DATA SET CATALOG # 177

66-110A-01A

SUPRATHERMAL ION DETECTOR DATA

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1. INTRODUCTION:

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

When printing, special settings may be required to make the text box appear on the printed output.

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC INFORMATION SYSTEM:

http://nssdc.gsfc.nasa.gov/nmc/

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

a. Associated Documents To find associated documents you will need to know the document ID number and then click here.
http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/

b. Core Catalog Materials

ATS-I

SUPRATHERMAL ION DETECTOR DATA

66-110A-01A

5 tapes were bad for a total of 60

This data set consists of fifty-five (55) 7094 compatible tapes written at 556 BPI, BCD, with two (2) files per tape. The first file contains only a header record and is very short. The second file is the data file. Both the 'D' and 'C' copies are 7 track tapes.

D#	C#	START	STOP
8003	7326	2/02/67	2/02/67
8004	7327	2/04/67	2/04/67
8005	7328	1/29/67	1/30/67
8006	7329	1/23/67	1/23/67
8007	7330	1/22/67	1/23/67
8008	7331	1/20/67	1/20/67
8009	7332	1/19/67	1/19/67
8010	7333	1/17/67	1/17/67
8011	7334	1/16/67	1/16/67
8012	7335	1/15/67	1/15/67
8015	7336	1/04/67	1/05/67
8016	7337	1/11/67	1/11/67
8017	7338	1/10/67	1/10/67
8018	7339	1/09/67	1/10/67
8019	7340	1/08/67	1/08/67
8020	7341	1/05/67	1/06/67
8021	7342	1/02/67	1/02/67
8022	7343	1/01/67	1/01/67
8023	7344	1/13/67	1/13/67
8024	7345	12/30/66	12/30/66
8025	7346	12/24/66	12/24/66
8026	7347	1/12/67	1/13/67
8028	7348	12/29/66	12/29/66
8029	7349	12/18/66	12/18/66
8030	7350	12/19/66	12/19/66
8031	7351	12/26/66	12/26/66
8032	7352	12/31/66	12/31/66

D#	C#	START	STOP
7973	7297	12/28/66	12/28/66
7975	7298	12/23/66	12/23/66
7976	7299	12/17/66	12/17/66
7977	7300	12/15/66	12/15/66
7978	7301	12/14/66	12/14/66
7979	7302	12/10/66	12/10/66
7980	7303	12/12/66	12/12/66
7981	7304	2/18/67	2/18/67
7982	7305	2/14/67	2/15/67
7983	7306	12/13/66	12/13/66
7984	7307	2/17/67	2/17/67
7985	7308	2/09/67	2/09/67
7986	7309	2/13/67	2/14/67
7988	7310	2/01/67	2/02/67
7989	7311	1/31/67	1/31/67
7990	7312	1/30/67	1/31/67
7991	7313	1/28/67	1/28/67
7992	7314	12/14/66	12/14/66
7993	7315	1/27/67	1/27/67
7994	7317	1/26/67	1/26/67
7995	7318	1/21/67	1/21/67
7996	7319	1/24/67	1/25/67
7997	7320	2/10/67	2/10/67
7998	7321	2/12/67	2/13/67
7999	7322	2/08/67	2/09/67
8000	7323	2/06/67	2/06/67
8001	7324	1/18/67	1/18/67
8002	7325	2/03/67	2/04/67

ATS-1/SID DATA REDUCTION

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27 December 1971

ATS-1/SID DATA REDUCTION

The purpose of this note is to describe very briefly the philosophy behind the reformat of the ATS-1 Suprathermal Ion Detector (SID) data tapes. The flight data tapes have been converted to a packed BCD format of 12-character words.

Figure 1a shows schematically the operational format of the SID instrument. There are 22 energy steps in a single energy spectra. Each energy step consists of 32 intervals, only 29 of which contain scientific data (particle count rates), the other 3 being used for housekeeping. A single sampling interval is broken into several parts (Figure 1b). With respect to the telemetry format the data is divided into sequences so that

1 sequence = 1 energy step

Scientific and housekeeping data from the SID together with header information were supplied to Rice by GSFC on tapes in the following format:

6 characters/word
41 words/logical record
5 logical records/physical record
≈ 140 physical records/file

IRRELEVANT TO DATA AT NSDC

The relations among the GSFC format and the telemetry and operational formats is:

Tape		SID		Telemetry
1 logical record	=	1 energy step	=	1 sequence
22 logical records	=	1 energy spectra		

Note that an energy spectra consists of a fractional number of physical records. A schematic of the ATS-1 telemetry format is shown in Figure 2.

In order to be useful all of the data of the GSFC tapes must be "unpacked" which consists of transforming the BCD and hexadecimal coded data into decimal and then dismantling the packed data word into its logical components. This process is carried out by the UNPACK subroutine. The packed GSFC tape format is given in Table 1. UNPACK also generates several data error codes which are listed in Table 2. In addition there is a data quality flag generated by GSFC; there are also several possible values for "filler" or invalid data (Table 2). Shown in Figure 3a is a sample of the data roughly as it appears after UNPACK-ing by a preliminary UNPACK program which lists seperately each data item appearing on the flight tape. All of the GSFC data tapes have been printed out in this manner as the basis for checks on any further manipulation of the data. The final reformat program unpacks the data in a similar manner and repacks it as indicated below. By way of introduction we note the following points:

a) Each 2-line set (A, B, C,...) is a single sequence. Each piece of data in the sequence may be identified from Table 1.

b) All of the scientific data points (F0C2-C15 and F1C1-15) in the printouts must be corrected for pre-scaling and telemetry encoding errors as follows:

   1) Telemetry error results in disagreement between the analog data sample $Z_{34}Z_{34}Z_{34}$ (F1C15) and its digital calibration (F12C8, C9, see Figure 3a for location). A comparison of these two numbers shows whether all the data in the sequence is to be rounded up or down For instance, in sequence C (Figure 3a) F1C15 has the value 15.5 while the calibration is 16 indicating

a round up is to be performed on all the data including F1C4 which is 5.8 and is rounded to 6. It is nearly always the case that the data is to be rounded up. This function is performed by UNPACK.

2) Pre-scaling of the raw data by the SID electronics must then be inverted to obtain the correct number of counts/accumulation interval. The correspondence between pre-scaled and corrected data is given in Table 3. This correction is performed by the PRNT subroutine. Note that all data produced by the present program is biased upward by 8 counts in order to avoid negative numbers in the repacked format. All data must have 8 counts subtracted from it before it is used.

c) In Figure 3a the location of the sun with respect to the data sequence is given approximately (± 1 angular channel) by the location of the asterisk (e.g. F0C3 in sequence A). The revised version of UNPACK in the reformat program corrects for the asymmetry of the 0.005 sec accumulation interval with respect to the 0.020 sec channel width (Figure 1b). The center of the channel is redefined as the center of the accumulation interval at 0.005 sec rather than the true center at 0.010 sec.

After UNPACK produces a single sequence of corrected data (stored in the array SPREAD), the main program puts the sequence into the array WORK which eventually contains an entire energy spectrum of 22 sequences. The main program checks the limiting

time and the sequence number (as a precaution against mis-ordering) and then continues, using UNPACK, to grind out one sequence at a time until WORK has been assembled. At this point the subroutine PRNT is called to perform the final data manipulation and repacking. Briefly PRNT does the following:

a) Corrects the pre-scaled data to give counts/accumulation interval as per Table 3 but does not remove the 8 count bias discussed above.

b) Rearranges the corrected data inside the array WORK to take account of the true number of angular channels (based on the satellite spin period)and the location of data with respect to the sun pulse.

   1) Although there are only 29 data points per sequence there are a total of 32 channels (Figure 1a). Note that one of the housekeeping channels always occurs inside of the 29 data channels (F1C0, Figure 2) so in effect there are 30 channels in a continuous data sequence excluding F0C0 and F0C1. Now the spin period may vary (~ days) usually inside the limits ≈ 0.60 to 0.64 sec. Thus the actual number of angular channels to be used may vary as well, according to the formula

$$N_{ch} = \frac{\text{Spin period (sec)}}{0.640 \text{ sec}} \times 32$$

   where N_{ch} is rounded to the nearest integer. For example, the spin period for the data in Figure 3a, b was 0.617 sec giving $N_{ch} = 31$. Note that the repacked data (Figure 3b) has only 31 channels including the filler data for F1C0 and F0C0 words. The permissible range in the number of channels is 29 to 32 inclusive. Should the spin rate vary outside the normal range, the

number of angular channels is held at the corresponding limit.

2) Data in the WORK array is rearranged so that the first piece of data becomes the one in which the sun pulse occurs (before this the "first" piece of data was the first piece in chronological order in the sequence). All of the other data then follows in chronological order so that the data is still contiguous in azimuth. For a full description see the discussion of instrument operation.

c) The data in WORK is then assembled into a new format for output by summation of the data into integers of maximum permissible size in the B5500 (the 12 digit number $2^{39} - 1 =$ 549755813887). This is done by assigning each piece of data the proper order of magnitude and then summing while making sure that the limit is not passed. For example, the four data points $Y_5Y_5Y_5$, $Y_6Y_6Y_6$, $Y_7Y_7Y_7$, $Y_8Y_8Y_8$ would be combined in the following way:

$$Y_5Y_5Y_5 \times 10^9 + Y_6Y_6Y_6 \times 10^6 + Y_7Y_7Y_7 \times 10^3 + Y_8Y_8Y_8.$$

This continues through the entire sequence which requires 10 such numbers, and the array WORK, which results in 220 I12 numbers (330 BCD words). An example of data repacked by this scheme is shown in Figure 3b. The format is listed in Table 4.

Control is then returned to the main program which stores the repacked WORK array in a 3-dimensional array called MOTHER which is capable of accumulating 32 WORK arrays (≈ 1 hour of data). Once MOTHER is full (or the end time is reached) the main program dumps MOTHER on the tape and either stops or goes back for more.

TABLE 1.

Format of Packed ATS-1/SID data

WORD	CONTENTS	EXPLANATION	FORM	TELEMETRY ID.
1	$T_D T_D T_D T_M T_M T_M$	T_D = Day of year	BCD	
2	$T_M T_M T_M T_M T_M S$	T_M = Time of day in msec.	BCD	
3	S S S S S S	S = Sequence number	BCD	
4	O U U U U U	U = Sequence number, not used	HEX	
5	O O O X X X	X = Counter calibration	BCD	FOC1
6-19	O O O $Y_N Y_N Y_N$	Y_N = Analog data (N=6-19)	BCD	FOC2 - FOC15
20-34	O O O $Z_N Z_N Z_N$	Z_N = Analog data (N=20-34)	BCD	F1C1 - F1C15
35	O O D D D D	D = Number of 5 msec intervals from start of sequence to 'see sun' pulse. Used only if time from WORD 41 is < 0	HEX	F4C8 - F4C11
36	O O O O C C	C = Digital calibration of data sample Z_{34}	HEX	F12C8, F12C9
37	O O E O O E	E = Energy step number.	HEX	F12C10, F12C11
38	O O O $P_1 P_1 P_1$	P_1 = Temperature, not used	BCD	F12C6
39	O O O $P_2 P_2 P_2$	P_2 = Temperature, not used	BCD	F12CF
40	O O M O O O	M = Instrument on/off, not used	HEX	F14C2
41	F O W W W W	F = Sequence data quality flag	BCD	
		W = Time in msec from start of sequence to 'see sun' pulse		

TABLE 2 ERROR NOTATIONS

A. DATA VALUES (F0C0 - F0C15; F1C0 - F1C15)

DATA (CORRECTED) OUTPUT	MEANING
≤ 496	VALID DATA (UNLESS OTHERWISE NOTED)
498	DATA EXCEEDED MAXIMUM ALLOWED (> 496)
499	DATA POINT <0
500	FILLER FOR HOUSEKEEPING CHANNELS (F0C0, F0C1, F1C0)

B. DATA QUALITY FLAG

FLAG	MEANING
2	GOOD TIME AND DATA
3	GOOD TIME, SOME BAD DATA
7	NO GOOD TIME OR DATA, DATA NOT PROCESSED.

C. UNPACK ERROR FLAG

FLAG	MEANING	UNPACK ACTION
0	NO UNPACK DETECTED ERRORS	-
1	ENERGY STEP ERROR, L.O. DIGIT	SET STEP = 33
2	" " " , H.O. DIGIT	" " "
3	" " " , STEP > 20	" " "
4	SUN TIME (WWWW & DDDD) ARE < 0	SET TIME = 0
5	NUMBER OF ANGULAR CHANNELS > 32	SET NO. = 32
6	SEQUENCE NUMBER < 0	SET NO. = 0
7	CALIBRATION (CC, WORD 36) INVALID	ALL DATA IS ROUNDED DOWN

TABLE 3.

SID PRE-SCALED DATA CONVERSION
TO COUNTS/ACCUMULATION INTERVAL

PRE-SCALED	REFORMATED TAPE OUTPUT	CORRECTED (COUNTS/ACC. INT.)
< 0	499	
0	0	-8
1	1	-7
2	2	-6
3	3	-5
4	4	-4
5	5	-3
6	6	-2
7	7	-1
8	8	0
9	9	1
10	10	2
.	.	.
.	.	.
15	15	7
16	16	8
17	18	10
18	20	12
.	.	.
.	.	.
31	31	38
32	32	40
33	33	44
34	34	48
.	.	.
.	.	.
47	108	100
48	112	104
49	120	112
50	128	120
.	.	.
.	.	.
63	232	224
64	240	232
65	256	248
66	272	264
.	.	.
.	.	.
79	480	472

DIFFERENTIAL DATA ONLY

TABLE 4

FORMAT OF REPACKED ATS-1/SID DATA

WORD	CONTENTS	EXPLANATION	PACKED (TABLE 1) WORD
1	$Y\ Y\ Y\ H\ H\ M\ M\ S\ S\ S_M S_M S_M$	Y = Day of year H = Hour of day M = Minute S = Second S_M = Milliseconds	1, 2
2	$E\ E\ A\ F_U F_D\ N\ N\ N\ N\ N\ N\ N$	E = Energy step A = Location of sun pulse within 20 msec. channel F_U = UNPACK error flag F_D = Data quality flag N = Sequence no.	37 35, 41 —— 41 2, 3
3 . . .	$D_1 D_1 D_1 D_2 D_2 D_2 D_3 D_3 D_3 D_4 D_4 D_4$	$D_i D_i D_i$ = Corrected analog data or filler for housekeeping words.	6-34
10	$D_{29} D_{29} D_{29} D_{30} D_{30} D_{30} D_{31} D_{31} D_{31}$ $D_{32} D_{32} D_{32}$		

FIGURE 1a. SCHEMATIC DIAGRAM OF A SINGLE ENERGY SPECTRUM.

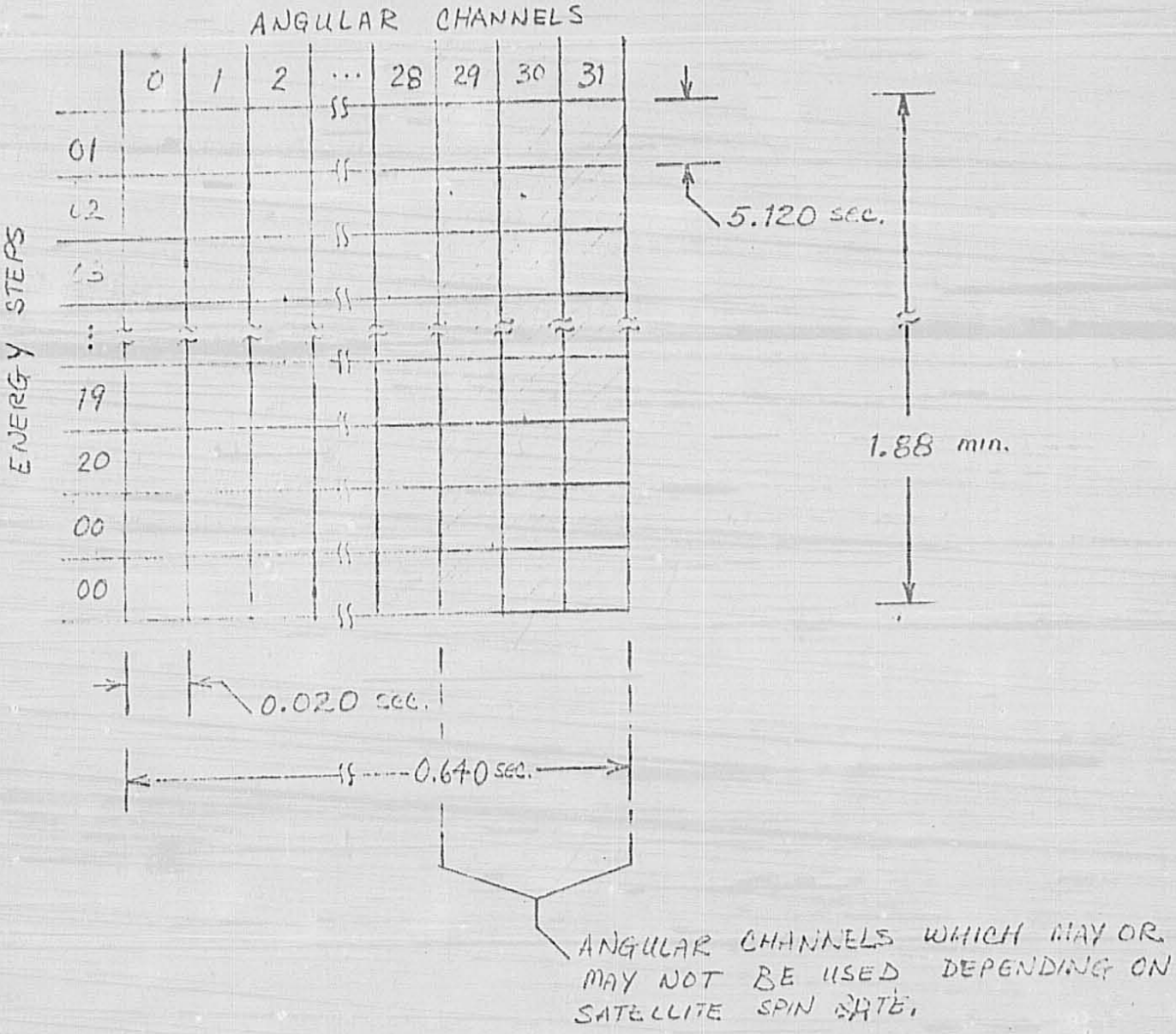

FIGURE 1b. SCHEMATIC OF A SINGLE SAMPLING INTERVAL (≡ SINGLE ANGULAR CHANNEL IN FIG. 1a.)

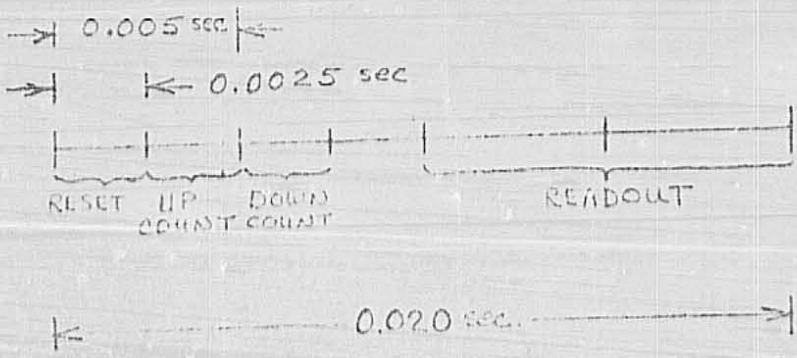

FIGURE 2. ATS-1 TELEMETRY FORMAT SHOWING SID DATA AND HOUSEKEEPING WORDS.

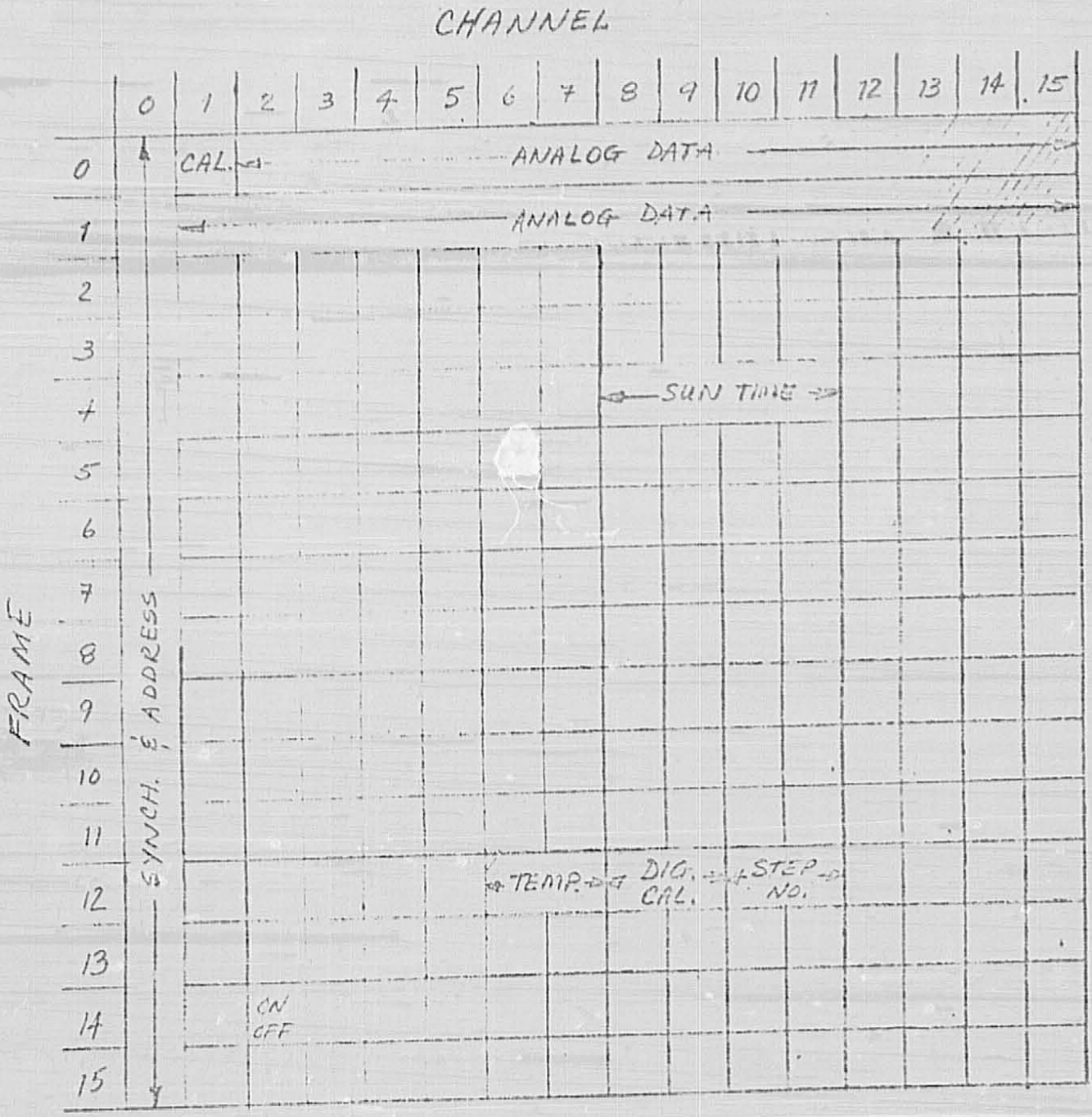

FIGURE 3a. UNPACK OUTPUT DATA FORMAT

DAY ($T_D T_D T_D$)

HOUR

MINUTE — $T_m T_m \cdots T_m$

SECOND

SEQUENCE No. (SSS...S)

FOC1, FOC2, etc. — DATA ARE FOC2 ... FOC15 AND F1C1 ... F1C15

F1C1 F1C2

APPROXIMATE CHANNEL IN WHICH SUN PULSE IS LOCATED

CALIBRATED ANALOG DATA F1C15

CALIBRATION F12C8,C9

ENERGY STEP F12C8,C9

TEMPERATURE F12C6, C7

UPPER: TIME (DDDD)
LOWER: TIME (WWWW)

SEQUENCE DATA QUALITY FLAG (F)

A	006-00-28-53.015	71.4	10.7	06.7	07.7	01.0	08.8	03.9	15.6	02.8	08.8	08.8	06.8	12.6	08.7	09.7		14	40.5	0078	1
	00199 0601607	05.7	01.8	11.7	03.0	05.9	04.8	07.7	04.7*	05.8	05.7	03.9	12.7	08.7	14.7	05.8	006		38.4	0470	
B	006-00-28-58.135	71.3	03.8	08.8	05.9	05.9	06.7	04.9	08.8	11.7	03.8	00.0	06.7	08.6	07.8	05.7*		15	40.5	0061	2
	00200 0601608	04.7	10.7	08.6	07.7	09.9	03.8	08.7	08.7	05.7	02.8	03.8	05.8	11.5	08.6	07.7	008		38.4	0445	
C	006-00-29-03.256	71.3	12.6	05.6	07.7	06.8*	04.9	05.8	01.0	02.0	08.6	11.5	07.7	10.7	03.8	14.5		16	40.4	0024	2
	00201 0601609	03.8	07.6	05.8	05.8	10.7	06.8	10.7	06.7	05.7	07.6	04.8	08.8	05.7	08.7	15.5	016		38.2	0120	
D	006-00-29-08.377	71.3	02.9	08.7	07.8	09.8	05.6	14.7	00.0	10.7	07.8	06.7	02.9	08.7	08.7	08.7		17	40.2	0110	2
	00202 0601610	02.9	09.7	06.8	12.6	11.6	04.0	03.8	05.7	07.9	09.8	08.7*	04.8	06.9	09.7	14.7	015		38.3	0550	
E	006-00-29-13.497	71.2	03.9	04.7	07.8	09.7	03.7	09.7	09.6	07.8	07.7	05.8	06.8	08.7	13.7	03.7		18	40.2	0073	2
	00203 0601611	05.7	07.8*	08.8	08.7	12.7	14.7	07.7	10.6	05.8	11.7	10.7	11.7	07.8	05.7	07.7	008		38.3	0365	
F	006-00-29-18.618	71.2	07.7	15.6	03.8	08.7	11.8	04.8	09.8*	11.5	00.9	05.8	04.0	00.9	07.7	07.8		19	40.2	0036	2
	00204 0601612	08.7	08.8	06.8	05.7	06.8	16.5	05.8	04.8	08.6	06.7	04.8	05.8	06.8	02.8	03.7	004		38.4	0120	
G	006-00-29-23.738	87.5	09.8	14.5	12.7	15.3	11.6	12.7	09.8	12.6	12.7	17.6	18.4	12.7	15.5	08.7		20	40.4	0122	2
	00205 0601613	12.6	13.7	09.8	09.7	09.6	12.7	11.6	13.7	13.6	14.6	13.6	15.5	13.7	10.9*	10.6	011		38.3	0610	

FIGURE 3b. REPACKED DATA FORMAT

DAY
HOUR
MINUTE
SECOND
MSEC
ENERGY STEP*
SUN TIME
UNPACK ERROR FLAG
DATA QUALITY FLAG
SEQUENCE
DATA STARTS WITH CHANNEL IN WHICH SUN IS LOCATED
TYPICAL DATA →
FILLER FOR F100 SYNCH & ADDRESS WORD ("555" FILLER CHANGED TO 748 WHEN READ AS DATA)
FILLERS [FOR EXTRA DATA CHANNEL 32 AND FOC 1 (COUNTERS)]

A –	4002	2	53	015	16	02	06	01	607	500	506	004	130	201	506	006	110	07	008	002	906	401	600	3	900	207	013	901	304	006	201	207	777	500	505	500
B –	4002	2	53	135	17	02	06	01	608	449	805	011	900	301	400	4	901	309	011	401	502	004	806	401	6	701	007	006	800	300	004	006	201	013	304	007
C –	4002	2	53	230	18	02	06	01	609	800	600	200	3	901	309	011	401	502	004	806	406	401	6	701	007	006	200	930	498	301	003	013	120	600	504	006
D –	4002	2	53	377	19	02	06	01	610	900	500	701	6	150	301	400	8	100	501	500	7	100	200	400	6	100	200	400	6	100	200	400	6	498	004	500
E –	4002	2	13	476	20	3	02	06	611	900	500	901	6	150	301	100	6	120	11	012	008	600	300	400	6	800	400	400	6	700	300	400	8	100	400	8
F –	4002	2	18	18	21	02	06	01	612	120	106	000	1	003	004	8	900	503	700	6	701	000	600	5	000	5	006	7	003	004	008	1	000	400	3	312
G –	4002	2	37	38	22	02	06	01	613	110	110	010	15	130	401	2	013	100	1	013	020	220	130	110	00	400	130	410	10	100	1	012	140	1	015	014
H –	4002	2	55	555	23	02	06	01	614	330	300	900	0	100	400	4	013	400	5	006	014	160	300	700	0	100	100	500	7	200	5	007	0	100	500	7
	4002	2	33	579	24	02	06	01	615	110	0	012	015	428	010	012	012	160	2	012	024	240	160	100	12	200	130	13	013	130	12	010	013	140	120	14
	4002	2	39	097	31	02	06	01	616	400	100	110	10	120	100	7	013	600	8	011	009	134	900	200	14	100	700	900	7	600	7	001	3	100	500	5
	4002	2	44	221	43	02	06	01	617	700	100	500	11	110	500	300	9	300	4	006	009	400	1	001	0	100	400	8	008	100	4	011	1	000	4	011
	4002	2	49	341	52	02	06	01	618	1	190	013	015	110	1	011	006	900	4	011	003	800	500	300	6	130	090	090	9	900	7	007	014	900	1	007
	4002	2	54	451	33	02	06	01	619	100	050	090	07	400	300	200	9	800	5	400	2	004	120	100	5	100	1	000	5	400	1	010	005	700	100	7
	4002	2	59	583	73	02	06	01	620	900	100	300	9	120	11	010	10	500	2	007	007	110	500	200	12	100	110	10	4	900	4	009	005	130	040	040
	4003	2	00	473	82	02	06	01	621	100	060	090	10	100	400	1	014	900	2	000	001	110	130	700	4	200	6	008	007	130	040	040	12	400	100	100

*ENERGY STEPS 0 AND 6 ARE OFTEN LABELED "33" (WITH UNPACK ERROR FLAG "1"); HOWEVER THIS DATA IS STILL VALID

July 14, 1972

To: Mr. Don Hei

From: A.D.P. Services JRI

Subject: ATS-I, 66-110A-01A, Suprathermal Ion Detector Data

The following tapes are bad and we would like to get replacements for them in order to complete the data set.

Group#	Tape#	Times
19	16R	359.00.11-359.22.52
72	89R	47.00.25-47.18.26
32	39R	07.00.33-07.20.18
31	38R	06.00.12-06.23.46
21	21R	361.00.00-361.23.22

Complete data set as is

Don Hei 7/17/72

12.2 11.47 ORIGINAL 15R

of 35

TAPE 15A CONTAINS DATA AS FOLLOWS

01 ATSH EXPERIMENTER TAPE NUMBER = 05 GROUP NUMBER = 0017 DATE PRODUCED = 670124

SATELLITE SPIN RATE = .15310E 09 RPM, EACH 20 MSEC PERIOD SUBTENDS 11.61 DEGREES, THERE ARE 31 ANGULAR CHANNELS

357223133562	33020469257	8004015014	7003014009	1004498006	1013011020	8009004008	14010008011	18001000020	901505500	
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357223148923	33312469260	5007016005	32003002498	6003006018	13001002010	1007016009	3016002000	18006013011	11016096500	
357223154044	71020469261	1000004015	7001010010	11015008014	7015004014	498007016011	9016009001	3011009001	12014001500	
357223159164	16402469262	1008010015	6001011001	3010014000	12012001009	13011008012	7015007002	1008498003	3008002500	
357223204284	33273469263	498498005008	8002008005	4010010002	7006007004	498006011014	16015007005	9006001003	5600512500	
357223209405	10202469264	2004011008	16011007009	5000011	8498022005	7006012005	10007009001	16013004007	352000004500	
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0	0	0	0	0	0	498000000	0	0	500	

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357223412300	12402469288	4009003009	1013000008	5007005005	9008099014	6020013009	11498009013	6015001022	14001007500	
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ATS-I 15-R

SUPRATHERMAL ION DETECTOR DATA

66-110A-01A

D-7975

556 B.P.I. B.C.D.

2 FILES

1ST & LAST RECORDS OF 2ND FILE

DECEMBER 23, 1966

DECEMBER 23, 1966

REC 1, LENGTH 2640

357223133562 33020469257 8004015014 7003014009 1004498006 1013011020 8009004008 14010008011 180
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REC 2, LENGTH 2640

357223326214 31020469279 4012016010 5011006010 7009004015 15008000012 1007011002 12010004020 80
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08009012499004498500357223513747 24030469300 32092028030499499028499 22498499022 20026052046 2602802
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REC 3, LENGTH 2640

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DATE IS MONDAY, 12/27/71 TIME IS 1058
LABEL 000000000LINE 001713617COMPILE DTY1/DYSTAT FORTRAN . 437755 (FROSCH,ALEX) FORTRAN/DTY1

PROGRAM USED TO REFORMAT ATS/SID DATA

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FILE  1=M, UNIT=TAPE, UNLABELED, ALPHA, RECORD=160                          R  0000
FILE  3=B     ,UNIT=TAPE,UNLABELED,ALPHA,RECORD=330                         R  0000
FILE  6=PRINT,UNIT=PRINT                                                    R  0000
C-                                                                  00000060 R  0000
                                                          START OF SEGMENT **********   1
      DIMENSION DATA(41,5),ID(15),COMP(2)                           00000100 R  0000
      DIMENSION WORK(41,22),PACKO(10,22),MOTHER(10,22,32)                   R  0000
      DIMENSION HDR(15)                                                     R  0000
      COMMON// IEND,INPUT(41),SPREAD(41)                            00000200 R  0000
      DATA COMP/6H098520,6H095390/                                  00000300 R  0000
      COMMON/STP/ST,IFLAG                                           00000350 R  0012
      DATA ANDFCT/077777777700/,ICODE/6H999999/                     00000400 R  0012
      INTEGER SUNCON,SPREAD,DATA                                    00000700 R  0032
      INTEGER WORK,PACKO,ST                                                 R  0032
      DATA NGOOD,SSUM,NSPEC,XCENT,YCENT/0,0.,0,2.,8./                       R  0032
      INTEGER TAPE,SDAY,BDAY                                        00000900 R  0051
C                                                                   00001000 R  0051
C                                                                   00001100 R  0051
      LFLAG=1                                                               R  0051
      K=1                                                                   R  0052
      KFLG=1                                                                R  0052
      ST=40                                                         00001150 R  0053
      ITIME=0                                                       00001200 R  0054
      M=1                                                           00001300 R  0055
      B=3                                                                   R  0056
 1111 REWIND M                                                      00001400 R  0057
      READ 10,TAPE,NFILS                                                    R  0061
   10 FORMAT (A6,I6)                                                        R  0074
C                                                                   00001900 R  0074
C     LABEL FILE                                                    00002000 R  0074
C                                                                   00002100 R  0074
C                                                                   00002200 R  0074
 1003 READ(M,12,END=1000,ERR=13) (HDR(J), J=1,15)                           R  0074
   12 FORMAT (15A6)                                                 00002400 R  0096
      GO TO 1000                                                    00002800 R  0096
C                                                                   00002900 R  0096
C     LABEL RECORDS                                                 00003000 R  0096
C                                                                   00003100 R  0096
 1000 CONTINUE                                                      00003200 R  0097
      INX=5                                                         00003300 R  0097
      READ (M,12,END=1000,ERR=30)  (DATA(J,1),J=1,15)                       R  0097
   30 N=30                                                          00003500 R  0119
      ANGINC=12.                                                    00003600 R  0119
      RPM= AND (ANDFCT,DATA(4,1))                                   00003700 R  0120
      IF(RPM.GE.COMP(2).AND.RPM.LT.COMP(1)) GO TO 31                00003800 R  0122
      IF(RPM.LT.COMP(2)) GO TO 32                                   00003900 R  0125
      GO TO 49                                                      00004000 R  0128
   31 ANGINC=360./31.                                               00004100 R  0129
      N=31                                                          00004200 R  0130
      GO TO 49                                                      00004300 R  0131
   32 ANGINC=11.25                                                  00004400 R  0132
      N=32                                                          00004500 R  0134
   49 CONTINUE                                                      00004600 R  0136
C                                                                           R  0136
C     INSERT HEADER PRINT OUT    4/15/70   DY                               R  0136
   13 WRITE (6,11)TAPE,( HDR(J),  J=1,15)                                   R  0136
   11 FORMAT (1H1,7X,6HTAPE  ,1A6,24HCONTAINS DATA AS FOLLOWS/      00002600 R  0155
     1    1H0,5X,15A6/)                                                     R  0155
      WRITE(6,60)RPM,ANGINC,N                                               R  0155
   60 FORMAT(" SATELLITE SPIN RATE = ",E12.5," RPM, EACH 20 MSEC "          R  0169
     1 "PERIOD SUBTENDS ",F5.2," DEGREES, THERE ARE ",I2," ANGULAR "        R  0169
```

```
     2 "CHANNELS"7)                                                          R  0169
C                                                                            R  0169
   50 READ 16,BDAY,IBH,IBM,IBS,SDAY,ISH,ISM,ISS                   00004700 R  0169
16    FORMAT(8I10)                                                           R  0193
      IF(IBH.EQ.99) GO TO 9999                                               R  0193
      DUM=0                                                          00005000 R  0195
      IHRB=IBH*3600000                                               00005100 R  0196
      IMNB=IBM*60000                                                 00005200 R  0198
      ISTART=IHRB+IMNB+IBS                                           00005300 R  0201
      IHRS=ISH*3600000                                               00005400 R  0203
      IMNS=ISM*60000                                                 00005500 R  0206
      ISTOP=IHRS+IMNS+ISS                                            00005600 R  0209
      KFLAG=1                                                        00005700 R  0211
      IF(INX.NE.5) GO TO 460                                         00005800 R  0212
 1001 READ(M,20,END=1012,ERR=190)   DATA                                     R  0215
   20 FORMAT (205A6)                                                 00006000 R  0231
  190 IF(KFLAG.EQ.2) GO TO 399                                       00006100 R  0231
  460 IF(DATA(1,1).EQ.ICODE) GO TO 999                               00006200 R  0234
      DO 210 NM=1,5                                                          R  0236
      J=6-NM                                                                 R  0241
      DO 200 I=1,41                                                  00006500 R  0243
  200 INPUT(I)=DATA(I,J)                                             00006600 R  0249
      CALL UNPACK                                                    00006700 R  0252
      IF(ISTART.GT.SPREAD(2)) GO TO 1001                             00006800 R  0253
  210 IF (ISTART.GE.SPREAD(2)) GO TO 500                             00006900 R  0256
C                                                                    00007000 R  0257
C     READ DATA                                                      00007100 R  0257
C                                                                    00007200 R  0257
  500 INX=J                                                          00007300 R  0259
      JJ=1                                                           00007400 R  0259
  399 DO 400 J=INX,5                                                 00007500 R  0261
      DO 410 I=1,41                                                  00007600 R  0266
  410 INPUT(I)=DATA(I,J)                                             00007700 R  0273
      CALL UNPACK                                                    00007800 R  0276
      IF(JJ.NE.1) GO TO 375                                          00007900 R  0277
      IF(SPREAD(ST).NE.3) GO TO 400                                  00008000 R  0279
      JLIM=25-SPREAD(ST)                                             00008100 R  0282
  375 IF(SPREAD(41).LT.0) GO TO 3800                                 00008200 R  0285
      IF(SPREAD(37).NE.6)GO TO 376                                           R  0287
      SPREAD(3)=DUM                                                          R  0290
  376 IF(SPREAD(3).LE.DUM)GO TO 4000                                         R  0292
      IF (SPREAD(ST) ? 33)  ISMAX=MAXO(ISMAX,SPREAD(ST))                     R  0294
      SKIPER=0                                                       00008400 R  0303
      DUM=SPREAD(3)                                                  00008500 R  0303
      IF (ISTOP.LE.SPREAD(2).AND.SDAY.EQ.SPREAD(1)) IFLAG=1          00008600 R  0304
      IF (SPREAD(41).EQ.7) GO TO 400                                         R  0308
  380 DO 420 I=1,41                                                  00008800 R  0312
  420 WORK(I,JJ)=SPREAD(I)                                           00008900 R  0318
      IF(SPREAD(ST).EQ.(33)) GO TO 1400                                      R  0322
      IF(SPREAD(ST).LT.ISMAX.AND.(SPREAD(ST).NE.1.AND.SPREAD(ST).NE.2))      R  0325
     1   GO TO 445                                                           R  0331
 1400 IF(JJ.GE.JLIM) GO TO 450                                       00009000 R  0333
      JJ=JJ+1                                                                R  0335
      GO TO 400                                                      00009200 R  0336
 3800 IF(SKIPER.EQ.1) GO TO 400                                      00009300 R  0338
      GO TO 380                                                      00009400 R  0340
 4000 SKIPER=1                                                       00009500 R  0341
  400 CONTINUE                                                       00009600 R  0342
  401 INX=1                                                          00009700 R  0343
      KFLAG=2                                                        00009800 R  0343
      GO TO 1001                                                     00009900 R  0344
  445 JJ=JJ-1                                                                R  0345
      J=J-1                                                                  R  0346
  450 KFLAG=1                                                        00010000 R  0348
```

```
      INX=J                                                     00010100 R  0348
      CALL PRNT(WORK,N,PACKO)                                           R  0349
      DO 300 J=1,22                                                     R  0352
      DO 300 I=1,10                                                     R  0357
  300 MOTHER(I,J,K)=PACKO(I,J)                                          R  0364
C                                                                       R  0370
C     NOW WRITE OUT MOTHER ON TAPE, THEN READ SAME                      R  0370
C                                                                       R  0370
      IF (K.LT.32.AND.IFLAG.EQ.0)  GO TO 2014                           R  0373
      IF(LFLG.EQ.2)GO TO 305                                            R  0376
      LFLG=2                                                            R  0378
 3000 REWIND 3                                                          R  0380
      TYM=TIME(0)                                                       R  0381
      WRITE(3,3001) TYM,TAPE,(HDR(J),J=1,15)                            R  0383
 3001 FORMAT(" REFORMAT DATE= ",A6," TAPE ",A6," CONTAINS DATA AS",     R  0404
     1 " FOLLOWS",15A6)                                                 R  0404
      ENDFILE 3                                                         R  0404
  305 WRITE(3,3010)MOTHER                                               R  0406
 3010 FORMAT(32(22012/))                                                R  0420
      WRITE(6,2005)MOTHER                                               R  0420
 2005 FORMAT   (22(10(1X,112)/)/)                                       R  0434
      K=0                                                               R  0434
 2014 K=K+1                                                             R  0435
      IF (IFLAG.EQ.1) GO TO 99                                  00010300 R  0436
      JJ=1                                                      00010400 R  0438
      ISMAX=0                                                           R  0439
      IF(INX.EQ.5) GO TO 401                                    00010500 R  0440
      INX=INX+1                                                 00010600 R  0442
      GO TO 399                                                 00010700 R  0443
 1012 CONTINUE                                                          R  0444
      MKNT=MKNT+1                                                       R  0444
      IF (MKNT.EQ.NFILS) GO TO 999                                      R  0445
      READ(M,12,END=999,ERR=1001)  (DATA(J,1),J=1,15)                   R  0447
      GO TO 1001                                                00010900 R  0469
   99 CONTINUE                                                  00011000 R  0470
      IFLAG=0                                                   00011100 R  0470
      GO TO 50                                                  00011200 R  0471
 9999 WRITE (6,2002)                                                    R  0472
 2002 FORMAT(" END OF CARD INPUT"///)                                   R  0476
  999 WRITE (6,2000)                                            00011900 R  0476
 2000 FORMAT (" END OF TAPE")                                   00012000 R  0460
      PTIME=TIME(2)/3600.                                               R  0480
      WRITE (6,2001)PTIME                                               R  0483
 2001 FORMAT (" ELAPSED PROCESSOR TIME IS ",F7.2, "  MINS.")            R  0494
      CLOSE 6                                                           R  0494
        CLOSE 3                                                         R  0495
      CLOSE 1                                                           R  0497
      STOP                                                      00012400 R  0499
      END                                                       00012500 R  0501
                                                              SEGMENT    1 TS  532 LONG
```

```
      SUBROUTINE PRNT(WORK,N,PACKO)                                     R  0000
      DIMENSION PACKO(10,22)                                            R  0000
      DIMENSION WORK(41,22),SAVE(35),JCHAN(22)                          R  0000
      COMMON//IEND,INPUT(41),SPREAD(41)                                 R  0000
      INTEGER DSTEP,WORK,SPREAD,PACKO                                   R  0000
      DATA I10,I9,I8,I7/1000000000,100000000,10000000/                  R  0017
      DATA I6,I5,I4,I3/1000000,100000,10000,1000/                       R  0034
      DO 90 J=1,22                                                      R  0039
      IF(J.NE.1)GO TO 30                                                R  0042
      JCHAN(J)=21                                                       R  0043
      GO TO 31                                                          R  0045
   30 JCHAN(J)=J-2                                                      R  0048
   31 WORK(1,J)=500                                                     R  0050
C                                                                       R  0050
C     REARRANGE DATA SO "SEL SUN" CHANNEL APPEARS IN WORK(4,J)          R  0050
C                                                                       R  0050
      DSTEP=WORK(39,J)                                                  R  0053
      DO 60 I=1,N                                                       R  0058
      IF((I+DSTEP)-(N+3))59,59,58                                       R  0063
   58 DSTEP=DSTEP-N                                                     R  0065
   59 SAVE(I)=WORK(I+DSTEP,J)                                           R  0070
   60 CONTINUE                                                          R  0070
      DO 62 I=4,N+3                                                     R  0077
   62 WORK(I,J)=SAVE(I-3)                                               R  0082
      GO TO (105,47,46,46),33-N                                         R  0090
   46 WORK(34,J)=500                                                    R  0093
   47 WORK(35,J)=500                                                    R  0096
  105 CONTINUE                                                          R  0096
      DO 90 I=4,N+3                                                     R  0102
      IF(WORK(I,J))100,44,44                                            R  0108
  100 WORK(I,J)=499                                                     R  0111
      GO TO 90                                                          R  0111
C                                                                       R  0111
C     SCALE DATA                                                        R  0111
C                                                                       R  0112
   44 IF(WORK(I,J).LE.16)GO TO 90                                       R  0116
      IF(WORK(I,J).LE.32)GO TO 91                                       R  0121
      IF(WORK(I,J).LE.48)GO TO 92                                       R  0125
      IF(WORK(I,J).LE.64)GO TO 93                                       R  0130
      IF(WORK(I,J).LE.80)GO TO 94                                       R  0134
      IF(WORK(I,J).GE.497)GO TO 95                                      R  0139
      GO TO 90                                                          R  0140
   91 WORK(I,J)=2.*(WORK(I,J)-8.)                                       R  0147
      GO TO 90                                                          R  0148
   92 WORK(I,J)=4.*(WORK(I,J)-20.)                                      R  0155
      GO TO 90                                                          R  0156
   93 WORK(I,J)=8.*(WORK(I,J)-34.)                                      R  0163
      GO TO 90                                                          R  0164
   94 WORK(I,J)=16.*(WORK(I,J)-49.)                                     R  0171
      GO TO 90                                                          R  0172
   95 WORK(I,J)=498                                                     R  0176
   90 CONTINUE                                                          R  0176
C                                                                       R  0176
C     GENERATE PROPER TIME NOTATION                                     R  0176
C                                                                       R  0177
      DO 70 I=1,22                                                      R  0182
      IHOUR=WORK(2,J)/3600000                                           R  0187
      THOUR=WORK(2,J)/3600000.                                          R  0192
      TMIN=(THOUR-IHOUR)*60.                                            R  0194
      IMIN=TMIN
```

```
      ISEC=(TMIN-IMIN)*60000.                                           R  0195
C                                                                       R  0196
C     PACK WORK(I,J) FOR TAPE OUTPUT                                    R  0196
C                                                                       R  0196
      PACKO(1,J)=WORK(1,J)*I9+IHOUR*I7+IMIN*I5+ISEC                     R  0200
      PACKO(2,J)=WORK(40,J)*I10+WORK(36,J)*I9+WORK(37,J)*I5+            R  0207
     1 WORK(41,J)*I7+WORK(3,J)                                          R  0217
      IE=0                                                              R  0223
      DO 180 IA=3,10                                                    R  0224
  180 PACKO(IA,J)=(WORK((IA-2)*4,J)+IE)*I9+                             R  0230
     1            (WORK((IA-2)*4+1,J)+IE)*I6+                           R  0237
     2            (WORK((IA-2)*4+2,J)+IE)*I3+                           R  0242
     3            (WORK((IA-2)*4+3,J)+IE)                               R  0247
   70 CONTINUE                                                          R  0254
      RETURN                                                            R  0254
      END                                                               R  0257
                                                                  SEGMENT    2 IS  277 LONG
```

```
      SUBROUTINE UNPACK                                   00038300 R  0000
      EQUIVALENCE (THYME,STEP,KOUNT)                      00038400 R  0000
      INTEGER THYME,SPREAD                                00038500 R  0000
      COMMON//TEND,INPUT(41),SPREAD(41)                   00038600 R  0000
      DATA MASK7/017777/,MASK17/0777                      00038700 R  0000
      DATA MASK3/07777777/                                00038800 R  0020
      DATA MASK4/07777777777/                             00038900 R  0031
      ZERO=0.                                             00039000 R  0042
      SPREAD(37)=6                                                 R  0043
C     CHECK FLAG                                          00039100 R  0043
      SPREAD(41)=CONCAT(ZERO,INPUT(41),42,12,6)           00039200 R  0044
      IF(SPREAD(41).EQ.18) SPREAD(41)=2                   00039300 R  0047
      IF (SPREAD(41).EQ.7) RETURN                         00039400 R  0050
      IF (SPREAD(41).NE.2) SPREAD(41)=3                   00039500 R  0055
C     CHECK STEP                                          00039600 R  0057
      STEP=CONCAT(ZERO,INPUT(37),42,42,6)                 00039700 R  0058
      STEP=HEX(STEP)                                      00039800 R  0061
      IF(STEP.GE.0) GO TO 110                             00039900 R  0062
      SPREAD(37)=1                                                 R  0064
      SPREAD(40)=33                                                R  0065
      GO TO 125                                                    R  0067
   95 SPREAD(40)=33                                                R  0068
C     ERROR                                               00040200 R  0068
  100 SPREAD(41)=4                                                 R  0070
      RETURN                                              00040400 R  0071
  110 TEMP=CONCAT(ZERO,INPUT(37),42,24,6)                 00040500 R  0075
      STEP=HEX(TEMP)*16+STEP                              00040600 R  0077
      IF(STEP.GE.0)GO TO 96                                        R  0079
      SPREAD(37)=2                                                 R  0082
      SPREAD(40)=33                                                R  0083
      GO TO 125                                                    R  0084
C     STEP OK, CONTINUE                                   00040800 R  0084
   96 TEMP=COMPL(STEP)                                             R  0086
      STEP=AND(TEMP,31)                                   00041000 R  0087
      IF(STEP.LE.20)GO TO 97                                       R  0088
      SPREAD(37)=3                                                 R  0090
      SPREAD(40)=33                                                R  0091
      GO TO 125                                                    R  0093
   97 STEP=STEP+2                                                  R  0094
      IF (STEP=6)  STEP=5                                          R  0095
      IF (STEP=22)  STEP=21                                        R  0097
      IF(STEP.GT.2) GO TO 120                             00041300 R  0099
C     STEP ZERO, CHECK FOR ACTUAL 0 OR 1                  00041400 R  0101
      IF("000200",L1,INPUT(5)) STEP=1                     00041500 R  0102
  120 SPREAD(40)=STEP                                     00041600 R  0107
C     NOW DO TIME                                         00041700 R  0107
  125 TEMP=AND(INPUT(41),MASK4)                           00041800 R  0109
      THYME=SCO(TEMP,4)                                   00041900 R  0110
      IF(THYME.GE.0) GO TO 140                            00042000 R  0112
C     CONVERT HEX DATA                                    00042100 R  0114
      THYME=0                                             00042200 R  0114
      DO 130 I=24,42,6                                    00042300 R  0115
      THYME=THYME*16                                      00042400 R  0120
      TEMP=CONCAT(ZERO,INPUT(35),42,I,6)                  00042500 R  0122
      THYME=HEX(TEMP)+THYME                               00042600 R  0124
      IF(THYME.GE.0)GO TO 130                                      R  0126
      SPREAD(37)=4                                                 R  0129
      THYME=0                                                      R  0130
  130 CONTINUE                                            00042800 R  0131
      THYME=THYME*5                                       00042900 R  0131
```

```
C     HAVE TIME, CONVERT TO SUN FRAME                          00043000 R  0131
  140 CONTINUE                                                 00043100 R  0133
      SPREAD(36)=MOD(IHYME&5,20)*.2&1                                R  0133
  150 SPREAD(39)=(IHYME+5)/20+1                                      R  0139
  160 CONTINUE                                                 00043800 R  0142
      IF(SPREAD(39).LE.32)GO TO 165                                  R  0142
      SPREAD(39)=32                                                  R  0144
      SPREAD(37)=5                                                   R  0145
C     CONVERT SEQUENCE NUMBER                                  00043900 R  0146
  165 SPREAD(3)=BCD(INPUT(3),6)                                      R  0147
      IF(SPREAD(3).GE.0)GO TO 166                                    R  0150
      SPREAD(37)=6                                                   R  0153
      SPREAD(3)=0                                                    R  0154
      GO TO 167                                                      R  0155
  166 SPREAD(3)=SPREAD(3)+AND(INPUT(2),15)*1000000                   R  0157
C     NOW GET DAY OF YEAR                                      00044400 R  0159
  167 TEMP=CONCAT(ZERO,INPUT(1),30,12,18)                            R  0163
      SPREAD(1)=BCD(TEMP,3)                                    00044600 R  0165
C     NOW GET TIME OF DAY                                      00044700 R  0166
      TEMP=CONCAT(ZERO,INPUT(2),18,12,30)                      00044800 R  0168
      SPREAD(2)=BCD(TEMP,5)                                    00044900 R  0170
      IF (SPREAD(2).LT.0) GO TO 170                            00045000 R  0173
      TEMP=AND(INPUT(1),MASK3)                                 00045100 R  0175
      SPREAD(2)=SPREAD(2)+BCD(TEMP,3)*100000                   00045200 R  0177
C     NOW CONVERT COUNTS                                       00045300 R  0179
  170 DO 200 I=6,19                                            00045400 R  0183
      KOUNT=BCD(INPUT(I),3)                                    00045500 R  0188
C     FOR ANN -- BURST PLOTS                                   00045600 R  0190
      IF(KOUNT.LT.0) KOUNT=1019                                00045700 R  0191
      SPREAD(I-2)=999-KOUNT                                    00045800 R  0194
  200 CONTINUE                                                 00045900 R  0197
      DO 210 I=20,34                                           00046000 R  0197
      KOUNT=BCD(INPUT(I),3)                                    00046100 R  0202
C     FOR ANN -- BURST PLOTS                                   00046200 R  0204
      IF(KOUNT.LT.0) KOUNT=1019                                00046300 R  0205
      SPREAD(I-1)=999-KOUNT                                    00046400 R  0208
  210 CONTINUE                                                 00046500 R  0211
C                                                              00046600 R  0211
C     CHECK CALIBRATION AND THEN ROUNDOFF DATA                        R  0211
C                                                              00046900 R  0211
      TEMP=AND(INPUT(36),MASK1)                                00047000 R  0211
      TEMP=HEX(TEMP)                                           00047100 R  0213
      TEMP2=CONCAT(ZERO,INPUT(36),42,36,6)                     00047200 R  0214
      TEMP=HEX(TEMP2)*16+TEMP                                  00047300 R  0216
      IF(TEMP.GE.0)GO TO 220                                         R  0219
      SPREAD(37)=7                                                   R  0221
  220 TEMP=COMPL(TEMP)                                               R  0223
      SPREAD(38)=AND(TEMP,MASK78)                                    R  0224
      MYTEMP=SPREAD(36)*10-SPREAD(33)                                R  0226
      IF(MYTEMP)1400,1300,1300                                       R  0228
 1400 INT=0                                                          R  0231
      GO TO 1000                                                     R  0231
 1300 INT=1                                                          R  0233
 1000 DO 1010 I=4,17                                                 R  0234
 1010 SPREAD(I)=(SPREAD(I)-MOD(SPREAD(I),10))/10&INT                 R  0240
      DO 1011 I=19,33                                                R  0246
 1011 SPREAD(I)=(SPREAD(I)-MOD(SPREAD(I),10))/10&INT                 R  0252
      RETURN                                                   00048500 R  0258
      END                                                      00048600 R  0261
                                                             SEGMENT    3 IS  270 LONG
```

```
      FUNCTION HEX(STEP)
C     DO CHARACTER REPLACEMENT ON HEXADECIMAL DATA
      IF(STEP.NE.48) GO TO 100
      HEX=0
      RETURN
  100 IF(STEP.NE.61) GO TO 110
      HEX=11
      RETURN
  110 IF(STEP.NE.63) GO TO 120
      HEX=12
      RETURN
  120 IF(STEP.GT.15) GO TO 130
      IF(STEP.EQ.10) GO TO 130
      IF(STEP.EQ.0) STEP=10
      HEX=STEP
      RETURN
  130 HEX=-1
      RETURN
      END
```

```
START OF SEGMENT **********    4
 00048700 R  0000
 00048800 R  0000
 00048900 R  0000
 00049000 R  0002
 00049100 R  0003
 00049200 R  0007
 00049300 R  0009
 00049400 R  0010
 00049500 R  0014
 00049600 R  0016
 00049700 R  0017
 00049800 R  0021
 00049900 R  0023
 00050000 R  0025
 00050100 R  0027
 00050200 R  0028
 00050300 R  0032
 00050400 R  0033
 00050500 R  0036
SEGMENT    4 IS    42 LONG
```

```
                                                                START OF SEGMENT **********   5
      FUNCTION BCD(NUMBER,K)                                          00050600 R  0000
      REAL NUMBER                                                     00050700 R  0000
      DATA MASK/0606060606060607                                      00050800 R  0000
      IF(AND(NUMBER,MASK).EQ.0)  GO TO 100                            00050900 R  0011
   90 BCD=-1                                                          00051000 R  0014
      RETURN                                                          00051100 R  0015
  100 KEEP=0                                                          00051200 R  0019
      ZERO=0                                                          00051300 R  0019
      IF(K.GT.6) GO TO 90                                             00051400 R  0020
      KK=48-K*6                                                       00051500 R  0022
      DO 110 I=KK,42,6                                                00051600 R  0024
      KEEP=KEEP*10                                                    00051700 R  0029
      KEEP=CONCAT(ZERO,NUMBER,42,I,6)+KEEP                            00051800 R  0031
  110 CONTINUE                                                        00051900 R  0035
      BCD=KEEP                                                        00052000 R  0035
      RETURN                                                          00052100 R  0036
      END                                                             00052200 R  0039
                                                                    SEGMENT    5 IS   50 LONG
```

```
                    SEGMENT     6 IS    97 LONG
                    SEGMENT     7 IS   138 LONG
                    SEGMENT     8 IS    55 LONG
          START OF SEGMENT **********     9
                    SEGMENT    15 IS     7 LONG
                    SEGMENT     9 IS    23 LONG

NUMBER OF SYNTAX ERRORS DETECTED = 0.
PRT SIZE = 116;  TOTAL SEGMENT SIZE = 1491 WORDS;  DISK SIZE = 61 SEGS;  NO. PRGM. SEGS = 36.
ESTIMATED CORE STORAGE REQUIREMENT = 8128 WORDS;  COMPILATION TIME = 18 SECS;  NO. CARDS = 403.
```