SECTION 1 - OVERVIEW

This note describes the design and use of four programs that are a part of the Rates Analysis System for data from the Pioneer-F/G Cosmic Ray Telescope experiment.

Two of these programs, the Pioneer Rates Summary Program (PFRSUM) and Pioneer Rates Summary Tape Merge Program, are intermediate steps in a data analysis system that begins with the generation of rates tapes by the Pioneer Data Reduction Program (PIODRP), and concludes with the generation of visual displays of data by the Pioneer Rates Display Program (PRDISP) or Pioneer Flux Display Program (PFDISP).

PFRSUM takes the rates tapes as inputs and generates sequential rates summaries that serve as a data base for PRDISP and PFDISP. PFRSTM provides a means for inserting into the data the last data that was missing when the original summary was created.

The third program described here is the Pioneer Rates Tape List Program (PFRTPL). This program provides quick-look examination of rates data by generating a formatted listing of the rates tapes.

The final program, the Pioneer PHA Tape List Program, is designed to generate a formatted dump of Pioneer PHA tapes.

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	location	Type	Description
HYRC	1	I*2	Start time of this interval (year, month, day, hour, minute, and second)
HMONC		I*2	
HDAYC	2	I*2	
HHRC		I*2	
HMINC	3	I*2	
HSECC		I*2	
H11	4	I*2	Spare
HMDAYC		I*2	Start time of current summary interval (modified Julian day and milliseconds of day)
MSECC	5	I*4	
MSTIME	6	I*4	Missing time (milliseconds) (i.e., total time during total interval for which there was no data)
ISRI(9,4)	7 (36)	I*4	Accumulated counts for sectored rates SRIA, SRIB, SRIC, and SRID (~~Table 2-1~~)
ISR2(9,8)	43 (72)	I*4	Accumulated counts for sectored rates SR2A, SR2B, SR2C, SR2D, SR2E, SR2F, SR2G, and SR2H (Table 2-1)
IUR(49)	115 (49)	I*4	Accumulated counts for unsectored rates (Table 2-1)
SSCOM1(4)	164	R*4	Sum of readouts for first subcom data
ISCOM2(6)	168	I*4	Sum of readouts for second subcom data
TSR1(9,4)	174	R*4	Total accumulation time for this interval corresponding to each count in array ISR1
TSR2(9,8)	210	R*4	Total accumulation time for this interval corresponding to each count in array ISR2
TUR(49)	282	R*4	Total accumulation time for this interval corresponding to each count in array IUR

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

US=28
SS=32

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

	A	B	C	D	E	F	G	H
S1	X	X	X	X				
S2	X	X	X	X	X	X	X	X
R1	X							
R2	X	X						
R3	X	X						
R4	X	X						
R5	X	X						
R6	X	X						
R7	X	X						
R8	X	X						
R9	X	X	X	X				
R10	X	X	X	X	X	X	X	X
R11	X	X						
R12	X	X						
R13	X	X						
R14	X	X	X	X	X	X	X	X
R15	X	X	X	X				
R16	X	X	X	X				

IR(20,8) = 160

IS(2,8,8) = 128

table 2-1
(2 of 3)

RATE SEQUENCE ID		UNSECTORED OR SECTORED RATE
UNSECTORED	SECTORED	
1	XX	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

U S =

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

table 2-1
(3 of 3)

RATE SEQUENCE ID		UNSECTORED OR SECTORED RATE
UNSECTORED	SECTORED	
4	XX	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) R16B
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 (3 of 3)

Variable	Location	Type	Description
HSCOM1(4)	331	I*2	Total number of readouts corresponding to each sum in array SSCOM1
HSCOM2(6)	333	I*2	Total number of readouts corresponding to each sum in array ISCOM2
	335		

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 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	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			
SRECST	SRECSP	Type	Description
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

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 5 - PIONEER PHA TAPE LIST PROGRAM

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 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.

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

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)

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 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.

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.DATA5  DD  *
TIME                          731204030000731204050000
RECORD      E01112            1         5
```

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

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

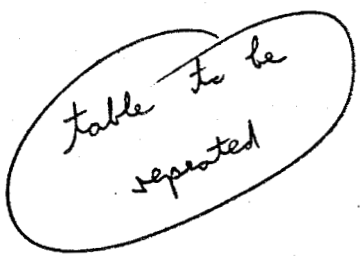

Table A-2. Subcom Data for Format B

table to be repeated

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)

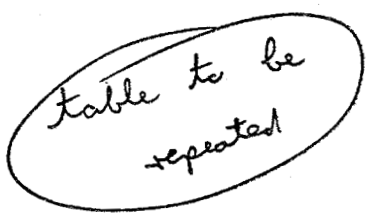

Table A-3. Rates Data Associated With Each Unsectored and Sectored Rate Sequence ID (2 of 3)

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

Mnemonic	Description
N5	Fourth page of data = 800, format A = 560, format B
N6	Fifth page of data = 1040, format A = 720, format B
1280	Sixth page of data (format A only)