COMPUTER SCIENCES CORPORATION
SYSTEM SCIENCES DIVISION (301) 589-1545
8728 COLESVILLE ROAD · SILVER SPRING, MARYLAND 20910

August 23, 1978

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Attention: G. Muckel
Code 664
Bldg. 2, Rm. S-207

Subject: Contract NAS 5-24350
Task Assignment 593
Working Paper

Gentlemen:

Enclosed are five copies of the informal working paper entitled "International Sun-Earth Explorer-C (ISEE-C) Cosmic Ray Experiment Encyclopedia Generator - Design Overview". This document deals with the design of the Encyclopedia Data Base Generator (ENCGEN) for the GSFC cosmic ray experiment on ISEE-C.

Please let me know if you have any questions regarding the document.

Very truly yours,

COMPUTER SCIENCES CORPORATION

L. C. Gunshol

L. P. Gunshol
Section Manager
Science and Applications Program

LPG:kg

Enclosures

INTERNATIONAL SUN-EARTH EXPLORER-C (ISEE-C)
COSMIC RAY EXPERIMENT ENCYCLOPEDIA GENERATOR
DESIGN OVERVIEW

Prepared by

Dr. J. Childs

COMPUTER SCIENCES CORPORATION

August 1978

This document deals with the design for the Encyclopedia Data Base Generator (ENCGEN) for the GSFC cosmic ray experiment on ISEE-C. The overall design of this system is based entirely on the Encyclopedia Generator written for the Voyager-1 and -2 cosmic ray experiments and designed by Dr. Nand Lal of CSC (1977).

The purpose of the ISEE-C ENCGEN is to take raw experiment data from the Experimenter Data Record (EDR) tapes, pack it, monitor it, summarize it, and put it into an encyclopedia tape format (see Appendix), in a form easily accessible by analysis programs. The major subsystems of ENCGEN consist of:

- READER - reads science data from EDR records; packs rates; dispatches data into subcom blocks
- MONITOR - monitors data quality and continuity, status changes, calibration data (marks up data within the subcom blocks)
- ANALYZER - establishes volume and chapter boundaries; fills out volume and chapter headers
- OUTPUTTER - outputs all data into verse structure. Summarizes rates; calculates spin periods; builds coincidence condition maps.

The four subsystems of ENCGEN share data and run parameters in a single common data area, the Master Control Block. The science and housekeeping data itself is processed in a region called the subcom block area. It is with this region that all major functions of the subsystems are performed.

The following tables outline the ENCGEN design. Table 1 is a Voyager ENCGEN routine chart, with an indication next to each module name as to whether the routine was left unchanged, modified, or deleted with the ISEE-C application. Table 2 is an ISEE-C ENCGEN routine chart indicating those routines that were carried over from Voyager, and those routines that were written new. Table 3 is a summary of changes made to the Voyager ENCGEN in developing the ISEE-C version. Tables 4 through 7 are Input/Output charts for the four major ENCGEN subsystems--READER, MONITOR, ANALYZER, and OUTPUTTER, respectively.

Finally, the ISEE-C Encyclopedia tape format is defined in the Appendix.

Table 1 - Voyager ENCGEN Routine Chart (1 of 3)

```
   V O Y A G E R   E N C Y C L O P E D I A   G E N E R A T O R

   I S E E - C   M O D I F I C A T I O N S

THE FOLLOWING IS A SUBROUTINE CHART OF THE VOYAGER ENCYCLOPEDIA
GENERATOR.  THE ROUTINES ARE MARKED FOR MODIFIED (.) AND THE
NUMBER OF LINES OF CODE MODIFIED FOR ISEE.  A BRIEF EXPLANATION
IS PLACED AT THE END .  (X) INDICATES THE ROUTINE IS DELETED FROM ISEE.

ENCMAIN                          ENCGEN INITIALIZATION PROGRAM
.(2).ENCGEN                      MAIN CONTROL SECTION OF ENCYCLOPEDIA GEN
          KTIME
          YDMD
          ANPARM                 ANALYZE PARAMETERS
               LOL               OPEN LOG LIBRARY BLOCK
               MOUNT
.(20)... ENINIT                  INITIALIZE FLAGS AND ALLOCATE AREAS
XXXXXXXXXXXXXXXRATTAB            SET UP RATES COMPRESSION TABLE
XXXXXXXXXXXXXXXXXXXDECLOG        DECIMAL TO LOG CONVERSION
XXXXXXXXXXXXXXXXXXXLOGDEC        LOG TO DECIMAL CONVERSION
.(77)........ FMGEN              SET UP PHA TAG ID MAP
          SEECCUNT               DETERMINE NUMBER OF SCIENCE ENG BLOCKS
.(50)... READER                  MAIN DRIVER ROUTINE FOR READ FUNCTIONS
               FREAD             READ INPUT TAPE RECORD
.(50)........ RDSEGPRO           DETERMINE NATURE OF SEGMENT
XXXXXXXXXXXXXXXXXXXXRDSEGSCI     HANDLE SCIENTIFIC DATA RECORDS
XXXXXXXXXXXXXXXXXXXXXXXRDIDMODE           LOAD DATA MODE ATTRIBUTE TABLE
.(58).................. MARKUP            MARKS UP DATA
XXXXXXXXXXXXXXXXXXXXXXXXXX  DPI           DATA PRESENCE INDICATORS
XXXXXXXXXXXXXXXXXXXXXXXXXX  DQSW          DATA QUALITY SWITCHES
XXXXXXXXXXXXXXXXXXXXXXXXXXX BASIC         MARKS UP STATUSES
.(45).................. RDIDSEG           IDENTIFIES DATA SEGMENT
.(26).................. RDESTREL          SENSE A DATAGAP
XXXXXXXXXXXXXXXXXXXXXXXXRDSAVTIM          SAVE TIMES INTO TIME ARRAY
.(80).................. DISPATCH          DISPATCH DATA INTO SUBCOM BLOCK
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISBTABL     SUBROUTINE LIST
.(30)........................ DISOPEN     ALLOC AND INIT NEXT SUBCOM
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISSETT      SET NOMINAL FOSC TIMES
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISSETS      DISPATCH STATUS
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISSETC      DISPATCH COMMAND DATA
.(80)........................ DISPPR      DISPATCH DATA
.(10)........................ DISPR1      DISPATCH RATES DATA
.(50)........................ DISPP       DISPATCH PHA DATA
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISFILL      PAD PHA AND RATES
.(30)........................ DISFILLP    PAD PHA DATA
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISCLOSE     SAVE CURRENT POINTERS
.(6)......................... DISUPDSG    UPDATE SEGMENT SOUGHT
.(14)........................ DISUPDSB    UPDATE SUPERBLOCK TIME
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXOPCODES      (FOR DISPATCHING)
XXXXXXXXXXXXXXXXXXXXXENGPRO               ENGINEERING RECORD PROCESSING
XXXXXXXXXXXXXXXXXXXXXXXXXVALUES
XXXXXXXXXXXXXXXXXXXXXXXXXSETUP
XXXXXXXXXXXXXXXXXXXXXXXXIDMXDP            IDENTIFY ENGINEERING DATA
XXXXXXXXXXXXXXXXXXXXXXXXPLGENG            PUT ENGINEERING INTO SUBCOM
XXXXXXXXXXXXXXXXXXXXDECOM                 SEARCH DECOM RECORD FOR POINTERS
```

Table 1 - Voyager ENCGEN Routine Chart (2 of 3)

```
________________________FNEXT_______________________OPEN NEXT EDR DATASET_______________
                             FNCLOSE                CLOSE CURRENT EDR DATASET
                                     LCW            CLOSE LOG WORK BLOCK
                                     LCL            CLOSE LOG LIBRARY BLOCK
•(1)••••••••••••••••••••••••••FNOPNEXT______________OPEN NEXT DATASET_______________
                                     LOL            OPEN LOG LIBRARY BLOCK
_____________________________________FTIO___________________________________________
•(64)•••••••• MONITOR                               MAIN DRIVER FOR MONITOR FUNCTIONS
XXXXXXXXXXXXXXXXXXXXXXXMONQUAL______________________LOCATE DATA CYCLE TO BE MONITORED
XXXXXXXXXXXXXXXXXXXXXXXXXXMOQEVAL                   MONITOR STATUS QUALITY
XXXXXXXXXXXXXXXXXXXXXXXXXXMONSTAT___________________MONITOR STATUS__________________
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXMCSMARK
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXMONCAL______________MONITOR CALIBRATION_____________
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXMCCACHK
•(5)••••••••••••••••••••••••••••••••••MONTREND______PERFORM TREND CHECK_____________
                                           MCTNCNE         INDEP OF GAIN & SUBCOM
___________________________________________MCTGAIN_________DEP ONLY ON GAIN_________
                                                MOTMARK    MARK TREND BITS
•(10)•••••••••••••••••••••••••••••••••••••••MCTSUBST_______DEP ONLY ON SUBCOM_______
•(10)•••••••••••••••••••••••••••••••••••••• MCTBOTH        DEP ON BOTH GAIN & SUBC
____________________________________________TRGEN__________TREND CHECK MACRO________
•(100)••••••••••••••••••••••••••••••••••••• TRTAB          TREND CHECK TABLE
_________________________ANLYZE_____________________MAIN DRIVER FOR ANALYZER FUNCTION
•(30)••••••••••••• ANVOLD                           ESTABLISH VOLUME BOUNDARIES
XXXXXXXXXXXXXXXXXXXXXXXXX GETTIM____________________TIME TABLE INTERPOLATION________
                                VONUCA              DETERMINE VOLUME NUMBER
___________________________ANCHPD___________________ESTABLISH CHAPTER BOUNDARIES____
XXXXXXXXXXXXXXXXXXXXXXXX ANCHDI                     PUT INFO INTO CHAPTER HEADER
•(20)••••••••••••••ANVOLH___________________________PUT DATA INTO VOLUME HEADER_____
•(70)••••••••••••• ANCHHD                           PUT DATA INTO CHAPTER HEADER
XXXXXXXXXXXXXXXXXXXXXXXXX ANCMOK____________________GET QUALITY OF COMMAND DATA_____
                           ANBUMP                   ADVANCE SUBCOM LIST POINTER
____________________________________________________________________________________
•(30)•••••••• OUTPUT                                MAIN DRIVER FOR OUTPUT FUNCTIONS
___________________________OUTOPEN__________________OPEN OUTPUT DATASETS____________
                                LOW                 OPEN LOG WORK BLOCK
________________________________RDJFCB______________________________________________
                           OUVOLOUT                 WRITE VOL HEADER; PRINT SUMMARY
___________________________UPDFEET__________________UPDATE TAPE FOOTAGE COUNT_______
•(3)•••••••••••••• OUCHPOUT                         WRITE CHAPTER HEADER
___________________________OURROUT__________________LOCATE RAW RATE VERSE IN OUTPUT_
                                VERSHEAD            FILL IN PREVERSE FIELDS
________________________________RAWRAT______________CONSTRUCT RAW RATES VERSE_______
                           OUCCMOUT                 LOCATE AREA FOR COINC CONDITION
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCONMPG__________________CONSTRUCT COIN COINDITION MAP___
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXDISHET              DISABLE HET HANDLER
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXLETDEL______________DELETE LET TERM HANDLER_________
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXBHETDEL             BUILD HET DELETE CODE
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXHETDEL______________HET DELETE TERM HANDLER_________
•(1)•••••••••••••• OURSMOUT                         LOCATE AREA FOR RATES SUMMARY
XXXXXXXXXXXXXXXXXXXXXXXXXXXXRATESM__________________CONSTRUCT RATES SUMMARY_________
XXXXXXXXXXXXXXXXXXXXXXXXXXXXRSDISP                  DISPLACEMENT TABLE
•(5)•••••••••••••• OUINITP__________________________TRANSFER EVENT RATES INTO_______
                                                    PHA BLOCKS
(30)•••••••••••••• OUPHICUT_________________________CONSTRUCT PHA HISTORY MAP_______
•(5)•••••••••••••• OUPHAOUT                         MOVE PHA VERSES INTO OUTPUT
•(8)•••••••••••••••••••••• OUPHASRT_________________SORT PHA DATA___________________
                                  OUPHALOC          ALLOCATE NEW PHA BLOCK
_______________________________OUPHASET_____________FILL PREVERSE OF PHA VERSE______
                               OUPHAPUT             MOVE PHA DATA INTO OUTPUT
```

Table 1 - Voyager ENCGEN Routine Chart (3 of 3)

	OUPHALIS	IDENTIFY VERSE PROCESSED
.(20)........	ENTERM	TERMINATE PROCESSING
	LTERM	CLOSE LOG BLOCK

****

DSECTS----

	CCM	COINCIDENCE CONDITION MAP
.(40)...	CHINT	CHAPTER INTRODUCTION
.(10)...	ENCMCB	MASTER CONTROL BLOCK
.(15)...	GLOBAL	LIST OF GLOBAL EQUATES AND MASKS
	INREC	EDR HEADER ENTRIES (DFNHDR MACRO)
	LOGDAT	LOG BLOCKS
XXXXXXXXX	MATTRIB	DATA MODE ATTRIBUTES
XXXXXXXX	SEGELMNT	SEGMENT ELEMENT
.(84)...	SEGHDR	EXPERIMENT DATA RECORD HEADER (SEGMENT)
	STAT	STATUS INPUT
.(50)....	SUBCOM	SUBCOM BLOCK
XXXXXXXX	TABLEHDR	DATA MODE TABLE PREFACES
.(70)...	VERSE	OUTPUT VERSES
.(6)....	VOLINT	VOLUME INTRODUCTION

UTILITY ROUTINES-----

XXXXXXXX	CNVTME	PACK LINE COUNTS INTO R*8
XXXXXXXX	DECLOG	DECIMAL TO LOG CONVERSION
XXXXXXXX	DLCUPK	UNPACK R*8 LINE COUNT
XXXXXXXX	DTMJS	UNPACK MSEC OF YEAR
XXXXXXXX	DTUPK	UNPACK MSEC OF YEAR
XXXXXXXX	FDSCOT	CONVERT FDSC TO FLOATING LINE COUNT
	FLOAT	TURNS FIXED INTO FLOATING POINT
	GETDATE	FETCH DATE
XXXXXXXX	GETFDSC	EXTRACT FDCS FROM DATA RECORD
XXXXXXXX	GETTIM	TIME INTERPOLATION ROUTINE
	INVOKE	CALL PROCEDURE
	I4TODP	CONVERT I*4 INTO R*8
XXXXXXXX	LOGDEC	LOG TO DECIMAL CONVERSION
	MOVE	GENERAL DATA MOVE ROUTINE
	MSG	GENERAL MESSAGE ROUTINE
	TIMCHK	
.(10)...	TIMECT	CONVERT TIME INTO R*8 MSEC

ATTRIBUTE BLOCKS------

XXXXXXXX	CR1ATTR	
XXXXXXXX	CR2ATTR	
XXXXXXXX	CR3ATTR	
XXXXXXXX	CR6ATTR	
XXXXXXXX	GS3ATTR	
XXXXXXXX	MATTRGEN	MACRO TO GENERATE ATTRIBUTE BLOCKS

MISC----

XXXXXXXX	DDCBGEN	GENERATE DATA DISPOSITION CONTROL BLOCK
XXXXXXXXXXXXX	DDCBCR6	DATA DISPOSITION CONTROL BLOCK FOR CR6
XXXXXXXXXXXXX	DDCB	DATA DISPOSITION CONTROL BLOCK FOR OTHERS
XXXXXXXXXXXXXXXXXXX	DATAGAP	ALLOCATE SUBCOM STATE AFTER DATA GAP
	LOPRCLOG	CREATE PROLOG FOR LOG BLOCK
XXXXXXXX	PHAMSK	EVENT DETECTOR CONDITIONS
XXXXXXXX	RECCNT	
XXXXXXXXXXXXX	SKPHD	
XXXXXXXX	SCEDAT	READ CARD
XXXXXXXXXXXXX	SKPHD	READ CARD
XXXXXXXX	STATUS	MACRO

Table 2 - ISEE-C ENCGEN Routine Chart (1 of 3)

```
            I S E E - C    E N C Y C L O P E D I A    G E N E R A T O R

  THE FOLLOWING IS A SUBROUTINE CHART OF THE ISEE-C ENCYCLOPEDIA
  GENERATOR.  (..... INDICATES A NEW ROUTINE)

  ENCMAIN            ENCGEN INITIALIZATION PROGRAM
        ENCGEN       MAIN CONTROL SECTION OF ENCYCLOPEDIA GENERATOR
              KTIME
              YDMD
              ANPARM                 ANALYZE PARAMETERS
                    LOL              OPEN LOG LIBRARY BLOCK
                    MOUNT, ETC
              ENINIT                 INITIALIZE FLAGS AND ALLOCATE AREAS
                    PMGEN            SET UP PHA TAG ID MAP
              SEBCOUNT               DETERMINE NUMBER OF SCIENCE BLOCKS
              READER                 MAIN DRIVER ROUTINE FOR READ FUNCTIONS
...............     RDVERIFY       VERIFY TAPE HEADER RECORD
...............     RDFKEEP        KEEP CERTAIN FILE HEADER DATA
                    FREAD          READ INPUT TAPE RECORD
                    RDSEGPRO         HANDLE SCIENTIFIC DATA RECORDS
.....................     PACKER           UNPACK DATA FROM EDR FORMAT
.....................     UPKQ             UNPACK DATA QUALITY INTO BYTES
.....................     UPKASC           UNPACK ANALOG/DIGITAL SUBCOMS
                          MARKUP                 MARK UP DATA TO REFLECT QUALITY
                          RDIDSEG                SET CURRENT TIME
                          RDESTREL               SENSE A DATAGAP CONDITION
                          DISPATCH               DISPATCH DATA INTO SUBCOM BLOCK
                                      DISOPEN        ALLOC AND INIT NEXT SUBCOM
..............................        DISMISC        DISPATCH MISC. DATA
                                      DISPPR         DISPATCH DATA
                                      DISPP          DISPATCH PHA DATA
                                      DISFILLP       PAD PHA DATA
..............................        DISASCHI       DISPATCH ANA/DIG SUBCOM
..............................        DISCHOSE       DRIVER PROG. FOR SELECTION
......................................     CHOSE      GENERAL ROUTINE TO SELECT
                                                      ONE VALUE FROM READOUTS
..............................        DISSCC         SPACECRAFT WORDS
..............................        DISQUAL        DISPATCH QUALITY FLAGS
..............................        DISUPDSP       UPDATE SUBCOM POSITN FLAG
                                      DISUPDSB       UPDATE NEXT TIME SOUGHT
                    FNEXT            OPEN NEXT EDR DATASET
                          FNCLOSE          CLOSE CURRENT EDR DATASET
                                LCW              CLOSE LOG WORK BLOCK
                                LCL              CLOSE LOG LIBRARY BLOCK
                          FNOPNEXT         OPEN NEXT DATASET
                                LOL              OPEN LOG LIBRARY BLOCK
                                UNLOAD, LEAVE, MOUNT, POSN, ETC.
              MONITOR     MONITOR CAL., STATUS, AND BIT RATE
                    MONTREND         HET TREND CHECK
                          MOTNONE          RATE INDEP OF GAIN AND SUBCOM
                          MOTGAIN          RATE DEP ON GAIN ONLY
                          MOTSUBST         RATE DEP ON SUBCOM ONLY
                          MOTBOTH          RATE DEP ON GAIN AND SUBCOM
.....................     MOTFIND          FIND CORRECT SUBCOM
```

Table 2 - ISEE-C ENCGEN Routine Chart (2 of 3)

```
          ANLYZE        MAIN DRIVER FOR ANALYZER FUNCTIONS
________________ANVOLD________ESTABLISH VOLUME BOUNDARIES________________
                     VCNUCA         DETERMINE VOLUME NUMBER
•••••••••••••••• ANANA1        ANALCG VALUE LIMIT CHECK
                 ANCHPC        ESTABLISH CHAPTER BOUNDARIES
________________ANVOLH________PUT CATA INTO VOLUME HEADER________________
•••••••••••••••• ANANA2        AVERAGE ANALOG VALUES; PUT IN CH INT
•••••••••••••••••••••••• ANCONV______CONVERT RAW ANALOG INTO PHYSICAL__
                 ANCHHD        PUT CATA INTO CHAPTER HEADER
________________ANBUMP________ADVANCE SUBCOM LIST POINTER________________
          CUTPUT        MAIN CRIVER FOR OUTPUT FUNCTIONS
________________OUTOPEN_______OPEN OUTPUT DATASETS_______________________
                     LOW            OPEN LOG WORK BLOCK
_____________________RDJFCB______________________________________________
                 OUVOLOUT      WRITE VCL HEADER; PRINT SUMMARY
________________UPDFEET_______UPDATE TAPE FOOTAGE COUNT__________________
                 OUCHPOUT      WRITE CHAPTER HEADER
________________OURFOUT_______LOCATE RAW RATE VERSE IN OUTPUT BUFFER_____
                     VERSHEAC       FILL IN PREVERSE FIELDS
_____________________RAWRAT_________CONSTRUCT RAW RATES VERSE____________
                 OUCCMOUT      LOCATE AREA FOR COINC CONDITION MAP
•••••••••••••••••••••CCMMPG_________CONSTRUCT COIN CONDITION MAP_________
••••••••••••••••••••••••••CCBCELCD       BUILD DISABLE TERMS
••••••••••••••••••••••••••CCDELCD________DISABLE TERMS BUILT IN__________
                                         CCBDELCD
••••••••••••••••••••••••••CCDISA_________DISABLE PHA EVENTS______________
                 OURSMOUT      LOCATE AREA FOR RATES SUMMARY VERSE
•••••••••••••••••••••RSUM___________CONSTRUCT RATES SUMMARY VERSE________
••••••••••••••••••••••••••RSSUM     SUM SINGLE RATES
••••••••••••••••••••••••••RSVSUBR___SUM SECTORED RATES___________________
•••••••••••••••••••••RSDISP         DISPLACEMENT TABLE
________________OUINITP_______TRANSFER EVENT RATES INTO PHA BLOCKS_______
••••••••••••••••OUPHIHET       CONSTRUCT PHA HISTORY MAP FOR HET
______________________VERSHEAD___________________________________________
••••••••••••••••OUPHIVLT       CONSTRUCT PHA HISTORY MAP FOR VLET
______________________VERSHEAD___________________________________________
                 OUPHAOUT      MOVE PHA VERSES INTO OUTPUT BUFFER
•••••••••••••••••••••OUPHASRH       SORT HET PHA DATA____________________
•••••••••••••••••••••OUPHASRV       SORT VLET PHA DATA
__________________________OUPHALOC______ALLOCATE NEW PHA BLOCK___________
                     OUPHASET       FILL PREVERSE OF PHA VERSE
_____________________OUPHAPUT_______MOVE PHA DATA INTO OUTPUT____________
                          OUPHALIS      IDETIFY VERSE PROCESSED
••••••••••••••••OUSCWRDS______SPACE CRAFT WORDS VERSE (58,59,60,61,62,__
                               AND 122)
__________ENTERM________TERMINATE PROCESSING_____________________________
                 LTERM    CLOSE LOG BLOCK
_________________________________________________________________________
*****************************************************************
_________________________________________________________________________
```

Table 2 - ISEE-C ENCGEN Routine Chart (3 of 3) I - 5

DSECTS -		
	CCM	COINCIDENCE CONDITION MAP
	CHINT	CHAPTER INTRODUCTION
	ENCMCB	MASTER CONTROL BLOCK
•••••	FILHDR	FILE HEADER RECORD
	GLOBAL	LIST OF GLOBAL EQUATES AND MASKS
	INREC	EDR HEADER ENTRIES (DFNHDR MACRO)
	LOGDAT	LOG BLOCKS
•••••	MADATA	UNPACKED DATA AREA
	SEGHDR	EXPERIMENT DATA RECORD HEADER (SEGMENT)
	STAT	STATUS INPUT
	SUBCOM	SUBCOM BLOCK
	VERSE	OUTPUT VERSES
	VOLINT	VOLUME INTRODUCTION
UTILITY ROUTINES -		
	FLOAT	TURNS FIXED INTO FLOATING POINT
	GETDATE	FETCH DATE
	INVOKE	CALL PROCEDURE
	I4TODR	CONVERT I*4 INTO R*8
•••••	MOD	CALCULATE THE MOD OF TWO NUMBERS
	MOVE	GENERAL DATA MOVE ROUTINE
	MSG	GENERAL MESSAGE ROUTINE
	TIMCHK	
	TIMEDT	CONVERT TIME INTO R*8 MSEC
MISC -		
	LOPROLOG	CREATE PROLOG FOR LOG BLOCK
	PHAMSK	

Table 3 - Routine Conversion Summary (1 of 4)

```
I S E E   T C   V O Y A G E R   C O N V E R S I O N

THE FOLLOWING IS A SUMMARY OF THE CHANGES MADE TO VOYAGER ENCYGEN
TO MAKE IT COMPATIBLE WITH ISEE-C FORMATS.

INITIALIZER:

          THE FOLLOWING ROUTINES WERE MODIFIED
          PMGEN FOR NEW TAPE AND INDEP SETS FOR HET AND VLET
          ENCGEN NO LONGER NEEDED SOME COPY STEPS
          ENINIT NO LONGER NEEDED TIME QUEUE

          THE FOLLOWING ROUTINES WERE DELETED
          RATTAB NO LONGER ANY RATE DECOMPRESSION
          DECLOG              "
          LOGDEC              "

READER:

          THE FOLLOWING ROUTINES WERE COMPLETELY REWRITTEN BUT THE
          BASIC FUNCTION IS THE SAME:
          MARKUP DATA DEPENDENT
          RDIDSEG   "
          RDESTREL  "
          DISPATCH TIME QUEUE DISCARDED
          DISOPEN  DATA DEPENDENT
          DISPFR    "
          DISPR1    "
          DISPP     "
          DISFILLP  "
          DISUPDSB  "
          DISUPDSG   "        (RENAMED DISUPDSP)

          THE FOLLOWING ROUTINES WERE DELETED PRIMARILY DUE TO
          LACK OF MODE ATTRIBUTES AND DIFFERENCES IN DATA.
          RDSEGSCI
          RDICMODE
          RDSAVTIM
          DISBTABL
          DISSETT
          DISSETS
          DISSETC
          DISFILL
          DISCLOSE
          DPI
          DQSW
          BASIC
          OPCODES
          ENGPRO
          VALUES    ALL OF ENGPRO ROUTINES NOT NEEDED BECAUSE OF
          SETUP     LACK OF SEPARATE ENGIN RECORD
          IDMXDP
          PLGENG
          DECOM
```

THE FOLLOWING ROUTINES WERE ADDED TO ISEE. SEE THE
ISEE FLOWCHART FOR DESCRIPTIONS
PACKER
UPKO
UPKASC
CHCSE
DISCHOSE
RDVERIFY
RDFKEEP
DISASCDG
DISSCC
DISQUAL
DISMISC

MONITOR:

THE FOLLOWING ROUTINES WERE COMBINED INTO MONITOR
MONQUAL
MOCEVAL
MONSTAT
MOSMARK
MONCAL
MOCACHK

MONTREND WAS MODIFIED TO INCLUDE MORE LOCAL VARIABLES

THE FOLLOWING ROUTINES WERE MODIFIED TO HANDLE TWO SUBCOMS
MOTSUBST
MOTBCTH

TRIAB WAS COMPLETELY REWRITTEN FOR THE NEW RATES

THE FOLLOWING ROUTINE WAS ADDED
MOTFIND

ANLYZE:

THE FOLLOWING ROUTINES WERE MODIFIED DUE TO DIFFERENT
CHAPTER AND VOLUME INTRODUCTION DEFINITIONS, AND
DIFFERENT SATELLITE TIME SPECIFICATIONS.
ANCHHD
ANVCLD
ANVCLH

THE FOLLOWING ROUTINES WERE ADDED TO ISEE.
ANANA1
ANANA2
ANCCNV

THE FOLLOWING VOYAGER ROUTINES WERE DELETED FROM ISEE
DUE TO DIFFERENCES IN TIMES, CHAPTER INTRO FORMAT, AND
LACK OF EXPLICIT COMMANDS.
ANCHD1
ANCHOK
GETTIM

OUTPUT:

THE FOLLOWING ROUTINES WERE MODIFIED FOR ISEE DUE TO A CHANGE IN RATE ,PHA AND STATUS WORDS:

OUTPUT
OUCHFOUT CHANGE IN RATE WORDS
OURROUT "
RAWRAT "
OUCCMOUT "
OURSMOUT
OUINITP
OUPHIOUT
OUPHAOUT
OUPHASRT

THE FOLLOWING ROUTINES WERE COMPLETELY REPLACED DUE TO DIFFERENCES IN RATES,STATUS AND COINCIDENCE MAPS

COMMPG (RENAMED CCMMPG)
RATESM
RSDISP

THE FOLLOWING ROUTINES WERE DELETED DUE TO DIFFERENCES IN HET AND LET DATA

DISHET
LETDEL
BHETDEL
HETDEL

END:

ENTERM WAS MODIFIED TO NOT PRINT THE SECOND FILE

DSECTS,UTILITY ROUTINES, ATTRIBUTE BLOCKS,ETC.

THE FOLLOWING ROUTINES WERE DELETED DUE TO LACK OF ATTRIBUTE BLOCKS ,CHANGE IN DISPOSITION OF DATA AND CHANGE IN CLOCKS.

MAITRIB
TABLEHDR
CNVTME
FDSCDT
GETFDSC
GETTIM
CR1ATTR-CR6ATTR
GS3ATTR
MAITRGEN
DDCBGEN
STATUS
RECCNT
SKFHD
SCEDAT
DTMJS
DTUPK
DDCBCR6
CDCB
DATAGAP
PHAMSK
SEGELMNT

Table 3 - Routine Conversion Summary (4 of 4)

```
THE FOLLOWING ROUTINES WERE MODIFIED TO REFLECT DIFFERENT DATA
CHINT
ENCMCB
SUBCOM
TIMEDT
VOLINT
VERSE
SEGHCR
```

Table 4 - READER Input/Output Chart

```
     INPUT TO ISEE-C    READER

   VIA ENCMCB:

ENSCID          X'00'  SPACE CRAFT IDENTIFIER
ENCDAT          X   DATA TO BE PROCESSED INDICATOR
ENRATM0          E'0.0'      IGNORE FOR BIT RATE 64
ENRATM1          E'64.0'      RATE ACCUM. TIME IN SEC. FOR BIT RATE 1024
ENRATM2          E'32.0'      RATE ACCUM. TIME IN SEC. FOR BIT RATE 2048
ENRATM3          E'128.0'     RATE ACCUM. TIME IN SEC. FOR BIT RATE 512
ENEXPNO          F'33'        EXPERIMENT NUMBER
ENNEXTSW        F   @ OF SUBCOM BLOCK NEXT TO BE WRITTEN INTO
ENEUNIT         F'-10'   EDR DATA UNIT NUMBER
ENCSEBR         F    # SCIENCE RECS. TO BE READ
ENMSSEC         D'1000'  MILLISECONDS PER SECOND

     ISEE - C  OUTPUT  FROM    READER
   VIA ISEE-C SUBCOM:
SUHSUB          H          SUBCOM POSITION FOR HET
SUVSUB          H          SUBCOM POSITION FOR VLET
SUSTATUS        F          HET STATUS WORD
SUVLETST        F          VLET STATUS WORD T1;T2 ENABLE
SUHET1GN        H          HET-1 GAIN MODE
SUHIGAIN        1
SULOGAIN        C
SUHET2GN        H          HET-2 GAIN MODE
SUHETCAL        X          HET  CAL BIT FROM DIGITAL SUBCOM
SUVLTCAL        X          VLET  CAL START BIT
SUVCALA         X          VLET CAL ALLOW BIT
SUGAPIND        X          DATA GAP INDICATOR
SUDQAL          X          DATA QUALITY ACCEPTANCE LEVEL
SUTQFLAG        X          TIME QUALITY FLAG
SUBITFLG        X          BIT RATE FLAG
SUSUBFLG        X          WORST OF QUALITY FLAGS OF HET AND VLET SUBCOMS
SUDTSTRT        D          START S/C TIME OF DATA-MILISEC SINCE START OF YR
*                          77. IF TIME IS NOT AVAILABLE, THIS FIELD CONTAINS
*                          THE VALUE SPECIFIED BY ENTIMPAD IN ENCMCB.
*                          ENTIMPAD WILL BE A NON-ZERO NEGATIVE NUMBER
SUSCC           F          SPACE CRAFT CLOCK
SUDQFLAG        4F         DATA QUALITY FLAGS
SUORBIT         0F         ORBITAL POSITION IN METERS
SUOPGSEX        F
SUOPGSEY        F
SUOPGSEZ        F
SUOPFLAG        F        ORBITAL POSITION FLAG
SUPREVSU        AL4        @ OF SUBCOM BLOCK THAT LOGICALLY PRECEDES THIS
SUNEXTSU        AL4        @ OF NEXT SUBCOM BLOCK
SUHETPHA        32D        AREA WHERE HET PHA EVENTS ARE STORED
SUVLTPHA        32D        AREA WHERE VLET PHA EVENTS ARE STORED
SURATES         24F        AREA WHERE HET RATE COUNTS ARE STORED
SUVLTRAT        16F        AREA WHERE VLET RATE COUNTS ARE STORED
SUHSCTRS        F          HET SECTORED RATE SUM
SUVSCTRS        F          VLET SECTORED RATE SUM
SUVLETAN        H        VLET ANALOG HOUSEKEEPING
SUHETEM         H        HET POWER MONITOR
SUVLTPM         H        VLET POWER MONITOR
SUHETTH         H        HET THERMISTOR
SUVLTTH         H        VLET THERMISTOR
                0F
SUSPIN          F        SPIN IN MILLISECONDS
SUSCWORD        96F      MF58,59,60,61,62,122 WORDS
```

Table 5 - MONITOR Input/Output Chart

```
        MONITOR DESIGN DOCUMENT

INPUT:  VIA ENCMCB
        ENNEXTSR        @ OF TOP OF FILLED SUBCOM QUEUE
        ENNEXTSW        @ OF BOTTOM OF FILLED SUBCOM QUEUE
        VIA SUBCOM
        SUGAPIND        GAP INDICATOR IN A DUMMY SUBCOM
        SUSTATUS        HET STATUS SET < 0 IF BAD
        SUFLAG          DISPOSITION FLAG SET TO 0
        SUHSUB          HET SUBCOM TO DEFINE STATUS CYCLE
        SUVLETST        VLET STATUS SET < 0 IF BAD
        SUVLTCAL        VLET CAL
        SUVCALA         VLET CAL ENABLE
        SUHETCAL        HET CAL
        SUPREVSU        SUBCOM @ CHAIN
        SUNEXTSU        SUBCOM @ CHAIN
        SURATES         RATES WORDS FOR TREND CHECK
OUTPUT: VIA SUBCOM
        SUFLAG          DISPOSITION FLAG SET TO -1 IF TO IGNORE
                        ONE STATUS CYCLE SET TO IGNORE FOR BAD STATUS,
                        CHANGE IN BITRATE AND DATA GAP.
                        TWO STATUS CYCLES SET TO IGNORE FOR CHANGE IN
                        STATUS
                        A STATUS CYCLE IS TWO SUBCOMS, EVEN AND ODD
        SUQFLAG         SET TO -1 IF BAD STATUS
        SUSFLAG         SET TO -1 IF STATUS CHANGED
        SUCALFLG        SET TO -1 IF CALERATION MODE
        SUBFLAG         SET TO -1 IF BIT RATE CHANGED
        SURATES         FIRST BYTE OF EACH RATE WORD SET TO INDICATE
                        TREND (SEE ENCYCLOPEDIA TAPE FORMAT)
        SUCHSMC         CALIBRATION MODE SET AS LONG AS MODE IS ON
                        NOT NOMINAL STATUS SET AS LONG AS NOT NOMINAL
                        STATUS CHANGE SET IN FIRST GOOD STATUS CYCLE
                        BITRATE CHANGE SET IN FIRST GOOD STATUS CYCLE
                        (SEE ENCYCLOPEDIA TAPE FORMAT)
        SUHETCAL        HET CAL
        SUAUTO1         HET1 AUTO GAIN
        SUAUTO2         HET2 AUTO GAIN
```

Table 8 - ANALYZER Input/Output Chart (1 of 2)

```
*****************************************************************
   I S E E - C   E N C Y C L O P E D I A   -   A N A L Y Z E R
   INPUT/OUTPUT TABLE.
*****************************************************************
     1. INPUT TO ANALYZER . . .
       . . . FROM MASTER CONTROL BLOCK:

ENNEXTSW      F        @ OF SUBCOM BLOCK NEXT TO BE WRITTEN INTO
ENNEXTSR      F        @ OF SUBCOM BLOCK NEXT TO BE READ
ENPRUNIT      F'6'     PROG MESSAGE LOG UNIT
ENVOLINT      F        @ OF VOLUME INTRODUCTION
ENCHPINT      F        @ OF CHAPTER INTRODUCTION AREA
ENVOLEN       D'900000'    NUMBER OF MILISECOND/VOLUME
ENKEEP        F'32'    NUMBER OF SUBCOMS TO PRESERVE BEFORE NEW DATA

       . . . FROM SUBCOM BLOCKS:

SUSTATUS      F        HET STATUS WORD
SUVLETST      F        VLET STATUS WORD T1;T2 ENABLE
SUHETCAL      X        HET  CAL BIT FROM DIGITAL SUBCOM
SUHCALA       X        HET CAL ALLOW BIT FROM STATUS
SUVLTCAL      X        VLET  CAL START BIT
SUVCALA       X        VLET CAL ALLOW BIT
SUGAPIND      X        DATA GAP INDICATOR
SUDQAL        X        DATA QUALITY ACCEPTANCE LEVEL
SUAUTO1       X        HET-I AUTO GAIN INDICATOR
SUAUTO2       X        HET-II AUTO GAIN INDICATOR
SUCHSMC       X        CHAPTER SUBJECT MATTER CODE
SUTQFLAG      X        TIME QUALITY FLAG
SUBITFLG      X        BIT RATE FLAG
SUDTSTRT      D        START S/C TIME OF DATA-MILISEC SINCE START OF YR
SUSCC         F        SPACE CRAFT CLOCK
SUDQFLAG      4F       DATA QUALITY FLAGS
SUFLAG        H        OVER ALL EVALUATION FLAG
SUORBIT       OF       ORBITAL POSITION IN METERS
SUPREVSU      AL4      @ OF SUBCOM BLOCK THAT LOGICALLY PRECEDES THIS
*                      BLOCK.
SUNEXTSU      AL4      @ OF NEXT SUBCOM BLOCK
SUVLETAN      H       VLET ANALOG HOUSEKEEPING
SUHETPM       H       HET POWER MONITOR
SUVLTPM       H       VLET POWER MONITOR
SUHETTH       H       HET THERMISTOR
SUVLTTH       H       VLET THERMISTOR
SUSPIN        F       SPIN IN MILLISECONDS
*****************************************************************
      2. OUTPUT FROM ANALYZER  . . .
       . . . INTO MASTER CONTROL BLOCK:

ENANDONE      X    ANALYZER COMPLETION CODE
ENNEXTSR      F    @ OF SUBCOM BLOCK NEXT TO BE READ
ENCHPLOC      16F      8 PAIRS OF @ OF 1ST AND LAST SUBCOMS
*                      FOR EACH OF A MAX OF 8 CHAPTERS.

       . . . INTO VOLUME INTRODUCTION:

VCVOVOLN      F            VOLUME NUMBER
VCVSTRT       OCL10        START TIME OF VOLUME
VCNMCHP       H            NUMBER OF CHAPTERS IN VOLUME
VOCHSMC       8X           SUBJECT MATTER CODE FOR CHAPTERS IN VOLUME

       . . . INTO CHAPTER INTRODUCTION:

CECHSMC       X            CHAPTER SUBJECT MATTER CODE
CHVOLN        F            VOLUME NUMBER
CEDTSTRT      OCL8         STARTING S/C TIME OF DATA INCLUDED
CHDTEND       OCL8         ENDING S/C TIME OF DATA
CESTSCC       F            STARTING TIME, SPACECRAFT CLOCK
CEHETST1      F            HET COMMAND STATUS, FIRST 3 BYTES
CEHETST2      F            HET COMMAND STATUS, SECOND 3 BYTES
```

Table 6 - ANALYZER Input/Output Chart (2 of 2)

CHVLETC	H	VLET CALIBRATION:
CHHETC	H	HET CALIBRATION
CHNMMF	H	NUMBER OF MINOR FRAMES IN CHAPTER
CHDQ00	H	SUM OF MINOR FRAMES PADDED (00)
CHDQ01	H	" " " WITH BAD DATA QUALITY (01)
CHDQ10	H	" " " WITH GOOD " " (10)
CHDQ11	H	" " " WITH EXCELLENT " (11)
CHTQ00	H	SUM OF MF WITH QUICK LOOK DATA (00)
CHTQ01	H	" " " " TIME QUALITY (01)
CHTQ10	H	" " " " TIME QUALITY (10)
CHTQ11	H	" " " " TIME QUALITY (11)
CHVLETAN	OCL32	ANALOG VALUES, AVERAGE GFOR CHAPTER:
CHHETPM	F	HETS POWER MONITOR, MV
CHVLETPM	F	VLETS POWER MONITOR, MV
CHHETTH	F	HETS THERMISTOR, DEGREES C
CHVLETTH	F	VLETS THERMISTOR, DEGREES C
CHOPGSEX	F	ORBITAL POSITION (GSEX), AVERAGE FOR CHAPTER
CHOPGSEY	F	ORBITAL POSITION (GSEY), AVERAGE FOR CHAPTER
CHOPGSEZ	F	ORBITAL POSITION (GSEZ), AVERAGE FOR CHAPTER
CHSPINPD	F	SPIN PERIOD(MSEC), AVERAGE FOR CHAPTER
CHDELSPN	F	MAXIMUM SPIN DEVIATION(MSEC)
CHNOWILD	H	SUM OF MINOR FRAMES WITH NORMAL SPIN READOUTS
CHWILD	H	SUM OF MINOR FRAMES WITH 'WILD' SPIN READOUTS
CHBITR	H	BIT RATE

Table 7 - OUTPUTTER Input/Output Chart (1 of 2)

```
****************************************************************
*  Encgen OUTPUT process for ISEE-C
****************************************************************

 MAJOR INPUT

 1.   ENCMCB - Master Control Block.  The following is broken
              down into sections.
      A.   Data Quality Flags and Record Keeping Data
           ENDQAL    X          data quality acceptance level
           ENSTARTV  F          start volume #
           ENENDV    F          last volume # processed
      B.   PHA Processing
           EN@PMSKH  F          @ HET PHA mask table
           EN@PMSKV  F          @ VLET PHA mask table
           EN@PMAPH  F          @ HET PHA map table
           EN@PMAPV  F          @ VLET PHA map table
           EN#PTYPE  F          # PHA verses
           ENMAXPB   F          # blocks alloc. for PHA Sort
           ENPBSIZE  F          # PHA events per PHA verse
           ENLPHA    F          Length PHA Sort Area
           EN@PHA    F          @ PHA Sort Area
           EN1STPV   F          Data type of first PHA Verse
           EN@PHISH  F          @ data types in HET PHA History Verse
           EN@PHISV  F          @ data types is VLET PHA History Verse
      C.   Addresses
           ENVOLINT  F          @ volume introduction
           ENCHPINT  F          @ chapter introduction
           ENCHFLOC  16F        8 pairs (max.) of 1st used and 1st
                                unused subcoms per chapter
      D.   I/O
           ENPRUNIT  F          prog. message log unit
           ENSCUNIT  F          logical unit for science messages
           ENCDCB    DCB        output tape logical unit
             ENENEXIT F           JFCB for output encyclopedia tape
             ENCJFCB  176C        JFC block for output tape unit
      E.   Output Tape Tracker
           ENBPFEET  D          # bits per feet
           ENIRGAP   D          # feet per inter-record gap
           ENFTMAX   D          maximum amt. of feet of use on output tape
           ENFTOUT   D          current amt. of feet used on output tape
      F.   Log Interface
           ENLOGDAT  F          @ COMMON block LOGDAT
      G.   Utility
           ENDCCNVT  2D         floating point conversion area
           ENL1      F          print code for L*1 data
           ENL4      F          print code for L*4 data
           ENI2      F          print code for I*2 data
           ENI4      F          print code for I*4 data
           ENR4      F          print code for R*4 data
           ENR8      F          print code for R*8 data

 2.   Chapter Introduction
           CHCHSMC   X          chapter subject matter code

 3.   Volume Introduction

 4.   SUBCOM - blocks of 64 minor frames assoc. with each chapter.
           SUHSUB    H          subcom position for HET
           SUVSUB    H          subcom position for VLET
           SUSTATUS  F          HET status word
           SUHET1GN  H          HET-1 gain mode
           SUHET2GN  H          HET-2 gain mode
           SUGAPIND  X          Data gap indicator
           SUPREVSU  F          @ of previous subcom
           SUNEXTSU  F          @ of next subcom
           SUHETPHA  32D        Area where HET PHA events are stored marked
                                for quality
           SUVLTPHA  32D        Area where VLET PHA events are stored marked
                                for quality
           SURATES   24F        Area where HET rate counts are stored marked
                                for trend and quality
           SUVLTRAT  16F        Area where VLET rate counts are stored marked
                                for trend and quality
           SUHSCTRS  F          sectored HET rates, summed and marked for
                                trend and quality
           SUVSCTRS  F          sectored VLET rates, summed and marked for
```

```
                    trend and quality
SUSPIN    F         spin time in milliseconds
SUBITFLG  X         bit rate flag
SUSCWORD  96F       mf 58, 59, 60, 61, 62, 122 words
```

***** ****** ****** ****** ***** *****

MAJOR OUTPUT

1. The following are placed on the Encyclopedia Tape
   A. Volume Introduction
   B. Chapter Introduction
   C. Verses
2. ENCMCB
   ENRTCODE F — Return code from Subroutine LOW
   ENWRKBLK 16F — Work block, returned from Subroutine LOW
   ENFTCUT D — amt. of feet currently used on output tape
3. LOGDAT - COMMON that interfaces with LOG and Subroutine LOW

APPENDIX A - ISEE-C LIBRARY ORGANIZATION

The ISEE-C library consists of encyclopedias. The encyclopedia is organized into volumes. Each volume is defined by a fifteen-minute interval that starts at an integral fifteen-minute boundary, i.e., on the hour, fifteen minutes after the hour, thirty minutes after the hour, and forty-five minutes after the hour. The clock used for the purpose of determining time is the Universal time at the spacecraft. Each volume is assigned a unique number which is the number of fifteen-minute intervals elapsed before the volume since the start of calendar year 1977. A volume comprises of an integral number of instrument subcom sequences, and therefore may contain experiment data for a time interval which differs from the time interval of the volume by as much as one subcom sequence. A volume begins with an introduction which identifies the volume and provides information regarding volume contents. Following the introduction, there may be one or more chapters.

A chapter contains data obtained under the same instrument conditions (status, analog), and begins with an introduction. The introduction identifies the chapter and provides a general description of chapter contents, and conditions that may have led to the creation of this chapter. A chapter is terminated when either a change in experiment status occurs, or there is a gap in the data. The chapter introduction identifies the actual start-time and end-time of data included in the chapter. A number of verses follow the chapter introduction.

A verse contains all data of a specified type that was acquired within the time span covered by the chapter. Each verse begins with a preface that identifies the verse as belonging to a particular chapter of a volume and describes the type of data contained in the verse. The data follows the preface in a format appropriate to the type of data.

The formats of an ISEE-C encyclopedia volume introduction, a chapter introduction, and a verse are presented below. Tables A-1 through A-6 provide additional details on these formats.

CHILDS

0.0 VOLUME INTRODUCTION

Byte	Length	Name	Description
0	1	VOCHPN	Chapter number (≡0)
1	1	VOVERN	Verse number (≡0)
2	1	EPV	Encyclopedia Program Version
3	1	SCID	Satellite Identification
4	4	VOVOLN	Volume number
8	6	EPDT	Encyclopedia Program Date
8	2	EPYR	(Year - 1900)
10	2	EPMIN	Month of year
12	2	EPDY	Day of month
14	6	VCDT	Volume Creation Date
14	2	VCYR	(Year - 1900)
16	2	VCMN	Month of year
18	2	VCDY	Day of month
20	10	VSTRT	Time of Volume (Start Time)
20	2	VSYR	(Year - 1900)
22	2	VSMN	Month of year
24	2	VSDY	Day of month
26	2	VSHR	Hour of day
28	2	VSMN	Minute of hour
30	2		Spare
32	2	NMCHP	Number of chapters in the volume (may be zero)
34	48	APRMV	Twelve 2-HW fields, one for each of the analog parameters, that define acceptably range of variation of the parameters, in units of the parameter. HW 0 - minimum acceptable value 1 - maximum acceptable value For parameters for which is a percentage change is acceptable, HW 0 is set = 255, and HW 1 contains acceptable variation, in parts per 256.

Byte	Length	Name	Description
~~82~~ 82 84 86	~~1~~ 2 2 2	VODQSUM	spare weighted sum of data quality Spare # MF
88 ~~86~~	8	CHSMC	Subject matter code for each of the chapters in the volume. One byte field identifies each of the chapters in the volume according to the following code: Bit 0 - 0-status nominal 1-status not nominal 1 - 0-real data 1-calibration data (HET or VLET) 2 - 0-analog parameters within tolerance 1-unusual analog parameters 3 - 0-no time gap 1-time gap in data 4 - 0-no bit rate change 1-bit rate change 5 - Spare 6 - 0-same status 1-change in status 7 - Spare
96 ~~94~~	1	DQAL	Data quality acceptance level (determines quality threshold for rates to be summarized)
97 ~~95~~-99	5		Spare

n. 0 CHAPTER INTRODUCTION n≥1

Byte	Length	Name	Description
0	1	CHCHPN	Chapter Number (≥1)
1	1	CHVERN	Chapter Verse Number - 0
2	1		Spare
3	1	CHCHSMC	Subject Matter Code

Byte	Length	Name	Description
4	4	CHVOLN	Volume Number
8	8	DTSTRT	Starting S/C time of data included
8	2	DTYR	Year - 1900
10	2	DTHR	Hour of year
12	2	DTSC	Second of hour
14	2	DTMSC	Millisecond of second
16	8	DTEND	Ending S/C time of data
16	2	ENDYR	Year - 1900
18	2	ENDHR	Hour of year
20	2	ENDSC	Second of hour
22	2	ENDMSC	Millisecond of second
24	4	STSCC	Starting time, S/C clock
28	6		Spare
34	2	NMYER	Number of verses in chapter
36	100	CHCN	Chapter Contents Table nth byte of this field points to the verse containing nth type of data
136	4		Spare
140	4	HETST1	HET Command Status, first 3 bytes right justified (bits CD-1 - CD24)
144	4	HETST2	HET Command Status, second 3 bytes right justified (bits CD25 - CD48)
148	2	VLETC	VLET Calibration High order byte - CAL Allow Low order byte - CAL Start
150	2	HETC	HET Calibration
152	2	NMMF	Total number of minor frames in chapter

Byte	Length	Name	Description
			Data Quality:
154	2	DQ00	Σ mf padded (00)
156	2	DQ01	Σ mf with bad data quality (01)
158	2	DQ10	Σ mf with good data quality (10)
160	2	DQ11	Σ mf with excellent data quality (11)
			Time Quality:
162	2	TQ00	Σ mf of quick look data (00)
164	2	TQ01	Σ mf with time quality 01
166	2	TQ10	Σ mf with time quality 10
168	2	TQ11	Σ mf with time quality 11
170	2		Spare
LENGTH	1	SYS	0 = SYSA 1 = SYSB 2 = BOTH
	1	SPARE	
			Analog Parameters, average for chapter low order HW - value high order HW - 0 - value read out in this chapter 1 - value inferred 2 - value not available
172	4	VP12V	VLET +12 volts, mv
176	4	VP6V	VLET +6 volts, mv
180	4	VTH3	VLET Thermistor 3, ^{o}c
184	4	VTH4	VLET Thermistor 4, ^{o}c
188	4		VLET Spare 1, raw
192	4		VLET Spare 2, raw
196	4	VM6V	VLET -6 volts, mv
200	4	VM12V	VLET -12 volts, mv
204	4	HETPM	HETS Power Monitor, mv
208	4	VLETPM	VLETS Power Monitor, mv
212	4	HETTH	HETS Thermistor, ^{o}c
216	4	VLETTH	VLETS Thermistor, ^{o}c

Byte	Length	Name	Description
220	4	OPGSEX	Orbital Position (GSEX) average for chapter
224	4	OPGSEY	Orbital Position (GSEY), average for chapter
228	4	OPGSEZ	Orbital Position (GSEZ), average for chapter
232	4	SPINPD	Spin Period (msec), average for chapter
236	4	DELSPN	Maximum Spin Deviation (msec)
238	2	VOWILD	Σ mf with normal spin readouts
240	2	WILD	Σ mf with "wild" spin readouts
242	2		Bit Rate 00 - 64 BPS 01 - 1024 BPS 10 - 2048 BPS 11 - 512 BPS

n.m VERSE (n,m 1)

Verse Preface (Length = 8 bytes)

Byte	Name	Description
0	VECHPN	Chapter number
1	VEVERN	Verse number
2		Spare
3	VESMC	Subject master code - Data Type (See Table A-1.)
4-7	VEVOLN	Volume number
8-11		Spare
12		Verse body - Data

PREVERSE = offset of data = 12

Data Type 0 - Raw Rates Data

	Name	Description	Length (bytes)
PREVERSE+0	HCMPS	HET Commutator position for the first set of rate readouts	1
+1	VCMPS	VLET Commutator position for the first set of rate readouts	1
+2	GAIN1	HET1 gain mode for the first set of readouts (0=low gain; 1=high gain)	1
+3	GAIN2	HET2 gain mode	1
+4	AUTO1	HET1 automatic gain switching (0=yes; 1=no)	1
+5	AUTO2	HET2 automatic gain switching	1
+6	NSEQ	Number of rate sequences in the verse (i.e., groups of 64 minor frames)	2
+8	RATE	40 *NSEQ rate words in the format in Table A-2.	

Data Type 1 - Coincidence Condition Map (Length = 300 bytes)

PREVERSE+0	CCM	One 16-bit word for each of the first 150 rates in Table A-3. Each work indicates the presence of terms in coincidence condition applicable to the corresponding rate. The format of the entries is shown in Table A-4.	

Data Type 2 - Rate Summary

PREVERSE+0	RSM	Two hundred fifty-four rate summary blocks (16 bytes each) corresponding to the rates in Table A-3. The format is in Table A-5.	254x16

Data Type 3 - VLET PHA History

PREVERSE+0	NUMPHA	Number of VLET PHA events in this chapter	4
+4		Spare	
+8	EVPREV	One byte field for each of the 16 PHA events that preceded the first PHA event in this chapter. Each byte contains the data type of the corresponding event. In the event of data discontinuity between previous volume and the current volume, these fields are padded.	16
+24	EVID	One byte field for each event in this chapter. Byte contains data type of the event. (Padded=all bits on; Null event=all bits off) Record filled to double-word boundary.	

Data Type 4 - HET PHA History

(Same as data type 3, except HET)

Data Types 5-22

PREVERSE+0	PHARAT	Rate summary block for the corresponding rate	16
+16	PHAEV	Number of events corresponding to data type	4
+20		Spare	4
+24	PHA	PHA events; 8-byte entry for each event in the format in Table A-6.	

Data Type 23 - Spacecraft Words

PREVERSE+0	SCBL	Number of blocks of spacecraft words
+4		Space
+8		(6 * 64 bytes) * SCBL spacecraft data words.

TABLE A-1. DATA TYPES

Code	Description
0	Raw rates
1	Coincidence condition map
2	Rate Summary
3	VLET PHA Summary
4	HET PHA Summary
5	HET-I AST, High Gain
6	HET-I AST, Low Gain
7	HET-I BSTP, High Gain
8	HET-I BSTE, High Gain
9	HET-I BST, Low Gain
10	HET-I PEN, High Gain
11	HET-I PEN, Low Gain
12-18	HET-II (same as 5-11)
19	VLET-I, event type 0
20	VLET-I, event type 1
21	VLET-I, event type 0
22	VLET-II, event type 1
23	Spacecraft words

TABLE A-2. RATE WORD FORMAT

Byte	Bit	Description
0	0	Fill data flag (0=no fill; 1=fill)
	1-2	Worst Data Quality Flag for minor frames required for this rate
	3	Bad spin value flag (sectored rates only) (0=spin nominal 1="wild" spin)
		Trend check indicators
	4	failed forward trend check (1=fail)
	5	failed backward trend check (1=fail)
	6	applied forward trend check (1=applied)
	7	applied backward trend check (1=applied)
1-3		Rate Counts

TABLE A-3. LOCATION OF RATE SUMMARY BLOCKS IN RATE SUMMARY TEXT

	Description		Symbol
1	HET-I, High Gain,	$A_1\ A_2\ \overline{C}_4\ \overline{G}_1\ \overline{G}_2$	AS
2	" "	$B_1\ B_2\ SB\ \overline{C}_1\ \overline{G}_1\ \overline{G}_2$	BSp
3	" "	$B_1\ B_2\ C_4\ \overline{SB}\ \overline{C}_1\ \overline{G}_1$	BSe
4	" "	$B_1\ B_2\ C_1$	PENH
5	" "	$B_1\ B_2\ C_1\ \overline{G}_1$	PGH
6	" "	$B_1\ B_2\ C_4\ \overline{C}_3\ SB\ \overline{G}_1$	BS4p
7	" "	$B_1\ B_2\ C_4\ \overline{C}_3\ \overline{SB}\ \overline{G}_1$	BS4e
8	" "	$B_1\ B_2\ C_4\ C_3\ \overline{C}_2\ SB\ \overline{G}_1$	BS3p
9	" "	$B_1\ B_2\ C_4\ C_3\ \overline{C}_2\ \overline{SB}\ \overline{G}_1$	BS3e
10	" "	$B_1\ B_2\ C_4\ C_3\ C_2\ \overline{C}_1\ SB\ \overline{G}_1$	BS2p
11	" "	$B_1\ B_2\ C_4\ C_3\ C_2\ \overline{C}_1\ \overline{SB}\ \overline{G}_1$	BS2e
12	HET-I, Low Gain,	$A_1\ A_2\ SA\ \overline{C}_4\ \overline{G}_3$	ASZ3
13	" "	$B_1\ B_2\ SB\ \overline{C}_1\ \overline{G}_3$	BSZ2
14-21	" "	(same as 4-11, except Low Gain)	
22-42	HET-II (same as 1-21, except HET-II)		
43-50	Sectored, HET-I, High Gain	$A_1A_2\ \overline{C}_4\ \overline{G}_1\ \overline{G}_2$	AS
51		$A_1\ A_2\ \overline{C}_4\ \overline{G}_1\ \overline{G}_2$, summed	AS
52-59		$B_1\ B_2\ SB\ \overline{C}_1\ \overline{G}_1\ \overline{G}_2$	BSp
60		$B_1\ B_2\ SB\ \overline{C}_1\ \overline{G}_1\ \overline{G}_2$, summed	BSp
61-68		$B_1\ B_2\ C_4\ SB\ \overline{C}_1\ \overline{G}_1\ \overline{G}_2$	BSp
69		$B_1\ B_2\ C_4\ SB\ \overline{C}_1\ \overline{G}_1\ \overline{G}_2$, summed	BSp
70-77		$B_1\ B_2\ C_4\ \overline{C}_1\ \overline{SB}\ \overline{G}_1\ \overline{G}_2$	BSe
78		$B_1\ B_2\ C_4\ \overline{C}_1\ \overline{SB}\ \overline{G}_1\ \overline{G}_2$, summed	BSe
79-86	Sectored, HET-I, Low Gain	$A_1\ A_2\ SA\ \overline{C}_4\ \overline{G}_3$	ASZ3
87		$A_1\ A_2\ SA\ \overline{C}_4\ \overline{G}_3$, summed	ASZ3
88-95		$B_1\ B_2\ SB\ \overline{C}_1\ \overline{G}_2$	BSZ2

	Description	Symbol
96	$B_1\ B_2$ SB $\overline{C}_1\ \overline{G}_2$, summed	BSZ2
97-150	Sectored, HET-II, (same as 43-96, except HET II)	
151	VLET-I $D_I\ D_{II}\ \overline{F}\ \Sigma_1$	DΣ1
152	DΣ1-DΣ2	DΣ1-DΣ2
153	$D_I\ D_{II}\ \overline{F}\ \Sigma_2$	DΣ2
154	$D_I\ D_{II}\ \overline{F}\ \Sigma_1\ E_1$	DΣ1E1
155	$D_I\ D_{II}\ \overline{F}\ \Sigma_1\ E_2$	DΣ1E2
156	$D_1\ D_{II}\ \overline{F}$	D
157-162	VLET-II (same as 151-155, except VLET-II)	
163-170	Sectored, VLET-I $D_I\ D_{II}\ \overline{F}\ \Sigma_1$	DΣ1
171	$D_I\ D_{II}\ \overline{F}\ \Sigma_1$, summed	
172-179	$D_I\ D_{II}\ \overline{F}$	D
180	$D_I\ D_{II}\ \overline{F}$, summed	
181-188	Sectored, VLET-II $D_1\ D_{11}\ \overline{F}\ \Sigma_1$	DΣ1
189	$D_1\ D_{11}\ \overline{F}\ \Sigma_1$, summed	
190-197	$D_1\ D_{11}\ \overline{F}$	D
198	$D_1\ D_{11}\ \overline{F}$, summed	
199	HET-I, High Gain, A_1	A1
200	" " A_2	A2
201	C_1	C1
202	C_2	C2
203	C_3	C3
204	C_4	C4
205	B_2	B2
206	B_1	B1
207	SA_1	SA1
208	SA_2	SA2
209	SB	SB

		Description	Symbol
246 234 222	210	G_1	G1
	211-222	HET-I, Low Gain (same as 199-210 except Low Gain)	
	223-246	HET-II (same as 199-222 except HET-II)	
251	247	VLET-I D_I	DI
252	248	" D_{II}	DII
253	249	" E	E
254	250	" F	F
	251-254	VLET-II (same as 247-250 except VLET-II)	

TABLE A-4. BIT ASSIGNMENTS FOR COINCIDENCE CONDITION MAP

Bit	HET
0	A_1
1	A_2
2	C_1
3	C_2
4	C_3
5	C_4
6	B_2
7	B_1
8	SA
9	SB
10	G_1
11	G_2
12	G_3
13	G_1'
14	0
15	0

One in a bit position implies that corresponding term is presented. Whether coincidence/anti-coincidence is determined by the rate definitions.

Bit 15 is set if the data type is disabled.

TABLE A-5. RATE SUMMARY BLOCK FORMAT

Byte	Description
0-3	Accumulated counts for this rate, excluding readouts which (a) appeared in a minor frame for which bit errors exceeded tolerance, or (b) failed trend check.
4-7	Time in seconds over which the counts above were accumulated.
8-11	Accumulated counts for this rate, excluding readouts for which data quality was unacceptable or gain mode was unavailable.
12-15	Time in seconds over which the counts in the preceding word were accumulated.

8

TABLE A-6. PHA EVENT FORMAT

Byte	Bit	Description
0-1	0-1	Worst Data Quality Flag for minor frames required for this PHA event
	2-3	Spare
	4-15	PHA Tag bits
2-3	0-3	0
	4-15	PHA 1 Readout
4-5	0-3	0
	4-15	PHA 2 Readout
6-7	0-3	0
	4-15	PHA 3 Readout

TAG BITS :

VLET —

12	13	14	15
TEL 1 ENAB	TEL 2 ENAB	EVENT TYPE	TEL I.D.

HET —

4	5	6	7	8	9	10	11	12	13	14	15
$C_2 \oplus C_4$	C_3	C_1	SB	G_2	$G_1\overline{G_3}$	TEL I.D.	HG	S_3	S_2	EVENT I.D.	S_1

5/31/7[illegible]
TYCH.

JEFF

ISEE-C HET EVENT TYPE VERSE DEFINITIONS (1 VERSE PER EVENT TYPE)

EVENT TYPE	CORRESPONDING EVENT TYPE RATE	SHORT LABEL	TAG BITS EVENT ID BIT	C_1	SB	HG
AS, HI GN	$A_1(A_2)(\overline{C_4})(\overline{G_1})\,\overline{G_2}$	AS	0	—	—	1
AS, LO GN	$A_1(A_2)\,SA\,(\overline{C_4})\,\overline{G_3}$	ASZ3	0	—	—	0
Se, HI GN	$B_1(B_2)(C_4)\,\overline{SB}(\overline{C_1})\overline{G_1}$	BSE	1	0	0	1
Sp, HI GN	$B_1(B_2)\,SB\,(\overline{C_1})(\overline{G_1})\overline{G_2}$	BSP	1	0	1	1
S, LO GN	$B_1(B_2)\,SB\,(\overline{C_1})\,\overline{G_3}$	BSZ2	1	0	—	0
EN, HI GN	$B_1(B_2)(C_1)$	PENH	1	1	—	1
EN, LO GN	$B_1(B_2)(C_1)$	PENL	1	1	—	0

NULL EVENTS: 48 ZEROES (TAG + PHA1 + PHA2 + PHA3)

EACH OF THE ABOVE EVENT TYPES CORRESPONDS TO TWO VERSES, ONE FOR HET-I AND ONE FOR HET-II.

EVERY NON-NULL EVENT FITS INTO ONE OF THE ABOVE CATEGORIES; EVENTS WHICH ARE INCONSISTENT IN SOME WAY WILL BE IDENTIFIED AT A LATER STAGE IN PROCESSING (FOR EXAMPLE, PEN EVENTS WITH $C_3 = 0$).

ISEE HET RATE TABLE

COUNTER	RATE	HG I	HG II	S1	S2	S3	S4	DET.
R1	$A_1(A_2)(\overline{C}_4)(\overline{G}_1)\ \overline{G}_2$		1					
	$A_1(A_2)SA(\overline{C}_4)\overline{G}_3$		0					
R2	$B_1\ (B_2)SB(\overline{C}_1)(\overline{G}_1)\ \overline{G}_2$		1	3/4 S*				
	$B_1\ (B_2)(C_4)\overline{SB}(\overline{C}_1)\overline{G}_1$		1	1/4 *				
	$B_1\ (B_2)SB(\overline{C}_1)\ \overline{G}_3$		0					
R3	$B_1\ (B_2)(C_1)$		–					
R4	$B_1\ (B_2)(C_1)\ \overline{G}_1$		–					
R5	$B_1\ (B_2)(C_4)\overline{C}_3 SB\ \overline{G}_1$		–	0				
	$B_1\ (B_2)(C_4)\overline{C}_3\overline{SB}\ \overline{G}_1$		–	1				
R6	$B_1\ (B_2)(C_4)C_3C_2SB\ \overline{G}_1$		–	0				HET-II
	$B_1\ (B_2)(C_4)C_3\overline{C}_2\overline{SB}\ \overline{G}_1$		–	1				
R7	$B_1\ (B_2)(C_4)C_3C_2(\overline{C}_1)SB\ \overline{G}_1$		–	0				
	$B_1\ (B_2)(C_4)C_3C_2(\overline{C}_1)\overline{SB}\ \overline{G}_1$		–	1				
R8	A_1		–	0	0	0	0	
	A_2		–	1	0	0	0	
	C_1		–	0	1	0	0	
	C_2		–	1	1	0	0	
	B_1		–	0	0	1	0	
	SA_1		–	1	0	1	0	
	SA_2		–	0	1	1	0	
	SB		–	1	1	1	0	
	C_3		–	0	0	0	1	
	C_4		–	1	0	0	1	
	B_2		–	0	1	0	1	
	G_1		–	1	1	0	1	
	B_1 }		–	0	0	1	1	
	SA_1 } REPEAT BLOCK		–	1	0	1	1	
	SA_2 }		–	0	1	1	1	
	SB }		–	1	1	1	1	
R9-R16	IDENTICAL TO R1-R8	–		–	–	–	–	HET-I
SR a	$A_1(A_2)(\overline{C}_4)(\overline{G}_1)\ \overline{G}_2$		1	0	0	0		HET-II
b	$B_1\ (B_2)\ SB\ (\overline{C}_1)(\overline{G}_1)\ \overline{G}_2$		1	0	1	0		
c	$B_1\ (B_2)(C_4)\ SB\ (\overline{C}_1)(\overline{G}_1)\overline{G}_2$		1	0	0	1		
d	$B_1\ (B_2)(C_4)(\overline{C}_1)\overline{SB}(\overline{G}_1)\ \overline{G}_2$		1	0	1	1		
	REPEAT a,b,c,d FOR HET-I	1		1	–	–		HET-I
e	$A_1(A_2)\ SA\ (\overline{C}_4)\ \overline{G}_3$		0	0	0	0		HET-II
e	$A_1(A_2)\ SA\ (\overline{C}_4)\ \overline{G}_3$	0		1	0	0		HET-I
f	$B_1\ (B_2)\ SB\ (\overline{C}_1)\ \overline{G}_2$		0	0	$\overline{0\cdot0}$			HET-II
f	REPEAT f FOR HET-II	0		1	$\overline{0\cdot0}$			HET-I

BSTp

BSTe

differentiate BSTp & BSTe PHA events by looking at SB tag

NOTES:

AS

AS≠3

BSP

BSe

BSε2

PENH/PENL

PGH/PGL

R1, R9 RATES CORRESPOND TO THE A-STOPPING EVENT TYPE FOR HETS I AND II.

* R2, R10 RATES CORRESPOND TO THE B-STOPPING EVENT TYPE FOR HETS I AND II (IN HIGH GAIN THE B-STOPPING EVENT TYPE DEFINITION IS TIME MULTIPLEXED FOR 3/4 AND 1/4 OF THE TIME BETWEEN TWO DEFINING CONDITIONS; $1/4 \equiv S_1 = S_2 = 1$)

R3, R11 = PEN

$SA = SA_1 \cdot SA_2$

BS4p/BS4ε2

BS4e/BS1/2*

(~) = DENOTES TERMS WHICH MAY BE DELETED FROM LOGICAL EXPRESSIONS BY COMMAND.

HG = 0 ⇒ LOW GAIN; HG I ⇒ HET I; HG II ⇒ HET II
HET I AND HET II GAINS ARE THE SAME WHEN IN AUTOMATIC GAIN CHANGING MODE BUT EACH MAY BE COMMANDED TO A FIXED GAIN INDEPENDENTLY.

NOTE REPEAT BLOCK FOR SINGLES RATES; E.G. IN ONE FULL SUBCOM CYCLE THE B1 SAMPLE TIME IS TWICE THAT FOR, SAY, B2.

NOTE: NO ( ) AROUND $\overline{G_3}$, UNLIKE MJS.

ALL RATE EQUATIONS CONTAIN A STROBE TERM TO ESTABLISH A COINCIDENCE APERTURE OF ~ 3 μ SEC. THE STROBE OCCURS 5.5 μ SEC AFTER THE FIRST OF THE FOLLOWING BECOMES TRUE: A_1, B_1, (B_2), (C_1), (C_4)

BIT STATES : BLANK ⇒ NOT RELEVANT
— ⇒ 0 OR 1

BITS HG I, HG II, S1, S2, S3, S4 ARE QUOTED HERE FOR ACCUMULATE TIME; RATES ARE ACCUMULATED DURING ONE 64 MINOR FRAME BLOCK AND READ OUT IN THE NEXT 64 MINOR FRAME BLOCK; THE STATES OF BITS HG I, HG II, S1, S2, S3, S4 READ OUT IN A 64 MINOR FRAME BLOCK CORRESPOND TO THE RATES IN THE FOLLOWING 64 MINOR FRAME BLOCK.

DELETION OF (C_1) IS CONTROLLED BY THE SAME COMMAND BIT AS FOR DELETION OF $(\overline{C_1})$ AND SIMILARLY FOR (C_4) AND $(\overline{C_4})$. A SINGLE COMMAND BIT CONTROLS DELETION OF $(\overline{G_1})$ TERMS IN R1 AND HET-II SECTOR RATES; A SEPERATE COMMAND BIT CONTROLS DELETION OF $(\overline{G_1})$ TERM IN R2; SIMILARLY FOR HET-I.

ISEE HET RATE TABLE

COUNTER	RATE	HG I	HG II	S1	S2	S3	S4	DET.
R1	$A_1(A_2)(\overline{C}_4)(\overline{G}_1)\ \overline{G}_2$		1					
	$A_1(A_2)SA(\overline{C}_4)\overline{G}_3$		0					
R2	$B_1\ (B_2)SB(\overline{C}_1)(\overline{G}_1)\ \overline{G}_2$		1	3/4 S*				
	$B_1\ (B_2)(C_4)\overline{SB}(\overline{C}_1)\overline{G}_1$		1	1/4 *				
	$B_1\ (B_2)SB(\overline{C}_1)\ \overline{G}_3$		0					
R3	$B_1\ (B_2)(C_1)$		–					
R4	$B_1\ (B_2)(C_1)\ \overline{G}_1$		–					
R5	$B_1\ (B_2)(C_4)\overline{C}_3 SB\ \ \overline{G}_1$		–	0				
	$B_1\ (B_2)(C_4)\overline{C}_3\overline{SB}\ \ \overline{G}_1$		–	1				
R6	$B_1\ (B_2)(C_4)C_3\overline{C}_2 SB\ \overline{G}_1$		–	0				HET-II
	$B_1\ (B_2)(C_4)C_3\overline{C}_2\overline{SB}\ \overline{G}_1$		–	1				
R7	$B_1\ (B_2)(C_4)C_3C_2(\overline{C}_1)SB\ \overline{G}_1$		–	0				
	$B_1\ (B_2)(C_4)C_3C_2(\overline{C}_1)\overline{SB}\ \overline{G}_1$		–	1				
R8	A_1		–	0	0	0	0	
	A_2		–	[illegible]	0	0	0	
	C_1		–	0	1	0	0	
	C_2		–	1	1	0	0	
	B_1		–	0	0	1	0	
	SA_1		–	1	0	1	0	
	SA_2		–	0	1	1	0	
	SB		–	1	1	1	0	
	C_3		–	0	0	0	1	
	C_4		–	1	0	0	1	
	B_2		–	0	1	0	1	
	G_1		–	1	1	0	1	
	B_1 } REPEAT BLOCK		–	0	0	1	1	
	SA_1 } REPEAT BLOCK		–	1	0	1	1	
	SA_2 } REPEAT BLOCK		–	0	1	1	1	
	SB } REPEAT BLOCK		–	1	1	1	1	
R9-R16	IDENTICAL TO R1-R8	–		–	–	–	–	HET-I
SR a	$A_1(A_2)(\overline{C}_4)(\overline{G}_1)\ \overline{G}_2$		1	0	0	0		HET-II
b	$B_1\ (B_2)\ SB\ (\overline{C}_1)(\overline{G}_1)\ \overline{G}_2$		1	0	1	0		
c	$B_1\ (B_2)(C_4)\ SB\ (\overline{C}_1)(\overline{G}_1)\overline{G}_2$		1	0	0	1		
d	$B_1\ (B_2)(C_4)(\overline{C}_1)\overline{SB}(\overline{G}_1)\ \overline{G}_2$		1	0	1	1		
	REPEAT a,b,c,d FOR HET-I	1		1	–	–		HET-I
e	$A_1(A_2)\ SA\ (\overline{C}_4)\ \overline{G}_3$		0	0	0	0		HET-II
e	$A_1(A_2)\ SA\ (\overline{C}_4)\ \overline{G}_3$	0		1	0	0		HET-I
f	$B_1\ (B_2)\ SB(\overline{C}_1)\ \overline{G}_2$		0	0	$\overline{0\cdot 0}$			HET-II
f	REPEAT f FOR HET-II	0		1	$\overline{0\cdot 0}$			HET-I

NOTES:

R1, R9 RATES CORRESPOND TO THE A-STOPPING EVENT TYPE FOR HETS I AND II.

* R2, R10 RATES CORRESPOND TO THE B-STOPPING EVENT TYPE FOR HETS I AND II (IN HIGH GAIN THE B-STOPPING EVENT TYPE DEFINITION IS TIME MULTIPLEXED FOR 3/4 AND 1/4 OF THE TIME BETWEEN TWO DEFINING CONDITIONS; $1/4 \equiv S_1 = S_2 = 1$)

R3, R11 = PEN

$SA = SA_1 \cdot SA_2$

(~) = DENOTES TERMS WHICH MAY BE DELETED FROM LOGICAL EXPRESSIONS BY COMMAND.

HG = 0 ⇒ LOW GAIN; HG I ⇒ HET I; HG II ⇒ HET II

HET I AND HET II GAINS ARE THE SAME WHEN IN AUTOMATIC GAIN CHANGING MODE BUT EACH MAY BE COMMANDED TO A FIXED GAIN INDEPENDENTLY.

NOTE REPEAT BLOCK FOR SINGLES RATES; E.G. IN ONE FULL SUBCOM CYCLE THE B1 SAMPLE TIME IS TWICE THAT FOR, SAY, B2.

NOTE: NO ( ) AROUND $\overline{G_3}$, UNLIKE MJS.

ALL RATE EQUATIONS CONTAIN A STROBE TERM TO ESTABLISH A COINCIDENCE APERTURE OF ~ 3 μ SEC. THE STROBE OCCURS 5.5 μ SEC AFTER THE FIRST OF THE FOLLOWING BECOMES TRUE: A_1, B_1, (B_2), (C_1), (C_4)

BIT STATES : BLANK ⇒ NOT RELEVANT
-- ⇒ 0 OR 1

BITS HGI, HGII, S1, S2, S3, S4 ARE QUOTED HERE FOR ACCUMULATE TIME; RATES ARE ACCUMULATED DURING ONE 64 MINOR FRAME BLOCK AND READ OUT IN THE NEXT 64 MINOR FRAME BLOCK; THE STATES OF BITS HGI, HGII, S1, S2, S3, S4 READ OUT IN A 64 MINOR FRAME BLOCK CORRESPOND TO THE RATES IN THE FOLLOWING 64 MINOR FRAME BLOCK.

DELETION OF (C_1) IS CONTROLLED BY THE SAME COMMAND BIT AS FOR DELETION OF $(\overline{C_1})$ AND SIMILARLY FOR (C_4) AND $(\overline{C_4})$. A SINGLE COMMAND BIT CONTROLS DELETION OF $(\overline{G}_1)$ TERMS IN R1 AND HET-II SECTOR RATES; A SEPERATE COMMAND BIT CONTROLS DELETION OF $(\overline{G_1})$ TERM IN R2; SIMILARLY FOR HET-I.

MINOR FRAME NO.	WORD 8: 7	6	5	4	3	2	1	0
0	$R1_{22}$	$R1_{21}$	$R1_{20}$	$R1_{19}$	$R1_{18}$	$R1_{17}$	$R1_{16}$	$R1_{15}$
1	$R1_{14}$	$R1_{13}$	$R1_{12}$	$R1_{11}$	$R1_{10}$	$R1_{9}$	$R1_{8}$	$R1_{7}$
2	$R1_{6}$	$R1_{5}$	$R1_{4}$	$R1_{3}$	$R1_{2}$	$R1_{1}$	$R2_{22}$	$R2_{21}$
3	$R2_{20}$	$R2_{19}$	$R2_{18}$	$R2_{17}$	$R2_{16}$	$R2_{15}$	$R2_{14}$	$R2_{13}$
4	$R2_{12}$	$R2_{11}$	$R2_{10}$	$R2_{9}$	$R2_{8}$	$R2_{7}$	$R2_{6}$	$R2_{5}$
5	$R2_{4}$	$R2_{3}$	$R2_{2}$	$R2_{1}$	$R3_{22}$	$R3_{21}$	$R3_{20}$	$R3_{19}$
6	$R3_{18}$	$R3_{17}$	$R3_{16}$	$R3_{15}$	$R3_{14}$	$R3_{13}$	$R3_{12}$	$R3_{11}$
7	$R3_{10}$	$R3_{9}$	$R3_{8}$	$R3_{7}$	$R3_{6}$	$R3_{5}$	$R3_{4}$	$R3_{3}$
8	$R3_{2}$	$R3_{1}$	$R4_{22}$	$R4_{21}$	$R4_{20}$	$R4_{19}$	$R4_{18}$	$R4_{17}$
9	$R4_{16}$	$R4_{15}$	$R4_{14}$	$R4_{13}$	$R4_{12}$	$R4_{11}$	$R4_{10}$	$R4_{9}$
10	$R4_{8}$	$R4_{7}$	$R4_{6}$	$R4_{5}$	$R4_{4}$	$R4_{3}$	$R4_{2}$	$R4_{1}$
11	$R5_{22}$	$R5_{21}$	$R5_{20}$	$R5_{19}$	–	–	–	–
–								
–								
21	–	–	–	–	$R8_{4}$	$R8_{3}$	$R8_{2}$	$R8_{1}$
22	$R9_{22}$	$R9_{21}$	$R9_{20}$	$R9_{19}$	–	–	–	–
–								
–								
32	–	–	–	–	$R12_{4}$	$R12_{3}$	$R12_{2}$	$R12_{1}$
33	$R13_{22}$	$R13_{21}$	$R13_{20}$	$R13_{19}$	–	–	–	–
–								
–								
43	–	–	–	–	$R16_{4}$	$R16_{3}$	$R16_{2}$	$R16_{1}$
44	$SR(1)_{20}$	$SR(1)_{19}$	$SR(1)_{18}$	$SR(1)_{17}$	$SR(1)_{16}$	$SR(1)_{15}$	$SR(1)_{14}$	$SR(1)_{13}$
45	$SR(1)_{12}$	$SR(1)_{11}$	$SR(1)_{10}$	$SR(1)_{9}$	$SR(1)_{8}$	$SR(1)_{7}$	$SR(1)_{6}$	$SR(1)_{5}$
46	$SR(1)_{4}$	$SR(1)_{3}$	$SR(1)_{2}$	$SR(1)_{1}$	$SR(2)_{20}$	$SR(2)_{19}$	$SR(2)_{18}$	$SR(2)_{17}$
47	$SR(2)_{16}$	$SR(2)_{15}$	$SR(2)_{14}$	$SR(2)_{13}$	$SR(2)_{12}$	$SR(2)_{11}$	$SR(2)_{10}$	$SR(2)_{9}$
48	$SR(2)_{8}$	$SR(2)_{7}$	$SR(2)_{6}$	$SR(2)_{5}$	$SR(2)_{4}$	$SR(2)_{3}$	$SR(2)_{2}$	$SR(2)_{1}$
49	$SR(3)_{20}$	$SR(3)_{19}$	$SR(3)_{18}$	–	–	–	–	–
50	–	–	–	–	–	–	–	–
51	$SR(3)_{4}$	$SR(3)_{3}$	$SR(3)_{2}$	$SR(3)_{1}$	$SR(4)_{20}$	$SR(4)_{19}$	$SR(4)_{18}$	$SR(4)_{17}$
52	–	–	–	–	–	–	–	–
53	–	–	–	–	$SR(4)_{4}$	$SR(4)_{3}$	$SR(4)_{2}$	$SR(4)_{1}$
54	$SR(5)_{20}$	$SR(5)_{19}$	$SR(5)_{18}$	–	–	–	–	–
55	–	–	–	–	–	–	–	–
56	$SR(5)_{4}$	$SR(5)_{3}$	$SR(5)_{2}$	$SR(5)_{1}$	$SR(6)_{20}$	$SR(6)_{19}$	$SR(6)_{18}$	–
57	–	–	–	–	–	–	–	–
58	–	–	–	–	$SR(6)_{4}$	$SR(6)_{3}$	$SR(6)_{2}$	$SR(6)_{1}$
59	$SR(7)_{20}$	$SR(7)_{19}$	$SR(7)_{18}$	$SR(7)_{17}$	–	–	–	–
60	–	–	–	–	–	–	–	–
61	–	$SR(7)_{3}$	$SR(7)_{2}$	$SR(7)_{1}$	$SR(8)_{20}$	$SR(8)_{19}$	$SR(8)_{18}$	$SR(8)_{17}$
62	–	–	–	–	–	–	–	–
63	–	–	–	–	–	$SR(8)_{3}$	$SR(8)_{2}$	$SR(8)_{1}$

MINOR FRAME NO.	WORD 9: 7	6	5	4	3	2	1	0	WORD 10: 7	6	5	4	3	2	1	0	WORD 11: 7	6	5	4	3	2	1	0
0	T12	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1	(MSB) ←				PHA ADDRESS 1 → (LSB)							
1	(MSB) ← PHA ADDRESS 2								→ (LSB)(MSB) ←								PHA ADDRESS 3 → (LSB)							
2–63									PHA DATA AS ABOVE REPEATED EVERY 2 FRAMES															

	TAGS												PHA 1	PHA 2	PHA 3
AST:	$C_2 \oplus C_4$	C_3	C_1	SA	G_2	$G_1 \bar{G}_3$	TEL. ID	HG	SCTR 3	SCTR 2	EVENT ID (0)	SCTR 1	A_1	A_2	$C_1+C_2+C_3$
BST:	$C_2 \oplus C_4$	C_3	C_1 (0)	SB	G_2	$G_1 \bar{G}_3$	TEL. ID	HG	SCTR 3	SCTR 2	EVENT ID (1)	SCTR 1	B_1	B_2	$C_2+C_3+C_4$
PEN:	$C_2 \oplus C_4$	C_3	C_1 (1)	SB	G_2	$G_1 \bar{G}_3$	TEL. ID	HG	SCTR 3	SCTR 2	EVENT ID (1)	SCTR 1	B_1	C_1	$C_2+C_3+C_4$

"G"	G_2	$G_1 \bar{G}_3$	
0	0	0	$\bar{G}_1 \bar{G}_2 \bar{G}_3$
1	0	1	$G_1 \bar{G}_2 \bar{G}_3$
2	1	1	$G_1 G_2 \bar{G}_3$
3	1	0	$G_1 G_2 G_3$

"C"	C_1	C_3	C_2+C_4	
0	0	0	0	$\bar{C}_1 \bar{C}_2 \bar{C}_3 \bar{C}_4$
1	1	0	0	$C_1 \bar{C}_2 \bar{C}_3 \bar{C}_4$
2	1	0	1	$C_1 C_2 \bar{C}_3 \bar{C}_4$
3	1	1	1	$C_1 C_2 C_3 \bar{C}_4$
–	1	1	0	$C_1 C_2 C_3 C_4$
4	0	0	1	$\bar{C}_1 \bar{C}_2 \bar{C}_3 C_4$
3	0	1	1	$\bar{C}_1 \bar{C}_2 C_3 C_4$
2	0	1	0	$\bar{C}_1 C_2 C_3 C_4$

TYH HIGH ENERGY TELESCOPE
ISEE-C TELEMETRY FORMAT

ISEE-C TYH PHA EVENT TAGS:

VLET									TEL 1 ENAB	TEL 2 ENAB	EVENT I.D.	TEL I.D.
HET	$C_2 \oplus C_4$	C_3	C_1	SB	G_2	$G_1 \bar{G}_3$	TEL I.D.	HG	SECT 3	SECT 2	EVENT I.D.	SECT 1
BIT	4	5	6	7	8	9	10	11	12	13	14	15

EVENT TYPES:

	EVENT I.D.	TYPE
VLET	0	DE_2
	1	$DE_1 - DE_2$
HET	0	AST
	1	BST IF $C_1 = 0$ PEN IF $C_1 = 1$

	TAGS												PHA 1	PHA 2	PHA 3
AST:	$C_2 \oplus C_4$	C_3	C_1	SA	G_2	$G_1 \bar{C}_3$	TEL ID	HG	SCTR 3	SCTR 2	EVENT ID	SCTR 1	A_1	A_2	$C_1 + C_2 + C_3$
											(0)				
BST:	$C_2 \oplus C_4$	C_3	C_1	SB	G_2	$G_1 \bar{G}_3$	TEL ID	HG	SCTR 3	SCTR 2	EVENT ID	SCTR 1	B_1	B_2	$C_2 + C_3 + C_4$
			(0)								(1)				
PEN:	$C_2 \oplus C_4$	C_3	C_1	SB	G_2	$G_1 \bar{G}_3$	TEL ID	HG	SCTR 3	SCTR 2	EVENT ID	SCTR 1	[illegible]	C_1	$C_2 + C_3 + C_4$
			(1)								(1)				

"G"	G_2	$G_1 \bar{G}_3$	
0	0	0	$\bar{G}_1 \bar{G}_2 \bar{G}_3$
1	0	1	$G_1 \bar{G}_2 \bar{G}_3$
2	1	1	$G_1 G_2 \bar{G}_3$
3	1	0	$G_1 G_2 G_3$

"C"	C_1	C_3	C_2+C_4	
0	0	0	0	$\bar{C}_1 \bar{C}_2 \bar{C}_3 \bar{C}_4$
1	1	0	0	$C_1 \bar{C}_2 \bar{C}_3 \bar{C}_4$
2	1	0	1	$C_1 C_2 \bar{C}_3 \bar{C}_4$
3	1	1	1	$C_1 C_2 C_3 \bar{C}_4$
–	1	1	0	$C_1 C_2 C_3 C_4$
4	0	0	1	$\bar{C}_1 \bar{C}_2 \bar{C}_3 C_4$
3	0	1	1	$\bar{C}_1 \bar{C}_2 C_3 C_4$
2	0	1	0	$\bar{C}_1 C_2 C_3 C_4$

TYH HIGH ENERGY TELESCOPE
ISEE-C TELEMETRY FORMAT

December 22, 1977

TO: Dr. Tycho von Rosenvinge/661

FROM: ISEE Data Processing Engineer/565.2

SUBJECT: ISEE Data Tape Formats

You will find attached a booklet providing general information relative to ISEE data processing at GSFC and a pulse code modulation (PCM) data tape format conforming as much as possible to your specific format request. You may find that I have included some telemetry words not requested by you but which I think you will need.

If any additional telemetry words are desired, you should let me know soon because these formats, unless amended, will be used to generate test tapes for our system testing. Please send me the address where your data tapes are to be delivered. Usually we find after launch that your address for correspondence is different than the address of your tape librarian.

If any questions arise, please feel free to contact me. My telephone number is 301-982-6408. If no answer, please call 301-982-5928, and leave your name, telephone number, and subject for discussion.

John H Schmidt

John H. Schmidt

Attachment

Experiment No. 33

filled out to size of data block.

Experimenter: von Rosenvinge   FILE HEADER RECORD

Computer word length: 32-bits   Tape type: 9 Track, 1600

Item No.	Data Offset		Field Size (bits)	Item Description
	Bytes	Words		
		0	1440	GSFC Tag
		45	32	Satellite ID Number (fix overlap info?)
			32	Recording Station Number
			32	Experiment ID Number (= 33)
				Start Time of Data
			32	Year
			32	Day of Year
			32	Milliseconds of Day ← First Clock in this File ←?
				Stop Time of Data
			32	Year
			32	Day of Year
			32	Milliseconds of Day
			32	Last Clock in this File (only one station & bit rate/file)
				Next File Start Time
			32	Year
			32	Day of Year
			32	Milliseconds of Day
			32	Next File Start Clock
			32	"Percentage" of Data Recovered in this File (Actual/Avail.) x 1000
			32	Number of Minor Frames in File (Actual)
			32	Bit Rate (2048,1024,512)
			32	Shipping Group Number
			32	Reel Sequence Number
			32	File Number on this Tape
			32	Orbital Position Flag 0 = Definitive orbit; 1 = Predicted orbit; 2 = No orbit; propagation delay not computed (ORBIT?)

s/c REC. TIME

Experiment No. 33

Experimenter: VON ROSENVINGE LOGICAL RECORD HEADER (64 MF)

Computer word length: 32 bits Tape type: 9 TRACK 1600

Item No.	Data Offset Bytes	Data Offset Words	Field Size (bits)	Item Description
		0	16	Experimenter ID Number
			16	Day of Year January 1 = Day 1 } 1st SH & MFO (0, 64, 128, 192)
		1	32	Milliseconds of Day
		2	32	Spacecraft Clock
		3	32	Average Frame ~~Rate~~ Period (microseconds) ✓
		4	8	Frame Counter ← 1st data frame?
			8	Fill Flag for Logical Record (00 = fill somewhere / 11 = no fill) ✓
			8	Bit Rate Flag 00 = other 01 = low 10 = high 11 = other
			8	Time Quality Flags — 2 bits
		5	32	Data Quality Flags (16Frames) [11 Good quality data / 10 Sat " " / 00 fill ← ??]
		6	32	Data Quality Flags (16frames)
		7	32	Data Quality Flags (16Frames)
		8	32	Data Quality Flags (16 Frames)
		9	32	Orbital Position (GSE_x)
		10	32	Orbital Position (GSE_y)
		11	32	Orbital Position (GSE_z)

Experiment No. 33

Experimenter: VON Rosenvinge

Computer word length: 32 - bits

Tape type: 9 TRACK 1600

Item No.	Data Offset Bytes	Data Offset Words	Field Size (bits)	Item Description
	48	12	56	MFW - 5,6,7,8,9,10,11 (frame Ø)
		⋮	⋮	⋮
			56	5,6,7,8,9,10,11 (frame 63)
	489 496	124	24	MFW - 61, 62, 63 (frame Ø) ← MFW 60 ? (MF count)
			⋮	⋮ SCI format ENG format Bit map
			24	61, 62, 63 (frame 63)
	685 688	172	512	MFW 58 0-63 ASC#1
	752	189	512	MFW 59 0-63 DSC
	816	204	512	MFW 122 : 0-63 ASC#2
	880	220	←	START OF NEXT logical record

$\frac{880 \text{ bytes}}{\text{logical record}} \times \frac{4 \text{ logical records}}{\text{Physical record}} = 3520$ bytes $+ 8 = 3528$ bytes/record $= 882$ 32-bit words $= 784$ 36-bit words

$\left[\frac{3520 \text{ bytes}}{\text{Physical record}} \times \frac{1 \text{ inches}}{1600 \text{ bytes}}\right] + \frac{1}{2} \frac{\text{inches}}{\text{gap}} = 2.7''$/record gap

$\boxed{\frac{1 \text{ Tape}}{\text{week}}}$

There will be about 5000 records/week → $5000 \times \frac{2.7}{12} = 1125$ feet/week.

ISEE

GENERAL INFORMATION

John Schmidt
ISEE DPE
Information Processing Division

June 1976
Revised January 1977

X

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

GENERAL INFORMATION

The ISEE experimenters will receive several types of data tapes from GSFC on a weekly basis. These types are:

- PCM telemetry - integer binary labels, integer binary data
- Common data (ISEE-A) - integer binary label, mixed data
- Common data (ISEE-C) - integer binary label, mixed data
- Definitive attitude/MCE* - floating point label, floating point data

All ISEE digital data tapes will be written in 9-track odd parity mode with 1600 cpi density unless the user can not accommodate this medium. In that case, the alternative will be 7-track, 556 cpi, odd parity. We do not recommend 800 cpi on either 7 or 9-track digital tapes.

The PCM telemetry data tapes will be made up from many files. Each telemetry message to GSFC from a ground station will reach the experimenter as a separate file. The elements of all files on all ISEE data tapes supplied by IPD will be as follows:

- File header record
- Data records
- End-of-file mark (EOF)

All tapes will end with three consecutive EOF marks. All tape shipments will be accompanied by a shipping letter itemizing the tape contents.

The common data tapes will have a single file per week. The file header record will be written in binary, and the data records will have mixed integer binary and the floating point requested by the recipient. Both the file header record and the data records will be compatible with the user's computer. The common data tape header record and the data record formats will be supplied at a later date.

---

* Multi-coordinate ephemeris (ISEE-A and B only)

The attitude/MCE tapes will also have a single file per week. The file header record and data records will be written in the floating point requested by the recipient. Each physical data record will have ten one-minute logical records.

There will be occasions when the experimenters' computer will not be able to read some portion of a data tape due to excessive parity errors or damaged tapes. These tapes have always been replaced. However, a new system has been designed, and the experimenters are requested to be prepared to receive not the whole tape (PCM telemetry data) reprocessed, but only the bad file. The IPD will perform all PCM data reprocessing on a file basis not by decom tapes as in the past. Each user must be prepared to merge the good part of the original decom tape with the replacement files. At the cost of data processing today, neither GSFC nor the experimenters can afford to reprocess a week of PCM data because one file is bad. All experimenters' analysis programs should be prepared to skip over a certain number of records with unrecoverable parity errors on each tape. Replacement of common data tapes and attitude/ MCE tapes will be performed according to the same policy; except the tapes are only one file long.

All correspondence with GSFC concerning any of the types of data covered in this memorandum must include the experimenter's IPD assigned experimenter number. We have numbered experiments consecutively through ISEE-A, B, and C as found on pages 110.1 and 110 of the ISEE-SIRD. These experimenter ID numbers are listed in Table 1.

All file header records will contain a 1440-bit field (40 36-bit words) preceding the described portion of the record. This field will be designated as the GSFC TAG and will not be described to the users. The length of the tag was chosen such that it occupies an integral number of words in all users' computers.

The spacecraft clock given in the file header record and in each logical record header will be a composite of the spacecraft clock from the status field and the

Table 1
ISEE Experimenter ID

ISEE-A	Project Code	Investigator
1	ANM	Dr. Anderson
2	BAM	Dr. Bame
3	FRM	Dr. Frank
4	GUM	Dr. Gurnett
5	HAM	Dr. Harvey
6	HEM	Dr. Helliwell
7	HOM	Dr. Hovestadt
8	HPM	Dr. Heppner
9	MOM	Dr. Mozer
10	OGM	Dr. Ogilvie
11	RUM	Dr. Russell
12	SHM	Dr. Sharp
13	WIM	Dr. Williams
ISEE-B		
14	AND	Dr. Anderson
15	EGD	Dr. Moreno
16	FRD	Dr. Frank
17	GUD	Dr. Gurnett
18	HAD	Dr. Harvey
19	KED	Dr. Keppler
20	PAD	Dr. Paschmann
21	RUD	Dr. Russell
ISEE-C		
22	ANH	Dr. Anderson
23	BAH	Dr. Bame
24	DFH	Dr. Hynds
25	HKH	Dr. Heckman
26	HOH	Dr. Hovestadt
27	MEH	Dr. Meyer
28	OGH	Dr. Ogilvie
29	SBH	Dr. Steinberg
30	SCH	Dr. Scarf
31	SMH	Dr. Smith
32	STH	Dr. Stone
33	TYH	Dr. Von Rosenvinge
34	WLH	Dr. Wilcox (CDT)

These numbers will appear on your internal and external tape labels and on the shipping letters accompanying the tapes.

frame counter field in the minor frame ~~This produces~~ a minor frame counter. ~~which cycles approximately once every 97 days.~~

The PCM telemetry tapes will have data records composed of N logical records, each containing one subcom sequence (64 minor frames on ISEE-A and 32 minor frames on ISEE-B). A typical physical record would contain four logical records. Each logical record will have several parts:

- A logical record header.
- The experimenter's PCM data.
- Necessary analog subcom data.
- Necessary digital subcom data.
- In some cases, the PCM data from some other experimenter.

The logical record header must be the first item in each logical record, but the other four items can come in any order.

All data tapes written by IPD computers will be compatible with the user's computer in regard to word length. There are several users who will be doing a portion of the data reduction and the co-investigator will also do a portion. In these cases, IPD will write the tapes to be compatible with one of the two computers. The IPD cannot send data from one experiment to more than one investigator.

<u>PCM Telemetry Tape Format</u>

All items written on the PCM telemetry tapes are written in integer binary.

The elements of the file header record on the PCM telemetry data tape are as follows:

- GSFC TAG
- Satellite ID number

- Recording station ID number
- Experiment ID number
- Start time of data (3 words)
  - year
  - day of year
  - milliseconds of day
- Stop time of data (3 words)
  - year
  - day of year
  - milliseconds of day
- Last clock in this file
- Next file start time of data (3 words)
  - year
  - day
  - milliseconds
- Next file clock start
- Percentage of data recovered $\left(\frac{\text{actual}}{\text{anticipated}}\right)$ ~~x100~~ X 1000 X
- Number of minor frames in file
- Bit rate (i.e., ~~4096~~ 4096, 16384, etc.) X
- Shipping group number
- Reel sequence number
- File number on this tape

- Orbital position data flag (1 word)
    - 0 = definitive orbit
    - 1 = predicted orbit
    - 2 = no orbit; propogation delay not computed

For all users who have computers with 32-bit words or larger, each of the above elements will be one word in the user's computer word length, except those elements identified as being three words and the GSFC TAG which is 1440-bits. Those users who have 16-bit computers will find several fields from the file header record and also later in the logical record header which are too large for their computers. Those fields will be presented as two adjacent 16-bit fields. The fields referred to are:

- Milliseconds of day
- Spacecraft clock
- Orbital position in meters

Because the orbital position can have negative components, IPD will provide these values in a single 32-bit data stream (~~ones~~ 1's or 3's complement). The file label records will be the same length as the data records which follow.

The logical record header which comes once per 64 minor frames on ISEE-A and every 32 frames on ISEE-B (subcom sequence) has the following elements:

- Experiment ID number
- Day of year of first bit of minor frame 0 (or 64, 128, 192).
- Milliseconds of day of first bit of minor frame 0 (or 64, 128, 192).
- Spacecraft clock for minor frame 0 (or 64, 128, 192).
- Average frame ~~rate~~ Period in microseconds
- Frame counter

- Fill flag - 00 = fill data at some point in logical record

  11 = no fill data in logical record

- Bit rate indicator - 00 = other

  01 = low bit rate 1024

  10 = high bit rate 2048

  11 = other 512

- Time quality - 00 = quick look — no time quality check & no delay correction. (any time?)

  01 = fraction smoothed and delay corrected but unverified by other stations

  10 = smoothed, delay corrected and verified after adjusting the ground station time

  11 = same as 10 but no adjustment required to ground station time

- Data quality flags (2 bits per minor frame)

  00 = fill data

  01 = unused "bad"

  10 = good (undecoded)

  11 = excellent (decoded)

- Orbital position in geocentric ~~equatorial inertial~~ SOLAR ECLIPTIC coordinates (meters)

  ~~GEI_x~~ GSE_x

  ~~GEI_y~~ GSE_y

  ~~GEI_z~~ GSE_z

X

The experimenters PCM data records will not contain any whole subcom cycle of fill data unless the experimenter has requested that his physical record be made up from one major frame. If he does, the four logical records will start [illegible] of frame 0 and end with minor frame [illegible] with fill data appropriately placed. Those experimenters whose data set is not driven by the major frame spike will not receive whole subcom sequences of fill.

Fill data will be all zeros in the data fields. If any of the 64 minor frames in a logical record has valid data, then the logical record header will also have valid information in all fields. If all 64 minor frames are missing then the header and the data portion of the record will ~~be all zeros~~ (not be included on output except as mentioned above, where all fields will be zero.

The data portion of the PCM telemetry data tapes will be described specifically in the attachments. The minor frame words (MFW), analog subcom #1 (ASC #1), analog subcom #2 (ASC #2) and, digital subcom (DSC) numbers used in the specific format descriptions correspond to the numbers in the ISEE telemetry list. ISEE-A list shown in Tables 4, 5, 6 and 7. The ISEE-B subcom words have not been so specified.

Common Data Tape Format

The common data tape format will be provided at a later date.

Attitude/MCE Data Tape Format

The attitude/MCE data tape formats are shown in Tables 2 and 3.

UNITED STATES GOVERNMENT

Memorandum

TO : John Schmidt
Code 565.2

DATE: January 19, 1978

FROM : T. von Rosenvinge
P.I. for ISEE-C-TYH

SUBJECT: Tape Formats for ISEE-C-TYH

We have reviewed the tape format which you sent us and we find that it is acceptable. Signed integer constants (such as position) will be required in two's complement. We currently understand that the file start times of all multi-file tapes will be in time sequential order, that the "start time of the next file" will be zero for the last file on the tape, and that such tapes will begin and end only on approximate one week boundaries. We accept your deletion of minor frame word 60 from our format. We further understand that each physical record will always correspond to a major frame and that a physical record could be all pad except for a single minor frame. File label records will be the same length as the data records which follow. The bit-rate indicator needs to be defined for ISEE-C. We do not know how to extract a number of needed quantities from the data but understand that the required information is contained in the data words you are sending us. These quantities include the sun time, magnetic field crossing time, spin-axis angle with respect to the spacecraft-sun line, instrument on-off status for all portions of the spacecraft, etc. We also understand that you do not check to see if engineering format is being used since operationally this is not supposed to happen.

T. von Rosenvinge
Cosmic Radiations Branch

recd 2/6/79

Table 1

Data Pool File Label

Word Number*	Description (All Values are Floating Point)
1 . . . n	1440 bits for Goddard Space Flight Center internal use. (1440 bits = n words, where n depends on the word size used.)
n+1	Satellite ID number.
n+2	Intended recipient of this tape. (See Table 2.)
n+3	YY, start of file, 2 digits of year.
n+4	DDD, start of file, Julian day 1-366.
n+5	SSSSS, start of file, seconds of day.
n+6	YY, end of file, 2 digits of year.
n+7	DDD, end of file, Julian day 1-366.
n+8	SSSSS, end of file, seconds of day.
n+9	High order bits — Clock at start of the data pool file.
n+10	Low order 21 bits — Clock at start of the data pool file.
n+11	Group number (corresponds to telemetry data tape group number.
n+12	Minimum value of spin period found within this file, seconds.
n+13	Maximum value of spin period found within this file, seconds.
n+14 . . . n+80	Spares

*Word size is dependent on the intended recipient

n+81	Number of time lines (maximum 80)	Up to 80 time lines
n+82	Start day of year (1)	
n+83	Start seconds of day (1)	
n+84	High order bits of start spacecraft clock (1)	
n+85	Low order 21 bits of start spacecraft clock (1)	
n+86	Bit rate (1–low bit rate; 4–high bit rate) (1)	
n+87	Start record number (1)	
.	.	
.	.	
	.	
n+656	Start day of year (80)	
n+657	Start seconds of day (80)	
n+658	High order bits of start spacecraft clock (80)	
n+659	Low order 21 bits of start spacecraft clock (80)	
n+660	Bit rate (1–low bit rate; 4–high bit rate) (80)	
n+661	Start record number (80)	
n+662 – 810	Fill to equal data record length	

Data Record

Word Number	Description (All values are floating point)
1	Day of year, record start
2	Seconds of day, record start
3	Clock, record start. High order portion
4	Clock, record start. Low order 21 bits
5	Recovery factor:
	(minor frames processed) / (75 x 256.), for 512 bps
	(minor frames processed) / ([illegible] x 256.), for 1024 bps
	(minor frames processed) / ([illegible] x 256.), for 2048 bps
6	Bit rate:
	1.0 = 512 bps (backup)
	2.0 = 1024 bps (low)
	4.0 = 2048 bps (high)
7	Dummy record indicator:
	0. = at least one minor frame of data within this record's span
	7.0 = no data within the span of this record. The record is a dummy
8	Timeline indicator
	0. = this record lies on an existing timeline
	7.0 = this record begins a new timeline
9	Data record number
10-12	Spares

(Data Record Continued)

Word #	Description (All values are floating pt.
13 – 19	SMH calibration data
20	Spin period average, previous hour.
21	GSE-X
22	GSE-Y
23	GSE-Z
21 – 23	Satellite position in GSE coords at time of first data point in this record.
24 . . . 168	Spares
169 188	Reserved for possible HOH algorithm.

(Data Record Continued)

Word #	Description (All values are floating point)	
189	MANUVR(1)	Maneuver indicators for each of the 12 approx. 5-minute intervals of this record: 0.0 = no maneuver this interval, 7.0 = maneuver indicated during this interval.
⋮		
200	MANUVR(12)	

SMITH Algorithm (Magnetometer) (SMH):

201	BZ(1)	Spin axis component,	magnetic field vector, Interval no. 1 of 60
202	BX(1)	Satellite-sun line comp.	
203	BY(1)	3rd component of triad	
204	BMAG(1)	Magnitude	magnetic field vector, interval no. 1 of 60
205	BDELTA(1)	Lattitude	
206	BPHI(1)	Longitude	
⋮	⋮		
555	BZ(60)	magnetic field vector, interval no. 60 of 60.	
556	BX(60)		
557	BY(60)		
558	BMAG(60)	magnetic field vector, interval no. 60 of 60.	
559	BDELTA(60)		
560	BPHI(60)		

STEINBERG Algorithm (SBH)

561	RAMAP1(1)	Average voltage, 1000 KHz.
562	RARMS1(1)	RMS, 1000 KHz. Interval no. 1 of 30.
⋮	⋮	⋮
619	RAMAP1(30)	Average voltage and RMS, 1000 KHz, interval no. 30 of 30
620	RARMS1(30)	

(Data Record Continued)

Word #	Description (All values are floating point)	
621	RAMAP2(1)	Average voltage, 200 KHz. Interval no. 1 of 30
622	RARMS2(1)	RMS, 200 KHz. Interval no. 1 of 30
⋮	⋮	⋮
679	RAMAP2(30)	Average voltage and RMS, 200 kHz, interval no. 30 of 30
680	RARMS2(30)	

ANDERSON Algorithm (ANH)

Word #		
681	EFLUX(1)	Electron flux, energy >15keV. Interval no. 1 of 12
⋮	⋮	⋮
692	EFLUX(12)	Electron flux, energy >15keV. Interval no. 12 of 12.
693	XRAY(1)	X-ray, counts/sec. Interval no. 1 of 12
⋮	⋮	⋮
704	XRAY(12)	X-ray, counts/sec. Interval no. 12 of 12

BAME Algorithm (BAH)

Word #		
705	IONPD(1)	Ion pseudo density, Interval no. 1 of 12
⋮	⋮	⋮
716	IONPD(12)	Ion pseudo density. Interval no. 12 of 12
717	WINDPS(1)	Solar wind pseudo speed. Interval no. 1 of 12.
⋮	⋮	⋮
728	WINDPS(12)	Solar wind pseudo speed. Interval no. 12 of 12.
729	WINDPA(1)	Solar wind pseudo flow angle. Interval no. 1 of 12.
⋮	⋮	⋮
740	WINDPA(12)	Solar wind pseudo flow angle. Interval no. 12 of 12.

(Data Record Continued)

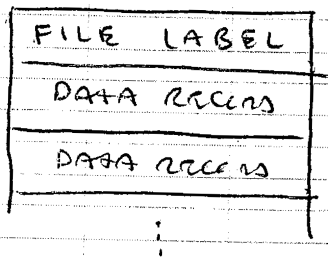
Word #		Description ~~(All values are floating point)~~
SCARF Algorithm (SCH):		
741.	PLA31(1)	Plasma wave 31 Hz, maximum voltage. Interval no. 1 of 12
742	PLA1K(1)	Plasma wave 1kHz, maximum voltage. Interval no. 1 of 12.
743	PLA31K(1)	Plasma wave 31 kHz, maximum voltage. Interval no. 1 of 12.
744	PLANT(1)	Plasma wave antenna status. Interval no. 1 of 12.
⋮	⋮	⋮
785	PLA31(12)	Plasma wave 31 Hz, maximum voltage. Interval no. 12 of 12
786	PLA1K(12)	Plasma wave 1kHz, maximum voltage. Interval no. 12 of 12
787	PLA31K(12)	Plasma wave 31 kHz, maximum voltage Interval no. 12 of 12.
788	PLANT(12)	Plasma wave antenna status. Interval no. 12 of 12.
VON ROSENVINGE Algorithm (TYH):		
789	PARTLO(1)	Particles, low range 4-57 MeV/nucleon Interval no. 1 of 4.
⋮	⋮	⋮
792	PARTLO(4)	Particles, low range 4-57 MeV/nucleon Interval no. 4 of 4.
793	PARTHI(1)	Particles, high range 18-70 MeV/nucleon Interval no. 1 of 4.
⋮	⋮	⋮
796	PARTHI(4)	Particles, high range 18-70 MeV/nucleon Interval no. 4 of 4.

(Data Record Continued)

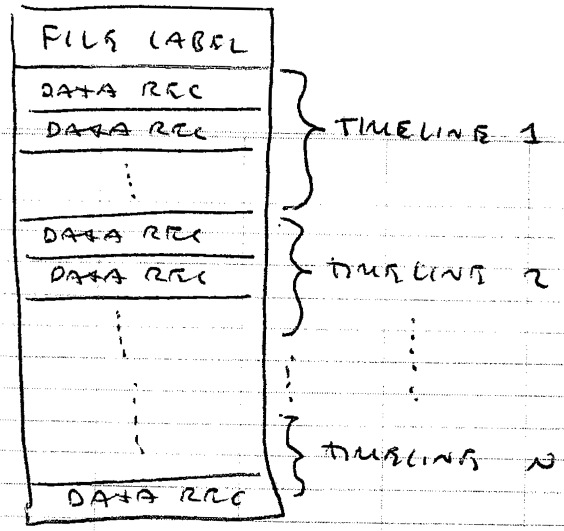
Word #	Description (All values are floating point)	
DE FEITER Algorithm (DFH):		
797	PROLO1(1)	Protons 78-205 KeV. Interval no. 1 of 3
798	PROLO2(1)	Protons 536-1400 KeV. Interval no. 1 of 3
799	ISOTRO(1)	Isotropy index. Interval no. 1 of
800	QUAD(1)	Quadrant. Interval no. 1 of 3.
⋮	⋮	⋮
805	PROLO1(3)	Protons 78-205 KeV. Interval no. 3 of 3.
806	PROLO2(3)	Protons 536-1400 KeV. Interval no. 3 of 3.
807	ISOTRO(3)	Isotropy index. Interval no. 3 of 3.
808	QUAD(3)	Quadrant. Interval no. 3 of 3.
MEYER Algorithm (MEH):		
809	LOWEE(1)	Low energy electrons rate. (5-150 MeV); Interval no. 1 of 2.
810	LOWEE(2)	Low energy (5-150 MeV) electrons rate. Interval no. 2 of 2

— END —

ISEE-C DATA POOL tapes



GROUP NUMBER



up to 80 time lines
each time line has a start time, clock, bit rate and a start record number.

DATA RECORD HAS:
RECORD START TIME, CLOCK
RECOVERY FACTOR
BIT RATE
"NEW TIMELINE" INDICATOR
RECORD NUMBER

MANUVR — INDICATORS FOR EACH OF THE 12 ~5-MIN INTERVALS OF RECORD
⇒ RECORD ~ 60 MIN.

MAGNETOMETER — 60 READOUTS / RECORD (~1/MINUTE)

STEINBERG — 30 READOUTS (2 MIN)

Anderson ELECTRON FLUX — 12 READOUTS (5 MIN)

BAME PLASMA — 5 MIN / REC.

SCARF " — "

TYCHO COSMIC RAY — 15 MIN / REC.

DR FRITZ — 20 MIN / REC.

MEYER — 30 MIN / REC.

SO "OVERLAP" HANDLING ON WHOLE TAPE ONLY REASONABLE AT RECORD LEVEL (60 MIN).

PRESUMABLY ONLY 1 BIT RATE / RECORD.

WHAT DO ~~THE~~ INTERVALS MEAN ON CHANGES OF BIT RATE, AT DATA GAPS

WE HAVE "RECOVERY FACTOR"

ISEE-C MEDIUM ENERGY COSMIC RAY EXPERIMENT TELEMETRY DESCRIPTION

Tycho von Rosenvinge

October 1, 1976

(REVISED JUNE 15, 1978)

ISEE-C TYH FORMAT

					VLET			HET							
					PHA		RATES	RATES	PHA						
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55	56	57	ANA S/C 1 58	DIG S/C 59	60	61	62	63
64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	ANA S/C 2 122	123	124	125	126	127

DMU Telemetry Format Convolutional Mode

1 MINOR FRAME

ISEE-C TYH DATA FORMAT

MINOR FRAME WORD	PARAMETER
5	VLET PHA DATA
6	
7	VLET RATES, FLAGS & PHA STATUS BITS
8	HET RATES
9	
10	HET PHA DATA
11	
58	ANALOG SUBCOM #1
59	DIGITAL SUBCOM
122	ANALOG SUBCOM #2

ANALOG SUBCOM 1 (BY POSITIONS, = STEPS)

STEP #	
51	VLETS ANALOG HOUSEKEEPING
52	HETS POWER MONITOR
53	VLETS POWER MONITOR

ANALOG SUBCOM 2

STEP #	
17	HETS THERMISTOR
19	VLETS THERMISTOR

DIGITAL SUBCOM (BY POSITIONS, = STEPS)

STEP #	
43	
44	HET SUBCOM BITS
45	AND COMMAND STATUS
46	AS FOLLOWS:

STEP #/Bit	7	6	5	4	3	2	1	0	
43	S5	S4	S3	S2	S1≡0	HG1	HG2	CAL	
44	CD8	CD7	CD6	-	-	-	-	CD1	S1≡0
45	CD16	CD15	-	-	-	-	-	CD9	
46	CD24	CD23	-	-	-	-	-	CD17	
43	S5	S4	S3	S2	S1≡1	HG1	HG2	CAL	
44	CD32	CD31	-	-	-	-	-	CD25	S1≡1
45	CD40	CD39	-	-	-	-	-	CD33	
46	CD48	CD47	-	-	-	-	-	CD41	

(By convention, Bit 7 is read out first in time and Bit 0 last)

HET SUBCOM POSITION = (S4)(S3)(S2)(S1)

COMMAND BIT ASSIGNMENT FOLLOWS:

CD1 - Dummy Bit (Always 0 in Readout).
CD2 - Suppress A_2 Term (HET-I).
CD3 - " B_2 " " .
CD4 - " $\overline{G}_1$ " " , B Stopping Only.
CD5 - " C_1 " " .
CD6 - " C_4 " " .
CD7 - " $\overline{G}_1$ " " , Other Than B Stopping.
CD8 - Delete AS Analysis (HET-I).
CD9 - " BSE " " .
CD10 - " BSp " " .
CD11 - " PEN " " .
CD12 - Suppress A_2 Term (HET-II).
CD13 - " B_2 " " .
CD14 - " $\overline{G}_1$ " " , B Stopping Only.
CD15 - " C_1 " " .
CD16 - " C_4 " " .
CD17 - " $\overline{G}$ " " , Other Than B Stopping.
CD18 - Delete AS Analysis " .
CD19 - " BSe " " .
CD20 - " BSp " " .

(CONTINUED)

COMMAND BIT ASSIGNMENT (CONT'D):

CD21 - Delete PEN Analysis (HET-II).

CD22 - Power Off G_4 (HET-I).

CD23 - " " G_3 " .

CD24 - " " G_2 " .

CD25 - " " G_1 " .

CD26 - " " B_2 " .

CD27 - " " B_1 " .

CD28 - " " A_2 " .

CD29 - " " A_1 " .

CD30 - " " C_4 " .

CD31 - " " C_3 " .

CD32 - " " C_2 " .

CD33 - " " C_1 " .

CD34 - " " G_4 (HET-II).

CD35 - " " G_3 " .

CD36 - " " G_2 " .

CD37 - " " G_1 " .

CD38 - " " B_2 " .

CD39 - " " B_1 " .

CD40 - " " A_2 " .

CD41 - " " A_1 " .

CD42 - " " C_4 " .

CD43 - " " C_3 " .

CD44 - " " C_2 " .

CD45 - " " C_1 " .

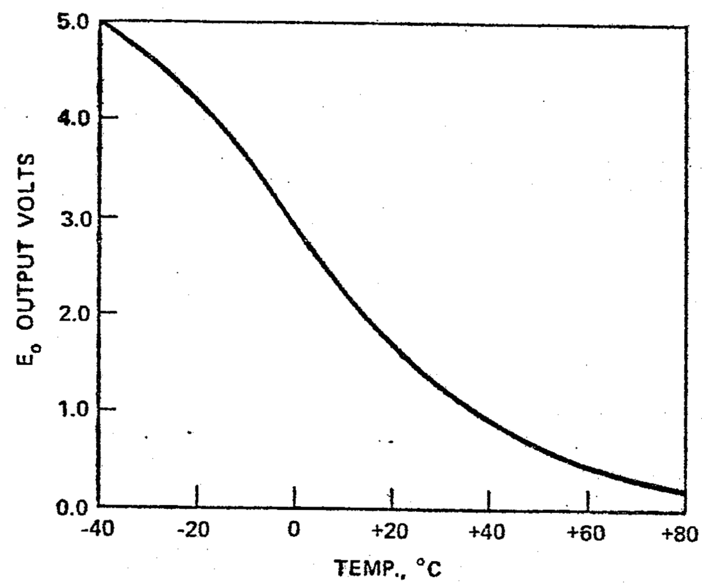
CD46 - CAL ENABLE (1 → CAL ENABLED).

$$\left.\begin{array}{l}\text{CD47} - HG_1 = S_5 \cdot \text{CD47} + \text{CD49} \cdot \overline{\text{CD47}} \\ \text{CD48} - HG_2 = S_5 \cdot \text{CD48} + \text{CD50} \cdot \overline{\text{CD48}}\end{array}\right\} \text{HG} = 1 \rightarrow \text{HIGH GAIN}$$

The HETS and VLETS power monitors nominally sit at +4.0 volts when the experiment is ON and at ground when the experiment is OFF. For definition purposes, any value > 2.5 volts = ON; ≤ 2.5 volts = OFF. The analog subcom 8-bit readout value must be multiplied by .02 volts to obtain the voltage level at the input to the analog subcom converter. Hence 5.10 volts is the converter full scale.

The thermistor conversion table for all thermistors is as follows:

DIGITAL READOUT	TEMPERATURE °C
17	+70
20	+65
24	+60
28	+55
33	+50
39	+45
46	+40
53	+35
62	+30
72	+25
84	+20
97	+15
111	+10
126	+ 5
142	0
158	- 5
174	-10
190	-15
200	-20
230	-30
249	-40
255	-50



VLET DATA

Data for the VLET system includes:

1. Pulse height analysis data (PHA data)
2. Rates data
3. Analog housekeeping
4. Power monitor and temperature data

The positions in a minor frame where these are read out have been indicated on the preceeding pages. We will now discuss each in turn in more detail.

The pattern of PHA and rates data readouts is indicated on the next page. A single PHA event corresponds to a single particle entering one of the two VLET telescopes. The data for a single PHA event consists of a DI pulse-height (11 bits), a DII pulse-height (11 bits), an E pulse-height (10 bits) and event tag bits Po and Pl. The three pulse-heights for a single event can be read out in 2 minor frames (words 5 and 6) as shown on the next page. However the Po and Pl tags are read out for two events at a time in word 7, frames 3, 7, 11, . . . as indicated. Thus the pulse height data and tag data for two PHA events is read out in four minor frames. The null event (no particle detected) is characterized by DI=DII=E=0. Pl tells whether the event was detected in Telescope 1 or in telescope 2; the state of the Po bit classifies the event as one of two different event types. Po and Pl indicate the set of storage registers from which readout occurs and need not be zero for null-events.

The VLET system contains 8 non-sectored rate counters and 8 sectored rate counters.

At the end of each block of 64 minor frames (minor frames 0-63) the contents of all 16 of these rate registers are transferred for read-out during the next block of 64 minor frames. The registers are then immediately cleared and any subcommutators are advanced in position. Non-sectored rate counters then immediately resume counting until the end of the new block of 64 minor frames. Each sectored rate counter counts a particular event rate only when the corresponding telescope is looking in a particular direction, i.e. the spin plane is divided into 8 different azimuthal sectors and to each sector corresponds one of the eight sector rate counters. After the end of one block of 64 minor frames, counting into the sector rate registers doesn't resume until the sun spike occurs. Events are then counted successively into the 8 different sector rate counters for 8, 16 or 32 complete spins depending upon whether the spacecraft bit-rate is 2048 IBPS, 1024 IBPS or 512 IBPS respectively. The nominal spin period is 3 seconds. Complete accumulation will therefore be finished by the end of the 64 minor frame block.

Each VLET rate register read-out (sectored and non-sectored) consists of 24 bits read out in word 7. Every fourth readout of word 7 contains tag/status information, however, so the contents of one rate register is read out every four minor frames and all 16 rate registers are read out in

64 minor frames (see Page 9. Register R1 is read out first, R2 next and so on through R8, then sector rate register SR1 is read out followed by SR2, . . . SR8.

The rate counter subcommutation and rate coincidence conditions are indicated in the table on Page 10. For 8-level subcommutation, the subcommutator position ≡ $[(S2)(S1)(S0)]_{octal}$. The S2, S1 and S0 bits are obtained from word 7, frames 3, 7 and 11 (modulo 16) respectively as shown on Page 9.

NOTE: ALL RATES REGISTERS (HET & VLET) ACCUMULATE DATA FOR 64 MINOR FRAMES AND READ OUT THE RESULTS DURING THE NEXT 64 MINOR FRAMES; THUS RATE READOUTS IN ONE 64 MINOR FRAME BLOCK SHOULD BE ASSOCIATED WITH THE SUBCOM POSITIONS READ OUT IN THE PRECEDING 64 MINOR FRAME BLOCK. THE HET AND VLET SUBCOMS ARE INDEPENDENT OF EACH OTHER.

The VLET analog housekeeping (step 51 on the spacecraft analog subcom #1) is further subcommed by 8 inside the experiment using the same subcommutator clock (S2)S1)(S0) as used for the VLET rate registers:

	PARAMETER	(S2)	(S1)	(S0)	ANALOG SUBCOM READOUT DESIGNATION
V_o =	+12 V	0	0	0	X_o
V_1 =	+6 V	0	0	1	X_1
V_2 =	Thermistor 3	0	1	0	X_2
V_3 =	Thermistor 4	0	1	1	X_3
V_4 =	Spare	1	0	0	X_4
V_5 =	Spare	1	0	1	X_5
V_6 =	-6 V	1	1	0	X_6
V_7 =	-12 V	1	1	1	X_7

The VLETS Power Monitor (analog subcom #1, step 53) nominally sits at 4.0 volts when the experiment is ON and at ground when the experiment is OFF.

The spacecraft analog subcom has a linear range from 0 to 5.10 V. Hence, the following conversions are necessary to relate the subcom readout X's with the appropriate voltage:

$$V_o = 0.06 \times X_o \text{ volts.}$$
$$V_1 = 0.04 \times X_1 \text{ volts.}$$
$$V_6 = 0.4 \times X_6 - 0.44 \times X_1 \text{ volts.}$$
$$V_7 = 0.0444 \times X_7 - 0.0733 \times X_o \text{ volts.}$$

The thermistor temperature conversions are the same as given on Page 5. X_o is read in the same 64 minor frame block as the one in which S_2, S_1 and S_o are zero, etc. (i.e., this is unlike the rates).

The VLETS Power Monitor (Analog Subcom #1, Step 53) nominally sits at 4.0 volts when the experiment is ON and at ground when the experiment is OFF. See Page 5 for further details.

VLET status readout is as indicated on Page 9. Systems 1 and 2 are both enabled when their status bits are zero. The PHA enable/disable commands are executed when they are received. The internal stimulus is not turned on, however, until the beginning of the first 64 minor frame block after the command is received. It remains on for 8x64 minor frame blocks and then automatically shuts itself off. It may also be commanded off. The internal stimulus system is ON during the 8x64 minor frame blocks which have the CAL ON bit set to 1. PHA events from the internal stimulus may continue to be read out for as many as eight pulse-height events after the system shuts off. The 64 minor frame block following the turn-off of the internal stimulus will contain rates accumulated when it was on, even though the CAL ON bit is reset to zero.

The VLET PHA counters are quite different from those for the HET. The counters for DI and DII start counting from zero and have no overflow protection. The E counter starts counting from zero and freezes at all ones if overflow is detected. (The HET PHA counters start counting from 1 and freeze at zero if overflow is detected.)

BIT STRUCTURE, VLET PHA/RATE READOUTS

WORD 5	WORD 6	WORD 7	
← PHA DATA	→	← RATE/TAGS →	
Z11 Z10 Z9 Z8 Z7 Z6 Z5 Z4	Z3 Z2 Z1 Y11 Y10 Y9 Y8 Y7	B24 B23 B22 B21 B20 B19 B18 B17	FRAMES 0, 4, 8,..
MSB ← DI	→ ← DII →	MSB	
Y6 Y5 Y4 Y3 Y2 Y1 X10 X9	X8 X7 X6 X5 X4 X3 X2 X1	B16 B15 B14 B13 B12 B11 B10 B9	FRAMES 1, 5, 9,..
← DII → ← E	→ LSB		
Z11 Z10 Z9 Z8 Z7 Z6 Z5 Z4	Z3 Z2 Z1 Y11 Y10 Y9 Y8 Y7	B8 B7 B6 B5 B4 B3 B2 B1	FRAMES 2, 6, 10,.
MSB ← DI	→ ← DII →	LSB	
Y6 Y5 Y4 Y3 Y2 Y1 X10 X9	X8 X7 X6 X5 X4 X3 X2 X1	A8 A7 A6 A5 A4 A3 A2 A1	FRAMES 3, 7, 11,.
← DII → ← E	→ LSB		

BIT CONTENTS

X = E PHA
Y = DII PHA
Z = DI PHA
B = RATE
A_i = TAGS AND STATUS

P_1 0 = TELESCOPE 1
1 = TELESCOPE 2

P_o 0 = EVENT TYPE 0
1 = EVENT TYPE 1

Frame #
Modulo 16

A_1 = { 3 S2 (VLET)
7 S1 (VLET)
11 S0 (VLET)
15 CAL ALLOW

A_2 = CAL ON

A_3 = P_1 } TAGS FOR PHA EVENT IN
A_4 = P_o } FRAMES (2,3), (6,7), ...

A_5 = TELESCOPE 2 PHA ENABLE

A_6 = TELESCOPE 1 PHA ENABLE

A_7 = P_1 } TAGS FOR PHA EVENT
A_8 = P_o } IN FRAMES (0,1), (4,5), . . .

VLET ANALOG SUBCOM POSITION = (S2)(S1)(S0)

860003

VLET RATE FORMAT (REVISED 9/2/76)

S2 = 8x64W7		0	0	0	0	1	1	1	1
S1 = 4x64W7		0	0	1	1	0	0	1	1
S0 = 2x64W7		0	1	0	1	0	1	0	1
T1	R1	DΣ1	DΣ1	DΣ1	DΣ1	DΣ1	DΣ1	DΣ1	DΣ1
	R2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2
	R3	DΣ1E1	DΣ1E2	DΣ1E1~	DΣ1E2	DΣ1E1	DΣ1E2	DΣ1E1	DΣ1E2
T2	R4	DΣ1	DΣ1	DΣ1	DΣL	DΣ1	DΣ1	DΣ1	DΣ1
	R5	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2	DΣ2
	R6	DΣ1E1	DΣ1E2	DΣ1E1	DΣ1E2	DΣ1E1	DΣ1E2	DΣ1E1	DΣ1E2
	R7	DT2	DT1 *	DT2	DT1	DT2	DT1	DT2	DT1
	R8	DIT1	DIIT1	ET1	FT1	DIT2	DIIT2	ET2	FT2
	RSE	DΣ1T1	DT1	DΣ1T2	DT2	DΣ1T1	DT1	DΣ1T2	DT2

D = DIDII$\overline{F}$ T1 = TELESCOPE 1, T2 = TELESCOPE 2

USE SUBCOM POSITION SAMPLE FROM PRECEDING 64 MINOR FRAME DATA BLOCK

$\boxed{}$ = length of subcom cycle

* NOTE 2,1 ORDER!

HET DATA

The TYH High-Energy Telescope (HET) produces three types of digital data (rate data, PHA data and command status data), and 3 analog parameters. One complete data cycle requires 16 blocks of 64 minor frames, or 1024 minor frames. A single 64 minor frame block format is shown in Figure 1.* Word 8 contains all the HET rate data, consisting of 16 consecutive 22-bit rate counter readouts, followed by 8 additional 20-bit sectored rate counter readouts, for a total of 512 bits in the 64 8-bit words. The first bit in the sequence (i.e., the first bit readout in time) appears in minor frame #0 and is the MSB (2^{21}) of rate counter #1; this is designated $R1_{22}$. The succeeding bits ($R1_{21}$, $R1_{20}$, $R1_{19}$ . . . R_1) complete the readout of R1, followed by R2 ($R2_{22}$, $R2_{21}$ . . . $R2_1$) and so on until all 16 rate counters and the 8 sectored rate counters (SR1 through SR8) have been readout. This represents 1/16 of a complete rate data cycle and corresponds to a single position of the rate counter commutator. The commutator position is read out as the S4, S3, S2 and S1 bits in the digital subcom (S4 is MSB) of the preceding 64 minor frame block. The logical rates, i.e., the required coincidence anticoincidence conditions among various elements of each telescope, are shown in Fig. 2.+ Some rates are not commutated at all (R3, R4, R11 and R12, for example), and represent the same coincidence condition regardless of the state of the S1-S4 bits and the HG_i bits (high gain/low gain) for each telescope. Other rates may be commutated between two quantities using only the S1 bit (e.g., R5) or only the HG_i bit (R1). R2 and R10, however, are commutated using both HG_i and the S1, S2 bits as well. The singles rates from each telescope element are commutated modulo 16 in R8 and R16 using all the bits S1, S2, S3, S4.

PHA (pulse-height analysis) data for selected events appears as a 48-bit sequence starting in the MSB of Word 9 of even-numbered frames and ending with the LSB of Word 11 of odd-numbered frames. The first 12 bits read out (T12-T1 in Fig. 1) are tag bits which identify the event type (A STopping, B STopping, or PENetrating), the telescope, the sector orientation of the spacecraft at the time of the particle detection, the penetration range of the particle through the C stack, and other housekeeping parameters of that event. The remaining 36 bits contain three 12-bit numbers representing the amplitude of three selected detector signals. Fig. 1 illustrates the various PHA addresses and identifies which detector quantity is represented for each of the PHA event types.

Command status data is read out in the digital subcom. Eight subcom words, i.e., 128 minor frames, are required for a complete readout of all 48 status bits. Each block of 64 minor frames, however, contains one readout of the rate commutation position and the two gain bits, one for each telescope. See page 3. Command status changes whenever a command is received; i.e., it is not aligned with 128 minor frame boundaries.

---

* Drawing labelled TYH High Energy Telescope, ISEE-C Telemetry Format, p. 12.
\+ Drawing labelled ISEE HET Rate Table, p. 13.

NOR FRAME NO.	WORD 8 bit 7	6	5	4	3	2	1	0
0	$R1_{22}$	$R1_{21}$	$R1_{20}$	$R1_{19}$	$R1_{18}$	$R1_{17}$	$R1_{16}$	$R1_{15}$
1	$R1_{14}$	$R1_{13}$	$R1_{12}$	$R1_{11}$	$R1_{10}$	$R1_{9}$	$R1_{8}$	$R1_{7}$
2	$R1_{6}$	$R1_{5}$	$R1_{4}$	$R1_{3}$	$R1_{2}$	$R1_{1}$	$R2_{22}$	$R2_{21}$
3	$R2_{20}$	$R2_{19}$	$R2_{18}$	$R2_{17}$	$R2_{16}$	$R2_{15}$	$R2_{14}$	$R2_{13}$
4	$R2_{12}$	$R2_{11}$	$R2_{10}$	$R2_{9}$	$R2_{8}$	$R2_{7}$	$R2_{6}$	$R2_{5}$
5	$R2_{4}$	$R2_{3}$	$R2_{2}$	$R2_{1}$	$R3_{22}$	$R3_{21}$	$R3_{20}$	$R3_{19}$
6	$R3_{18}$	$R3_{17}$	$R3_{16}$	$R3_{15}$	$R3_{14}$	$R3_{13}$	$R3_{12}$	$R3_{11}$
7	$R3_{10}$	$R3_{9}$	$R3_{8}$	$R3_{7}$	$R3_{6}$	$R3_{5}$	$R3_{4}$	$R3_{3}$
8	$R3_{2}$	$R3_{1}$	$R4_{22}$	$R4_{21}$	$R4_{20}$	$R4_{19}$	$R4_{18}$	$R4_{17}$
9	$R4_{16}$	$R4_{15}$	$R4_{14}$	$R4_{13}$	$R4_{12}$	$R4_{11}$	$R4_{10}$	$R4_{9}$
10	$R4_{8}$	$R4_{7}$	$R4_{6}$	$R4_{5}$	$R4_{4}$	$R4_{3}$	$R4_{2}$	$R4_{1}$
11	$R5_{22}$	$R5_{21}$	$R5_{20}$	$R5_{19}$	–	–	–	–
–								
–								
21	–	–	–	–	$R8_{4}$	$R8_{3}$	$R8_{2}$	$R8_{1}$
22	$R9_{22}$	$R9_{21}$	$R9_{20}$	$R9_{19}$	–	–	–	–
–								
–								
32	–	–	–	–	$R12_{4}$	$R12_{3}$	$R12_{2}$	$R12_{1}$
33	$R13_{22}$	$R13_{21}$	$R13_{20}$	$R13_{19}$	–	–	–	–
–								
–								
43	–	–	–	–	$R16_{4}$	$R16_{3}$	$R16_{2}$	$R16_{1}$
44	$SR(1)_{20}$	$SR(1)_{19}$	$SR(1)_{18}$	$SR(1)_{17}$	$SR(1)_{16}$	$SR(1)_{15}$	$SR(1)_{14}$	$SR(1)_{13}$
45	$SR(1)_{12}$	$SR(1)_{11}$	$SR(1)_{10}$	$SR(1)_{9}$	$SR(1)_{8}$	$SR(1)_{7}$	$SR(1)_{6}$	$SR(1)_{5}$
46	$SR(1)_{4}$	$SR(1)_{3}$	$SR(1)_{2}$	$SR(1)_{1}$	$SR(2)_{20}$	$SR(2)_{19}$	$SR(2)_{18}$	$SR(2)_{17}$
47	$SR(2)_{16}$	$SR(2)_{15}$	$SR(2)_{14}$	$SR(2)_{13}$	$SR(2)_{12}$	$SR(2)_{11}$	$SR(2)_{10}$	$SR(2)_{9}$
48	$SR(2)_{8}$	$SR(2)_{7}$	$SR(2)_{6}$	$SR(2)_{5}$	$SR(2)_{4}$	$SR(2)_{3}$	$SR(2)_{2}$	$SR(2)_{1}$
49	$SR(3)_{20}$	$SR(3)_{19}$	$SR(3)_{18}$	–	–	–	–	–
50	–	–	–	–	–	–	–	–
51	$SR(3)_{4}$	$SR(3)_{3}$	$SR(3)_{2}$	$SR(3)_{1}$	$SR(4)_{20}$	$SR(4)_{19}$	$SR(4)_{18}$	$SR(4)_{17}$
52	–	–	–	–	–	–	–	–
53	–	–	–	–	$SR(4)_{4}$	$SR(4)_{3}$	$SR(4)_{2}$	$SR(4)_{1}$
54	$SR(5)_{20}$	$SR(5)_{19}$	$SR(5)_{18}$	–	–	–	–	–
55	–	–	–	–	–	–	–	–
56	$SR(5)_{4}$	$SR(5)_{3}$	$SR(5)_{2}$	$SR(5)_{1}$	$SR(6)_{20}$	$SR(6)_{19}$	$SR(6)_{18}$	–
57	–	–	–	–	–	–	–	–
58	–	–	–	–	$SR(6)_{4}$	$SR(6)_{3}$	$SR(6)_{2}$	$SR(6)_{1}$
59	$SR(7)_{20}$	$SR(7)_{19}$	$SR(7)_{18}$	$SR(7)_{17}$	–	–	–	–
60	–	–	–	–	–	–	–	–
61	–	$SR(7)_{3}$	$SR(7)_{2}$	$SR(7)_{1}$	$SR(8)_{20}$	$SR(8)_{19}$	$SR(8)_{18}$	$SR(8)_{17}$
62	–	–	–	–	–	–	–	–
63	–	–	–	–	–	$SR(8)_{3}$	$SR(8)_{2}$	$SR(8)_{1}$

NOR FRAME NO.	D 9 bit 7	6	5		3	2	1	0	WORD 10 bit 7	6	5	4	3	2	1	0	WORD 11 bit 7	6	5	4	3	2	1	0
0	T12	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1	(MSB) ←				PHA ADDRESS 1 → (LSB)							
1	(MSB) ← PHA ADDRESS 2								→ (LSB)				(MSB) ←				PHA ADDRESS 3 → (LSB)							
2									PHA DATA AS ABOVE REPEATED EVERY 2 FRAMES															

	TAGS											PHA 1	PHA 2	PHA 3
AST:	$C_2 \oplus C_4$	C_3	C_1	SA	G_2	$G_1 G_3$	TEL. ID	HG	SCTR 3	SCTR 2	EVENT ID (0)	SCTR 1	A_1	A_2	$C_1 + C_2 + C_3$
BST:	$C_2 \oplus C_4$	C_3	C_1 (0)	SB	G_2	$G_1 G_3$	TEL. ID	HG	SCTR 3	SCTR 2	EVENT ID (1)	SCTR 1	B_1	B_2	$C_2 + C_3 + C_4$
PEN:	$C_2 \oplus C_4$	C_3	C_1 (1)	SB	G_2	$G_1 G_3$	TEL. ID	HG	SCTR 3	SCTR 2	EVENT ID (1)	SCTR 1	B_1	C_1	$C_2 + C_3 + C_4$

"G"	G_2	$G_1 \bar{G}_3$	
0	0	0	$\bar{G}_1 \bar{G}_2 \bar{G}_3$
1	0	1	$G_1 \bar{G}_2 \bar{G}_3$
2	1	1	$G_1 G_2 \bar{G}_3$
3	1	0	$G_1 G_2 G_3$

"C"	C_1	C_3	C_2+C_4	
0	0	0	0	$\bar{C}_1 \bar{C}_2 \bar{C}_3 \bar{C}_4$
1	1	0	0	$C_1 \bar{C}_2 \bar{C}_3 \bar{C}_4$
2	1	0	1	$C_1 C_2 \bar{C}_3 \bar{C}_4$
3	1	1	1	$C_1 C_2 C_3 \bar{C}_4$
–	1	1	0	$C_1 C_2 C_3 C_4$
4	0	0	1	$\bar{C}_1 \bar{C}_2 \bar{C}_3 C_4$
3	0	1	1	$\bar{C}_1 \bar{C}_2 C_3 C_4$
2	0	1	0	$\bar{C}_1 C_2 C_3 C_4$

TYH HIGH ENERGY TELESCOPE
ISEE-C TELEMETRY FORMAT

ISEE HET RATE TABLE

COUNTER		RATE	HG I	HG II	S1	S2	S3	S4	DET.
R1		$A_1(A_2)(\bar{C}_4)(\bar{G}_1)\ \bar{G}_2$		1					
		$A_1(A_2)SA(\bar{C}_4)\bar{G}_3$		0					
R2		$B_1\ (B_2)SB(\bar{C}_1)(\bar{G}_1)\ \bar{G}_2$		1	3/4 S*				
		$B_1\ (B_2)(C_4)\overline{SB}(\bar{C}_1)\bar{G}_1$		1	1/4 *				
		$B_1\ (B_2)SB(\bar{C}_1)\ \bar{G}_3$		0					
R3		$B_1\ (B_2)(C_1)$		–					
R4		$B_1\ (B_2)(C_1)\ \bar{G}_1$		–					
R5		$B_1\ (B_2)(C_4)\bar{C}_3 SB\ \bar{G}_1$		–	0				
		$B_1\ (B_2)(C_4)\bar{C}_3\overline{SB}\ \bar{G}_1$		–	1				
R6		$B_1\ (B_2)(C_4)C_3\bar{C}_2 SB\ \bar{G}_1$		–	0				HET-II
		$B_1\ (B_2)(C_4)C_3\bar{C}_2\overline{SB}\ \bar{G}_1$		–	1				
R7		$B_1\ (B_2)(C_4)C_3 C_2(\bar{C}_1)SB\ \bar{G}_1$		–	0				
		$B_1\ (B_2)(C_4)C_3 C_2(\bar{C}_1)\overline{SB}\ \bar{G}_1$		–	1				
R8		A_1		–	0	0	0	0	
		A_2		–	1	0	0	0	
		C_1		–	0	1	0	0	
		C_2		–	1	1	0	0	
		B_1		–	0	0	1	0	
		SA_1		–	1	0	1	0	
		SA_2		–	0	1	1	0	
		SB		–	1	1	1	0	
		C_3		–	0	0	0	1	
		C_4		–	1	0	0	1	
		B_2		–	0	1	0	1	
		G_1		–	1	1	0	1	
		B_1 } REPEAT BLOCK		–	0	0	1	1	
		SA_1 } REPEAT BLOCK		–	1	0	1	1	
		SA_2 } REPEAT BLOCK		–	0	1	1	1	
		SB } REPEAT BLOCK		–	1	1	1	1	
R9-R16		IDENTICAL TO R1-R8	–		–	–	–	–	HET-I
SR	a	$A_1(A_2)(\bar{C}_4)(\bar{G}_1)\ \bar{G}_2$		1	0	0	0		HET-II
	b	$B_1\ (B_2)\ SB\ (\bar{C}_1)(\bar{G}_1)\ \bar{G}_2$		1	0	1	0		
	c	$B_1\ (B_2)(C_4)\ SB\ (\bar{C}_1)(\bar{G}_1)\bar{G}_2$		1	0	0	1		
	d	$B_1\ (B_2)(C_4)(\bar{C}_1)\overline{SB}(\bar{G}_1)\ \bar{G}_2$		1	0	1	1		
		REPEAT a,b,c,d FOR HET-I	1		1	–	–		HET-I
	e	$A_1(A_2)\ SA\ (\bar{C}_4)\ \bar{G}_3$		0	0	0	0		HET-II
	e	$A_1(A_2)\ SA\ (\bar{C}_4)\ \bar{G}_3$	0		1	0	0		HET-I
	f	$B_1\ (B_2)\ SB\ (\bar{C}_1)\ \bar{G}_2$		0	0	$\overline{0\cdot 0}$			HET-II
	f	REPEAT f FOR HET-I	0		1	$\overline{0\cdot 0}$			HET-I

NOTES:

R1, R9 RATES CORRESPOND TO THE A-STOPPING EVENT TYPE FOR HETS I AND II.

* R2, R10 RATES CORRESPOND TO THE B-STOPPING EVENT TYPE FOR HETS I AND II (IN HIGH GAIN THE B-STOPPING EVENT TYPE DEFINITION IS TIME MULTIPLEXED FOR 3/4 AND 1/4 OF THE TIME BETWEEN TWO DEFINING CONDITIONS; $1/4 \equiv S_1 = S_2 = 1$)

R3, R11 = PEN

$SA = SA_1 \cdot SA_2$

(~) = DENOTES TERMS WHICH MAY BE DELETED FROM LOGICAL EXPRESSIONS BY COMMAND.

HG = 0 ⇒ LOW GAIN; HG I ⇒ HET I; HG II ⇒ HET II
HET I AND HET II GAINS ARE THE SAME WHEN IN AUTOMATIC GAIN CHANGING MODE BUT EACH MAY BE COMMANDED TO A FIXED GAIN INDEPENDENTLY.

NOTE REPEAT BLOCK FOR SINGLES RATES; E.G. IN ONE FULL SUBCOM CYCLE THE B1 SAMPLE TIME IS TWICE THAT FOR, SAY, B2.

NOTE: NO ( ) AROUND $\overline{G_3}$, UNLIKE MJS.

ALL RATE EQUATIONS CONTAIN A STROBE TERM TO ESTABLISH A COINCIDENCE APERTURE OF ~ 3 μSEC. THE STROBE OCCURS 5.5 μSEC AFTER THE FIRST OF THE FOLLOWING BECOMES TRUE: A_1, B_1, (B_2), (C_1), (C_4)

BIT STATES: BLANK ⇒ NOT RELEVANT
— ⇒ 0 OR 1

BITS HG I, HG II, S1, S2, S3, S4 ARE QUOTED HERE FOR ACCUMULATE TIME; RATES ARE ACCUMULATED DURING ONE 64 MINOR FRAME BLOCK AND READ OUT IN THE NEXT 64 MINOR FRAME BLOCK; THE STATES OF BITS HG I, HG II, S1, S2, S3, S4 READ OUT IN A 64 MINOR FRAME BLOCK CORRESPOND TO THE RATES IN THE FOLLOWING 64 MINOR FRAME BLOCK.

DELETION OF (C_1) IS CONTROLLED BY THE SAME COMMAND BIT AS FOR DELETION OF $(\bar{C}_1)$ AND SIMILARLY FOR (C_4) AND $(\bar{C}_4)$. A SINGLE COMMAND BIT CONTROLS DELETION OF $(\bar{G}_1)$ TERMS IN R1 AND HET-II SECTOR RATES; A SEPERATE COMMAND BIT CONTROLS DELETION OF $(\bar{G}_1)$ TERM IN R2; SIMILARLY FOR HET-I.

The HET internal stimulus, however, is turned on at the beginning of the first 64 minor frame block after the internal stimulus command (P88, provided CD46=CAL ENABLE bit = 1) is received. The internal stimulus system then stays on for 16x64 minor frames (1 complete sybcom cycle) and then automatically shuts itself off. The internal stimulus may be shut off earlier by resetting the CAL ENABLE bit (CD46) to zero. Note that the CAL bit in the HET status data is set during the 16x64 minor frame blocks during which the internal stimulus is ON. Corresponding rate data extends into the following 64 minor frame block. PHA data accumulated while the internal stimulus is on can extend as much as 3 event readouts after the time it is shut off (i.e., a CAL bit = 0 in a 64 minor frame block is not a guarantee that this block contains no data from the internal stimulus).

HET null PHA events consist of a string of 48 zeros. The lowest PHA channel value for a non-null HET event is 1; a pulse-height readout of zero for a non-null event implies overflow of the corresponding counter; i.e., top of range. The tag bit field could be tested alone as a test for null events since it should be all zeros only for null events.

ISEE-C Sector Rates (HET + VLET).

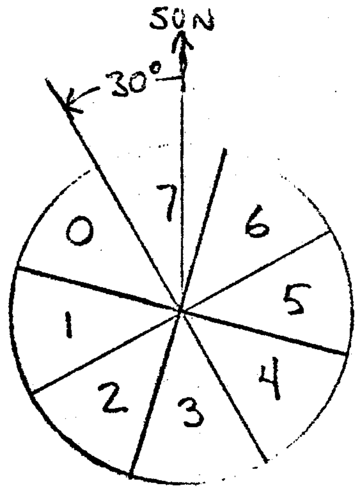
Nominal spin rate = 20 RPM → Spin Period T = 3 seconds. One complete readout of 8 sector rate counter contents takes 64 minor frames or 32 seconds at 2048 IBPS. At the end of a 64 minor frame block the contents of the 8 sector rate counters are transferred for readout during the next such block; the next rate to be sectored is selected by advancing the appropriate sub-com by one step and clearing the 8 counters. When the next sun-pulse is detected, rate accumulation begins in the first sector rate counter. One-eighth of a revolution later the rate pulses are switched from the first sector rate counter to the second for the next one-eighth of a spin and so on. At the end of one complete spin counting is resumed in counter one. The process stops after n complete spins, where n is bit-rate dependent:

IBPS	n
2048	8
1024	16
512	32

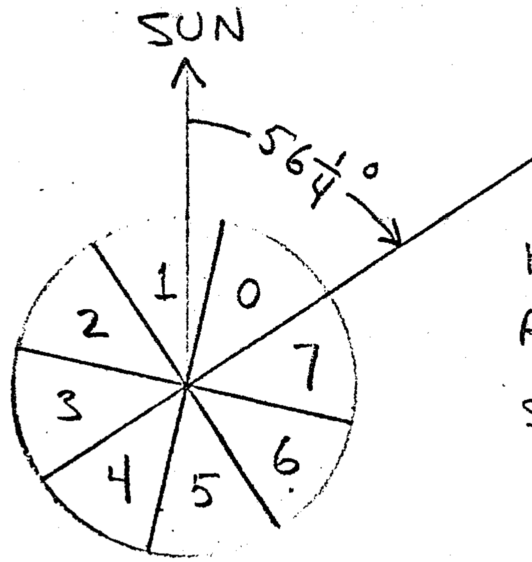
To obtain counts per second, divide the number of events counted by nxT/8 seconds.

The sun-pulse may be derived from either the Panoramic Attitude Sensor System (PAS) or from the Fine Sun Sensor System (FSS). The PAS and FSS systems are located in facets 6 and 14 respectively, 180° apart. However, each is canted by 22-1/2° and the sun-pulse from the FSS is delayed by 180° so that the sun-pulse is generated when sunlight is normally incident on facet 5 (actually the PAS pulse comes 0.35° later than this). The facets are numbered 1 to 16 according to a right-hand rule, the rotation of the spacecraft follows a right-hand rule and the spin axis will point to the North Ecliptic pole $\pm 1°$. The VLETS are located in facet 8 with their symmetry axes in the spin plane and rotated from a normal to facet 8 by 15° towards facet 7. The HETS are located such that their symmetry axes lie in the spin plane, the A-ends looking in a direction parallel to a vector from the center of the spacecraft to the junction of facets 2 and 3. This leads to the patterns on page 16.

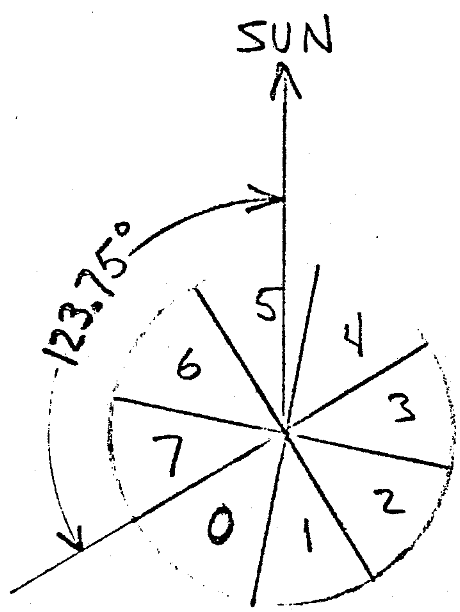
The VLET sector rates are accumulated in 24 bit counters; the HET sectored rates are accumulated in 20 bit counters.



VLET SECTORS



HET
A-STOPPING
SECTORS



HET
B-STOPPING
SECTORS

EVENT ID BIT	C_1	C_3	$C_2 \oplus C_4$	EVENT TYPE	"C"
0	0	0	0	AST	0 (A)
0	1	0	0		1 (B)
0	0	1	0		H
0	1	1	0		E
0	0	0	1		F
0	1	0	1		2 (C)
0	0	1	1		G
0	1	1	1	AST	3 (D)
1	0	0	0	BST	0 (A)
1	1	0	0	PEN	B
1	0	1	0	BST	2 (H)
1	1	1	0	PEN	P (E)
1	0	0	1	BST	4 (F)
1	1	0	1	PEN	C
1	0	1	1	BST	3 (G)
1	1	1	1	PEN	D

* ( ) ENCLOSE INDISTINGUISHABLE NON-PHYSICAL C COMBINATION "C" VALUES

C_1	C_3	$C_2 \oplus C_4$	PHYSICAL "C"	PHYSICAL C COMBINATION	NON-PHYSICAL "C"	NON-PHYSICAL C COMBINATION
0	0	0	0	$\overline{C_1}\,\overline{C_2}\,\overline{C_3}\,\overline{C_4}$	A	$\overline{C_1}\,C_2\,\overline{C_3}\,C_4$
1	0	0	1	$C_1\,\overline{C_2}\,\overline{C_3}\,\overline{C_4}$	B	$C_1\,C_2\,\overline{C_3}\,C_4$
1	0	1	2	$C_1\,C_2\,\overline{C_3}\,\overline{C_4}$	C	$C_1\,\overline{C_2}\,\overline{C_3}\,C_4$
1	1	1	3	$C_1\,C_2\,C_3\,\overline{C_4}$	D	$C_1\,\overline{C_2}\,C_3\,C_4$
1	1	0	P	$C_1\,C_2\,C_3\,C_4$	E	$C_1\,\overline{C_2}\,C_3\,\overline{C_4}$
0	0	1	4	$\overline{C_1}\,\overline{C_2}\,\overline{C_3}\,C_4$	F	$\overline{C_1}\,C_2\,\overline{C_3}\,\overline{C_4}$
0	1	1	3	$\overline{C_1}\,\overline{C_2}\,C_3\,C_4$	G	$\overline{C_1}\,C_2\,C_3\,\overline{C_4}$
0	1	0	2	$\overline{C_1}\,C_2\,C_3\,C_4$	H	$\overline{C_1}\,\overline{C_2}\,C_3\,\overline{C_4}$

"C" fully [illegible]

Project Newsletter
May '78

Bendix has won the competition for the contract for the operation of the Control Center at GSFC. This contract is now with RCA. The effective date for the Bendix takeover is June 1. We stand a chance of losing some or all of our experienced spacecraft analysts and controllers. We hope our losses are nil or minimal, but training time will be required if we get some new people. A status report will be available at the June SWT meeting.

The following is from the DPE, John Schmidt:

> This is to clarify the time tagging of the ISEE data tapes.
>
> All previous documentation to experimenters specifically stated that the time on your experiment data tape is the time of the first bit of the first word of the subcom cycle.
>
> We want to inform you that the time given with each subcom cycle is not the time of the first bit of the first minor frame of the subcom cycle. The time given is, and will continue to be, the time of the trailing edge of the last bit of the first minor frame of the subcom cycle. To change your computer programs to conform to this change, you must sub~~mit~~tract one frame period from all times given on the experimenter tapes. You will find that this value is given in each logical record (Item 5).
>
> The ISEE-C time specification is changed to be the same as this new specification for ISEE-A and ISEE-B.

If you have any questions or want to discuss the matter, feel free to call John Scmidt on 301-982-6408 or TELEX-GSTS Schmidt/565.2

IV. EXPERIMENTS

Final Reports

All U.S. experimenters have a contractual requirement to submit a final report. We are not interested in an engineering type report to be submitted now. We do want a final scientific report to be submitted at the end of the data analysis period of performance. As a minimum, the final report should include a summary of the scientific

Jeff
For your information

Larry

4.1.1.3.3 Minor Frame Counter Conversion

Minor frame word 60 contains the minor frame counter (MFC). All 8 bits are used to make a straight binary conversion to minor frame count. The valid range for the minor frame counter is $2^0 - 1$ (=0) to $2^8 - 1$ (=255).

4.1.1.3.4 Status Group Word Conversion

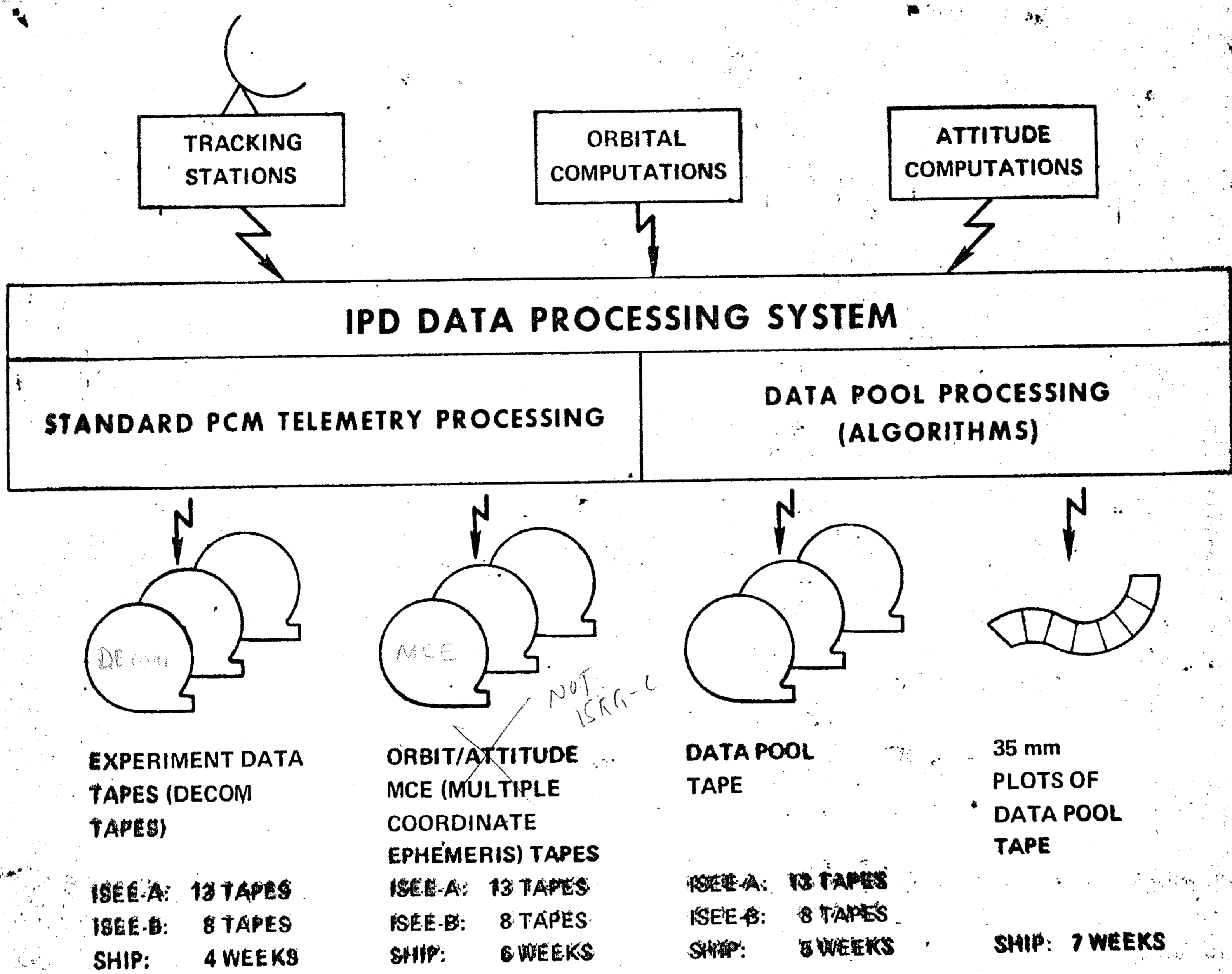
The status group words are located in minor frame words 61, 62, and 63. Format and telemetry bit rate information is contained in words 62 and 63. The group is subcommutated so that words 62 and 63 are of interest only when the 2 LSBs of word 60 are "1 1". Bit 0 (LSB) of word 62 then indicates the telemetry format (= 0, scientific format; = 1, engineering format).

Bits 2 through 0 (LSBs) of word 63 then indicate the telemetry bit rates as follows:

Configuration	Meaning
1 0 1	2048 bits per second
1 1 0	1024 bits per second
1 1 1	512 or 64 bits per second

If bits 2 through 0 are "1 1 1", bits 5 through 3 of the same word are examined to determine which of the two slowest bit rates is in effect. A bit configuration of "1 0 1" indicates 64 bits per second, while "0 0 0" indicates 512 bits per second.

In DEF processing, if word 62 indicates engineering format, data in that telemetry frame is rejected. (IPD does not recognize engineering format and treats all data as being formatted in the scientific mode.) The Convert function checks the format of the next telemetry frame. After a user-specified number of engineering-formatted frames have been rejected, processing terminates with an appropriate error message.



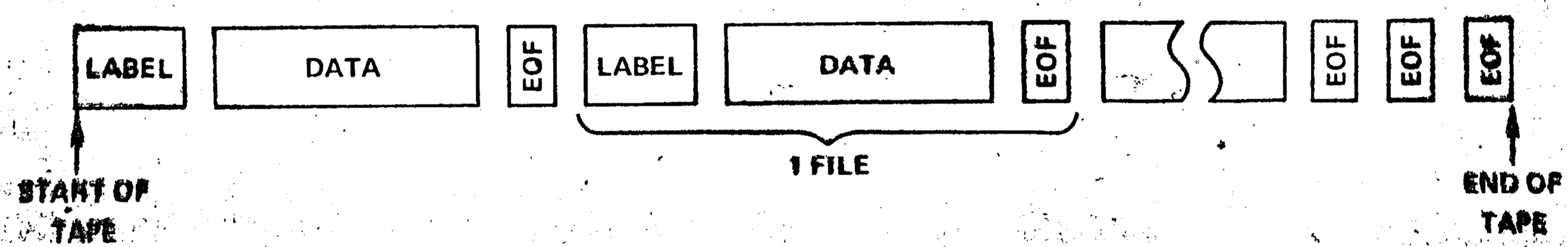
TRACKING STATIONS
ORBITAL COMPUTATIONS
ATTITUDE COMPUTATIONS
IPD DATA PROCESSING SYSTEM
STANDARD PCM TELEMETRY PROCESSING
DATA POOL PROCESSING (ALGORITHMS)
DECOM
MCE
NOT ISEE-C
EXPERIMENT DATA TAPES (DECOM TAPES)
ISEE-A: 13 TAPES
ISEE-B: 8 TAPES
SHIP: 4 WEEKS
ORBIT/~~ATTITUDE~~ MCE (MULTIPLE COORDINATE EPHEMERIS) TAPES
ISEE-A: 13 TAPES
ISEE-B: 8 TAPES
SHIP: 6 WEEKS
DATA POOL TAPE
ISEE-A: 13 TAPES
ISEE-B: 8 TAPES
SHIP: 5 WEEKS
35 mm PLOTS OF DATA POOL TAPE
SHIP: 7 WEEKS

DATA TAPE FORMAT DEVELOPMENT

- RECEIVE PRELIMINARY TAPE FORMAT PROPOSALS FROM EXPERIMENTERS.
- EVALUATE ALL FORMAT PROPOSALS FOR FEASIBILITY.
- INCORPORATE FEASIBLE FORMAT REQUESTS INTO IPD DATA PROCESSING SYSTEM.
- DEVELOP STANDARDIZED INFORMATION SET (DATA RECORD HEADER) BASED ON ALL FEASIBLE FORMAT REQUESTS.
- COMMUNICATE WITH INDIVIDUAL EXPERIMENTERS AS NECESSARY.
- DESIGN DETAILED DATA TAPE FORMATS FOR EACH EXPERIMENTER.
- SUBMIT FORMATS TO EXPERIMENTERS FOR FINAL APPROVAL.

EXPERIMENT DATA TAPE STRUCTURE

- DATA PROCESSING GROUPS CONSIST OF 7 DAYS OF DATA, SUBDIVIDED INTO FILES.
- EACH TAPE CONTAINS A WHOLE NUMBER OF FILES.
- EACH FILE BEGINS WITH A LABEL AND ENDS WITH AN EOF.
- EACH FILE CONTAINS DATA FROM ONLY ONE STATION AND AT ONLY ONE BIT RATE.
- FILES MAY OR MAY NOT OVERLAP.
- ISEE-A AND ISEE-B DATA ARE ON SEPARATE SETS OF TAPES, AND MIGHT NOT COVER EXACTLY THE SAME TIME PERIOD.



FILE LABEL

'1440 BIT TAG	EXPERIMENTER'S FILE LABEL	PAD

- TAG IS WHOLE NUMBER OF ANY SIZE COMPUTER WORDS; FOR INTERNAL GSFC USE.

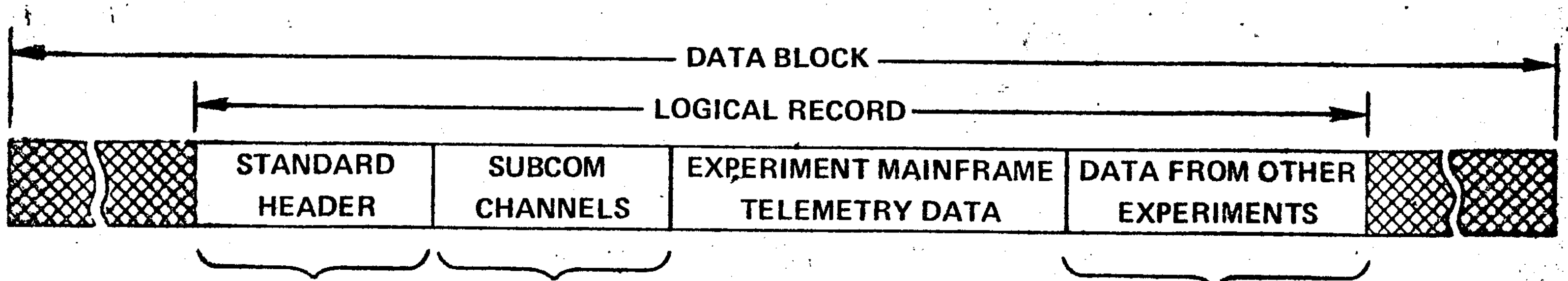
- EXP. ID
- SATELLITE ID
- STATION ID
- START & STOP TIMES
- FILE QUALITY
- NO. OF FRAMES
- BIT RATE, HIGH OR LOW
- GROUP NO.
- TAPE REEL NO.
- FILE NO.
- TIME CORRECTION:

  DEFINITIVE, PREDICTED OR NONE
- FILE OVERLAP INFORMATION

POSITIVE BINARY INTEGERS

DATA BLOCK AND LOGICAL RECORD

- DATA BLOCKS (PHYSICAL TAPE BLOCKS) ARE FIXED LENGTH AND ARE COMPATIBLE WITH USER WORD LENGTH.
- EACH DATA BLOCK CONSISTS OF N LOGICAL RECORDS.
- EACH LOGICAL RECORD CORRESPONDS TO ONE SUBCOM SEQUENCE.



STANDARD HEADER:

BINARY INTEGER:
- EXP. ID
- GMT
- S/C CLOCK
- FRAME COUNTER
- AVERAGE FRAME TIME
- FILL FLAG
- BIT RATE
- TIME/DATA QUALITY FLAGS

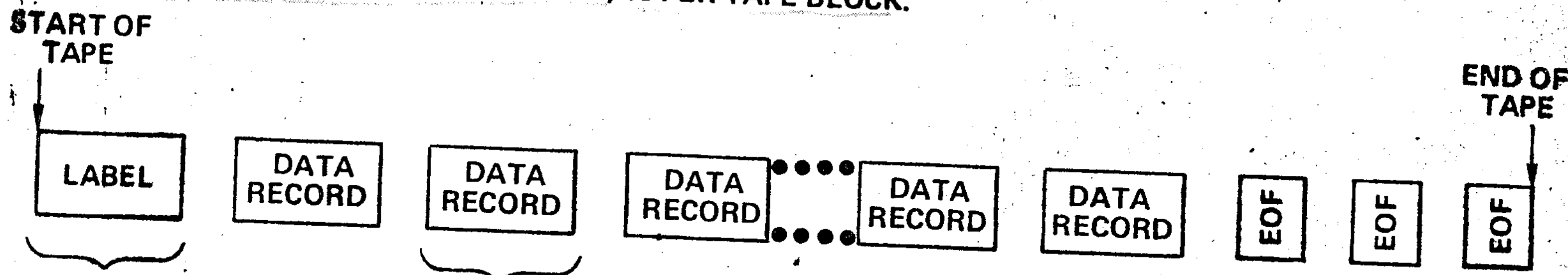
- POSITION: GEI_X, GEI_Y, GEI_Z

SUBCOM CHANNELS:
- ANALOG AND DIGITAL SUBCOM WORDS. ALL, OR AS REQUESTED

DATA FROM OTHER EXPERIMENTS:
- RAW DATA ONLY
- MUST BE FORMALLY REQUESTED, THEN APPROVED IN WRITING BY THE "DONOR" EXPERIMENTER.

ORBIT/ATTITUDE MCE TAPE

- ONE TAPE PER 7-DAY DATA GROUP.
- ONE FILE PER TAPE:
- SEPARATE TAPES FOR A, B, AND C.
- LABEL AND DATA RECORDS IN USER COMPATIBLE FLOATING POINT AND USER WORD LENGTH.
- ONE LOGICAL RECORD PER MINUTE, 10 PER TAPE BLOCK.



- START/STOP TIMES
- ORBIT PARAMETERS
- ORBITAL ELEMENTS FOR GENERATION OF SATELLITE POSITION DATA.
- PAD TO DATA RECORD LENGTH

- GMT
- SATELLITE POSITION, MULTIPLE COORDINATES
- MOON POSITION, MULTIPLE COORDINATES
- SUN POSITION
- TRANSFORMATION MATRICES
- MAGNETIC FIELD MODEL

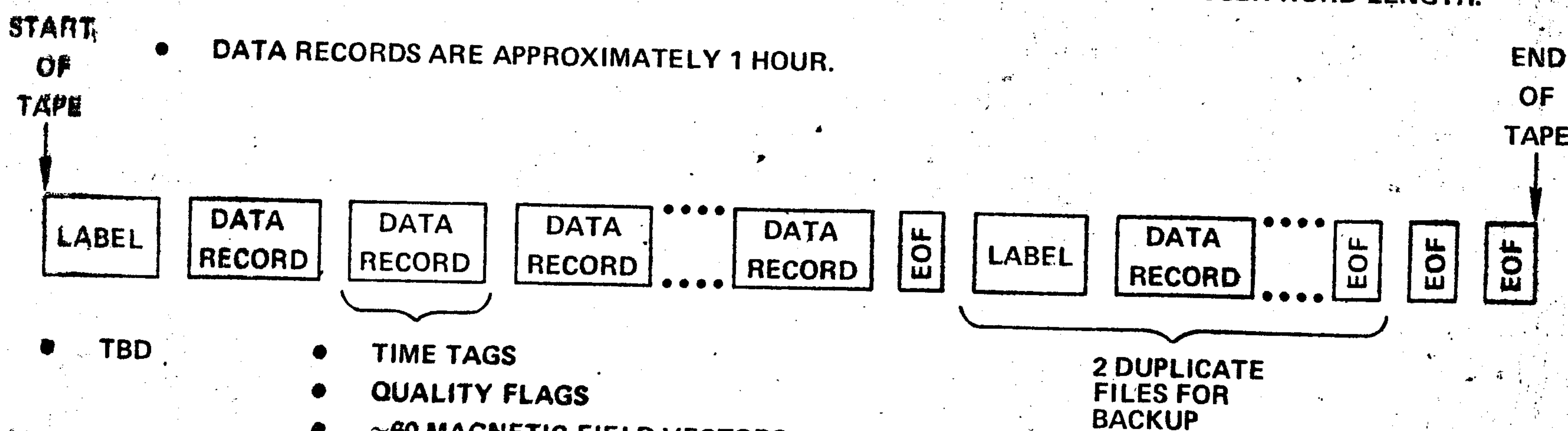
- SEPARATION VECTOR, A TO B
- SPIN PERIOD
- ATTITUDE-SPIN AXIS IN GEI
- MISC DISTANCES AND ANGLES
- ATTITUDE QUALITY FLAG (PROPOSED)

DATA POOL TAPE DEVELOPMENT

- RECEIVE PRELIMINARY ALGORITHMS FROM EXPERIMENTERS.
- FUNCTIONAL DESIGN OF DATA POOL PROCESSING SYSTEM, BASED ON ALGORITHMS.
- DETERMINE GENERAL CONTENTS OF DATA POOL TAPE.
- RECEIVE FINAL DATA POOL ALGORITHMS FROM EXPERIMENTERS, AS NECESSARY.
- DETAILED DESIGN OF DATA POOL PROCESSING SYSTEM.
- DETAILED DESIGN OF DATA POOL RECORD FORMAT.
- DEVELOP INDIVIDUAL ALGORITHM MODULES IN CONJUNCTION WITH EXPERIMENTERS.
- REVISE DETAILED DATA POOL FORMAT AS NECESSARY.
- PRODUCE DATA POOL TEST TAPES USING SIMULATED DATA SUPPLIED BY THE EXPERIMENTERS.

DATA POOL TAPE

- ONE TAPE PER 7-DAY DATA GROUP.
- ONE FILE PER DATA GROUP, REPEATED 3 TIMES FOR BACKUP.
- FILE LABEL IS IN BINARY INTEGER, IN USER WORD LENGTH.
- DATA POOL QUANTITIES ARE IN USER COMPATIBLE FLOATING POINT AND USER WORD LENGTH.
- DATA RECORDS ARE APPROXIMATELY 1 HOUR.



- TBD

- TIME TAGS
- QUALITY FLAGS
- ~60 MAGNETIC FIELD VECTORS
- ~12 EACH, 5-MINUTE QUANTITIES
- ~4 EACH, 15-MINUTE QUANTITIES
- 1 EACH, HOURLY QUANTITIES
- 60 POSITION VECTORS IN SOLAR ECLIPTIC COORDINATES

DATA POOL QUANTITIES FROM PRELIMINARY ALGORITHMS

ORIGINAL PROPOSAL	PRELIMINARY ALGORITHM
1) MAGNETIC FIELD, 3 COMPONENTS/MIN (3 WORDS)	RUSSELL 3 SPIN CORRECTED MAGNETIC FIELD COORDINATES, PAYLOAD COORD'S. (1 MINUTE INTERVALS) 26 PARAMETERS (HOURLY)
2) PLASMA-VELOCITY, DENSITY, TEMPER-ATURE. (3 WORDS)	BAME 4 ELECTRON ENERGY LEVELS 1 ION PSEUDO DENSITY 1 ION AVERAGE DENSITY 1 SOLAR WIND PEAK SPEED 1 SOLAR WIND PSEUDO DENSITY (5 MINUTE INTERVALS)
3) 20-50 keV AND 50-100 keV ELECTRONS AND PROTONS (4 WORDS)	WILLIAMS 1 32-50 keV e's 1 32-50 keV p's 1 80-126 keV e's 1 80-126 keV p's (5 MINUTE INTERVALS)

DATA POOL QUANTITIES

ORIGINAL PROPOSAL	PRELIMINARY ALGORITHM
4) NUMBER DENSITY AND ENERGY DENSITY OF LOW ENERGY ELECTRONS AND IONS. (4 WORDS)	<u>FRANK</u> 1 SPIN AVERAGED PROTON NUMBER DENSITY. (5 MINUTE INTERVALS) <u>ANDERSON</u> 1 8-200 keV ELECTRON FLUX. 1 8-200 keV PROTON FLUX. (5 MINUTE INTERVALS)
5) E-FIELD BANDPASS CHAN-NEL, 400 Hz.	<u>GURNETT</u> 1 562 Hz WAVE ELECTRIC FIELD MAGNITUDE. (5 MINUTE INTERVALS)
6) B-FIELD BANDPASS CHANNEL, 400 Hz.	<u>GURNETT</u> 1 562 Hz WAVE MAGNETIC FIELD MAGNITUDE. (5 MINUTE INTERVALS)

DATA POOL QUANTITIES

ORIGINAL PROPOSAL	PRELIMINARY ALGORITHM
7) HARVEY ON-OFF	HARVEY 1 5-LEVEL STATUS WORD. (1 MINUTE INTERVALS)
8) ELECTRON GUN ON-OFF	MOZER 1 GUN ON OR OFF INDICATOR. (1 MINUTE INTERVALS)
9) ELECTRON DENSITY FROM SHARP	SHARP 1 COLD PLASMA DENSITY (5 MINUTE INTERVALS)
10) 15 MINUTE AVERAGES OF HIGHER ENERGY COUNTING RATES. 300 keV-1 meV * 10-30 meV 30-60 meV	HOVESTADT 1 125 keV PROTONS 1 125 keV ALPHAS 1 HEAVIES (Z >2) GREATER THAN 100 keV/NUCLEON. (15 MINUTE INTERVALS)

*SIMPSON WAS TO HAVE PROVIDED THESE.

TESTING AND VERIFICATION

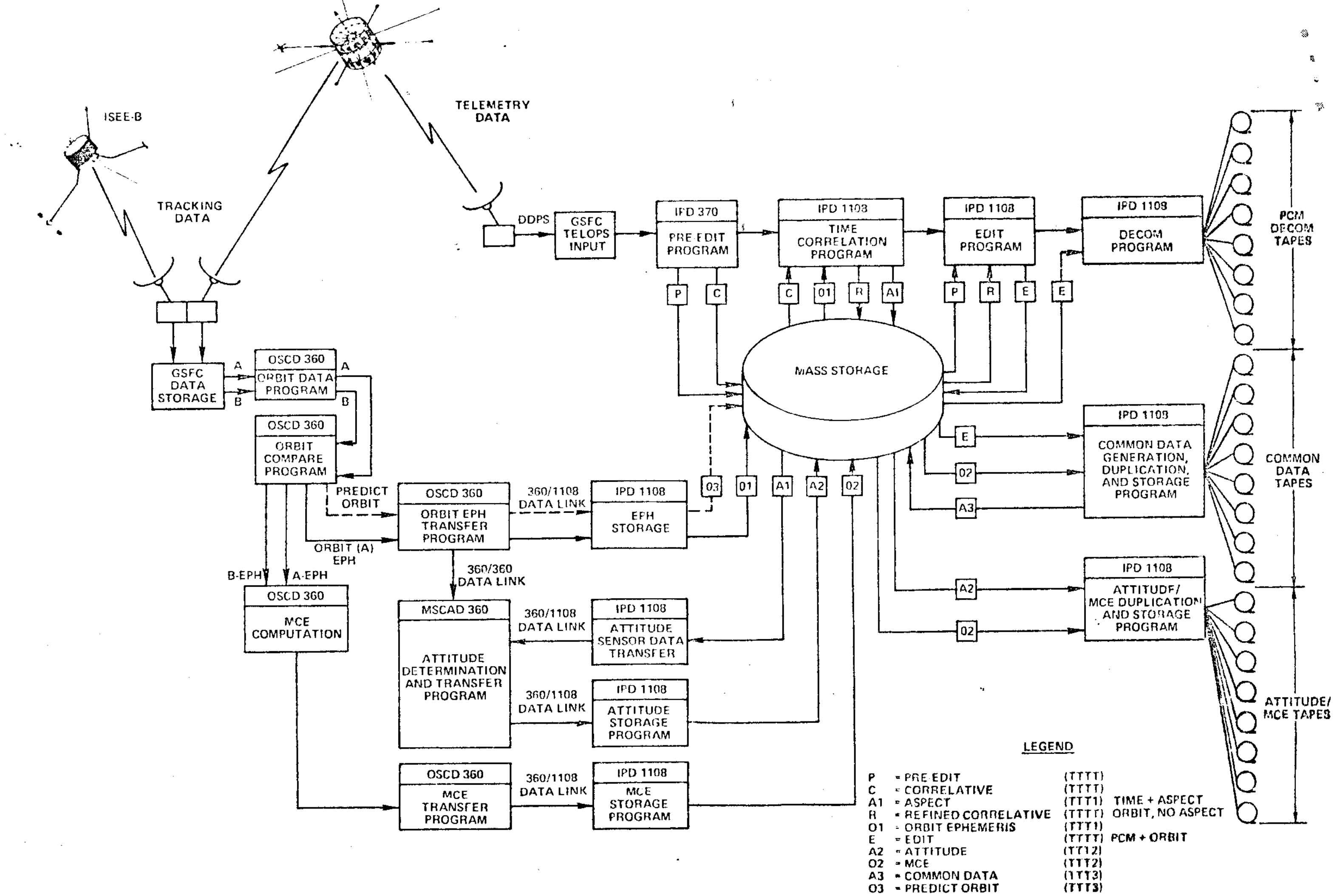
EXPERIMENT DATA TAPES

- SPACECRAFT INTEGRATION
  - DECOM TEST TAPES TO ALL EXPERIMENTERS.
  - TAPE DUMPS OF SAMPLE RECORDS.
- THERMAL-VACUUM TEST
  - DECOM TEST TAPES TO ALL EXPERIMENTERS.
  - TAPE DUMPS OF SAMPLE RECORDS.
- STANDARDIZATION OF FORMATS MINIMIZES ERRORS.

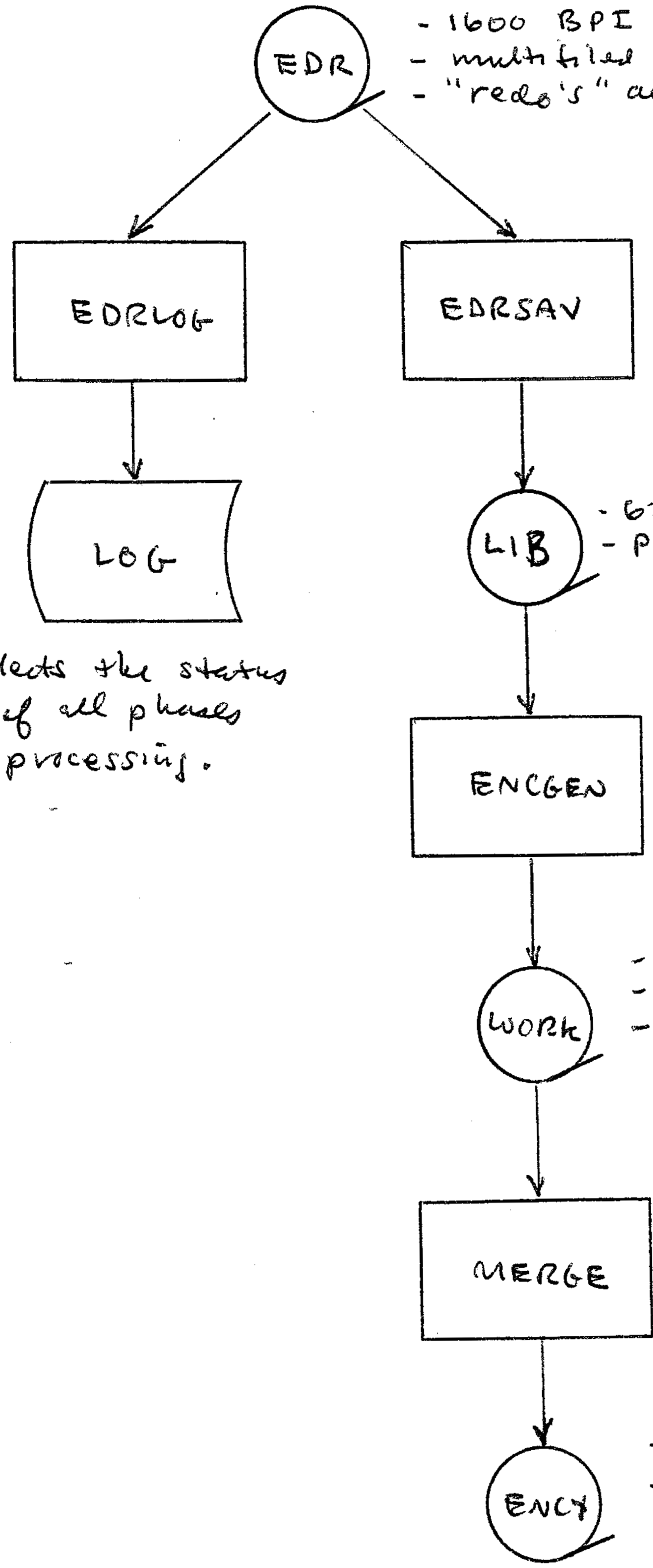
DATA POOL ALGORITHMS

- SPACECRAFT INTEGRATION AND THERMAL-VACUUM TESTS
  - DATA POOL TEST TAPE TO EACH EXPERIMENTER.
  - PRINTED LISTING OF DATA POOL QUANTITIES.
- SIMULATED DATA
  - PRODUCE AND SHIP DATA POOL TAPES FROM SIMULATED TELEMETRY INPUT SUPPLIED BY EXPERIMENTERS (VIA CARDS, TAPE).
  - COMPARE OUTPUT TO PREDICTED OUTPUT AS DETERMINED BY EXPERIMENTER.
- LIVE DATA
  - 8-WEEK POSTLAUNCH VERIFICATION PERIOD.

ISEE-A DATA FLOW



ISEE-C DATA FLOW



EDR:
- 1600 BPI, 9 track
- multifiled (1 file / station message)
- "redo's" are issued on a file basis

EDRSAV:
- copies EDR data into permanent library

LIB:
- 6250 BPI
- permanent compressed EDR library tapes

ENCGEN:
- organizes data into encyclopedia format

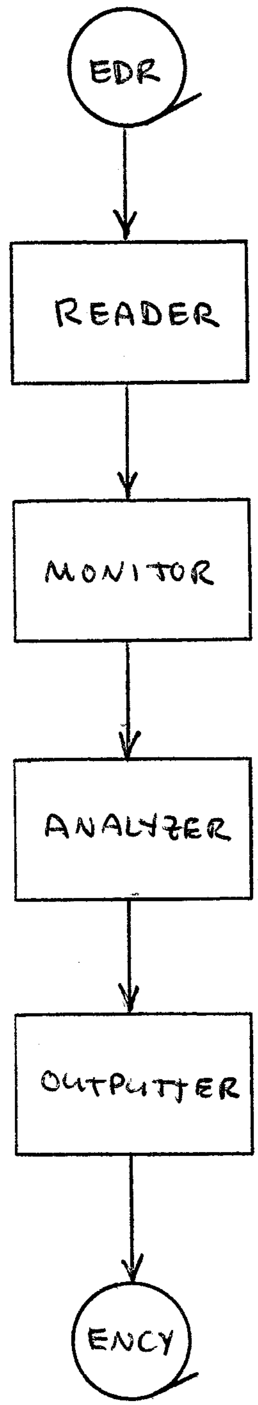
WORK:
- 6250 BPI
- data in encyclopedia format
- 1 work file / library tape file

MERGE:
- merges work data into time order, eliminates overlap of data

ENCY:
- 6250 BPI
- encyclopedia data in time order
- merged with no overlaps
- used for input to flux and rate plot analysis programs, etc.

The LOG reflects the status and history of all phases of the data processing.

FLOW CHART OF ISEE-C ENCYCLOPEDIA GENERATOR



- read science & engineering data from EDR records; unpack rates; dispatch data into subcom blocks

- monitors data quality and continuity, status change, calibration data. (Marks up data within subcom blocks)

- establish chapter and volume boundaries; creates headers.

- outputs all data into verse structure. Summarize rates, calculate spin periods, build coincidence condition map.

CAPITAL 'C'

'ZBEKE.LIB.CNTL(PROLOGF)'

```
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC             00000100
C 1.   ROUTINE:                                                   00000200
C                                                                 00000300
C 2.   SYSTEM, SATELLITE, VERSION:                                00000400
C                                                                 00000500
C 3.   ENGLISH NAME:                                              00000600
C                                                                 00000700
C 4.   LANGUAGE:                                                  00000800
          FORTRANG OR FORTRANH   LEVEL 21.6    360/91/75    OS/MVT 00000900
C 5.   PURPOSE:                                                   00001000
C                                                                 00001100
C 6.   CALLING SEQUENCE:                                          00001200
C      ARGUMENT            TYPE     I/O     DESCRIPTION           00001300
C                                                                 00001400
C 7.   NOTES:                                                     00001500
C      7A.  RESTRICTIONS:                                         00001600
C                                                                 00001700
C      7B.  SPECIAL FEATURES:                                     00001800
C                                                                 00001900
C 8.   VARIABLES:                                                 00002000
C      8A.  LOCAL                                                 00002100
C           VARIABLE             TYPE    DESCRIPTION              00002200
C                                                                 00002300
C      8B.  COMMON                                                00002400
C           COMMON               VARIABLES                        00002500
C                                                                 00002600
C 9.   I/O INFORMATION:                                           00002700
C      UNIT NO.         USE DESCRIPTION                           00002800
C                                                                 00002900
C10.   ERROR HANDLING:                                            00003000
C                                                                 00003100
C11.   SUBROUTINES CALLED:                                        00003200
C      SUBROUTINE        DESCRIPTION                              00003300
C                                                                 00003400
C12.   CALLED BY:                                                 00003500
C      ROUTINE           DESCRIPTION                              00003600
C                                                                 00003700
C13.   METHOD:                                                    00003800
C                                                                 00003900
C14.   REFERENCE:                                                 00004000
C                                                                 00004100
C15.   PROGRAMMER AND DATE:                                       00004200
                                                                  00004300
C16.   MODIFICATIONS:                                             00004400
C                                                                 00004500
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC              00004600

*** END OF MEMBER ***      46 RECORDS PROCESSED     **********************************


IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   ZBEKE.LIB.CNTL                                 KEPT          DDNAME=SYSI
IEF285I   VOL SER NOS= DISK00.
IEF285I   SYS78083.T134654.SV000.ZBEKELS3.R0000001       SYSOUT        DDNAME=SYSI
IEF285I   VOL SER NOS= K3SCR2.
IEF285I   SYS78083.T134654.SV000.ZBEKELS3.R0000002       SYSOUT        DDNAME=SYSI
IEF285I   VOL SER NOS= K3SCR5.
IEF285I   SYS78083.T134654.SV000.ZBEKELS3.R0000003       DELETED       DDNAME=SYSI
IEF285I   VOL SER NOS= K3SCR4.
IEF285I   SYS78083.T134654.RV000.ZBEKELS3.S0000004       SYSIN         DDNAME=SYS
IEF285I   VOL SER NOS= K3SCR4.
IEF285I   SYS78083.T134654.RV000.ZBEKELS3.S0000004       DELETED       DDNAME=SYS
IEF285I   VOL SER NOS= K3SCR4.
IEF373I STEP /LISTPDS / START 78083.1347
IEF374I STEP /LISTPDS / STOP  78083.1347 CPU    0MIN 00.49SEC MAIN   90K LCS    0K
 - STEP 01 -      RETURN CODE = 0000                                   STEP TIME =
                                      IO IN SECS. DISK=     2.62,DRUM=      .00,T
 - SURCHARGES=(DRIVES ALOC=000,TAPE MOUNTS=000,CORE=000,PAPER=000,PRIORITY=00000)
      // EXEC NOTIFYTS
      XXDEFAULT   PROC MODE=,USRID=,MSG=                NOTIFYTS, EAC/21JUN73   000
      ***         SEND BACKGROUND JOB REPORT TO TSO USER                        000
      XXNOTIFYTS  EXEC PGM=NOTIFYTS,REGION=20K,COND=EVEN,                       000
      XX          PARM='&MODE,&USRID,&MSG'                                      000
       IEF653I SUBSTITUTION JCL - PARM=',,'
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF373I STEP /NOTIFYTS/ START 78083.1347
IEF374I STEP /NOTIFYTS/ STOP  78083.1347 CPU    0MIN 00.07SEC MAIN    8K LCS    0K
 - STEP 02 -      RETURN CODE = 0000                                   STEP TIME =
                                      IO IN SECS. DISK=      .20,DRUM=      .00,T
 - SURCHARGES=(DRIVES ALOC=000,TAPE MOUNTS=000,CORE=000,PAPER=000,PRIORITY=00000)
```

```
*** OPTIONS IN EFFECT ***   NOUPDTE,NOSSI,LINECNT=080,EROPT=ACC,SELECT
*** OPTIONS IN EFFECT ***   SPECIFIED-MEMBERS

LIBRARIES:

    01 - VOL=DISK00   DSN=ZBEKE.LIB.CNTL                                    DSORG=PO

 24MAR78 13.47.07 - VOL=DISK00, DSN=ZBEKE.LIB.CNTL

      NAME        PAGE   RECORDS     T T R C    USER INFORMATION (HEX)

      PROLOGA       1       46      000B0600
      PROLOGF       2       46      000C0300

*** END OF LIBRARY ***      2 MEMBERS PROCESSED WITH A TOTAL OF       92 RECORDS

*** END OF RUN ***    01 LIBRARIES PROCESSED WITH A TOTAL OF        92 RECORDS.  W


 24MAR78 13.47.07 - VOL=DISK00, DSN=ZBEKE.LIB.CNTL
                     'ZBEKE.LIB.CNTL(PROLOGA)'      ASIS

*CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC          00000100
* 1.   ROUTINE:                                                  00000200
*                                                                00000300
* 2.   SYSTEM, SATELLITE, VERSION:                               00000400
*                                                                00000500
* 3.   ENGLISH NAME:                                             00000600
*                                                                00000700
* 4.   LANGUAGE:                                                 00000800
*          ASMG    LEVEL G    RELEASE 21MAR76   360/91/75   OS/MVT   00000900
* 5.   PURPOSE:                                                  00001000
*                                                                00001100
* 6.   CALLING SEQUENCE:                                         00001200
*      ARGUMENT            TYPE     I/O     DESCRIPTION          00001300
*                                                                00001400
* 7.   NOTES:                                                    00001500
       7A.  RESTRICTIONS:                                        00001600
                                                                 00001700
*      7B.  SPECIAL FEATURES:                                    00001800
*                                                                00001900
* 8.   VARIABLES:                                                00002000
*      8A.  LOCAL                                                00002100
*           VARIABLE            TYPE     DESCRIPTION             00002200
*                                                                00002300
*      8B.  COMMON                                               00002400
*           COMMON              VARIABLES                        00002500
*                                                                00002600
* 9.   I/O INFORMATION:                                          00002700
*      UNIT NO.        USE DESCRIPTION                           00002800
*                                                                00002900
*10.   ERROR HANDLING:                                           00003000
*                                                                00003100
*11.   SUBROUTINES CALLED:                                       00003200
*      SUBROUTINE      DESCRIPTION                               00003300
*                                                                00003400
*12.   CALLED BY:                                                00003500
*      ROUTINE         DESCRIPTION                               00003600
*                                                                00003700
*13.   METHOD:                                                   00003800
*                                                                00003900
*14.   REFERENCE:                                                00004000
*                                                                00004100
*15.   PROGRAMMER AND DATE:                                      00004200
*                                                                00004300
*16.   MODIFICATIONS:                                            00004400
*                                                                00004500
*CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC            00004600

*** END OF MEMBER ***     46 RECORDS PROCESSED     ******************************

  4MAR78 13.47.07 - VOL=DISK00, DSN=ZBEKE.LIB.CNTL
```

11/3/78

ISEE-C MTG. WITH TYCHO, NAND, DON

Items to be done:

☐ (1) Indication of System A or System B? ~~is~~ ? promised 11/6/78 (JEFF)
- for Thermistor measurements.

(2) Note that VLKT Analog is not working and is not expected to work.

(JEFF)
☐ (3) Would like PHA plots of quick-look data. Time?

(4) ENGRN — ANA and DIG words
☐ — need estimate of overhead now (JEFF)
— continue with current processing

☐ (5) MERGE PROGRAM — (ED)
overlap handling: If 2 vol's of same vol #:
- pick volume with better quality
- if same quality, pick with ~~fuller of~~ more data.

☒ (6) Get copy of design doc. for Tycho. (JEFF)

☐ (7) Need user guide & request form for Matrix Program. (Nand)

☐ (8) Initiate Data Tech action. (Jeff)

☐ (9) Flux Display — (Nand?)
- rate display capability
- nomenclature resolved?
- Nand & Don to analyze flare matrices

☐ (10) Flare matrices for 9/23/78 at 09:30. (Jeff)

IMP FLUXPLOT — input scaling factor.

11/6/78

ESTIMATE OF OVERHEAD OF S/C WORDS:

- USING START OF 2nd FILE AS EXAMPLE

	VOL HEADER —	26 x 4	104 ✓
	CH HEADER —	58 x 4	232 ✓
*	RAW RATE —	(46 x 12) x 4	2208 ✓
	CCM —	80 x 4	320 ✓
	RATE SUM —	(85 x 12) x 4	4080 ✓
*	VERT MAP —	114 x 4	456 ✓
*	HRT MAP —	114 x 4	456 ✓
		30 x 4	120
		12 x 4	48
		22 x 4	88
		10 x 4	40
		26 x 4	104
		50 x 4	200
		68 x 4	272
		24 x 4	96
		10 x 4	40
		16 x 4	64
		10 x 4	40
		20 x 4	80
		80 x 4	320
		50 x 4	200
	(V)	32 x 4	128

$\}$ 1840

S/C W

13 SUBCOMS
ASSUME (13 x 6 Bytes) x64 — 4992 ~~78~~

13588

35%

~15% with only 58, 59, 122

0000 1000	0010 0000	1100	0000
0001 0000	0000 0100	0000	0011

HET STATUS PROBLEM

OLD	082000	0000C0
expect	100400	000003
set	000003	100400

→ means $\overline{G_1}$ BST (Het-I)
$\overline{G_1}$ BST (Het-O)
(AUTO GAIN)

HET

INSERT CODE CHANGE INTO
ANC44D

OUTSTANDING PROBLEMS:

1. ENCGEN — UPLRASCF READY TO FLIP STATUS — ED
   STILL ENCGEN
   TREND CHECK ON SECTORS
   (CORRECTED TABLES IN TREND CHECK & OUTPUT)
   ANALYZER ENHANCEMENTS

2. EDRSAV — data overlap seen on lis. tape — ED

3. LOG PROBLEMS ~ OK.

4. MERGE — NAND ←

5. EORLIST — ~~[illegible]~~ ✓
   LIBLIST

6. BNCHLIST — CHILDS LIST — ED — JEFF
   GENERAL SOURCE LIB. CNTL — Prior. on Jel

7. FLUXPLOT - NAND ←

8. CALIBRATED TAPE REFORMATTER — PAM? ✓

9. MATRIX DISPLAY ✓

10. ~~[illegible]~~ ANISOTROPY DISPLAY

SAT. PROG. SOURCE (ADM / FCLT)
BUILD
LOOKATME
PROC
SOURCE — BACKUP / RELOAD
~~USERGIDS~~

SAT. GENERAL, SOURCE

SAT. ~~GENERAL~~ (DELIVER) , LOAD
~~EIR~~
PROCESS

SAT. USERGIDS, TEXT

SAT. LIB, CNTL

ISRT.CNTL FLOATTCL
FLOATTST
FLOATT
FIXX

```
*     TEST    ROUTINE   FOR   FLOAT  AND   FIX   MACROS
                                                    * COMMENT
         MACRO
~~&NAME~~ FLOATT &GPR,&FPR,&AREA
         IF    (LTR,&GPR,&GPR,P)
               ST    &GPR,&AREA.+12
               LD    &FPR,&AREA
               AD    &FPR,&AREA.+8
         ELSE
               LCR   &GPR,&GPR
               ST    &GPR,&AREA.+12
               LD    &FPR,&AREA
               AD    &FPR,&AREA.+8
               LCDR  &FPR,&FPR
         FI
         MEND

         MACRO
         FIXX  &GPR,&FPR,&AREA
         IF    (LTDR,&FPR,&FPR,P)
               AWR   &FPR,&AREA
               STD   &FPR,&AREA.+16
               L     &GPR,&AREA.+20
         ELSE
               LCDR  &FPR,&FPR
               AWR   &FPR,&AREA
               STD   &FPR,&AREA.+16
               L     &GPR,&AREA.+20
               LCR   &GPR,&GPR
         FI
         MEND

ENDCONVT       DS    0D                  AREA FOR FL-FX CONV.
               DC    X'4E',7X'00'
               DC    X'45',7X'00'
               DS    D
```

```
FLOATT ~~1~~, 0, ENDCONVT
  FIXX

           PRINT  NOGEN
FLOATEST   PROC   LINKAGE=(OS,(SREG))
*       TEST DRIVER FOR FLOATT & FIXX
*       FLOATT CONVERTS SIGNED I*4 TO R*8
*       FIXX      "        "      R*8 TO I*4
*
        SR 1,1
        SR 2,2
        LA 3,20
        DO WHILE,(CR,1,3,LT)
            L      4,INPUT(1)
            FLOAT  4,0,ENDCONVT
            STD    0,OUTPUT(2)
            ~~LA     1,4(1)~~
            ~~LA     2,8(2)~~
            FIXX   5,0,ENDCONVT
            ST     5,~~OUTPUT~~FIXPUT(1)
*
            LD     2,ANPUT(2)
            FIXX   6,2,ENDCONVT
            ST     6,AUTPUT(1)
            FLOATT 6,0,ENDCONVT
            STD    0,AOUTPUT(2)
            LA     1,4(1)
            LA     2,8(2)
        OD
        ABEND  22,DUMP
        CORP
*
INPUT      DC   F'0'
           DC   F'1'
           DC   F'2000000000'
           DC   F'-1'
           DC   F'-2000000000'
OUTPUT     DS   5D
FIXPUT     DS   5F
ANPUT      DC   D'0.0'
           DC   D'+2.5'
           DC   D'16777216.25'
           DC   D'-16.999999'
           DC   D'-1048575.'
           ~~DC D~~
AUTPUT     DS   5F
AOUTPUT    DS   5D
```

ANAORB	DS	3D
(ANASPIN)	DS	D
ANAORB#	DS	3H
(ANASPIN#)	DS	H
ANAANA	DS	12H
(ANAANA#)	DS	12H
ANASDG	DS	4H
(ANASTG)	DS	4H
ANASSC	DS	H
(SPARE)	DS	H
ANONMME	DS	H
ANODG	DS	4H
(ANOTG)	~~DS H~~ DS	4H
ANOENG	DS	12F
ANOORBIT	DS	3F
(ANOSPIN)	DS	3F ← (ANE DEW F F H H)
ANOBITR	DS	H
(SPARE)	DS	H

KNINIT ← ASSEMBLY!

OHRCK MONITOR!

(US [illegible] 1PRASETS)

ISEE-C ENGGEN PROBLEMS:

VIL INTRO:

1. APRUM VALUES NOT CORRECT (ENGIN)
2. SMC NOT TRANSFERRED. (ANALYZER)

CH. INTRO.

1. # VERSE [illegible] "28"? (ENGIN)
2. ~~STATUS~~ BGS STATUS [illegible] INCONSISTENT:
   (A) PACKER READS [illegible] AS [illegible]
   AND FOR [illegible]
   (B) MONITOR TREATS [illegible] A [illegible]
   ~~BUT [illegible]~~ ??
   (C) CCM GENERATOR [illegible]
   SOLN IS TO LEAVE [illegible]
   [illegible]) AND ~~[illegible]~~ MODIFY CCM
   GENERATOR TO REFLECT ACTUAL [illegible]
3. TREND CHECK NOT ON SUM OF SECTORED RATES, SINCE [illegible] SECTORS DIFFER FROM OTHERS. (NOTICED IN [illegible])
4. [illegible] STATISTICS IN CH. INTRO. (ANAL)
5. SPARE [illegible] —
   THROW OUT 61, 62, 63
   58, 59, 122 — KEEP DIGITAL (ANAL) (OUTPUT)
   ANALOG, [illegible] AVERAGE
6. UPDATE — NO 1RG. AFTER EACH REC. ON WITH TAPES (CNT [illegible])
7. OVERLAY AND [illegible] — ONLY OUTPUT [illegible] RATES [illegible]
8. TREND CHECK MAP ERROR IN TRT~~AB~~

```
*****************************************************************************
*
*          ISEE-C DATASET NAMING SCHEME
*
*************************************************************************
*
*     NAME (prefix=SEICC)       CONTENTS
*     ---------------------     ----------
*     PROGNAME.SOURCE           source decks
*                               LOOKATME
*                               procedures
*                               BUILD deck (to create load modules)
*
*     USERGIDE.TEXT             user guides
*
*     PROCESS.LOAD              load modules of programs related to
*                                            data processing
*
*     ANALYSIS.LOAD             load modules of programs related to
*                                            data analysis
*
*     LIB.CNTL                  JCL decks;  also backup and reload
*                                            procedures
*
*     PROCESS.LOAD              load modules of programs related to
*                                            data processing
*
*     ANALYSIS.LOAD             load modules of programs related to
*                                            data analysis
*
*     LIB.CNTL                  JCL decks;  also backup and reload
*                                            procedures
*
*     LIB.CLIST                 CLIST's
*
*************************************************************************
*
*    NOTES:
*      For each PROGNAME, there will be a corresponding member of
*    the same name located in USERGIDE.TEXT, LIB.CNTL, the
*    appropriate LOAD library, and possibly LIB.CLIST.
*
*************************************************************************
```

11/1/78

ENGGEN.LOAD

SDC03 ISEE PROC BACKUP

****

11/1/78

****

load modules)

ams related to
processing

ams related to
analysis

up and reload
dures

ams related to
processing

ams related to
analysis

up and reload
dures

****

nding member of
NTL, the
IST.

****

IDCØ3 ISGG PROC BACKUP
IDCØ5 IDC PROC BACK
IDC1Ø PROCESSING TAPE

LGG. OUTPUT ...
on ZGGNG.ISGG...
(... 10,6)

ISEG-C
REVISED TABLE FOR RSUM.

```
3160 RSDISPHS  EQU  *
         DC  H'2112,1248',3H'2256,1392'
         DC  H'2112,1248',3H'2256,1392'
         DC  2H'1536,672,1680,816,1824,960,1968,1104'
     *
         DC  H'2128,1264',3H'2272,1408'
         DC  H'2128,1264',3H'2272,1408'
         DC  2H'1552,688,1696,832,1840,976,1984,1120'
     *
         DC  H'2144,1280',3H'2288,1424'
         DC  H'2144,1280',3H'2288,1424'
         DC  2H'1568,704,1712,848,1856,992,2000,1136'
     *
RSUMTAB  DC  H'2160,1296',3H'2304,1440'
         DC  H'2160,1296',3H'2304,1440'
         DC  2H'1584,720,1728,864,1872,1008,2016,1152'
     *
         DC  H'2176,1312',3H'2320,1456'
         DC  H'2176,1312',3H'2320,1456'
         DC  2H'1600,736,1744,880,1888,1024,2032,1168'
     *
         DC  H'2192,1328',3H'2336,1472'
         DC  H'2192,1328',3H'2336,1472'
         DC  2H'1616,752,1760,896,1904,1040,2048,1184'
3165 *
3740
         DC  H'2208,1344',3H'2352,1488'
         DC  H'2208,1344',3H'2352,1488'
         DC  2H'1632,768,1776,912,1920,1056,2064,1200'
     *
         DC  H'2224,1360',3H'2368,1504'
3730     DC  H'2224,1360',3H'2368,1504'
3740 *   DC  2H'1648,784,1792,928,1936,1072,2080,1216'
```

RD1SPV

R1

000
001 1 8 × ~~1~~ 151
010 2 8 × ~~[illegible]~~ 153
011
100 3 ~~4 (160, 161)~~ 4 (154, 155)
101 4 8 × 157
110
111 5 8 × 159 ←
6 4 (160, 161)
7 4 (162, 156)
8 247, 248, 249, 250, 251, 252, 253, 254

1 8 (2400)
2 8 (2432)
3 4 (2448, 2464)
4 8 (2496)
5 8 (2528) –
6 4 (2544, 2560)
7 4 (2576, 2481)
8 3936, 3952, 3968, 3984, 4000, 4016, 4032, 4048

RSD1SPVS

1 2(163, 172, 181, 190) | 2(2592 2736 2880 3024
2 164, etc.
3
4
5
6
7
8

2(2592	2736	2880	3024
2608	2752	2896	3040
2624	2768	2912	3056
2640	2784	2928	3072
2656	2800	2944	3088
2672	2816	2960	3104
2688	2832	2976	3120
2704	2848	2992	3136

RSD1SPSS

L
1 II 141 H '141, 87', 3H '168, 96'
2 I 87 2H '105, 51, 114, 60, 123, 69, 132, 78'
3 II 150
4 I
5 II H '2240, 1376', 3H '2384, 1520'
6 I 2H '1664, 800, 1808, 944, 1952, 1088, 2096, 1232'
7 II
8 I

H
1 "
2 " V125 2H '171, 180, 189, 152'
3 "
4 " 2H '2720, 2864, 3008, 3152'
5
6
7
8

TREND CHECK:

LEGAL

PASS CHECK

	— — — —	
0	0 0 0 0	NOT CHECKED
1	0 0 0 1	PASS B
2	0 0 1 0	PASS F
3	0 0 1 1	PASS BOTH
~~4~~	0 1 0 0	ILLEGAL
5	0 1 0 1	FAILS B.
~~6~~	0 1 1 0	~~PASS F~~ ILLEGAL
7	0 1 1 1	PASS F
~~8~~	1 0 0 0	ILLEGAL
~~9~~	1 0 0 1	~~PASS B.~~ ILLEGAL
10	1 0 1 0	FAIL F.
11	1 0 1 1	PASS B.
~~12~~	1 1 0 0	ILLEGAL
~~13~~	1 1 0 1	~~FAIL~~ ILLEGAL
~~14~~	1 1 1 0	ILLEGAL
15	1 1 1 1	FAIL BOTH

LEGAL PASS 1, 2, 3, 7, B

LEGAL FAIL 5, A, F

ILLEGAL COMBOS 4, 6, 8, 9, C, D, E

ISEE-C tapes:

	YR	~~AUG~~ START		STOP
IEDRØ1	'78	AUG 12, 15:11		~~AUG 15, 5:47~~ AUG 20, 0145
IEDRØ2		AUG 20, 0138	—	AUG 26, 2103
GE8844		AUG 26 2155	—	SEPT 2, 2312
GU3267		SEPT ~~AUG~~ 3, 0112	—	SEPT 9, 2239
NOT IN GU7098		SEPT 10, 0025	—	SEPT 16, 2335
GX3668		SEPT 17, 0000	—	SEPT 23, 2330

(SEPT 8, 1625)

VLET — GMT 251/16:25 9/8/78

definitely seeing [illegible] PHA [illegible]

GMT — 226/13:21:53 8/14/78 VLET CAL ON

— 13:26:09

AUG 14, 13:21 — 1326

VLET CAL ON: AUG 14, 13:21 — 13:26

~~FILE 29 OF~~

(IEDRØ1, 29) covers 78/8/14 12:39 — 1438

ORDINARY EVENTS:

(QU3267, 68) covers 78/9/8 1502 — 1700

1 page / record

1 record / 32 sec.

2 HR — 120 MIN ~ 240 PPS.

```
:@
:!
QED
ef
READY
qed 'seicc.encgen2.asm(anbump)'
QED
1
ANBUMP   PROC  SAVE=14
*********************************************************************
*
*  ISEE-C ANALYZER  --  ANBUMP
*  RESETS SUBCOM LIST POINTER AND DETECTS ANALYZER DONE CONDITION.
*  RESET ENNEXTSR TO ENKEEP SUBCOMS FROM THE END OF THE CURRENT
*  VOLUME.
*  IF ANALYZER IS FINISHED (ANVOLEND = ENNEXTSW), SET ENANDONE = 1
*
*********************************************************************
         L      3,ANVOLEND
         USING SUBCOM,3
         IF (C,3,ENNEXTSW,EQ)       IF EOV = EOD
              IF (CLI,ENCDAT,YES,EQ)        AND IF STILL DATA TO READ
                   ST     3,ENNEXTSR        RESET QUEUE POINTERS
                   MSGMAC UNIT=ENPRUNIT,                              *
               FORM='(''SUBCOM QUEUE FLUSHED'')'
              ELSE
                   MVI    ENANDONE,YES
                   MSGMAC UNIT=ENPRUNIT,                              *
               FORM='(''ANALYZER DONE WITH ALL DATA'')'
              FI
         ELSE
              L      4,ENKEEP
              IF (LTR,4,4,NZ)          IF ENKEEP NE 0
                   DO UNTIL,(BCT,4),OR,(C,3,ENNEXTSR,EQ)
                        L      3,SUPREVSU
                   OD
              FI
              ST     3,ENNEXTSR
              L      5,ENVOLINT
              USING VOLINT,5
              MSGMAC UNIT=ENPRUNIT,LIST=(VOVOVOLN,VOVOVOLN,ENI4),     *
               FORM='(''*ANALYZER DONE WITH VOLUME'',I10)'
              DROP  5
         FI
         DROP  3        (SUBCOM)
*
         CORP
END OF DATA
```

CHANGE PROLOGUE

[illegible] PROBLEMS:

CHPTER ① SIC CLOCK IN CH, INTRO IS FW (NOT BD)

RAWRTG ② SPIN BIT ON RATES IS 3, not 2 (thru 0).

VOLUME ③ DIGITAL READ FROM WRONG LOCATION?

④ AUTOMATIC GAIN SWITCHES OFF?

~~⑤ UPDATE = [illegible] NOT TO BE INCLUDED.~~
~~(RAW ONLY OUTPUT?)~~

~~⑥ OUTPUT. [illegible] SHOULD [illegible]~~
~~OUTPUT [illegible] RAW RATES, NOT [illegible]~~
~~(SUMMED SCALER IF NOT 'RAW RATE')~~
~~[illegible] RAW [illegible]~~

FOR USE PROB'S

① IF NO GOOD DATA AND

Ⓐ ENCDAT = YES,
RESET ~~R~~R/W POINTER & NORMAL RETURN
~~[illegible]~~ # IN CHN VOL = 0
~~[illegible]~~ (VOLINT)
VONMCHP

Ⓑ ENCDAT = NO,
SET ENANDR-R = YES

ANBUMP

```
IF (ANVOLEND = NEXTSW)
    IF (ENCDAT = YES)
        SET   NEXTSR = NEXTSW
    ELSE
        SET ENANDR-R = YES
        MSG
ELSE
    SET SR IN USUAL FASHION  <———— MSG (DONE)
FI
```

6/20/78

ISEE-C Design Consideration

① HET command status

In the command status bits, "delete AS analysis" means that there is no analysis of A-stopping PHA events, both high gain and low gain. These "delete" bits have no effect on the handling of rates data.

② PHA event analysis

The following scheme should be used in PHA event analysis:

FF A.) If the event is padded, mark as padded in map, no sort.

F0 B.) If the event ~~is~~ illegitimate
(HET: power < 2.5 volts or event type deleted)
(VLET: power < 2.5 volts or PHA not enabled)
then mark as such in map, no sort.

00 C.) If null event
(HET: all 48 bits should be zero (tags + r.o.'s)
(VLET: only 36 readout bits should be zero (not tags)
mark as null in map, no sort.

F8 D.) If unacceptable data quality
mark as unacceptable in map*, no sort.

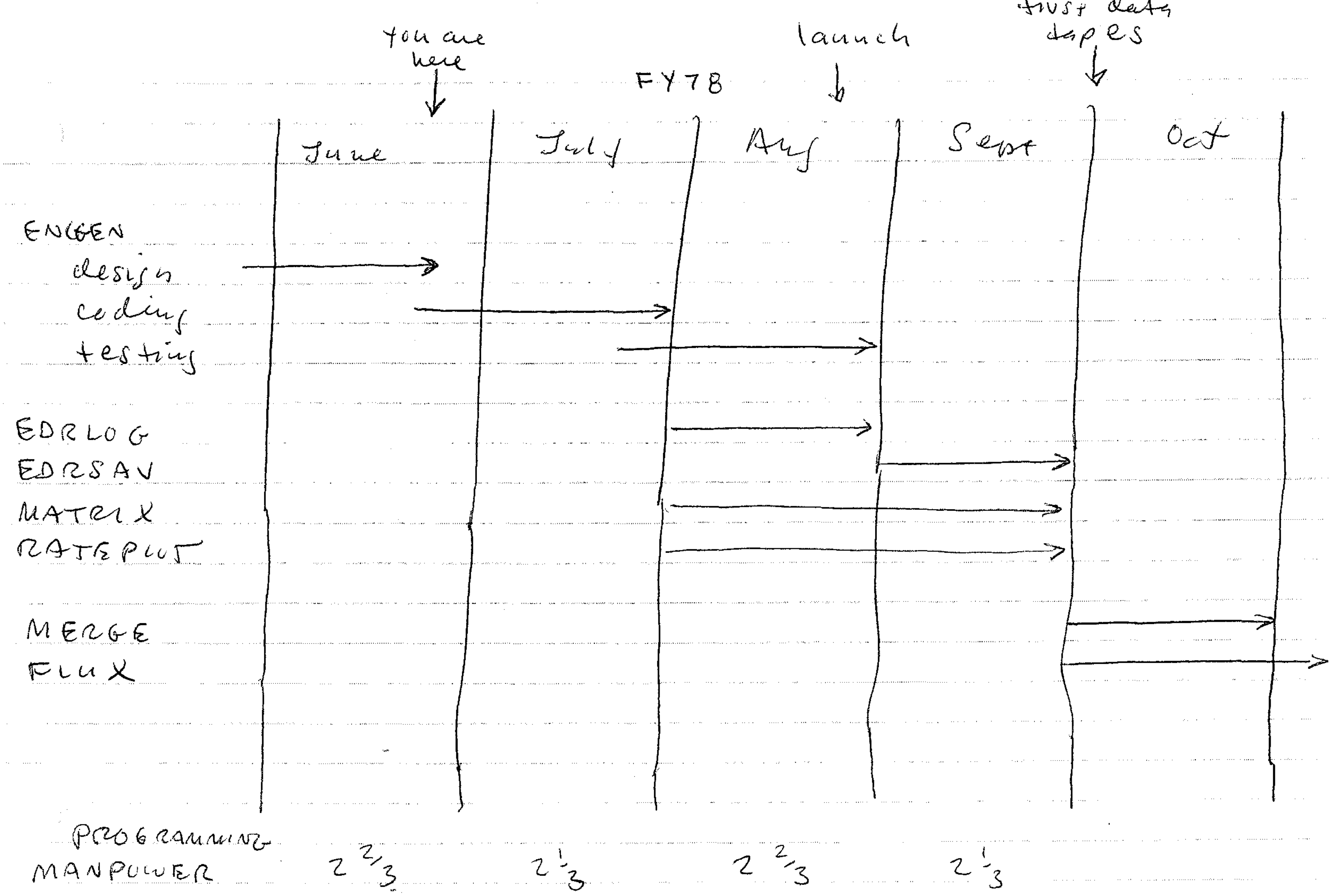
E.) Else, mark as event type in map, sort in verses.

64 × 30
64
384
30
11520
35K

145 ft/week for s/c word

*TBD.

ISEE-C status report as of 6/20/78



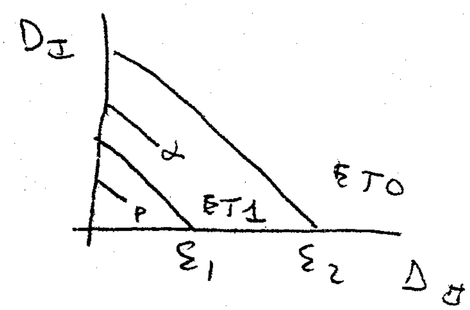
6/5/78

ISEE-C Items

(1) HET subcom -

We should preserve S5 in the HET subcom.

(2) VLET PHA event type-rates.



event	rate
ET0	$D\Sigma 2$
ET1	$(D\Sigma 1 - D\Sigma 2)$

Still not sure ~~what~~ whether to include 2 rates with the VLET-I and VLET-II ET1 PHA events. How does Voyager handle such cases? Matrix plots include many rates?

(3) Temperature & voltage conversion.

We should include the converted values of the analog parameters on the ency tape.

HETS, VLETS PWR ⇒ 20 mV/count

(0-255 → 0-5.1 volts)

HETS, VLETS THERMISTER ⇒ see table.

VLET ±6, ±12 volts ⇒ another sheet (G. Porreca)

VLET thermistors ⇒ ?

(4) Quick look tapes — MSOCC, 360, Interdata

(5) CMD bits

HET PULSE COMMAND (P88) —TURNS INTERNAL

[illegible]

SET TO 1 BY THE HET SERIAL COMMAND.

HET SERIAL ~~CMD~~ COMMAND #22

6/5/78

BIT 37 = 0

INPUT BIT S/C CMD	DATA WAY	HOSEA	OUTPUT BIT DIG. S.C. FR/BIT	LINE	
37	W1	1	44/0	CD-1	DUMMY BIT (ALWAYS "0" IN READOUT
36	W2	2	44/1	CO2	SUPRESS A2 TERM (HET-1) (1=suppressed)
35	W3	3	44/2	CO3	" B2 " "
34	W4	4	44/3	CO4	" $\overline{G}_1$ " " (BS only)
33	W5	5	44/4	CO5	" C_1 " "
32	W6	6	44/5	CO6	" C_4 " "
31	W7	7	44/6	CO7	" $\overline{G}$ " " (other than BS)
30	W8	8	44/7	CO8	DELETE AS ANALYSIS "
29	W9	9	45/0	CO9	" BS_e " "
28	W10	10	45/1	CO10	" BS_p " "
27	W11	11	45/2	CO11	" PENT "
26	W12	12	45/3	CO12	SUPRESS A2 TERM (HET-2)
25	W13	13	45/4	CO13	" B2 " "
24	W14	14	45/5	CO14	" $\overline{G}_1$ " " (BS only
23	W15	15	45/6	CO15	" C_1 " "
22	W16	16	45/7	CO16	" C_4 " "
21	W1	17	46/0	CO17	" $\overline{G}$ " " (other than BS)
20	W2	18	46/1	CO18	DELETE AS ANALYSIS "
19	W3	19	46/2	CO19	" BS_e " "
18	W4	20	46/3	CO20	" BS_p " "
17	W5	21	46/4	CO21	" PENT " "
16	W6	22	46/5	CO22	POWER OFF G_4 (HET-1)
15	W7	23	46/6	CO23	" " G_3 "

BIT 37 = 0	14	W8	24	46/7	CD24	POWER OFF G2 (HET-1)
	13	W9	25	108/0	CD25	" " G_1 "
	12	W10	26	108/1	CD26	" " B_2 "
	11	W11	27	108/2	CD27	" " B_1 "
	10	W12	28	108/3	CD28	" " A_2 "
BIT 37 = 1 ↓	33	W5	29	108/4	CD29	" " A_1 "
	32	W6	30	108/5	CD30	" " C_4 "
	31	W7	31	108/6	CD31	" " C_3 "
	30	W8	32	108/7	CD32	" " C_2 "
	29	W9	33	109/0	CD33	" " C_1 "
	28	W10	34	109/1	CD34	POWER OFF G_4 (HET-2)
	27	W11	35	109/2	CD35	" " G_3 "
	26	W12	36	109/3	CD36	" " G_2 "
	25	W13	37	109/4	CD37	" " G_1 "
	24	W14	38	109/5	CD38	" " B_2 "
	23	W15	39	109/6	CD39	" " B_1 "
	22	W16	40	109/7	CD40	" " A_2 "
	21	W1	41	110/0	CD41	" " A_1 "
	20	W2	42	110/1	CD42	" " C_4 "
	19	W3	43	110/2	CD43	" " C_3 "
	18	W4	44	110/3	CD44	" " C_2 "
	17	W5	45	110/4	CD45	" " C_1 "
	16	W6	46	110/5	$\underline{CD46}$	CAL OVERRIDE (1 = CAL ENABLE)
	15	W7	47	110/6	$\underline{CD47}$	HG_1 = GAIN CHANGE HET-1
	14	W8	48	110/7	$\underline{CD48}$	$HG_1 = S_5 \cdot CD47 + CD49 \cdot \overline{CD47}$
	13	W9	49	—	$\underline{CD49}$	HG_2 = GAIN CHANGE HET-2
	12	[illegible]	50	—	$\underline{CD50}$	$HG_2 = S_5 \cdot CD48 + CD50 \cdot \overline{CD48}$

DELETE C1 command sets
C1 range bit in tag field to 1!??
NO?

SET BIT 49 — HET1 → HI GN

IF CD 47 = 0 ⇒ HET-1 GN SET BY BIT 49
CD 48 = 0 ⇒ HET-2 GN SET BY BIT 50

NORMAL STATE 1 – 46 = 0
47 = 48 = 1

HETS PWR MF 58, Step 52 : > $2\frac{1}{2}$ VOLTS IS ON

HRITS
VLRTS

THERMISTOR CONVERSION

°C	IDEAL DIGITIZED COUNT OUTPUTS
-50°	255
-40°	249
-30°	230
-20°	200
-15°	190
-10°	174
-5°	158
0°	142
5°	126
10°	111
15°	97
20°	84
25°	72
30°	62
35°	53
40°	46
45°	39
50°	33
55°	28
60°	24
65°	20
70°	17

255
.02
5.10

HRITS
VLRTS
D.C. VOLTAGE

20 MV / COUNT

I.E. 255 → 5.1 VOLTS

VLRTS

NAND — VITARM   DOUBLE RATES
MATRIX P.O. HAVE ONLY 1T RATE?

MSOCC   XDS ~~930~~ → PDP-11
MULTI-SAT   CONT CNTR

VLET Voltage Conversion 3/17/77

X_i = 8 bit number of digitized analog readout (assume conversion range 0 − 5.11 volts)

V_i = displayed computed number (volts)

$X_0 \sim 200$
$X_1 \sim 150$
$X_6 \sim 100$
$X_7 \sim 60$

Then:

$$V_\phi = 0.06\, X_\phi \text{ volts}$$

$$V_1 = 0.04\, X_1 \text{ volts}$$

$$V_6 = 0.4\, X_6 - 0.44\, X_1 \text{ volts}$$

$$V_7 = \frac{0.4\, X_7 - 0.66\, X_\phi}{9} \text{ volts}$$

.44

_ X X . X X

-132

6/1/78

VLET STATUS :

1) SUBCOM.

IF INCONSISTENT, THROW UP HANDS

2) PHA ENABLE

IF ON AT ALL, REPORT AS ON.

3) CAL ALLOW

IF ON AT ALL, REPORT AS ON

4) CAL START

IF INCONSISTENT, THROW UP HANDS

5) PHA EVENT TAG BITS

0 — 7	8	9	10	11
	PHA 1 EN	PHA 2 EN	P_0	P_1
	T_1	T_2	P_0	P_1

6/13/78

ISEE-C Items —

1.) EDR tapes —

The file header record is of the same size as all other physical records (3528 bytes). The "GSFC tag" is simply the file header record in 36-bit word format. In particular, the first 16-bit halfword is zero, which would distinguish it from the experimenter i.d. number (33).

The data is in FB format. The last 36-bit word (or for our purposes, the last 32-bit word) is a physical record count. It's value is zero for the file header record, and 1, 2, 3, --- for subsequent data records.

2.) Spacecraft clock —

Internally, the spacecraft clock "ticks" once every ½ second, and recycles every ~~97~~ 97 days (≈ 16,770,000 ticks or 2^{24}). The clock we readout, however, has been sampled from the internal clock based on the bit rate. Thus the following ~~holds~~ holds, for any bit rate:

64 clock counts / 64 mf block 97 days → clock recycle

3.) Sectored Rates —

The following number of spins are summed:

At 2048 BPS, 8 spins summed.
" 1024 " , 16 " "
" 512 " , 32 " "

TDC -

1) VCET STATUS IN CH. INFO. ~~[illegible]~~

(STATUS CHANGE → NEW CH ?)

Tyler 2) RATE TAPE FOR VCET PLUS EVENTS.

3) preserve (SJ) ?

4) GSFC TAG IDENTITY ?

NAND

5) MAGIC IN COMPLETE CYCLE OR SUBCOM, ?

Tyler switch 6) FILE HEADER IN ONE BLOCK WITH 3 FILLER LOGICAL RECORDS

OR IS F.H. A LOGICAL RECORD BLOCK BY ITSELF

OR IS 1ST BLOCK FILE HEADER + 3 LOGICAL RECORD.

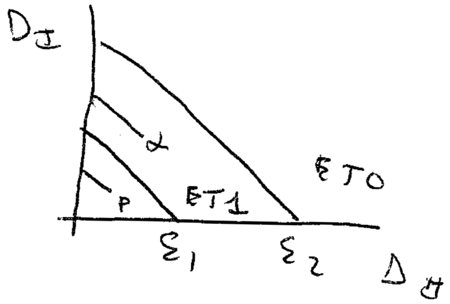
6/5/78

ISEE-C Items

① HET subcom -

We should preserve S5 in the HET subcom.

② VLET PHA event type-rates.



event	rate
ETO	$D\Sigma 2$
ET1	$(D\Sigma 1 - D\Sigma 2)$

Still not sure ~~whether~~ whether to include 2 rates with the VLET-I and VLET-II ET1 PHA events. How does Voyager handle such cases? Matrix plots include many rates?

③ Temperature & voltage conversion.

We should include the converted values of the analog parameters on the ency tape.

HETS, VLETS PWR ⇒ 20 mV/count

(0-255 → 0-5.1 volts)

HETS, VLETS THERMISTOR ⇒ see table.

VLET ±6, ±12 volts ⇒ another sheet (G. Porreca)

VLAT thermistors ⇒ ?

④ Quick look tapes   MSOCC -

360 interdata } :

⑤ Cmd sits

HET PULSE COMMAND (P88) — TURNS INTERNAL CALIBRATION ON INDIVIDUAL [illegible] HAS BEEN SET TO 1 BY THE ~~#~~ HET SERIAL COMMAND.

HET SERIAL ~~CMD~~ COMMAND #22

6/5/78

BIT 37 = 0

INPUT BIT S/C CMD	DATA WAY	HOSEA	OUTPUT BIT DIG S.C. FR/BIT	LINE	
37	W1	1	44/0	CD-1	DUMMY BIT (ALWAYS "0" IN READOUT
36	W2	2	44/1	CD2	SUPRESS A2 TERM (HET-1) (1=suppressed)
35	W3	3	44/2	CD3	" B2 " "
34	W4	4	44/3	CD4	" ~~B2~~ $\overline{G_1}$ " " (BS only)
33	W5	5	44/4	CD5	" C1 " "
32	W6	6	44/5	CD6	" C4 " "
31	W7	7	44/6	CD7	" $\overline{G}$ " " (other than [illegible]
30	W8	8	44/7	CD8	DELETE AS ANALYSIS "
29	W9	9	45/0	CD9	" BSe " "
28	W10	10	45/1	CD10	" BSp " "
27	W11	11	45/2	CD11	" PENT
26	W12	12	45/3	CD12	SUPRESS A2 TERM (HET-2)
25	W13	13	45/4	CD13	" B2 " "
24	W14	14	45/5	CD14	" ~~B2~~ $\overline{G_1}$ " " (BS only)
23	W15	15	45/6	CD15	" C1 " "
22	W16	16	45/7	CD16	" C4 " "
21	W1	17	46/0	CD17	" $\overline{G}$ " " (other BS
20	W2	18	46/1	CD18	DELETE AS ANALYSIS "
19	W3	19	46/2	CD19	" BSe " "
18	W4	20	46/3	CD20	" BSp " "
17	W5	21	46/4	CD21	" PENT " "
16	W6	22	46/5	CD22	POWER OFF G4 (HET-1)
15	W7	23	46/6	CD23	" " G3 "

BIT 37 = 0	14	W8	24	46/7	CD24	POWER OFF G_2 (HET-1)
	13	W9	25	108/0	CD25	" " G_1 "
	12	W10	26	108/1	CD26	" " B_2 "
	11	W11	27	108/2	CD27	" " B_1 "
	10	W12	28	108/3	CD28	" " A_2 "
BIT 37 = 1	33	W5	29	108/4	CD29	" " A_1 "
	32	W6	30	108/5	CD30	" " C_4 "
	31	W7	31	108/6	CD31	" " C_3 "
	30	W8	32	108/7	CD32	" " C_2 "
	29	W9	33	109/0	CD33	" " C_1 "
↓	28	W10	34	109/1	CD34	POWER OFF G_4 (HET-2)
	27	W11	35	109/2	CD35	" " G_3 "
	26	W12	36	109/3	CD36	" " G_2 "
	25	W13	37	109/4	CD37	" " G_1 "
	24	W14	38	109/5	CD38	" " B_2 "
	23	W15	39	109/6	CD39	" " B_1 "
	22	W16	40	109/7	CD40	" " A_2 "
	21	W1	41	110/0	CD41	" " A_1 "
	20	W2	42	110/1	CD42	" " C_4 "
	19	W3	43	110/2	CD43	" " C_3 "
	18	W4	44	110/3	CD44	" " C_2 "
	17	W5	45	110/4	CD45	" " C_1 "
	16	W6	46	110/5	CD46	CAL OVERRIDE (1 ⇒ CAL ENABLE)
	15	W7	47	110/6	CD47	HG_1 = GAIN CHANGE HET-1
	14	W8	48	110/7	CD48	$HG_1 = S_5 \cdot CD47 + CD49 \cdot \overline{CD47}$
	13	W9	49	—	CD49	HG_2 = GAIN CHANGE HET-2
	12	[illegible]	50	—	CD50	$HG_2 = S_5 \cdot CD48 + CD50 \cdot \overline{CD48}$

DELETE C1 command sets
C1 range bit in tag field to 1!??
NO?

SET BIT 49 — HET1 → HI GN

IF CD 47 = 0 ⇒ HET-1 GN SET BY BIT 49
CD 48 = 0 ⇒ HET-2 GN SET BY BIT 50

NORMAL STATE 1 – 46 = 0
47 = 48 = 1

HETS PWR MF 58, step 52 : > $2\frac{1}{2}$ VOLTS IS ON

HRITS
VHRRS

THERMISTOR CONVERSION

255
.02
5.10

°C	IDEAL DIGITIZED COUNTS OUTPUTS
-50°	255
-40°	249
-30°	230
-20°	200
-15°	~~184~~ 190
-10°	~~168~~ 174
-5°	158
0°	142
5°	126
10°	111
15°	97
20°	84
25°	72
30°	62
35°	53
40°	46
45°	39
50°	33
55°	28
60°	24
65°	20
70°	17

HRITS
VHRRS

D.C. VOLTAGE

20 MV / COUNT

i.e. 255 → 5.1~~00~~ VOLTS

VHRRS

NAVS — VOYAGER DOUBLE RATES
MATRIX P.O. HAVE ONLY 1/2 T RATE ?

MSOCC — XDS ~~9~~30 → PDP-11
MULTI-SAT CONT CNTR

VLET Voltage Conversion 3/17/77

X_i = 8 bit number of digitized analog readout (assume conversion range 0 – 5.11 volts)

V_i = displayed computed number (volts)

400

$X_0 \sim 200$

$X_1 \sim 150$

$X_6 \sim 100$

$X_7 \sim 60$

Then:

$$V_\phi = 0.06\, X_\phi \text{ volts}$$

$$V_1 = 0.04\, X_1 \text{ volts}$$

$$V_6 = 0.4\, X_6 - 0.44\, X_1 \text{ volts}$$

$$V_7 = \frac{0.4\, X_7 - 0.66\, X_\phi}{9} \text{ volts}$$

XX.XX

.44

-132

6/1/78

VLET STATUS:

1) SUBCOM.

IF INCONSISTENT, THROW UP HANDS

2) PHA ENABLE

IF ON AT ALL, REPORT AS ON.

3) CAL ALLOW

IF ON AT ALL, REPORT AS ON

4) CAL START

IF INCONSISTENT, THROW UP HANDS

5) PHA EVENT TAG BITS

0 — 7	8	9	10	11
$\times$	PHA1 EN	PHA2 EN	P_0	P_1
	T_1	T_2	P_0	P_1

2048 BPS

$$\underbrace{128 \times 8 \times \underbrace{\cancel{8} \times 64}_{512}}_{65536}$$

ISEE-C

READER - PAM
~~MONITOR~~ MONITOR - GD
ANALYZER - JERR
OUTPUT - [illegible]

Questions:

TYCHO - 1.) What is the nature of the calibration data? Is HET and VLET calibration separate? (see separate chapter 8/15)

2.) Do we get test tapes from JPL?

3.) Do we want to put all of words 61, 62, 63, 58, 59, 122 ~~[illegible]~~ onto ENCY tape? (Separate verse or chapter header?)

4.) Keep raw rates verse?

5.) In PHA verses, do we need more than 1 event type rate? Or can we use the Rate Summary verse?

6.) Sum DATA quality flags? Time quality flags?

7.) ~~Are~~ Is there a set of HIGH & low gain rates - singles.

8.) Fill flag

CSC. 1.) Can we afford 2 PHA history maps? Or is generation of 2 PHA maps too cumbersome?

N[illegible]D 1.) Alignment?

Need to know:

- specifics of data quality flags (2 bits/frame)
- source of spin calculation (L.G.)
- HEO CMD status breakdown
- NATURE OF CALIBRATION DATA, IF ANY
- test tapes

- Launch July 23rd

- overlap bits

- PHA tags: maintain time order within verse

PHA overflow: locks to zero
~~[illegible]~~ initially, set to 1's.
(one greater than Voyager)
N.B. if zeros, must be no readout

VLBT — 10 bits freeze at all 1's if on the
11 bits not possible electronically

HET
PHA: NON-PHYSICAL events were LETTERS
WITH GSE DISPLAY (except "P")

MAINTAIN VLBT SPARES

CONVOLUTIONAL ENCODER
PARITY BITS TO SAME RATE
HIGH QUALITY — NO ERRORS
CORRECTABLE —
NOT "
] accept Set se version

→ Data rejection question
How does Voyager do it?
What about 2-3 MR / rate readout.

PENETRATING events (HET) PEN: $B_1 B_2 C_1$

No requirement on $C_2\ C_3\ C_4$
Voyager requires C_2, C_3, C_4 on,
AND NOT true.

odd events in odd verse, is correct

VLCT

D_I

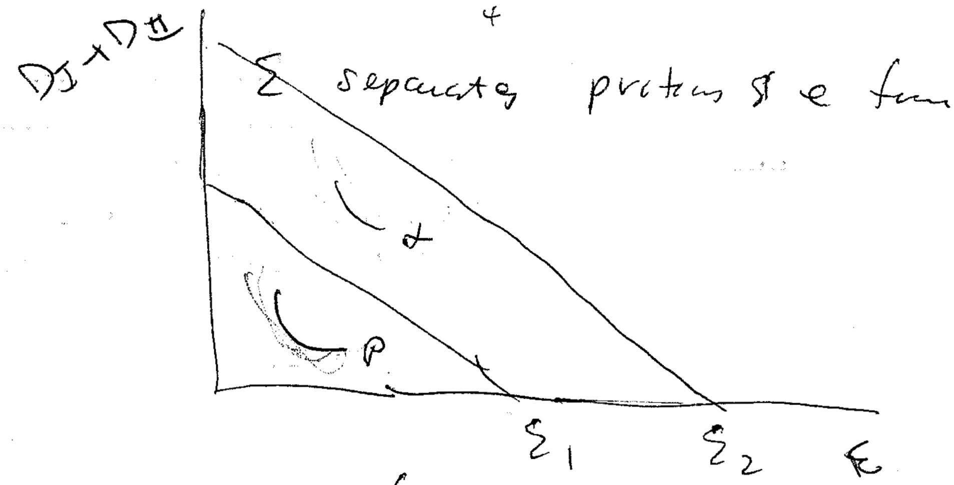
D_{II}

E

F

$$\Sigma = D_I + k_1 D_{II} + k_2 E$$

$$k_1 = \tfrac{1}{4} \qquad k_2 = \tfrac{1}{10}$$



Σ_1 (and $\overline{\Sigma_2}$) α's only

Σ_2 heavy ions

When is experiment on or off

1.) power monitor on? (for VLCT or WCT)
we need a threshold
2.) Are telescope enable bits on?

Check for if telescope not enabled are there <u>non-null</u> events from that telescope.

VLCT polling

ET0 T1	ET1 T1	ET0 T2	ET1 T2

#
How to identify null readouts.
ON, ENABLED, & then (NULL?)
Pwr monitor to read $\gtrsim$ 4 volts

COMMAND STATUS:
Status put out

Sys. Maint. Prog. Guide

I.

II.

A. R-CTOEA

1. Initialize

2. Reader

3. Monitor

4. Analysis

5. ~~E.~~ Output

6. Misc. — data structs, Common Blocks

B. MRROR — prologues

C. RDRLOG

D. RDRSAV — prologues

E. WIMCIS

F. UTILITIES

$\boxed{\text{SDCIO}}$, 1 , — to tr.

CUSO — extend

LIST

[REMOVE —
[ASSIGN —

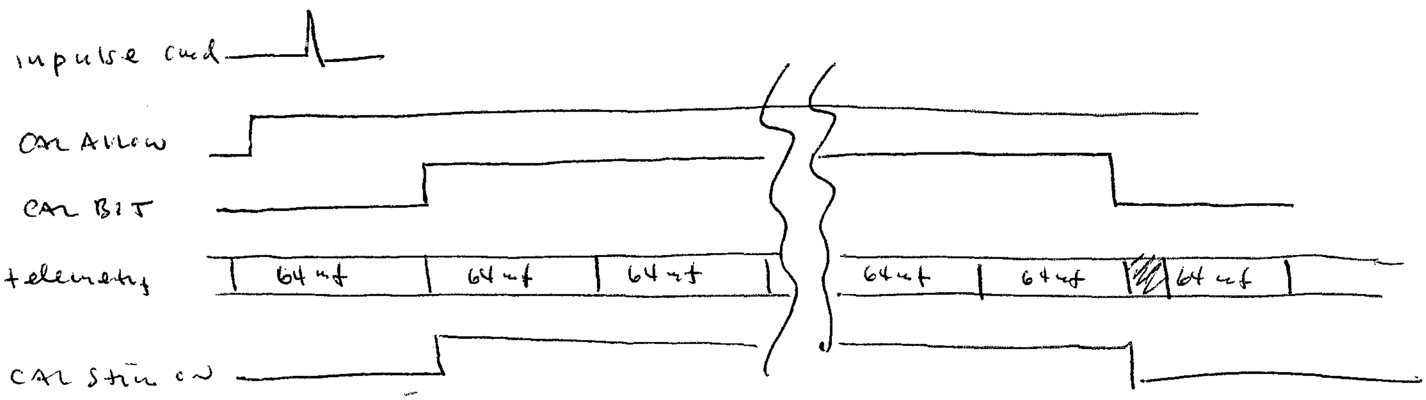
Mtg. w. Tycho 8/18

Handout: Spin Synchronous Clock

Going thru every tape format:

PS:3 — need separate HGT & VLGT calibration bits

HGT (VLGT)



PHA data shifted by 2, 4, 6 (or 8 with VLGT) due to old events.

→ Throw out ~~rates~~ 1st set of rates after data gap due to status uncertainty.

MONITOR

→ Throw out 1st 8 mf's worth of PHA data after data gap and after CAL.

VLGT — CAL START only up during cal.

→ Check validity of redundant VLGT subcom & CAL bit values.

→ Also bit rate validity between status & file header.

Tycho needs: Guide's VLGT HSKPG conversion

I need: TEMP & PWR new conversion, HGT CMD bit

Need bit rate for dead time correction (see Kurt)

(1) new chapter due to bit rate change

(2) ch. header will have bit rate.

[illegible]

Test tapes:
A. Kugel

Three kinds of ~~[illegible]~~ records:

(1) data (binary)   64 x 16 x 8 bits

(2) ASCII message   ≤ 80 bytes

(3) EOF mark   (delimit "runs". EOV = 2 EOF'S)

Tycho has duplicates.

800 BPI, one record I.D. preceding each file.

Howard E. copied the tapes.

Test tapes from IPD — yes! but limited data.

If feasible, merge GSI data into test tapes

Monitor —

- mark up spins as wild
- don't include bad rates in summary

Perform rate trend check — done on Σ sectors.

→ Include summed sectored rates in rate summary verse

CDF HEADER:

AVR SPIN

MAX DEV

good

not good

CMD —

IF START OR STOP OR DATA, IGNORE 2 FULL ~~RECORDS~~ BLOCKS

| ~~CMD1~~ | ~~CMD2~~ | CMD1 | CMD2 |

IF CMD CHANGES, THROW OUT 3 BLOCKS

| ↑ | - | ↑ | ~~-~~ | ~~↓~~ | - | ↓ |

Vand — If turn exp on, what happens? VERY messy, HET OK.

- If off, put monitor off — throw out 1 MAJOR frame.

IMP-8 – flipped for better antenna pattern
need to use 85', not 30' dishes
ISEE-A – 35' ~~[illegible]~~ dishes, higher bit rate, closer, GOOD ACCURACY

spin measurements should have 2σ check
(use 10%)
Use actual spin period as measured for sectoring.

61, 62, 63 S/C clock, starter reg., end reg.
50 ANA SC #1 temp

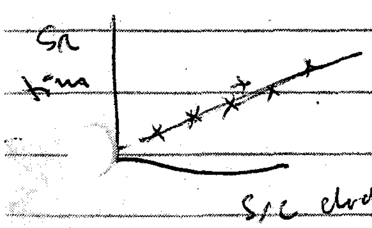
Plan: save all DIG & ANA subcoms

Data Quality — see definition

ignore	00	fill
	01	bad data (known errors) — don't use for now
accept	10	medium quality data – not corrected via convolutional coding, data (not real time) but not errors detected.
	11	corrected good data.

Summarized data — only <u>DQ 11</u> data!

Time quality —
UT is S/C transmit time (extrap. back from receiver)
IPD will smooth out time data from many stations
S/C clock drifts



3 things done:
1) delay correction to S/C transmit
2) smoothing fit & correction
3) renormalization to standard

conv encoded — if decoded & corrected or no errors $\boxed{11}$

— if decoding attempted & parity indicates not corrected $\boxed{10}$

— S/C data errors $\boxed{01}$

not ~~en~~ encoded — $\boxed{10}$ also no S/C data or frame sync errors detected

$\boxed{01}$ errors detected.

95% of 1519-A data excellent

Time quality — use all but quick look.

include Σ of each level
also Data quality

→ Throw out quick look data
Plan on being able to process quick look data outside of normal processing. (critical logs, etc)

Spin values:
→ no reason to create new chapter for spin
~~tag a chapter~~
put in avg spin value, maximum deviation

For now – plan to save all DIG and ANA subcom words on the exp tapes — design a new verse.

<u>Data Quality</u>: 4 levels –

00 fill data

01 not encoded and errors detected

SPIN PERIOD

19.75 ± .2 rpm

3.0075

3.078

3.038 ± .031 sec/rev.

Doc. vitagen

redo data structs

design

test proposal.

ANALYSIS —

treat data in terms of "status cycles" (2 Slides)

TABLE 1. DATA TYPES

DATA types

Code	
0	Raw Rates
1	Curr. condition Map
2	Rate Summary
3	PHA History
4	HET-I AST, HG
5	~~HET-I BST~~ HET-I AST, LG
6	~~HET-I PEN~~ HET-I BST, HG
7	HET-I BST, LG
8	HET-I PEN, HG
9	HET-I PEN, LG
10-15	HET-II (same as 4-9)
16	VLET-I, ET 0
17	VLET-I, ET 1
18	VLET-II, ET 0
19	VLET-II, ET 1

TABLE 2. COINCIDENCE CONDITION MAP

Coincidence Condition Map

Bit	HRS	VLSU
0	A_1	D_I
1	A_2	D_{II}
2	C_1	~~F~~ E
3	C_2	~~E~~ F
4	C_3	~~E_2~~ E_1
5	C_4	~~E_1~~ 0
6	B_2	~~E_2~~ 0
7	B_1	0
8	SA	0
9	SB	0
10	G_1	0
11	G_2	0
12	G_3	0
13	0	0
14	0	0
15	DISABLE	DISABLE

Table 5. Rate Summary Stack Location

Detailed ISEE-1 Rates

(reorder so that single come first)

1	I.	Het-I	$A_1 A_2 \overline{C_4}\ \overline{G_1}\ \overline{G_2}$	HG
2			$B_1 B_2\ SB\ \overline{C_1}\ \overline{G_1}\ \overline{G_2}$	"
3			$B_1 B_2 C_4\ \overline{SB}\ \overline{C_1}\ \overline{G_1}$	"
4			$B_1 B_2 C_1$	
5			$B_1 B_2 C_1 \overline{G_1}$	
6			$B_1 B_2 C_4 \overline{C_3}\ SB\ \overline{G_1}$	
7			$B_1 B_2 C_4 \overline{C_3}\ \overline{SB}\ \overline{G_1}$	
8			$B_1 B_2 C_4 C_3 \overline{C_2}\ SB\ \overline{G_1}$	
9			$B_1 B_2 C_4 C_3 \overline{C_2}\ \overline{SB}\ \overline{G_1}$	
10			$B_1 B_2 C_4 C_3 C_2 \overline{C_1}\ SB\ \overline{G_1}$	
11			$B_1 B_2 C_4 C_3 C_2 \overline{C_1}\ \overline{SB}\ \overline{G_1}$	
12			A_1	
13			A_2	
14			B_1	
15			B_2	
16			C_1	
17			C_2	
18			C_3	
19			C_4	
20			SA_1	
21			SA_2	
22			SB	
23	II.	HET-I	$A_1 A_2\ SA\ \overline{C_4}\ \overline{G_3}$	LG
24			$B_1 B_2\ SB\ \overline{C_1}\ \overline{G_3}$	"

G1

25-43 (same as 4-22, except low gain) "

44-86 III, IV (same as 1-43, except for HET-II)

87	V.	VLET-1	$D_I D_{II}\ \overline{F}\ \mathcal{E}_1$	
88			$D_I D_{II}\ \overline{F}\ \mathcal{E}_2$	
89			$D_I D_{II}\ \overline{F}\ \mathcal{E}_1 E_1$	
90			$D_I D_{II}\ \overline{F}\ \mathcal{E}_1 E_2$	
91			$D_I D_{II}\ \overline{F}$	
92			D_I	
93			D_{II}	
94			E	
95			F	

96-104 VI (same as 87-95, except for VLET-2)

105 – 112	Sectored	VII	HET-I	$A_1 A_2 \overline{C_4}\ \overline{G_1}\ \overline{G_2}$	HG.
113 – 120	"		"	$B_1 B_2\ SB\ \overline{C_1}\ \overline{G_1}\ \overline{G_2}$	
121 – 128	"		"	$B_1 B_2 C_4\ SB\ \overline{C_1}\ \overline{G_1}\ \overline{G_2}$	
129 – 136	"		"	$B_1 B_2\ C_4\ \overline{C_1}\ \overline{SB}\ \overline{G_1}\ \overline{G_2}$	
137 – 144	"	VIII,	HET-I	$A_1 A_2\ SA\ \overline{C_4}\ \overline{G_3}$	LG
145 – 152	"		"	$B_1 B_2\ SB\ \overline{C_1}\ \overline{G_2}$	
153 – 200	"	IX, X.	(same as 105 – 152, except for HET-II)		
201 – 208	"	XI.	VLET-I	$D_I\ D_{II}\ \overline{F}\ \Sigma_1$	
209 – 216	"		"	$D_I\ D_{II}\ \overline{F}$	
217 – 232	"	XII	(same as 201 – 216, except for VLET-II)		

Housekeeping:

ANALOG SUBCOM 1, word 58
steps 51 VLGTS Hskp. Data
52 HGTS Pwr Mon.
53 VLGTS Pwr Mon.

ANALOG SUBCOM 2, word 122
step 17 HGTS temp
19 VLGTS Temp

Digital subcom; word 59
step 43 HGT CMD STATUS (subcom, spin, cmd)
44 "
45 "
46 "

Normal Scientific format
words 5 - 11

Need, additionally, spin info.

PHA events :

HET :	PHA_1	12 bits
	PHA_2	12 bits
	PHA_3	12 bits
	tags	12 bits
VLET :	PHA_1	11 bits
	PHA_2	11 bits
	PHA_3	10 bits
	tags	2 bits

Rates :	HET NS	22 bits
	HET Sect	20 bits
	VLET NS, S	24 bits

ISEE-C Rates

I.	Nonsectored	HET-I	High Gain Rates
II.	"	HET-I	Low " "
III.	"	HET-II	High " "
IV.	"	HET-II	Low " "
V.	"	VLET-I	Rates
VI.	"	VLET-II	"
VII.	Sectored	HET-I	High Gain Rates
VIII.	"	HET-I	Low " "
IX.	"	HET-II	High " "
X.	"	HET-II	Low " "
XI.	"	VLET-I	Rates
XII.	"	VLET-II	"

(232 rates)

Tycho —

Here are some items concerning the ISEE-C IPD tapes and the spacecraft.

① Could we find out the first 16 bits of the GSFC tag on the file header-record? Is it a fixed value? [We would like to know this in order to distinguish, in the first halfword of any record on the input tape, (1) a file header record, (2) a logical record, (3) anything else.]

N.B. Schmidt says that the GSFC TAG would not be "described to the users."

② Our understanding of the tape organization is that each physical record will correspond to a major frame, and that "file label records will be the same length as the data records which follow."

Thus we conclude that the first physical record of each tape will only contain a file header record. But is this file header physical record filled out to the size of a logical data record (880 bytes) or to the size of a physical data record (3528 bytes).

IS the record format on the tape variable added to each physical record (see the "bytes/record" calculation on the tape format handout.

(3) Are there a fixed number of spacecraft clock counts per 64 mf block (or per major frame)? If so, what is this counts value? Is this a bit-rate dependent quantity?

(4) We understand that the spin period will be 19.75 ± .2 rpm, or 3.038 ± .031 sec/revolution. Is there a fixed number of spins per 64 minor frame block (eg. 10?)? Is this a bit rate dependent value?

J

CSC COMPUTER SCIENCES CORPORATION

INTEROFFICE CORRESPONDENCE

to DISTRIBUTION from J. Childs date May 23, 1978

subject Discussions with L. Gunshol and T. Von Rosenvinge on May 18, 19 1978

The following items were discussed:

(1) Calibration Data

The HET and VLET systems may be calibrated independently. Hence, we need two bits in the chapter subject matter code to indicate CAL data from HET and/or VLET. Calibration data is enabled by the CAL ALLOW bit. Calibration data is generated when the CAL START bit (for VLET) or the CAL bit (for HET) is set. All calibration data must go in a separate chapter.

(2) Data Rejection

After CAL data, throw out the first eight minor frames worth of PHA data.

(3) Redundant Information

We should check the equivalence of the redundant VLET subcom and CAL bit values. The bit rate values should be verified with both the record header and the file header.

(4) Bit Rate

The bit rate value will be included in the chapter introduction. The following table is used to translate the bit rate indicator:

00 - other (64?)
01 - 1024
10 - 2048
11 - 512

A bit rate bit has been defined for the Chapter Subject Matter Code. If a bit rate change occurs, this will be cause for a new chapter. It is expected that a bit rate change will be accompanied by a data gap. It is also expected that we will see no scientific data transmitted at 64 bps.

(5) Test Tapes

We should expect test tapes from IPD shortly. We should also, however, be prepared to run GSE accelerator calibration data through the Encyclopedia Generator. The more realistic accelerator data should better aid in the testing of the program.

(6) Additional Data Words

For now, we should plan to include all of MFW 61, 62, 63, 58, 59, and 122 on the encyclopedia tapes. We will define a new verse for these words. At a later date, we may be required to save only a subset of the above data.

(7) Data Quality Flags

There are two data quality ~~flags~~ flag bits per minor frame. The bit values mean the following:

00 - fill data

01 - errors detected in the telemetry

10 - if encoded, no corrections made; if not encoded, no errors detected

11 - (encoded) no errors detected or errors corrected.

For rates to be summarized, only data quality 11 rate values should be included (for now). Hence, the data quality acceptance level should be set to 3. All rates will be included in the raw rates verse, however.

The Chapter Introduction will include statistics on the data quality of all minor frames in the chapter.

(8) Time Quality Flags, Quicklook Data

We should accept all data in normal production except quicklook data (Time Quality Flag 00). The Chapter Introduction will include statistics on the time quality of all blocks in the chapter. We should be able to process quicklook data outside of the normal production system.

(9) Spin Values

The Chapter Introduction will include the following information concerning spin:

- the average spin period for the chapter
- the maximum deviation
- the number of "wild" readouts
- the number of "non-wild" readouts

Here we define a "wild" spin readout as one that is more than three standard deviations from the norm.

The monitor section of the encyclopedia generator will perform the check on spins, marking up the wild readouts appropriately.

to DISTRIBUTION from J. Childs date May 23, 1978

subject Discussions with L. Gunshol and T. VonRosenvinge on May 18, 1978 page 3

Those sectored rates which are measured in blocks with wild spin values should not be included in the summarized rates verse.

(10) Data Uncertainty due to incomplete status

When a change in HET status is detected in continuous data (reflecting a command), three blocks of data should be thrown out--the two blocks that contain the different status readouts and the intermediate block wherein irrelevant status is read out.

At both the beginning and end of a continuous data stream (i.e., after and before time gaps), two full blocks should be thrown out due to status uncertainty.

(11) Trend check on sectored rates

For sectored rates, the trend check must be applied to the sum of the sectored rate.

(12) ILLEGAL Events

Again, to clarify --

legal PHA events are those PHA readouts that are recorded when both the telescope is on (i.e., has power) and the PHA is enabled for the telescope or event type. A event for VLET is illegitimate if either the power is off or the PHA is disabled. A event for HET is illegitimate if either the HET power is off or the corresponding event type is disabled.

(13) G_1 Level

The HET hardware has been modified to allow separate deletion of the G_1 term according to event type. The deletable G_1 term for A-stopping and sectored rates will continue to be known as "G_1". The deletable G_1 term for B-stopping protons (register R2) shall be hereafter known as G_1' (primed).

JDC:kag

DISTRIBUTION:

E. Eng
L. Gunshol
E. Ronish
P. Schuster
T. VonRosenvinge

SUMMED SECTORED

1. Establish output tape format. (& data structure)
- VLRO rates w. PWO data
- Expand existing verse — no impact on output routine

- overlap — at EDR stage or BNCH. stage
- only one input format
- rate summarizer has to handle sectional things
- ~~data~~ structures, tables all diff,
  rate deltas

$$\text{system register gain} \underset{B}{\overset{A}{\rightleftarrows}} \text{unique rate}$$

A for rate summarizer.
B for trend check

1) spacecraft clock ~~+~~ frame ctr.

~~in sync ?~~

~~in phase !~~

~~thus~~ Cussion

2) need to look at 2 bits in word 63
(format bits in command register) to determine
if engineering or scientific format.

3) commands — ~~issued~~ executed whenever issued (exc. calibration)

4) prediction of manpower requirements
cf. Voyager
consider overlap
" Paul 's thesis, time off, etc.

Test tape —
could merge calibration data into decom tape

need to establish data structure for non
SUBCOM, ENGINEER, extract
etc.

calibration

• READER – very satellite dep't

OUTPUT – routine itself will probably not change but subroutines will

time: suggest use GMT
not need to use FDSC or S/C clock since no playback or DMT, etc

→ (1) establish ENCY format
(2) " subcom "

RR. (4' Subcoms x 42) x 4bytes x 10 — 5040
CCM 150 * 2bytes — 300
RSUM (254 x) 16bytes — 4064
PHAHCS (32 x Subcoms) x 1 bytes + 16 bytes — 976
PHAHCC (32 x Subcom) x 1byte + 16 bytes — 976
1' ~~+4 PHA verse x~~
(64 x Subcoms) x 8 bytes = 14 verses = 15360
(6 x 64 x Subcoms) x 4 bytes (100) → 11520

30 subcom/15 min

38.236
VOL 68
CHA 228

38.532

Preverse 23 12x 276

38,808

12.5 min

12"/15 min

4'/hr

100'/day

have problems which require the intervention of someone here at the Goddard Space Flight Center (GSFC)--that is my job and the members of the project are busy with ISEE-C as well as A and B.

Our meeting after the Western AGU at Berkeley in on, and Kinsey Anderson will inform you all of the details and agenda. He will be chairman, and I will be there, pending permission from the Goddard management. Please come with any relevant data so that we can make decisions about periods for special study.

Please do not forget to work on the description of your experiment. Perhaps I should mention again we need eleven double-spaced, typed pages (inclusive of diagrams) for each experiment. Approximately 1/3 of this paper should describe the instrument. I will try to return your stuff to you as edited by Tycho and me, but if you don't get it to me in time, I will not be able to do so.

ıstly, the time will come when I will be asked to justify keeping ISEE turned on, etc. For this and other purposes, it would be most useful to get from each experimenter titles and abstracts of talks and publications for a file which I will start to be used only for this purpose. I hope you will comply with this request.

ISEE-C (Dr. von Rosenvinge)

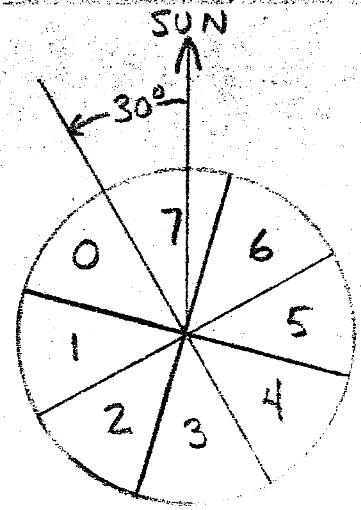
I would like to begin by congratulating all the many people who worked so hard and well on both sides of the Atlantic to make ISEE 1 and 2 a success. You have provided very high standards to live up to for those of us working on ISEE-C. I only hope that we can do as well.

Now that data is starting to flow in it seems to be an appropriate time to remind you of the standard scales for time-history plots which have been adopted by the ISEE Project. The same standards are also being used by the IMS and by the Solar-Geophysical Data reports from Boulder. The basic scales are 0.8 cm/day for Bartels rotation plots, 1 cm/hr. for 1-day plots, 6 cm/hr. for 4-hour plots, and 12 cm/hr. for 2-hour plots. A magnification of 18.25 should be used for microfilm. Adhering to these standards may cause some of you some trouble; however, I believe that doing so is the easiest, cheapest, and most effective step which can be taken to facilitate correla-ve data analysis.

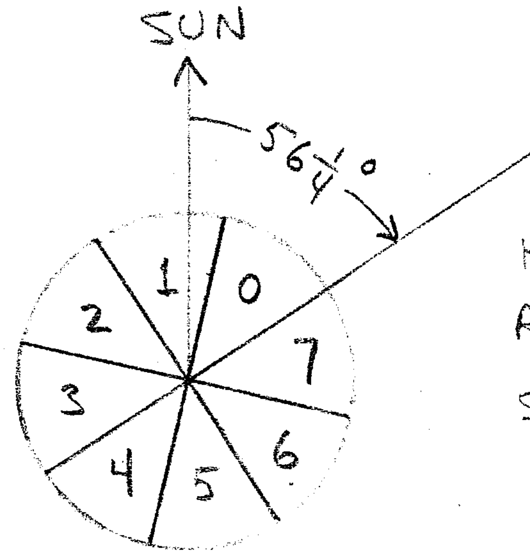
Some four different experiments on ISEE 1 and 2 have some sunlight sensitivity and in one case the affected telescopes are a total loss. Experimenters were cautioned about this possibility in the March/April 1977 Newsletter. You have all received a recent telegram on this subject as well. Please take it seriously and satisfy yourselves that you don't have a problem. This includes a solar heating problem before and during the spacecraft slow roll at launch.

A Critical Design Review was held at Fairchild and a number of points of interest came up. One is that no experimenter responded to Fairchild's request for inputs regarding the sun-spin test. This is perhaps remarkable considering the importance of the sun-pulse to many of you. To review, the sun-pulse may be derived from either the Panoramic Attitude Sensor System (PAS) or from the Fine Sun Sensor System (FSS). The PAS and FSS systems are located in facets 6 and 14 respectively, 180° apart. However, each is canted by 22-1/2° and the sun-pulse from the FSS is delayed by 180° so that the sun-pulse is generated when sunlight is normally incident on facet 5 (actually the PAS pulse comes 0.35° later than this). The facets are numbered according to a right-hand rule, the rotation of the spacecraft follows a right-hand rule and the spin axis will point to the North Ecliptic pole ±1°. Other points include: Anderson wants to substitute a Cd^{109} source in his X-ray experiment for the AM^{241} source; consideration is being given to having the thermal vacuum test before the EMC and vibration tests; adherence to schedule is being made difficult by having experiments out of the spacecraft, late experimenter response to requests for information such as wire-list checks, long/short form test requirements, etc, and continued MICOS problems; the Project Office does not know for sure how many experiments plan to be out during the calibration period. I have requested that Vu-Graphs from the review be sent to each of you.

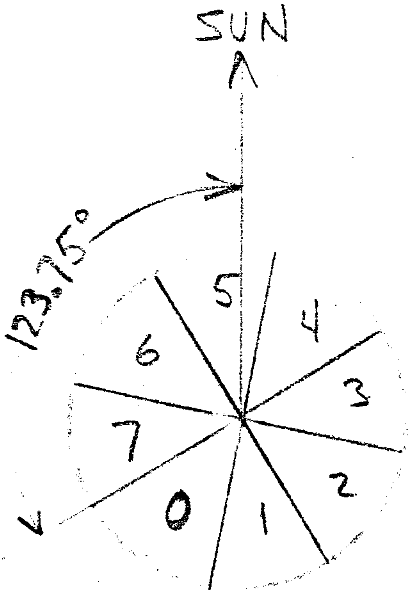
It has been decided to eliminate the attitude/orbit tape. The spacecraft position will be placed on experimenter tapes in the Geocentric Solar Ecliptic coordinate system only. These coordinates will result from a transformation of GEI coordinates to GSE coordinates by John Schmidt. Checks on his algorithm indicate position errors 150 km and angular position errors of 20 arc seconds resulting from this transformation. His algorithm uses the obliquity of date, not the mean annual obliquity. The spacecraft attitude will normally only be determined once a month when in the halo orbit. This will be reported on a form, a preliminary version of which is enclosed in the Newsletter as attachment 3.



VLET SECTO



HET
A-STOPPING
SECTORS



HET
B-STOPPING
SECTORS

```
         MACRO
         SUBCOM
         GBLA  &SUBCIN
&SUBCIN  SETA  &SUBCIN+1
         AIF   (&SUBCIN EQ 1).SUBCOM
               MEXIT
.SUBCOM  ANOP
.*  GENERATE SYMBOLIC NAMES AND STRUCTURE FOR SUBCOM STATE ENTRY
.*  BASED ON VOYAGER SUBCOM 5/26/78 EWR
         PRINT GEN
SUBCOM   DSECT
* ISEE-C SUBCOM
SUHSUB   DS    H        SUBCOM POSITION FOR HET
SUVSUB   DS    H        SUBCOM POSITION FOR VLET
SUSTATUS DS    F        HET STATUS WORD
SUVLETST DS    F        VLET STATUS WORD T1;T2 ENABLE
* HET AND VLET SUBCOM ARE INDEPENDENT , ONE SUBCOM = 64MF
SUHET1GN DS    H        HET-1 GAIN MODE
SUHIGAIN EQU   1
SULOGAIN EQU   0
SUHET2GN DS    H        HET-2 GAIN MODE
SUHETCAL DS    X        HET  CAL BIT FROM DIGITAL SUBCOM
SUHCALA  DS    X        HET CAL ALLOW BIT FROM STATUS
SUVLTCAL DS    X        VLET  CAL START BIT
SUVCALA  DS    X        VLET CAL ALLOW BIT
SUGAPIND DS    X        DATA GAP INDICATOR
SUDQAL   DS    X        DATA QUALITY ACCEPTANCE LEVEL
SUAUTO1  DS    X        HET-I AUTO GAIN INDICATOR
*                     AUTOMATIC GAIN SWITCHING
*                     0 = YES 1 = NO
SUAUTO2  DS    X        HET-II AUTO GAIN INDICATOR
SUCHSMC  DS    X        CHAPTER SUBJECT MATTER CODE
SUTQFLAG DS    X        TIME QUALITY FLAG
SUBITFLG DS    X        BIT RATE FLAG
SUSUBFLG DS    X        WORST OF QUALITY FLAGS OF HET AND VLET SUBCOMS
*  ASSOCIATED TIMES
         DS    0D
SUDTSTRT DS    D        START S/C TIME OF DATA-MILISEC SINCE START OF YR
*                       77. IF TIME IS NOT AVAILABLE, THIS FIELD CONTAINS
*                       THE VALUE SPECIFIED BY ENTIMPAD IN ENCMCB.
*                       ENTIMPAD WILL BE A NON-ZERO NEGATIVE NUMBER
SUSCC    DS    F        SPACE CRAFT CLOCK
SUDQFLAG DS    4F       DATA QUALITY FLAGS
* EVALUATION FLAGS      0- NOT EXAMINED, 1- OK, -1 TO BE IGNORED
SUFLAG   DS    H        OVER ALL EVALUATION FLAG
SUQFLAG  DS    H        DISPOSITION POSTED BY QUALITY MONITOR
SUSFLAG  DS    H        DISPOSITION POSTED BY STATUS MONITOR
SUCALFLG DS    H        DISPOSITION POSTED BY CAL STATE MONITOR
SUANFLAG DS    H        DISPOSITION POSTED BY ANALOG MONITOR
SUBFLAG  DS    H        DISPOSITION POSTE BY BITRATE MONITOR R
*
SUORBIT  DS    0F       ORBITAL POSITION IN METERS
SUOPGSEX DS    F
SUOPGSEY DS    F
SUOPGSEZ DS    F
SUOPFLAG DS    F      ORBITAL POSITION FLAG
*  DATA LOCATIONS
SUPREVSU DS    AL4      @ OF SUBCOM BLOCK THAT LOGICALLY PRECEDES THIS
*                       BLOCK.
SUNEXTSU DS    AL4      @ OF NEXT SUBCOM BLOCK
SUHETPHA DS    32D      AREA WHERE HET PHA EVENTS ARE STORED
SUVLTPHA DS    32D      AREA WHERE VLET PHA EVENTS ARE STORED
SURATES  DS    24F      AREA WHERE HET RATE COUNTS ARE STORED
SUVLTRAT DS    16F      AREA WHERE VLET RATE COUNTS ARE STORED
SUHSCTRS DS    F        HET SECTORED RATE SUM
SUVSCTRS DS    F        VLET SECTORED RATE SUM
*                       RATES ARE NOT LOGARITHMIC, COUNTS
*                       REPRESENTS THE ACTUAL COUNTER VALUE
* ANALOG SUBCOM #1
SUVLETAN DS    H      VLET ANALOG HOUSEKEEPING
SUHETPM  DS    H      HET POWER MONITOR
SUVLTPM  DS    H      VLET POWER MONITOR
* ANALOG SUBCOM #2
SUHETTH  DS    H      HET THERMISTOR
SUVLTTH  DS    H      VLET THERMISTOR
* DIGITAL SUBCOM
         DS    0F
```

```
SUSPIN   DS    F      SPIN IN MILLISECONDS
* SPACECRAFT WORDS
SUSCWORD DS    96F    MF58,59,60,61,62,122 WORDS
SULEN    EQU   *-SUBCOM
         PRINT NOGEN
         MEND
```

*** END OF MEMBER ***   83 RECORDS PROCESSED   ***********************

```
         MACRO
         VOLINT
         GBLA  &VOLININ
&VOLININ SETA  &VOLININ+1
         AIF   (&VOLININ EQ 1).VOLINT
               MEXIT
.VOLINT  ANOP
         PRINT GEN
VOLINT   DSECT
***********************************************************************
*                                                                     *
*  VOLUME INTRODUCTION DSECT FOR ISEE-C ENCY DATA BASE.               *
*   AFTER VOYAGER VOLINT - PAS                                        *
*                                                                     *
*                                                                     *
***********************************************************************
VOLSDW   DS    F
VOVOCHPN DC    X'00'         CHAPTER NUMBER
VOVOVERN DC    X'00'         VERSE NUMBER
VOEPN    DS    X             ENCY PROGRAM VERSION
VOSCID   DS    X             SATELLITE ID:
VOFLISEE EQU   X'02'            ISEE-C
VOVOVOLN DS    F             VOLUME NUMBER
VOEPDT   DS    0CL6          ENCY PROGRAM DATE:
VOEPYR   DS    H                YEAR, BASE 1900
VOEPMN   DS    H                MONTH OF YEAR
VOEPDY   DS    H                DAY OF MONTH
VOVCDT   DS    0CL6          VOLUME CREATION DATE:
VOVCYR   DS    H                YEAR, BASE 1900
VOVCMN   DS    H                MONTH OF YEAR
VOVCDY   DS    H                DAY OF MONTH
VOVSTRT  DS    0CL10         START TIME OF VOLUME
VOVSYR   DS    H                YEAR, BASE 1900
VOVSMO   DS    H                MONTH OF YEAR
VOVSDY   DS    H                DAY OF MONTH
VOVSHR   DS    H                HOUR OF DAY
VOVSMN   DS    H                MINUTE OF HOUR
         DS    H                (SPARE)
*
VONMCHP  DS    H             NUMBER OF CHAPTERS IN VOLUME
VOAPRMV  DS    12H           ACCEPTANCE LIMITS FOR ANALOG PARAMETERS
*                                    12 PARAMETERS
*                               BYTE 0 - MINIMUM ACCEPTABLE VALUE
*                               BYTE 1 - MAXIMUM ACCEPTABLE VALUE
*                               (FOR %, (0) = 255, (1) = PARTS/256)
VOCHSMC  DS    8X            SUBJECT MATTER CODE FOR CHAPTERS IN VOLUME
VOCHSTAT EQU   X'80'            BIT 0 - (0=OK, 1=UNUSUAL STATUS)
VOCHHCAL EQU   X'40'            BIT 1 - (0=REAL HET DATA, 1=CALIB. DATA)
VOCHVCAL EQU   X'08'            BIT 2 - (0=REAL VLET DATA, 1=CALIB.DATA)
VOCHANA  EQU   X'20'            BIT 3 - (0=OK, 1=ANALOG VALUE(S) UNUSUAL)
VOCHGAP  EQU   X'10'            BIT 4 - (0=OK, 1=TIME GAP)
VOCHBITR EQU   X'04'            BIT 5 - (0=BIT RATE CHANGE, 1=NO CHANGE)
*                               BITS 6-7 - SPARE
VODQAL   DS    X             DATA QUALITY ACCEPTANCE LEVEL
*                             (DETERMINES QUALITY THRESHOLD FOR RATES
*                              TO BE SUMMARIZED)
         DS    X
VOVOLEND EQU   *-VOLINT
         PRINT NOGEN
         MEND
```

*** END OF MEMBER ***   60 RECORDS PROCESSED   **********************

01JUN78 15.45.45 - VOL=DISK02, DSN=ZBPAS.ISEE.CNTL

```
         MACRO
         CHINT
         GBLA  &CHINTIN
&CHINTIN SETA  &CHINTIN+1
         AIF   (&CHINTIN EQ 1).CHINT
               MEXIT
.CHINT   ANOP
         PRINT GEN
CHINT    DSECT
***********************************************************************
*                                                                     *
*  CHAPTER INTRODUCTION DSECT FOR ISEE-C ENCY DATA BASE.              *
*   AFTER VOYAGER CHINT   -   PAS                                     *
*                                                                     *
***********************************************************************
CHSDW    DS    F
CHCHPN   DS    X              CHAPTER NUMBER
CHVERN   DC    X'00'          CHAPTER VERSE NUMBER
         DS    X              (SPARE)
CHCHSMC  DS    X              CHAPTER SUBJECT MATTER CODE
CHVOLN   DS    F              VOLUME NUMBER
CHDTSTRT DS    0CL8           STARTING S/C TIME OF DATA INCLUDED
CHDTYR   DS    H                 YEAR, BASE 1900
CHDTHR   DS    H                 HOUR OF YEAR
CHDTSC   DS    H                 SECOND OF HOUR
CHDTMSC  DS    H                 MILLISECOND OF SECOND
CHDTEND  DS    0CL8           ENDING S/C TIME OF DATA
CHENDYR  DS    H                 YEAR, BASE 1900
CHENDHR  DS    H                 HOUR OF YEAR
CHENDSC  DS    H                 SECOND OF HOUR
CHENDMSC DS    H                 MSEC OF SECOND
CHSTSCC  DS    F              STARTING TIME, SPACECRAFT CLOCK
CHOPGSEX DS    F              ORBITAL POSITION (GSEX) AVERAGE FOR CHAPTER
CHOPGSEY DS    F              ORBITAL POSITION (GSEY) AVERAGE FOR CHAPTER
CHOPGSEZ DS    F              ORBITAL POSITION (GSEZ) AVERAGE FOR CHAPTER
CHSPINPD DS    F              SPIN PERIOD(MSEC), AVERAGE FOR CHAPTER
CHDELSPN DS    F              MAXIMUM SPIN DEVIATION(MSEC)
CHNOWILD DS    H              SUM OF MINOR FRAMES WITH NORMAL SPIN READOUTS
CHWILD   DS    H              SUM OF MINOR FRAMES WITH 'WILD' SPIN READOUTS
*                             DATA QUALITY:
CHDQ00   DS    H              SUM OF MINOR FRAMES PADDED (00)
CHDQ01   DS    H               "     "      "    WITH BAD DATA QUALITY (01)
CHDQ10   DS    H               "     "      "    WITH GOOD "       "   (10)
CHDQ11   DS    H               "     "      "    WITH EXCELLENT  "     (11)
*                             TIME QUALITY:
CHTQ00   DS    H              SUM OF MF WITH QUICK LOOK DATA (00)
CHTQ01   DS    H              "   "  "  "    TIME QUALITY (01)
CHTQ10   DS    H              "   "  "  "    TIME QUALITY (10)
CHTQ11   DS    H              "   "  "  "    TIME QUALITY (11)
CHNMMF   DS    H              NUMBER OF MINOR FRAMES IN CHAPTER
CHNMVER  DS    H              NUMBER OF VERSES IN CHAPTER
CHCN     DS    100X           CHAPTER CONTENTS TABLE
*                                (BYTE POSITION IS VERSE DATA TYPE)
CHHETST1 DS    F              HET COMMAND STATUS, FIRST 3 BYTES
*                                RIGHT JUSTIFIED (BITS CD1 - CD24)
CHHETST2 DS    F              HET COMMAND STATUS, SECOND 3 BYTES
*                                RIGHT JUSTIFIED (BITS CD25 - CD48)
CHVLETC  DS    H              VLET CALIBRATION:
*                                HIGH ORDER BYTE -  CAL ALLOW
*                                LOW  ORDER BYTE -  CAL START
CHHETC   DS    H                 HET CALIBRATION
CHVLETAN DS    0CL16          VLET ANALOG HOUSEKEEPING:
*                               LOW  ORDER BYTE - VALUE
*    (CHVLETST) F ?             HIGH ORDER BYTE -
*                                 0 - VALUE READ OUT IN THIS CHAPTER
*                                 1 - VALUE INFERRED
*                                 2 - VALUE NOT AVAILABLE
CHVP12V  DS    H                      +12 VOLTS
CHVP6V   DS    H                      + 6 VOLTS
CHVTH3   DS    H                      THERMISTOR 3
CHVTH4   DS    H                      THERMISTOR 4
         DS    H              SPARE
         DS    H              SPARE
CHVM6V   DS    H                      - 6 VOLTS
CHVM12V  DS    H                      -12 VOLTS
CHHETPM  DS    H                      HETS POWER MONITOR
CHVLETPM DS    H                      VLETS POWER MONITOR
```

```
CHHETTH  DS    H                          HETS THERMISTOR
CHVLETTH DS    H                          VLETS THERMISTOR
CHBITR   DS    H          BIT RATE
         EQU   B'00000000'                  64 BPS
         EQU   B'00000001'                  1024 BPS
         EQU   B'00000010'                  2048
         EQU   B'00000011'                  512 BPS
         DS    H            SPARE
CHEND    EQU    *-CHINT
         PRINT NOGEN
         MEND
```

*** END OF MEMBER ***   88 RECORDS PROCESSED   **********************

```
         MACRO
         VERSE
         GBLA   &VERSIN
&VERSIN  SETA   &VERSIN+1
         AIF    (&VERSIN EQ 1).VERSE
                MEXIT
.VERSE   ANOP
         PRINT GEN
VERSE    DSECT
*    STRUCTURE OF A VERSE
*    AFTER VOYAGER VERSE - PAS
VESDW    DS     F     SEGMENT DESCRIPTOR WORD
VECHPN   DS     X     CHAPTER NUMBER OF CHAPTER TO WHICH THIS
*                     VERSE BELONGS
VEVERN   DS     X     LOCATION OF THIS VERSE IN THE CHAPTER
         DS     X     SPARE
VESMC    DS     X     CODE THAT DEFINES SUBJECT OF THIS VERSE
*    DESCRIPTION OF SUBJECT MATTER CODES
VERRATE  EQU    0     RAW RATE VERSE
VECCM    EQU    1     COINCIDENCE CONDITION MAP VERSE
VERSUM   EQU    2     RATE SUMMARY VERSE
VEVPHIS  EQU    3     VLET PHA HISTORY VERSE
VEHPHIS  EQU    4     HET PHA HISTORY VERSE
VEH1ASTH EQU    5     HET-I AST, HIGH GAIN
VEH1ASTL EQU    6     HET-I AST, LOW  GAIN
VEH1BSPH EQU    7     HET-I BSTP, HIGH GAIN
VEH1BSEH EQU    8     HET-I BSTE, HIGH GAIN
VEH1BSTL EQU    9     HET-I BST, LOW  GAIN
VEH1PENH EQU    10    HET-I PEN, HIGH GAIN
VEH1PENL EQU    11    HET-I PEN, LOW  GAIN
VEH2ASTH EQU    12    HET-II AST, HIGH GAIN
VEH2ASTL EQU    13    HET-II AST, LOW  GAIN
VEH2BSPH EQU    14    HET-II BSTP, HIGH GAIN
VEH2BSEH EQU    15    HET-II BSTE, HIGH GAIN
VEH2BSTL EQU    16    HET-II BST, LOW  GAIN
VEH2PENH EQU    17    HET-II PEN, HIGH GAIN
VEH2PENL EQU    18    HET-II PEN, LOW  GAIN
VEVLI0   EQU    19    VLET-I, EVENT TYPE 0
VEVLI1   EQU    20    VLET-I, EVENT TYPE 1
VEVLII0  EQU    21    VLET-II, EVENT TYPE 0
VEVLII1  EQU    22    VLET-II, EVENT TYPE 1
VESCWRD  EQU    23    SPACECRAFT WORDS
*                     CLASSIFIED
VEVOLN   DS     F     VOLUME NUMBER OF VOLUME TO WHICH THIS VERSE
*                     BELONGS
VEBODY   DS     0D
RRATVERS EQU    VERSE
RRHCMPS  DS     X     HET  COMMUTATOR POSITION FOR THE FIRST SET OF RATE
*                     READOUTS
RRVCMPS  DS     X     VLET COMMUTATOR POSITION FOR THE FIRST SET OF RATE
*                     READOUTS
RRGAIN1  DS     X     HET-I GAIN MODE FOR THE FIRST SET OF RATE
*                     READOUTS.  (0- LOW GAIN; 1- HIGH GAIN)
RRGAIN2  DS     X     HET-II GAIN MODE FOR THE FIRST SET OF RATE
*                     READOUTS
RRAUTO1  DS     X     HET-I AUTO GAIN SWITCHING INDICATOR
*                     (0-YES; 1-NO)
RRAUTO2  DS     X     HET-II AUTO GAIN SWITCHING INDICATOR
RRNSEQ   DS     H     NUMBER OF RATE SEQUENCES IN VERSE (I.E., GROUPS OF
*                           64 MINOR FRAMES)
RRRATE   DS     0D    RATE WORDS
*
CCMVERSE EQU    VERSE
         ORG    VEBODY
CCMCCM   DS     180H
         DS     0D
CCMVLEN  EQU    *-CCMVERSE
*
RSUMVERS EQU    VERSE
         ORG    VEBODY
RSUMRSM  DS     (236*2)D
RSUMVLEN EQU    *-RSUMVERS
*
PHISVERS EQU    VERSE
         ORG    VEBODY
PHNUMPHA DS     F     NUMBER OF PHA EVENTS READ DURING CHAPTER
         DS     0D
```

```
PHEVPREV DS     16X  IDENTIFICATION OF 16 EVENTS THAT IMMEDIATELY
*                    PRECEDED THE CURRENT CHAPTER
PHEVID   EQU    *    IDENTIFICATION OF EACH OF THE PHNUMPHA
*                    EVENTS READ OUT DURING THIS CHAPTER
PHAVERSE EQU    VERSE
         ORG    VEBODY
PHARAT   DS     2D   RATE SUMMARY BLOCK FOR THE CORRESPONDING RATE
PHPHAEV  DS     F    NUMBER OF EVENTS CORRESPONDING TO DATA TYPE
PHPBLINK DS     F   @ OF NEXT BLOCK IN CHAIN. 0 IMPLIES LAST BLK
PHAPHA   EQU    *    PHA EVENTS- ONE DOUBLE WORD FOR EACH EVENT
*                     SPACECRAFT WORDS VERSE
SWVERSE  EQU    VERSE
         ORG    VEBODY
SWSCBL   DS     F     NUMBER OF BLOCKS OF SPACECRAFT WORDS
         DS     F     SPARE
SWSCDATA EQU    *          (6 * 64) * SCBL BYTES OF DATA
         PRINT  NOGEN
         MEND

*** END OF MEMBER ***      95 RECORDS PROCESSED    *********************
```

```
          MACRO
          ENCMCB    &TYPE=
.*   STRUCTURE OF MASTER CONTROL BLOCK FOR ISEE, ADOPTED FROM
.*       VOYAGER.
          GBLA   &ENCMCIN
&ENCMCIN  SETA   &ENCMCIN+1
          AIF    (&ENCMCIN EQ 1).ENCMCB
                 MEXIT
.ENCMCB   ANOP
          AIF    ('&TYPE' EQ '').DTYPE
ENCMCB    CSECT
          AGO    .CDTYPE
.DTYPE    ANOP
ENCMCB    DSECT
.CDTYPE   ANOP
          PRINT GEN
          GLOBAL
*    STRUCTURE OF MASTER CONTROL BLOCK
ENSCID    DC     X'00'   SPACE CRAFT IDENTIFIER
*                        REFS:
ENEPN     DC     X'01'   ENCYCLOPEDIA PROGRAM VERSION NUMBER
*                        REFS:
ENEPDT    GETDATE      ENCY PROGRAM DATE
*                      REFS: GETDATE(I)
ENEXDT    GETDATE      PROGRAM EXECUTION DATE
*                      REFS: GETDATE(I)
ENCDAT    DS     X     DATA TO BE PROCESSED INDICATOR
*                      REFS:  LOCATE(I),ENCGEN(R),FNEXT(W)
ENERROR   DS     X     ERROR CODE
*                      REFS:  ENINIT(I),ENCGEN(R),READER(W),
*                             ANLYZE(W)
ENANDONE  DS     X     ANALYZER COMPLETION CODE
*                      REFS:  ENINIT(I),ENCGEN(R),ANLYZE(W)
ENFHOBPF  DS     X     FILE HEADER ORBIT POSITION FLAG
*                      0=DEFINITIVE,1=PREDICTED,2=NO ORBIT
*                      REFS: READER(I)
ENFHBITR  DS     X     FILE HEADER BIT RATE
*                       0000 0000=64 BPS, 0000 0001=1024 BPS,
*                       0000 0010=2048 BPS, 0000 0011=512 BPS
*                      REFS: READER(I)
ENRATM0    DC     E'0.0'        IGNORE FOR BIT RATE 64
ENRATM1    DC     E'64.0'      RATE ACCUM. TIME IN SEC. FOR BIT RATE 1024
ENRATM2    DC     E'32.0'      RATE ACCUM. TIME IN SEC. FOR BIT RATE 2048
ENRATM3    DC     E'128.0'     RATE ACCUM. TIME IN SEC. FOR BIT RATE 512
ENEXENO    DC     F'33'        EXPERIMENT NUMBER
ENNEXTSW  DS     F     @ OF SUBCOM BLOCK NEXT TO BE WRITTEN INTO
*                      REFS:  ENINIT(I),ENCGEN(R),READER(W), ANLYZR(R)
ENNEXTSR  DS     F     @ OF SUBCOM BLOCK NEXT TO BE READ
*                      REFS:  ENINIT(I),ENCGEN(R),ANLYZE(RW)
ENFDETR   DS     F     @ OF FIRST DATA LOCATOR ENTRY
*                      REFS:  LOCATE(I),FNEXT(R)
ENCDPTR   DS     F     @ OF CURRENT DATA LOCATOR ENTRY
*                      REFS:  LOCATE(I),FNEXT(RW)
ENTOPSUB  DS     F            @ OF TOP OF SUBCOM QUEUE
*                      REFS:  ENINIT(I)
ENBOTSUB  DS     F     @ OF BOTTOM OF SUBCOM QUEUE
*                      REFS:  ENINIT(I)
ENEUNIT   DC     F'-10'  EDR DATA UNIT NUMBER
*                      REFS:  ENINIT(I),FNEXT(R),READER(R)
ENCSEBR   DS     F      # SCIENCE RECS. TO BE READ
*                       REFS: ENCGEN(I),READER(R)
ENCURSP   DS     F      CURRENT SUBCOM POSITION
*                       0 = EVEN, 1 = ODD
*                       REFS: READER  (R,W)
ENSEEKSP  DC     F'41646'   SUBCOM POSITION SOUGHT
*                       0 = EVEN, 1 = ODD
*                       REFS: READER(R,W)
ENPREVSP  DS     F      PREV. SUBCOM POSITION
*                       0 = EVEN, 1 = ODD
*                       REFS: READER(R,W)
ENLAGTIM  DC     D'1280.0'     LAG TIME IN DECISEC.
*                               BETWEEN LIB. FILES
*                              REFS: READER(R)
ENDTIM64  DC     D'64.0'       # MF/LOGICAL REC.
*                              REFS: READER(R)
ENCURMFT  DS     D             CURRENT MF TIME SPAN
*                              REFS: READER(I,R)
```

```
ENSPINIT DC     F'41646'      NEW FILE TESTER
*                             REFS: READER(R)
EN@DAT   DS     F             @ CURRENT DATA RECORD IN
*                               INPUT TAPE BUFFER
*                             REFS: READER(R,W)
ENPRUNIT DC     F'6'   PROG MESSAGE LOG UNIT
*                REFS: RO FOR ALL SECTICNS OF ENCGEN
ENDQAL   DC     X'03'   DATA QUALITY ACCEPTANCE LEVEL
*                REFS: ANPARM(I),READER(RO)
ENCURSB  DS     D   TIME OF CURRENT SUPER BLOCK
*                REFS: READER(RW)
ENSEEKSB DS     D   TIME OF SUPER BLOCK SOUGHT
*                REFS: ENINIT(I),READER(RW)
ENMSHOUR DC     D'3600000'      MILISECONDS PER HOUR
*                REFS: READER(RO)
ENMSSEC  DC     D'1000'  MILLISECONDS PER SECCND
*                REFS: READER(RO)
ENDCONVT DS     0D
*                     REFS:  UTILITY
         DC     X'4E',7X'00'       AREA FOR FLOAT
         DC     X'4E',7X'00'       CONVERSION
ENTIMPAD DC     D'-1.' VALUE SIGNIFYING PADDED TIME
*                   REFS:
*  PHA VERSE GENERATION INTERFACE
EN@PMSKH DC     V(PHAMSH)  PHA MASK TABLE ADDRESS FOR HET
*                   REFS: ENINIT(R),OUTPUT ROUTINES(R)
EN@PMSKV DC     V(PHAMSV)  PHA MASK TABLE ADDRESS FOR VLET
*                   REFS: ENINIT(R), OUTPUT ROUTINES (R)
EN@PMAPH DS     F          @ OF PHA MAP FOR HET EVENTS
*                   REFS: ENINIT(2), OUTPUT ROUTINES(R)
EN@PMAPV DS     F           @ OF PHA MAP FOR VLET EVENTS
*                   REFS: ENINIT(W),OUTPUT ROUTINES(R)
EN#PTYPE DS     F           NUMBER OF PHA VERSES
*                    REFS: OUTPUT ROUTINES(R)
ENMAXPB  DS     F           NUMBER OF BLOCKS ALLOCATED FOR PHA SORT
*                   REFS:
ENPBSIZE DS     F           SIZE OF PHA BLOCK IN # OF EVENTS
*                   REFS: OUTPUT ROUTINES(R)
ENLPHA   DS     F           LENGTH OF PHA SORT AREA
*                   REFS: OUTPUT ROUTINES(R)
EN@PHA   DS     F           @ OF PHA SORT AREA
*                   REFS: OUTPUT ROUTINES(R)
EN@PHISH DS     F           @ OF HET PHA HISTORY REC DATA
*                   REFS: OUPHIHET(I), OUPHISRT(R)
EN@PHISV DS     F        @ OF VLET PHA HISTORY REC DATA
*                 REFS: OUPHIVLT(I), OUPHISRT(R)
EN1STPV  DS     F           DATA TYPE OF FIRST PHA VERSE
*                   REFS:
ENVOLINT DS     F           @ OF VOLUME INTRODUCTION
*                   REFS: OUTPUT ROUTINES(R), ANL47E (R)
ENCHPINT DS     F           @ OF CHAPTER INTRODUCTION AREA
*                   REFS: OUTPUT ROUTINES(RW), ANL47E (R)
ENCHENDY DS     9F          SUBCOM @ FOR CHAPTERS IN PRESENT VOL
*                   REFS:
ENTIMTOL DC     D'5'    TIME INTERPOLATION TOLERANCE (AAAA)
*                   REFS:
ENVOLEN  DC     D'900000'         NUMBER OF MILISECOND/VOLUME
*                                 REFS: ANL47E (R)
ENCDCB   DCB    DSORG=PS,MACRF=PL,DDNAME=ENCY,BFALN=F,EXLST=ENENEXIT
*                OUTPUT ENCYCLOPEDIA TAPE DCB
*                REFS: OUTPUT ROUTINES(R)
*
ENAPRMV  DC      8H'255'  ANALOG PARAM MIN/MAX VALUES
         DC      X'7D',X'FF'      125,255 COUNTS FOR HET AND
         DC      X'7D',X'FF'     VLET POWER MCNITOR
         DC      2H'255'
*                          REFS:
ENKEEP   DC     F'32'      NUMBER OF SUBCOMS TO PRESERVE BEFORE NEW DATA
*                          REFS: ANL47E (R)
*
ENSCUNIT DC     F'8'       LOGICAL UNIT FOR SCIENCE MESSAGES
*                          REFS: MESSAGE ROUTINES(R)
ENL1     DC     F'2'       LOGICAL*1 TYPE CODE FOR CALLS TO MSG
ENL4     DC     F'3'       LOGICAL*4
ENI2     DC     F'4'       INTEGER*2
ENI4     DC     F'5'       INTEGER*4
ENR8     DC     F'6'       REAL*8
ENR4     DC     F'7'       REAL*4
```

```
*
         DS    0F
ENENEXIT DC    X'E7',AL3(ENCJFCB)    JFCB FOR OUTPUT ENCY TAPE
                                        REFS: OUTPUT ROUTINES(R)
*
ENCJFCB  DS    176C       JFCB BLOCK FOR ENCY TAPE OUTPUT
                         REFS: OUTPUT ROUTINES(R)
*
ENCHPLOC DS    16F       8 PAIRS OF @ OF 1ST AND LAST SUBCOMS
                         FOR EACH OF A MAX OF 8 CHAPTERS.
*
*                        REFS: OUTPUT ROUTINES(R), ANALYZER(W)
ENSTARTV DS    F      FIRST VOLUME PROCESSED
*                     REFS: OUTPUT ROUTINES(RW)
ENENDV   DS    F      LAST VOLUME PROCESSED
*                     REFS: OUTPUT ROUTINES(W)
ENBPFEET DC    D'75000.'    BYTES PER FEET AT 6250BPI
*                           REFS: OUTPUT ROUTINE(R)
ENIRGAP  DC    D'0.05'      INTER-RECORD GAP (FEET)
*                           REFS: OUTPUT ROUTINE(R)
ENFTMAX  DC    D'1800.'     MAX AMOUNT OF TAPE TO WRITE
*                           REFS: OUTPUT ROUTINE(R)
ENFTOUT  DC    D'0.'        AMOUNT OF TAPE CURRENTLY WRITTEN
*                           REFS: OUTPUT ROUTINES(RW)
*  FOR LOG INTERFACE
ENLOGDAT DC    V(LOGDAT)
ENRTCODE DS    F            RETURN CODE FROM LAST LOG RTN
*                           REF: OUTPUT ROUTINES(R)
ENATTRIB DS    16F          ATTRIBUTE BLOCK
*                           REFS: OUTPUT ROUTINES(R)
ENWRKBLK DS    16F          WORK BLOCK
*                           REFS: OUTPUT ROUTINES(R)
ENLIBBLK DS    16F          LIBRARY BLOCK
*                           REFS:
ENERCODE DC    F'0'         ERROR CODE
*                           REFS:
*
ENMONCAL DC    X'00'     CAL. DATA MONITOR FLAG, USUALLY NO
         DC    3X'00'
*                        REFS: MONITOR(R)
ENMAXFIL DC    F'0'      NO. OF FILES TO PROCESS UNDER ENMONCAL MODE
*                        REFS: MONITOR(R)
ENCBLEN  EQU   *-ENCMCB     LENGTH OF CONTROL BLOCK
*                    REFS:  ENCGEN
         PRINT NOGEN
         MEND
```

*** END OF MEMBER ***   198 RECORDS PROCESSED   ***********************