) $ = D1(5)
(READOUTS THAT FAILED TREND-CHECK WERE REJECTED)



JAN 1975 SPACE-CRAFT TIME JAN 1975

HELIOS-A (GSFC/CRT) TIME-HISTORY OF RATIO (R10C / R10E) FOR THE PERIOD 1/ 1/75 0: 0: 0 TO 1/ 5/75 0: 0: 0
(ACCUMULATION INTERVAL 1 HR 0 MIN 0 SEC)

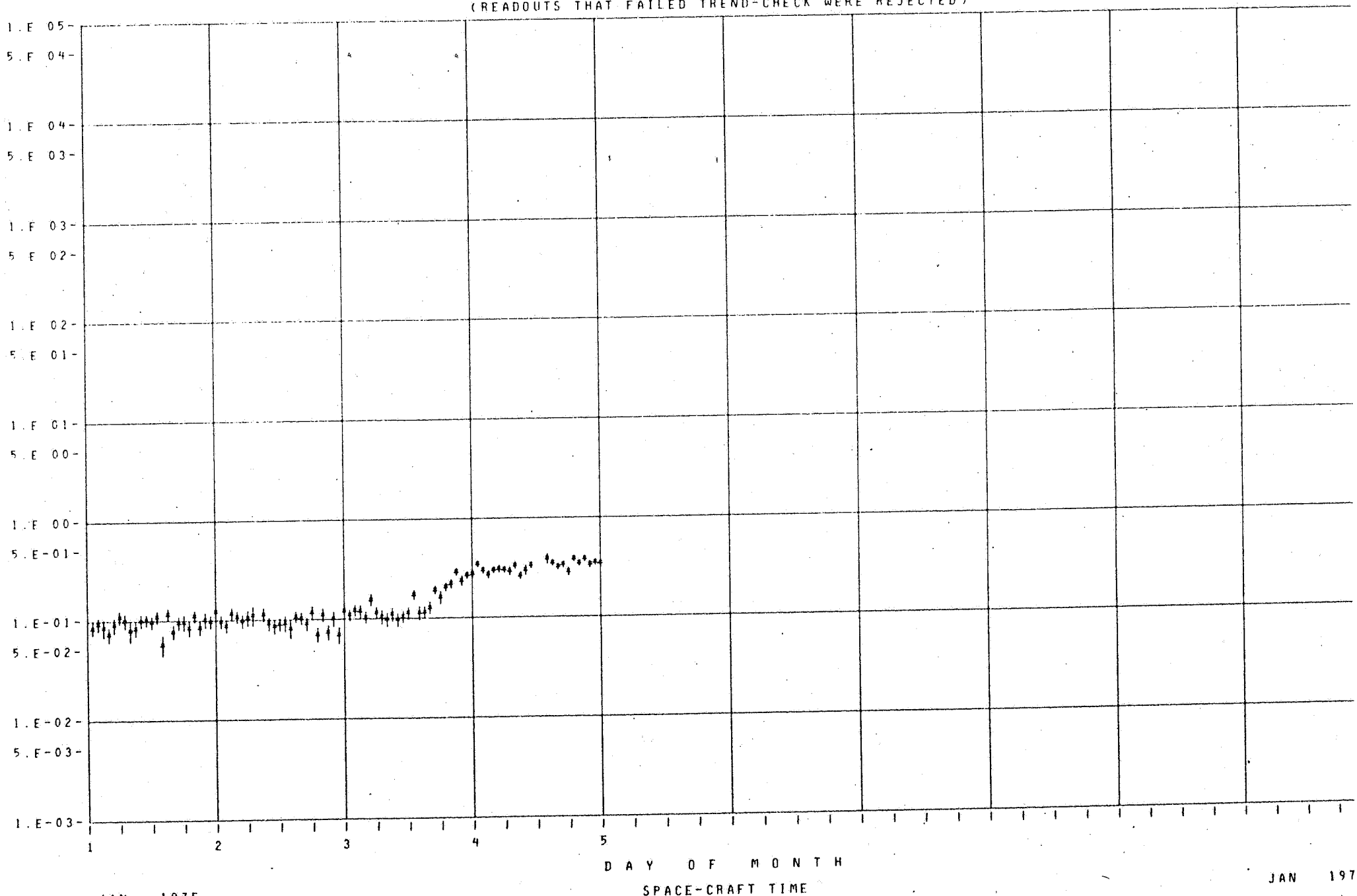
R10C = D1(3) R10E = D1(5)
(READOUTS THAT FAILED TREND-CHECK WERE REJECTED)



JAN 1975 SPACE-CRAFT TIME JAN 1975

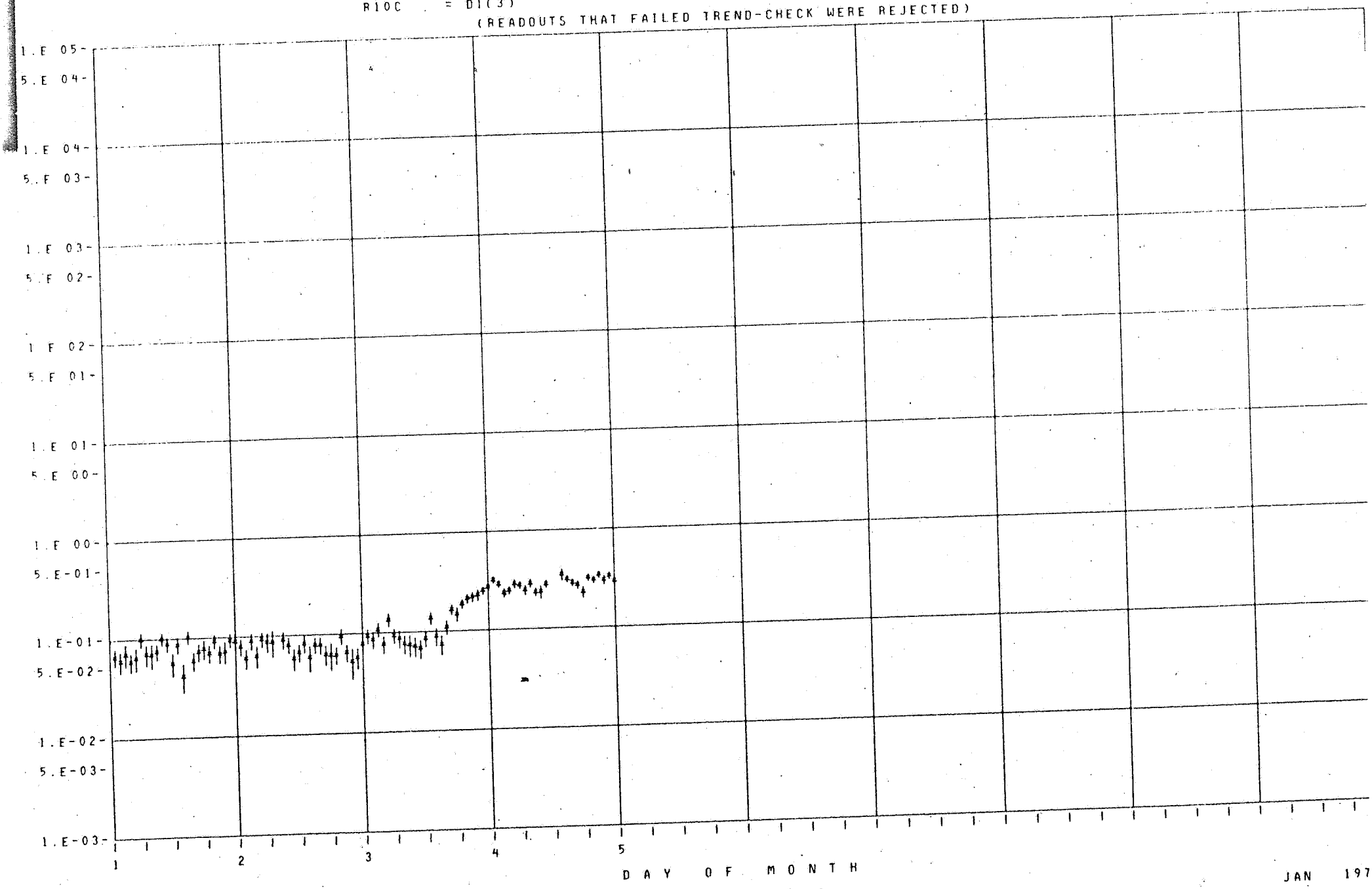
HELIOS-A (GSFC/CRT) TIME-HISTORY OF THE SUM (R10C +R10E) FOR THE PERIOD 1/ 1/75 0: 0: 0 TO 1/ 5/75 0: 0: 0
(ACCUMULATION INTERVAL 1 HR 0 MIN 0 SEC)

R10C = DI(3). R10E = DI(5)
(READOUTS THAT FAILED TREND-CHECK WERE REJECTED)



HELIOS-A (GSFC/CRT) TIME-HISTORY OF THE DIFFERENCE (R10C -R10E) FOR THE PERIOD 1/ 1/75 0: 0: 0 TO 1/ 5/75 0: 0: 0
(ACCUMULATION INTERVAL 1 HR 0 MIN 0 SEC)

R10C = D1(3) R10E = D1(5)
(READOUTS THAT FAILED TREND-CHECK WERE REJECTED)



SPACE-CRAFT TIME

HELIOS-A (GSFC/CRT) TIME-HISTORY OF RATES R10C AND R10E FOR THE PERIOD 1/ 1/75 0: 0: 0 TO 1/ 5/75 0: 0: 0
(ACCUMULATION INTERVAL 1 HR 0 MIN 0 SEC) *** MULTIPLICATIVE FACTOR 1.500 ***