#488

HELIOS 1 & 2
HOURLY AVERAGED ELECTRON PROTON
74-097A-10A
76-003A-10A

Table of Contents

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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 This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system.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

HELIOS-A

HOURLY AVERAGED ELECTRON-PROTON

74-097A-10A SPHE-00079

This data set has been restored. There were originally four 9-track, 1600 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on an IBM 360 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR004590	DS004590	D042969	1	12/10/74 - 03/31/75
		D048307	2	04/01/75 - 03/13/79
		D048306	3	01/01/79 - 06/21/80
		D048305	4	04/01/80 - 12/31/80

HELIOS-B

HOURLY AVERAGED ELECTRON-PROTON

76-003A-10A SPHE-00207

This data set has been restored. There were originally three 9-track, 1600 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on a 360 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR004855	DS004855	D042970	1	01/15/76 - 03/31/76
		D048309	2	01/15/76 - 04/05/78
		D048308	3	04/01/78 - 03/08/80

REQ. AGENT	RAND NO.	ACQ. AGENT
BER	V0077	HKH
DEW	V0142	HKH

HELIOS A AND B

HOURLY AVERAGED ELECTRON - PROTON

74-097A-10A

76-003A-10A

This data set consists of 7 data tapes. These tapes are 1600 BPI, 9 track, binary and were created on a PDP 11/40 computer. The time spans, D#'s and C#'s are as follows:

74-097A-10A

D#	C#	TIME SPAN
D-42969	C-21458	12/10/74 - 03/31/75
D-48305	C-22405	04/01/80 - 12/31/80
D-43306	C-22406	01/01/79 - 06/21/80
D-48307	C-22407	04/01/75 - 03/31/79

76-003A-10A

D-42970	C-21459	01/15/76 - 03/13/76
D-48308	C-22408	04/01/78 - 03/08/80
D-48309	C-22409	01/15/76 - 04/15/78

MAX-PLANCK-INSTITUT FÜR AERONOMIE

POSTFACH 20
D-3411 KATLENBURG-LINDAU 3
GERMANY

TELEFON
(05556) 411

BAHNSTATION
3410 NORTHEIM/HAN.

FERNSCHREIBER
0965527 AERLI D

TELEGRAMME
AERONOMIE KATLENBURG-LINDAU

BANK
KREIS-SPARKASSE NORTHEIM
(BLZ 26250001) 41104449

Max-Planck-Institut für Aeronomie, Postfach 20, D-3411 Katlenburg-Lindau 3

Dr. J. Vette
Code 601
NASA-Goddard Space Flight Center
NSSDC

Greenbelt, Maryland 20771
U.S.A.

IHR ZEICHEN	IHRE NACHRICHT VOM	UNSER ZEICHEN	DURCHWAHL	DATUM
		KE/KRI/sch	(05556) 41	21 April 1982

additions
DSC # 488

3: HELIOS-A - 74-097A-10A
2: HELIOS-B - 76-003A-10A

Dear Jim,

by separate mail we are sending you five HELIOS-E8-Tapes with the following contents:

The E8-Tapes contain hourly averages of all available E8 science data measured in E8-mode A (BMFT-FB W76-14, 1976; ESA-TT-390-Revised, 1977) and the corresponding measuring times.

Tape Structure:

Each tape contains one file with data blocks of fixed length (4464 bytes). The end of a tape is marked by two consecutive end-of-file marks. The density is 1600 bpi.

Data-Block Contents:

Each item within one data block has a length of 4 bytes. The integer items (I) are of two's complement (important only to identify zero). The real tmes (R) have the following format:

0		7						31
S	X_1	X_2	H_1	H_2	H_3	H_4	H_5	H_6

, X_i, H_i = hexadecimal numbers; $X_1 < 8$, $H_1 > 0$

The sign bit S indicates whether the value is positive (0) or negative (1). The absolute value is

$$0.\,H_1\,H_2\,H_3\,H_4\,H_5\,H_6 \times 10^{X_1\,X_2-40}$$ in hexadecimal notation.

The 1116 items are described in the following table (next page).

../2

Item	Type	Description
1	I	((YEAR - 1974)*366+DOY)*24+HOUR)
2	I	YEAR } BEGIN OF THE TIME INTERVAL
3	I	DOY }
4	I	HOUR }
5	I	MINUTE }
6	I	LENGTH OF THE TIME INTERVAL IN MINUTES (60)
7	I	IMPORTANT FOR TAPE GENERATION, ONLY
8	I	SEQUENCE NUMBER OF THE SOURCE TAPE
9	I	REEL NUMBER OF THE SOURCE TAPE
10	I	0-HELIOS 1, 1-HELIOS 2
11	I	1-E8 MODE A, 0-E8 MODE B
12-14	I	NOT DEFINED
15	R	RATE, F-DATA ENERGY CHANNEL 1, SECTOR 1, ELECTRONS
16	R	CORRESPONDING MEASURING TIME ≤ 3600/256 SEC
17-46	R	15 REPETITIONS OF 15-16 FOR THE ENERGY CHANNELS 2-16, SECTOR 1
47-526	R	15 REPETITIONS OF 15-526 FOR THE SECTORS 2-16
527-1038	R	SAME AS 15-526 FOR PROTONS
1039, 1040	R	RATE, MEASURING TIME ≤ 3600/32 SEC FOR R-ELECTRONS, SECTOR 1
1041-1070	R	15 REPETITIONS OF 1039-1040 FOR THE SECTORS 2-16
1071-1102	R	SAME AS 1041-1070 FOR PROTONS
1103-1104	R	W4 } RATE, MEASURING TIME ≤ 3600 SEC
1105-1106	R	W23 }
1107-1108	R	W24 }
1109-1110	R	W44 }
1110-1116	I	NOT DEFINED

Negative rates indicate non available or invalid source data.

Best regards,

(Dr. E. Keppler)

MAX-PLANCK-INSTITUT FÜR AERONOMIE

POSTFACH 20
D-3411 KATLENBURG-LINDAU 3
GERMANY

TELEFON
(05556) 411

Max-Planck-Institut für Aeronomie, Postfach 20, D-3411 Katlenburg-Lindau 3

Dr. J. Vette
Code 601
NASA-Goddard Space Flight Center
NSSDC

Greenbelt, Maryland 20771
U.S.A.

BAHNSTATION
3410 NORTHEIM/HAN.

FERNSCHREIBER
[illegible]

TELEGRAMME
AERONOMIE KATLENBURG-LINDAU

BANK
KREIS-SPARKASSE NORTHEIM
(BLZ 26250001) 41104449

IHR ZEICHEN	IHRE NACHRICHT VOM	UNSER ZEICHEN	DURCHWAHL	DATUM
		KE/KRI/sch	(05556) 41	11 December 1980

Dear Dr. Vette:

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Data-Block Content
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0		7						31
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The sign bit S indicates whether the value is positive (0) or negative (1). The absolute value is

$$0.\,H_1\,H_2\,H_3\,H_4\,H_5\,H_6 \times 10^{X_1 X_2 - 40}$$ in hexadecimal notation.

The 1116 items are described in the following table (next page).

MAX-PLANCK-INSTITUT FÜR AERONOMIE

74-097A-10A 76-003A-10A

Item	Type	Description
1	I	((YEAR - 1974)*366+DOY)*24+HOUR)
2	I	YEAR } BEGIN OF THE TIMEINTERVAL
3	I	DOY }
4	I	HOUR }
5	I	MINUTE }
6	I	LENGTH OF THE TIMEINTERVAL IN MINUTES (60)
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1105-1106	R	W23 }
1107-1108	R	W24 }
1109-1110	R	W44 }
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Best regards,

(Dr. E. Keppler)

Max-Planck-Institut für Aeronomie
Institut für Stratosphären-Physik
3411 Lindau/Harz, Postfach 60

Project HELIOS
Experiment 8
April 1974

DESCRIPTION OF EXPERIMENT 8

"ELECTRON-PROTON-DETECTOR"

CONTENTS:

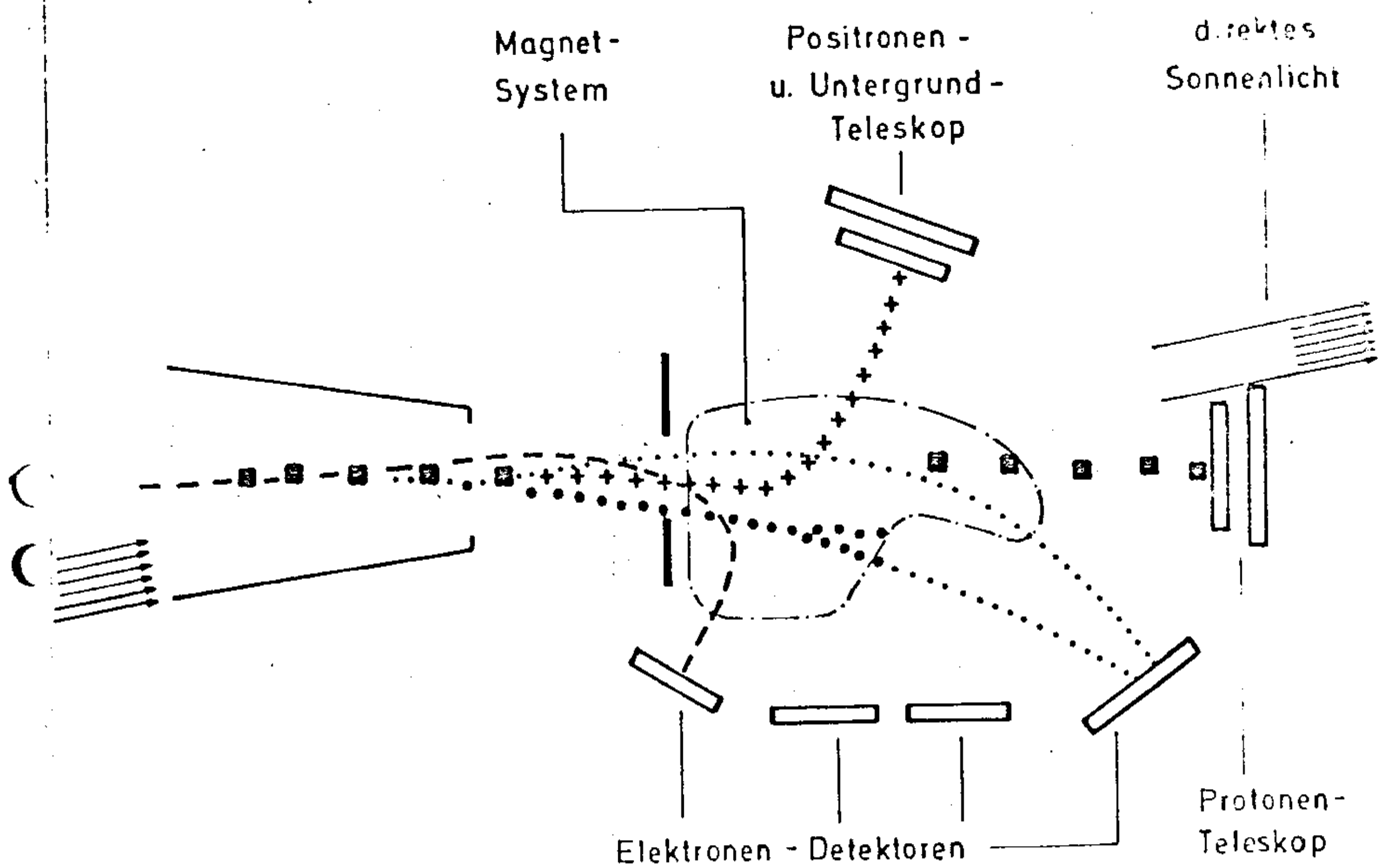
1. *GENERAL, PHYSICAL PROPERTIES*

Experiment 8 utilizes an inhomogeneous magnetic field of about 800 Gauß normal to the sensor axis (which is the center line of the cone of acceptance) in order to separate positively and negatively charged particles. Fig. 1 shows the principle.

Electrons are bent away from the center line and are being detected by 4 semiconductor detectors of different thicknesses. They are arranged such as to allow the detection of electrons from 20 keV up to more than 1 MeV.

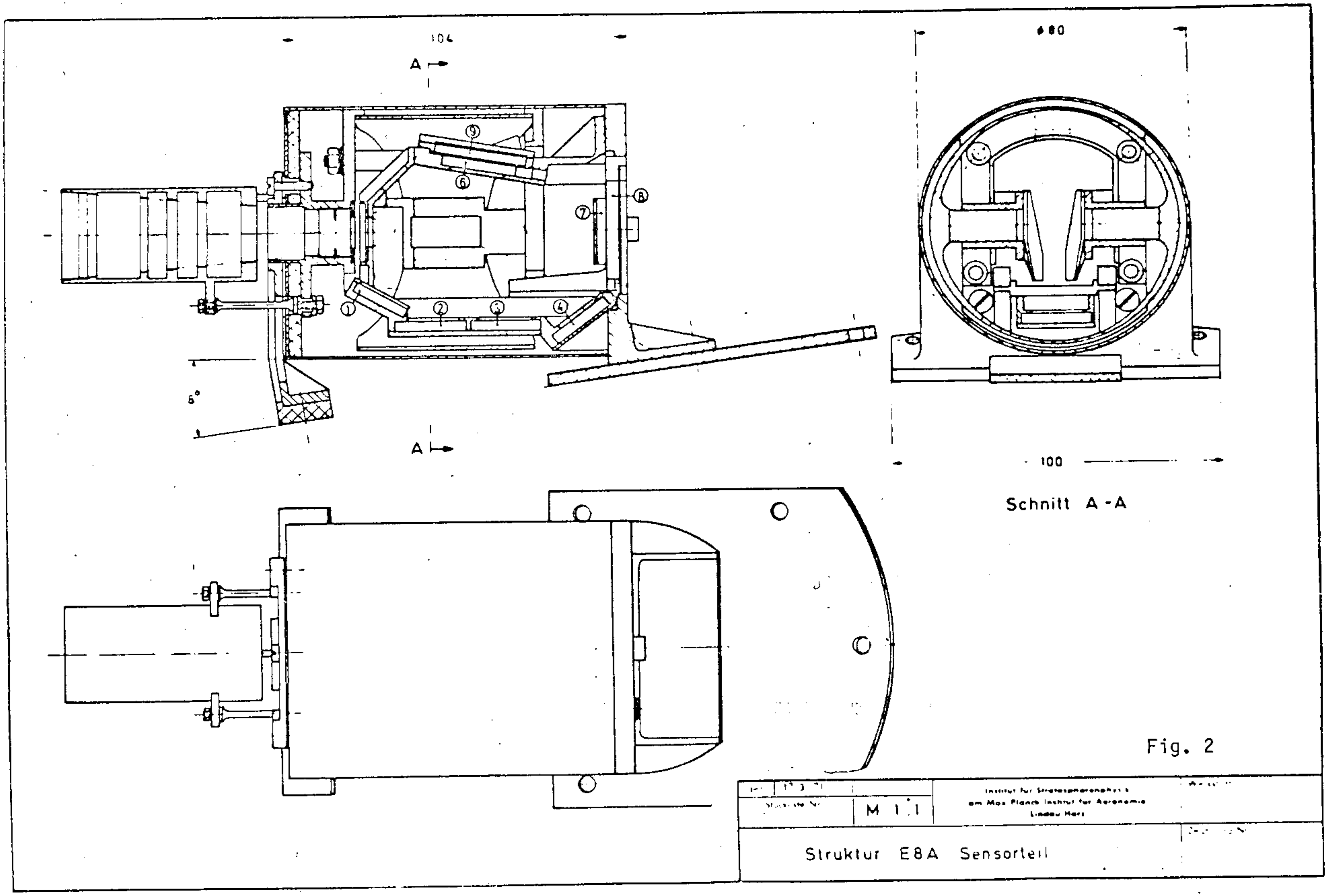
Protons of energies above 40 keV are not affected by the small scale magnetic field and proceed to a proton telescope of 2 detectors, mounted opposite to the entrance aperture. Positrons are bent opposite to the electrons and may be detected by a detector at that place. This one is also backed by a "background detector" to form a coincidence/anticoincidence device in order to reduce cosmic ray background contribution to the positron channel. Table 1 summarizesthe energy ranges of the sensor system. The geometrical factor of the sensor system is about 0,1 cm^2ster for e^- and p, assuming isotropic angular distribution.

Fig. 2 shows two cross sections of the sensor system. The system looks rather complicated; this is due to constructional elements introduced in order to resolve the thermal problem: semiconductor detectors reduce their noise level considerably if temperature is lowered to about 0°C, the slope then flattens as one goes to even lower temperatures. A design goal for this experiment was therefore to get operational temperatures in the 0°C range. On the other hand temperature analysis predicts for the experiment aperture, protruding through the S/C skin up to 180°C (at perihel). Therefore two measures were taken: (a) The experiment was coupled through a large base plate to the S/C. Honeycomb structure, which is directly under a thermal control louvre system. So the louvre system is supposed to control the temperature of the base plate. All detectors are mounted rigidly to the base plate through massive material. (b) All other structure, not to be cooled is thermally



Magnet-
System
Positronen -
u. Untergrund -
Teleskop
direktes
Sonnenlicht
Elektronen - Detektoren
Protonen-
Teleskop

Fig. 1


104
A
A
6°
1
2
3
4
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7
8
9
ø80
100
Schnitt A - A
M 1:1
Institut für Stratosphärenphysik
am Max Planck Institut für Aeronomie
Lindau Harz
Struktur E8A Sensorteil

Fig. 2

decoupled from that system through titanium bolts and teflon isolation. Tests has shown, that the system should work as expected.

In order to keep the magnetic stray field down at the required level, the magnets have been surrounded by a large magnetic flux joke. Finally a mu-metal-can surrounds the whole system.

TABLE 1: DETECTORS AND ENERGY RANGES.

Detector No.	Area (mm^2)	Thickness (μ)	Particle Type	Energy Range
1	100	300	e^-	20- 60 keV
2	200	300	e^-	50- 300 keV
3	200	1000	e^-	200- 700 keV
4	250	500	e^-	> 600 keV
6	200	1000	e^+	150- 500 keV
7	125	300	p	50-1000 keV
8	300	300	p	> 6 MeV
9	300	300	background	

The experiment is split up into three boxes:

E8A Sensor System
E8B Digital Electronic Box
E8C Analog Electronic Box

All electrical interface to the S/C is made through E8B. Fig. 3 shows, how the experiment is mounted into the S/C. E8A is inclined against the S/C mounting deck by about 8° in order to avoid direct sunlight hitting the detectors. As at perihel the straylight within the experiment is very high, a requirement on the angular distance of the experiment relative to the sun sensor has been made, in order to have the sectorization (see below) such that sector switching is done prior and after sun passage (only one sector possibly deterioriated).

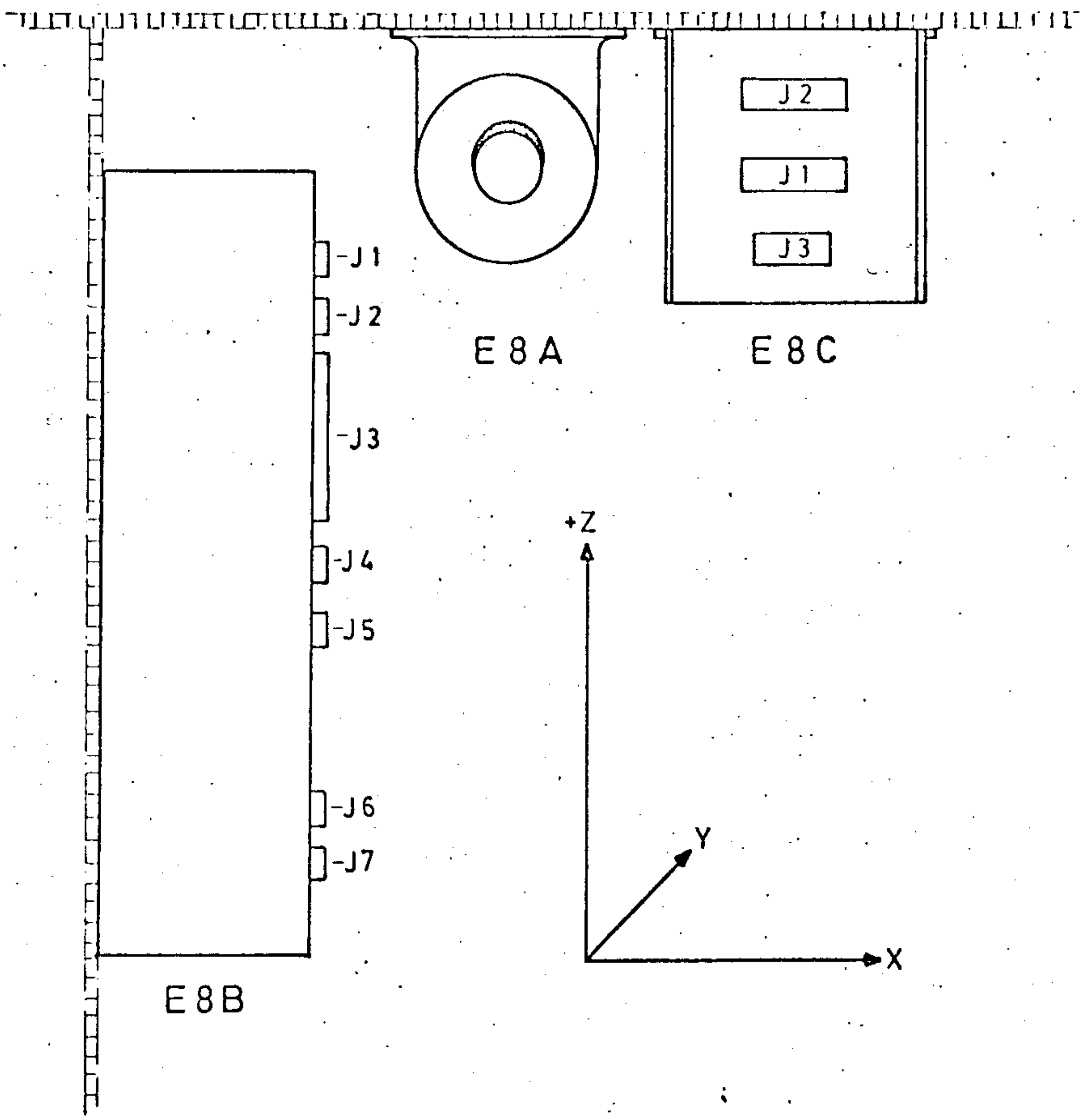


Fig. 3

gez. 5. 5. 77		Institut für Stratosphärenphysik am Max-Planck-Institut für Aeronomie Lindau/Harz	Werkstoff:
Stückliste Nr.:			
Einbauanordnung des Exp. 8 im S/C ab PT			Zeichnung Nr.:

2. DETECTION PRINCIPLE

Fig. 4 shows a block diagram, drawn in order to show the detection principle, neglecting details for clearance. For energy analysis a 3 bit PHA is used. As the energy range of electrons, hitting a particular electron detector (Table 1) is limited, the amplification of each amplifier following a particular detector is adjusted such that its energy range is projected towards the 3 bit analyzer. Each amplifier is followed by a discriminator, adjusted for the lowest energy to be recorded. Thus a signal from this discriminator denotes the line on which a pulse has appeared. Line identification and pulse height information of a particular particle (e^-) entering the sensor are now used to form the address of a memory cell to which one pulse is added (each cell allows for 19 bit storage). Hereby the following scheme (Table 2) is utilized:

TABLE 2: ENERGY CHANNEL FORMATION.

Pulse Height window / Line Number	1	2	3	4	5	6	7	8
1	1	2	3	4	5	6	7	8
2	6	7	8	9	10	11	12	13
3	10	11	12	13	14	15	15	16
4	--	--	--	--	16	16	16	16

Numbers in the matrix indicate pulse height channel.

By this method the 3 bit PHA is actually used as a 4 bit PHA. Table 3 describes energy allocation (typical values, slightly different for each unit). In order to avoid confusion, the energy analysis is blocked for two or more particles appearing within 0,5 μsec on different lines by utilizing an anticoincidence veto signal.

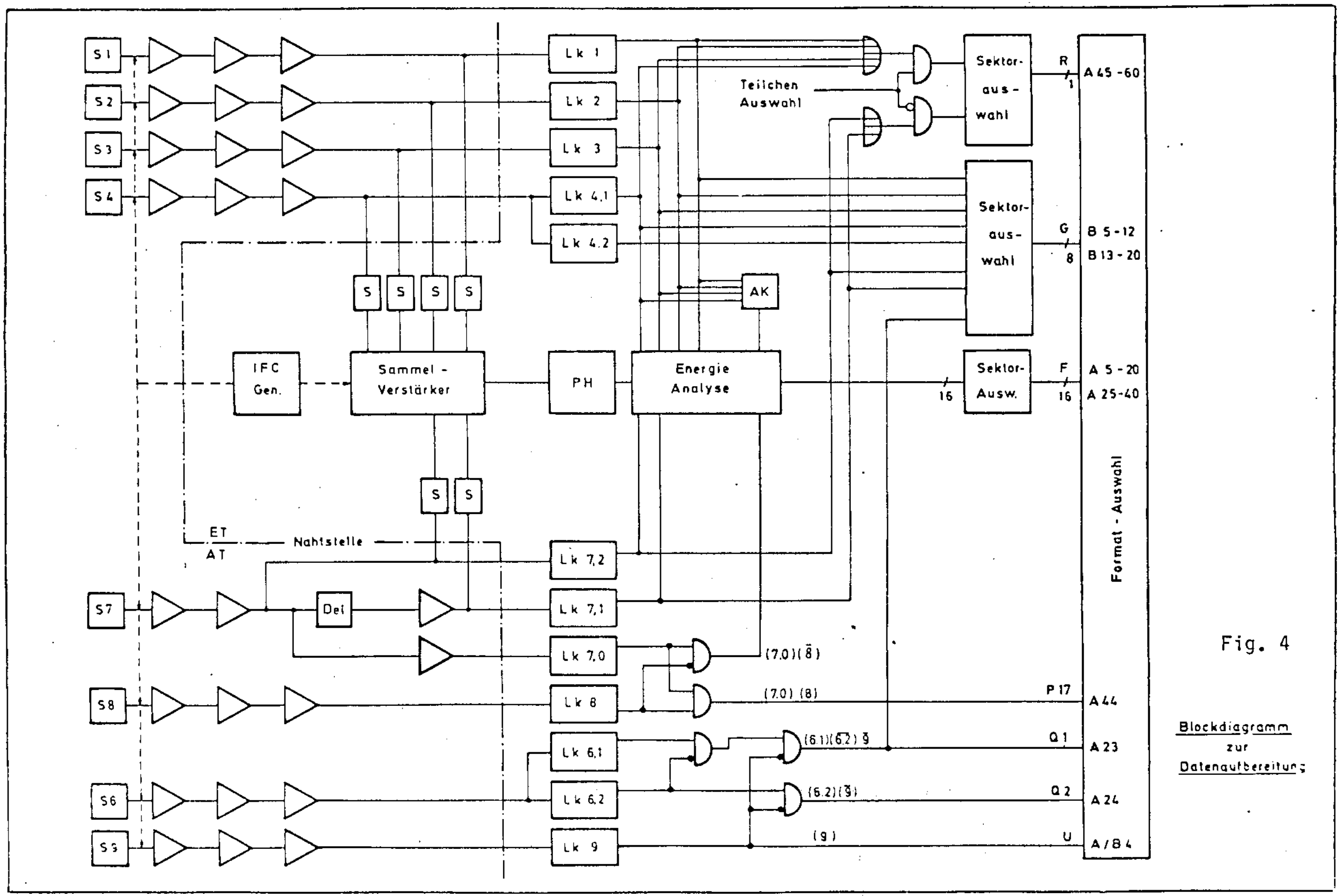


Fig. 4

Blockdiagramm
zur
Datenaufbereitung

Proton detection utilizes another scheme: The amplifier has two outputs, both differ in amplification level by about a factor of 7. Each output is monitored by a 0,6 Volt discriminator. The higher amplified branch (lower energy branch) is further splitted into two lines: one is delayed by 1 µsec, the other not. The latter (L 7.0) is used to form together with the S8 sensor a coincidence veto signal, which blocks energy analysis. The former (L 7.1 and L 7.2) is fed towards the PHA (3 bit). The signal on the delayed line is being analyzed if no pulse on L 7.2 has appeared. So also here the PHA is used as 4 bit device. Again the line identification signal is used to allocate the memory address (1 out of 16) (F-data). Energy channels are shown in Table 3.

There is only one PHA which is shared in time multiplex by electrons and protons. In addition the output pulses of the delayed proton channel and of the signal (L1+L2+L3+L4) from the electron detectors are separately counted to form the energy integral information (R-data). Also the coincidence rate of the proton telescope (L7,L8) is recorded.

For positron detection sensor 6 is monitored by two discriminators (L, H). The background detector rate (B) is also recorded. The positron information transmitted to ground is then (L $\bar{H}$ $\bar{B}$), H and B. L and H are adjusted to the range within which particles may hit the detector 6 (see Table 1).

TABLE 3: ENERGY CHANNELS (keV).

Energy Channel	Electron-Detector No. 1	2	3	4 *	Protons***
1	17-22				21- 27
2	22-28				27- 35
3	28-36				35- 44
4	36-46				44- 56
5	46-58				56- 71
6	58-74	58- 74			71- 90
7	74-92	74- 93			90-110
8	> 92	93-120			110-137
9		120-153			137-174
10		153-201	153-201		174-222
11		201-248	201-250		222-279
12		248-298	250-300		279-353
13		> 298	300-412		353-444
14			412-525		444-563
15			525-835		563-677
16			> 835**	>170	677-~6000

* Energy loss in detector 4, equivalent to E > 600 keV, defined by magnetic system.

**Efficiency at that energy < 10 % of that in channel 15.

***Energy loss in front detector. 21 keV equivalent to about 50 keV kinetic energy.

3. *OPERATIONAL PRINCIPLES, MODE A*

The sensor system has an aperture equivalent to 10° half angle. In order to realize its directional capabilities, data are collected by sectorization into 16 sectors. Sector 1 starts always with the "see-sun-pulse". As the S/C rotates around the sun, the sector pattern is always synchronized to the see-sun-pulse. For obtaining directional data in a reasonable time, we use the integral rates of electrons or protons, and count them for 1/16 spin revolution into register 1, during sector 2 in register 2 etc. After 1 spin revolution we again continue to count in register 1, etc., until m spin revolutions are completed. At that time the contents of the 16 registers are reduced into 8 bit words (quasilogarithmically compressed) and stored in buffer registers. For this operation we require 2 sectors, which is a deadtime during which no measurements will be performed. With the next sector we again start counting in the same manner, however protons, if during the former cycle electrons have been measured. Again m revolutions will be used as measuring time, however, the direction in space will be maintained (sector 1 starts with the see-sun-pulse, even if measuring time starts with sector 3 or 11). By this method we obtain the directional flux of electrons and protons resolved into 16 directions in a rather short time (R-data).

In parallel, for the same time energy spectra are being obtained, also resolved into 16 sectors, but at a lower rate: During the first m revolutions energy spectra, say, for electrons, are obtained in sector 1 and 9. During the second m revolutions electron energy spectra from sector 2 and 10 are obtained. After 8 such measuring times we have energy spectra from electrons from 16 different directions. In the next 8 measuring cycles we do the same for protons, etc. We call this category of data F-data. The scheme is illustrated in Table 4, details of electronics are shown in Fig. 5.

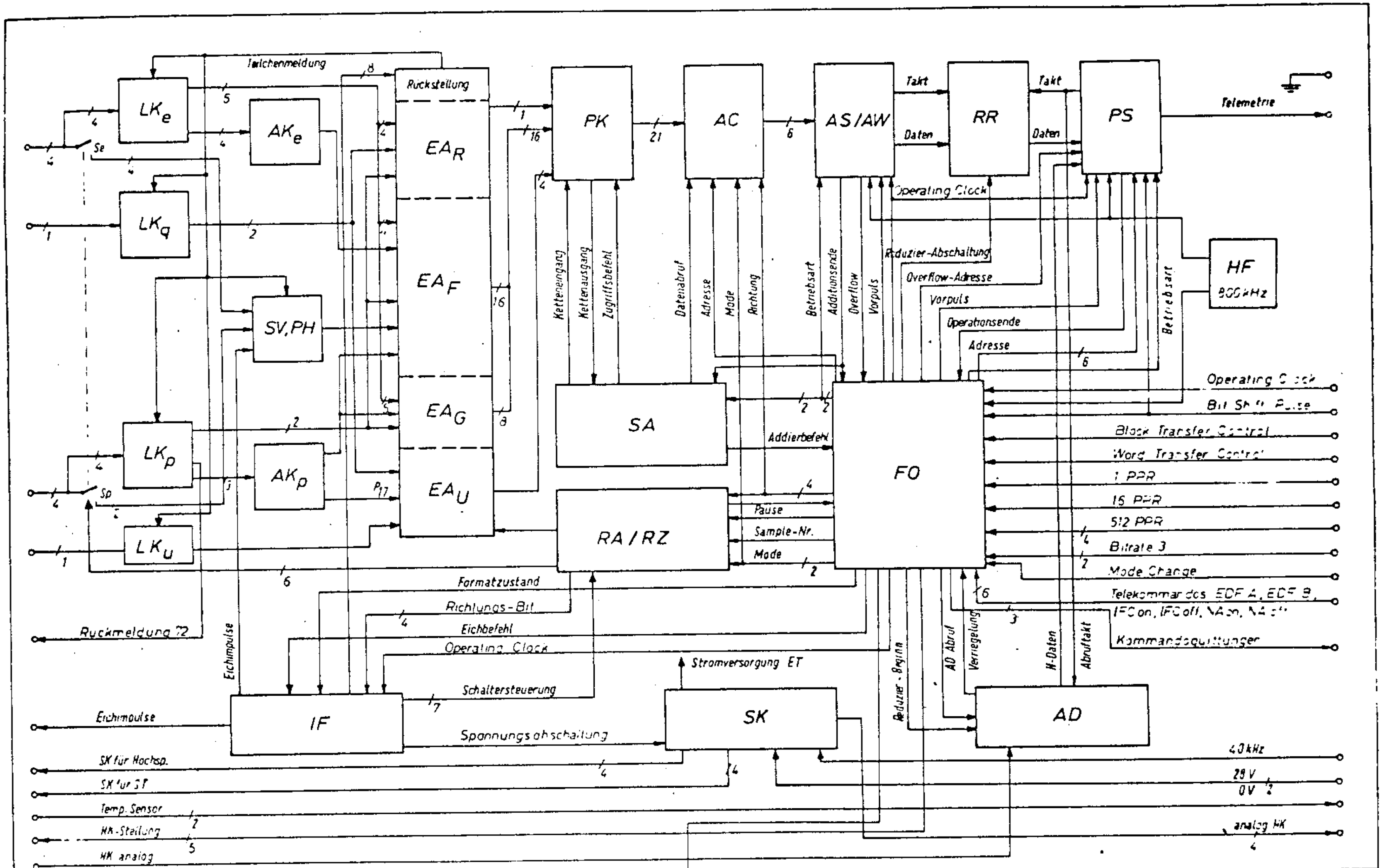


Fig. 5

SEL

Projekt Elektronendetektor Helios
Blockschaltbild Elektronikteil

ZEW/ZLE

ABLE 4: MEASUREMENT CYCLE - MODE A.

volution).	1 2 3 4 ... m	1...m	1...m	1...m		1...m	1...m	....	....	....	....	....	....	....	....
asuring /cle No.	⟵ 1 ⟶	2	3	4	....	7	8	9	10	11	....	15	16	17	....
Cycle	R_e	R_p	R_e	R_p	....	R_e	R_p	R_e	R_p	R_e		R_e	R_p	R_e	....
Cycle	F_e Sector 1,9	$F_e S_{10}^2$	$F_e S_{11}^3$	$F_e S_{12}^4$		$F_e S_{15}^7$	$F_e S_{16}^8$	$F_p S_9^1$	$F_p S_{10}^2$	$F_p S_{11}^3$		$F_p S_{15}^7$	$F_p S_{16}^8$	$F_e S_9^1$	....

In addition the positron data (2 words), background data (1 word) and proton coincidence rate (1 word) are being collected for the same time, without sectorization.

These data form a fixed scheme, which is transmitted to the ground. Added to these "science data" are housekeeping informations and experiment status informations (words designated by H and S). By this means a total of 60 words is formed, which is called 1 EDF (Experiment Data Frame) and this is specific for the Experiment Mode A, therefore it is called EDF-A.

4. *DETERMINATION OF "m"*

The number "m" of completed revolutions, which defines the measuring time, is determined during inflight calibration (IFC) and stored until the next IFC is performed in a memory within the experiment. By means of m the experiment is coupled to the S/C-telemetry system. All the rest of data collection has no direct interface with telemetry; it is only controlled by the sector pulses and the see-sun-pulse, delivered to the experiment by the S/C.

After an IFC cycle is initiated, the experiment counts the number of sector pulses appearing between three BTC-pulses. BTC-pulses (Block-Transfer-Pulse) are delivered from the S/C. The experiment is coupled to the S/C such, that following one BTC, 20 words are read out, so after 3 BTC's one EDF-A is being read out. So this time defines the interval between two requests of the S/C for data words. As in this time also data reduction has to be done, we have to provide a fixed time for that. Deadtime on the other hand should be kept small. Therefore we utilize the following scheme: The number of sector pulses ($T_0/8$) received during a telemetry cycle is reduced by a certain fixed number. The rest is devided by 8, and this number is called m, which is the largest integer multiple of spin periods within one telemetry cycle. How to determine m is shown in Fig. 4. Lower bitrates make m larger, which means our measuring time becomes larger. At very low bitrates, this would be unreasonably long, therefore we defined an experiment mode of operation, mode B, which produces only 20 words of information and allows shorter measuring time. This format is called EDF-B.

5. *OPERATIONAL PRINCIPLES, MODE B*

In this mode the counting rates of the discriminators, which monitor the analog data lines (Fig. 3) are being transmitted (rates of sensors 1, 2, 3, two rates of sensor 4, sectored rate of sensor 6 ($L \bar{H} \bar{B}$), and two rates of sensor 7 (protons)). Sectorization is being done in $T_0/8$ sectors (T_0 = spin period), and two sets of sectored data are transmitted in one frame (sector 1+4, 2+5, 3+6, 4+8). These data are called G-data. In addition status and housekeeping data are being transmitted. The energy ranges contained in these words correspond directly to those given in Table 1. Proton ranges are 21 - 137 keV (energy loss) and >137 keV. The measuring sequence is shown in Table 5.

TABLE 5: MEASUREMENT CYCLE - MODE B.

Revolution No.	1 2 3 ... m	1...m	1...m	1...m	1...m	...
Measuring Cycle	← 1 →	2	3	4	5	...
Data Cycle Sectors	1,5	2,6	3,7	4,8	1,5	...

The experiment operates at the bitrates 2048, 1024, 512, 256 bps in Mode A automatically, and at all lower bitrates in Mode B. However, it may be commanded by sending a proper command to operate in Mode A at all bitrates, and also in Mode B at 512 and 1024 bps. Mode B at 2048 will result in not usable data.

6. *INFLIGHT CALIBRATION*

For inflight calibration purposes a pulsetrain with exponentially falling amplitude is applied to all amplifier chains in parallel. Specific ones are selected through properly commanding the analog switches (Fig. 3). Three specific objectives are met by IFC: (a) all thresholds of the PHA are checked; (b) amplification of electron and proton channels are tested using one and the same PHA-threshold; (c) m is determined. The data pattern is shown in Fig. 10 and 11. (There is a scheme valid for EDF-A and one for EDF-B.) The way, how m is to be determined, is shown in Fig. 12. See also Fig. 5.

7. *DATA FRAMES*

The normal data frame is shown in Fig. 6 for EDF-A, and in Fig. 7 for EDF-B.

FIG. 6: EDF-A-WORDS.

1 H-1	2 S-1	3 H-2	4 B	5 F_{PHA1}	6 F_{PHA2}	....	20 F_{PHA16}
21 H-1	22 S-2	23 Q-2	24 Q-1	25 F_{PHA1}	26 F_{PHA2}	....	40 F_{PHA16}
41 H-1	42 S-3	43 0	44 K	45 R_{S1}	46 R_{S2}	....	60 R_{S16}
1 H-1	2 S-1	3 H-2	4 B	5 F_{PHA1}	6 F_{PHA_2}	....	20 F_{PHA16}
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

FIG. 7: EDF-B-WORDS.

1 H-1	2 0	3 H-2	4 B	5 G	6 G	.....	20 G

All data to the left of the dashed line in Fig. 5 and 6 are normal 8 bit words, all data to the right are quasilogarithmically compressed. The quasilogarithmical compressesion scheme is illustrated in Fig. 8.

FIG. 8: QUASILOG. COMPRESSION SCHEME

Bit No.	1	2	3	4	5	6	7	8	
	E1	E2	E3	E4	M1	M2	M3	M4	1 DATA WORD
	MSB			LSB	MSB			LSB	
	← Exponent →				← Mantissa →				

Leading 1 being supressed. After decoding mantissa reads $M_0M_1M_2M_3M_4$, where $M_0 = 0$, if $E_1 = E_2 = E_3 = E_4 = 0$.

Original Data Word:

Bit No.	0	1	2	3	.....	n-1	n	n+1	......	16	17	18
Design	W_{18}	W_{17}	W_{16}	W_{15}		W_{n+1}	W_n	W_{n-1}	.	W_2	W_1	W_0
Binary	X	X	X	X		X	1	0		0	0	0

$0 \leq n \leq 18$; X any value.

a.) $4 \leq n \leq 18$: $E_1 \ldots E_4$ is inverted dual number of (n-4); mantissa $M_1 \ldots M_4$ corresponds to $(W_{n-1}, \ldots W_{n-4})$.

b.) $0 \leq n \leq 3$: $(E_1 \ldots E_4) = (0 \ldots 0)$; mantissa corresponds to $W_3, W_2, W_1, W_\emptyset$.

7.1 EDF-A

In Fig. 6 word 5 to 20 contain F-data from sector X ($1 \leq X \leq 8$), word 25 to 40 from sector X+8, F-data being either electron or proton data, as indicated by word 1 (see below). Word 45 to 60 contain R-data from sector 1 to 16, being either electron or proton energy integral information as indicated by word 1 (see below).

Word 4 is the background information (sensor 9, Fig. 3), which is not sectorized. Word 23 and 24 contain the information H and L $\bar{H}$ $\bar{B}$ respectively (see section 2). Also these data are not sectorized. Word 44 contains the coincidence rate (S7 S8), not sectorized. So to determine the counting rate corresponding to word 5-20, 25-40, 45-60

$$N = \frac{W \cdot 16}{m \cdot T_0} \quad \text{counts/sec} \quad , \text{ where } T_0 = \text{spin period, } W = \text{contents;}$$

of one of these words. For word 4, 23, 24, 44 we have $N = \frac{W}{m \cdot T_0}$.

Word 3 is the housekeeping word H-2 (see section 7). H-1 and S-1, S-2, S-3 words are experiment status information words. Fig. 9 shows their meaning.

FIG. 9: INTERPRETATION OF H-1 AND S-WORD (BIT 1 = FIRST BIT SHIFTED).

H-1 - Bits

Interpretation	1	2	3	4	5	6	7	8
Format A	1							
Format B	0							
EDF-counter		X	X	X	X			
NA-ON (EDF-B only)		1						
NA-OFF " " "		0						
F-Data Electrons		0						
F-Data Protons		1						
R-Data Electrons					0			
R-Data Protons					1			
Reset EDF						0	0	0
X-EDF						0	1	1
Normal Data						1	1	X
Overflow X-EDF								1
No Overflow								0

S - Bits

Interpretation	1	2	3	4	5	6	7	8
S: Word No. 2	0	0						
Word No. 22	0	1						
Word No. 42	1	0						
No Overflow			X	X				
Overflow in W5-20			0	0				
" " " W25-40			0	1				
" " " W45-60			1	1				
Overfl.in W4,23, 24,44			1	0				
NA-ON					1			
NA-OFF					0			
Fixed						0	0	0

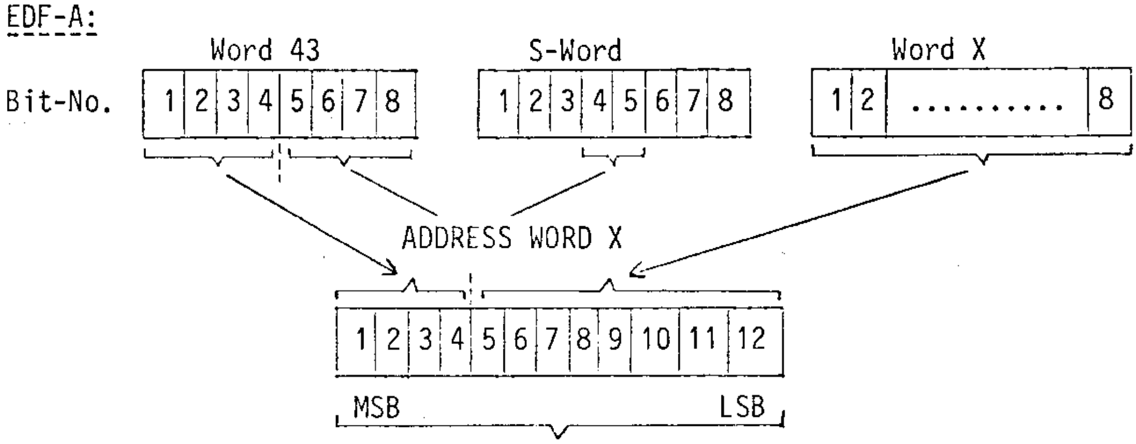
So from the words H-1 and S everything on the experiment status is known.

7.2 *OVERFLOW*

Word 43 is called O-word and is used for overflow information. In case of low bitrates overflow may occur. So all data words have this precaution. If a particular channel shows overflow, counting is stopped in all channels. That channel showing overflow is used to count from thereon until end of measuring time (determined by m) $T_0/8$-sector pulses. The address of the particular channel showing overflow is contained in word 43. Whether this is in word 5-20, 25-40, 45-60 or in W4, 23,24,44, is indicated by bits 3 and 4 of the S-word (see Fig. 9). Details are shown in Fig. 10.

FIG. 10: OVERFLOW EVALUATION.

EDF-A:

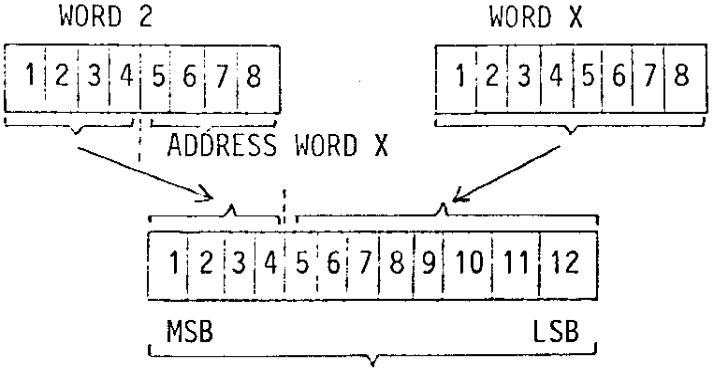


N (linear coded)

Elapsed time T from overflow occurrence to end of measuring time

$$T = N \cdot \frac{T_0}{8} \qquad (T_0\text{: spin period})$$

EDF-B:



N (linear coded)

Elapsed time $T = N \cdot T_0/8$ (T_0: spin period)

7.3 *EDF-B*

Words 5 to 20 contain the science data, utilizing the following scheme:

Word	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Channel	S1	S2	S3	S4.1	S4.2	S7.1	S7.2	S6	S1	S2	S3	S4.1	S4.2	S7.1	S7.2	S6
Sector	X	X	X	X	X	X	X	X	X+4	X+4	X+4	X+4	X+4	X+4	X+4	X+4

Sector number is contained in bit 2-5 of the H-1 word (word 1). Word 2 contains the overflow information (see Fig. 9), word 3 contains housekeeping data (see below), word 4 contains the counting rate of the background detector S9 (not sectorized). The counting rate is obtained from the data by

$$N = \frac{W \cdot 8}{m \cdot T_0} \qquad \text{(word 5-20)}$$

$$N = \frac{W}{m \cdot T_0} \qquad \text{(word 4).}$$

7.4 *INFLIGHT CALIBRATION FRAMES*

Fig. 11 shows the scheme how inflight calibration frames are structured in EDF-A, Fig. 12 shows this for EDF-B. Fig. 12 illustrates how m is to be determined from the information, contained in the IFC-Data-Frame (= X-EDF).

FIG. 11: INFLIGHT CALIBRATION FRAME IN EDF-A.

1 373	2 $0^{6}_{7}0$	3 HK 15 HK 16	4 S9	W5-W9 PHA1-5 Sensor 1	W10-W13 PHA1-4 Sensor 2	W14-W17 PHA1-4 Sensor 3	W18-W20 PHA1-PHA4 Sensor 4						
21 373	22 $1^{6}_{7}0$	23 S 6.2	24 S6.1	W25-W27 PHA1-3 Sensor7.1	W28-W30 PHA1-3 direct	W31-W32 ---	W33-W35 PHA1-PHA3 Sensor7.2	W36-40 PHA4-8 direct					
41 373	42 $2^{6}_{7}0$	43 013	44 K	W45 In- te- gral S1	W46 Int. S2	W47 Int. S3	W48 Int. S4	W49, 50 Ø	W51 Int. S7	W52 53 54 Ø	W55 Int. S7	W56 m	W57- 60 Ø

Information in W1, 2, 3, 21, 22, 41, 42, 43 noted in octal form.

FIG. 12: INFLIGHT CALIBRATION FRAME IN EDF-B.

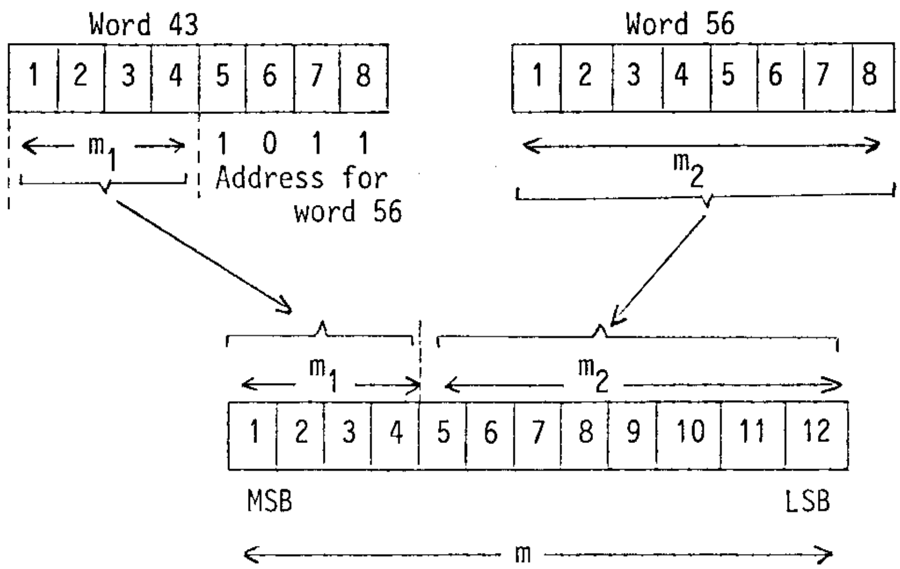
1	2	3	4	5	6	7	8	9	10-15	16	17	18	19	20
173	$0^{1}_{3}3$	HK15 HK16	S9	Inte- gral S1	Inte- gral S2	Inte- gral S3	Inte- gral S4.1	Inte- gral S4.2	Ø	m	Ø	Inte- gral S7.1	Inte- gral S7.2	Inte- gral S6

Informations in words 1 and 2 are noted in octal form.

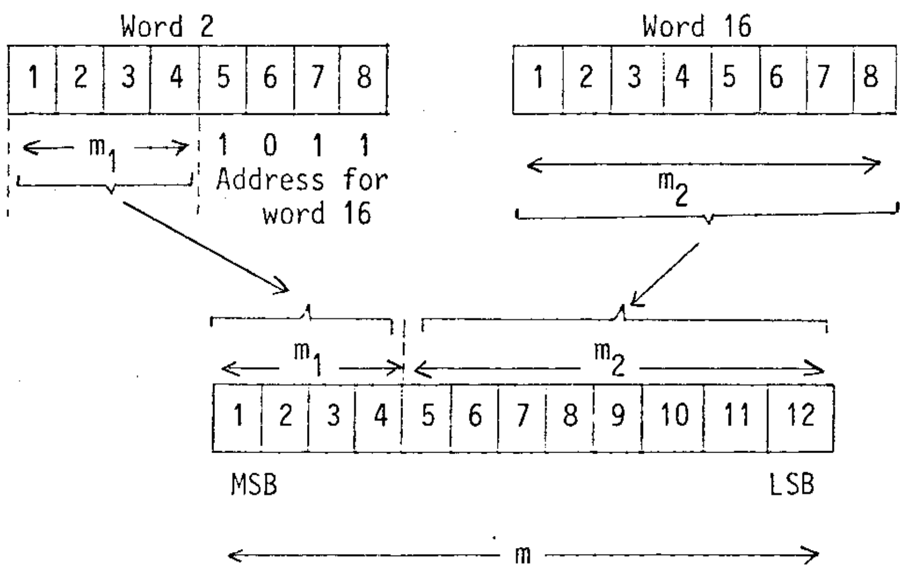
The values of the H- and S-words in Fig. 11 and 12 are given in octal numbers as they are fixed. Word 3 in Fig. 11 and 12 contain housekeeping values as described below. The values of the data words are temperature dependent, therefore for validity ckeck special tables have to be used. Also for determination of relevant information from the X-EDF's the experimenter should be contacted.

FIG. 13: EVALUATION OF m (see also S-word, section 7.1).

EDF-A:



EDF-B:



Measuring period $= m \cdot T_o$ (T_o: spin period)

8. *HOUSEKEEPING AND ENGINEERING DATA*

The experiment produces housekeeping data (A/D converted within the experiment) and engineering data (analog delivered to the S/C).

The following data are housekeeping data channels, included in word 3 (EDF-A and B) of the experiment data frame:

0	Signal Ground	8	Noise S2
1	Noise S6	9	Temperature Analog Electronic
2	Noise S7	10	Temperature Sensor System
3	Noise S8	11	Signal Ground
4	Noise S3	12	+ 5 V Internal Supply Voltage
5	Noise S4	13	+ 12 V Internal Supply Voltage
6	Noise S9	14	- 6 V Internal Supply Voltage
7	Noise S1	15	Test Input

They are 4 bit coded, two of them are combined to form word 3 (= 8 bit, bit 1-4 and bit 5-8). The number of the first channel contained in a particular EDF is indicated by bit 3-5, word 1 (H-word). The second channel is always that with the subsequent number. All data are in mV. Calibration curves are available on request. The following engineering data are contained in the engineering format of the S/C (8 bit coded). The list includes other engineering data containing relevant other informations.

ENGINEERING DATA - E8

Designation	MBB Acronyms		Meaning	Calibration
D 080	TEE 801	TD 28 AT	Temperature Sensor Box E8A	S/C calibrated
D 081	TEE 802	TD 28 BT	Temperature Electronic Box E8B	S/C calibrated
C 036	ASE 8V4+	TE8V4	Temperature Electrinic Box E8C	internal calibrated
C 037	ASE 8C4+	TE8C4	Current on 28 V line	$I_{28}=0,0676 \frac{mA}{V}$ · HK(I28) [V
A-000/0	DPE8A4		"L": EDF-A ON "H": EDF-B ON	
A-000/1	DPE8B4		"L": IFC-CYCLE "H": NORMAL CYCLE	
A-000/2	DPE8C4		"L": S1 ON "H": S1 OFF	
B-003/5	E8PWR		"L": E8 POWER OFF "H": E8 POWER ON	
D-040/4	NEBUS		"H": NON ESSENTIAL BUS ON	
D-000/0-7 D-001/0-3	SPNRPM		SPIN PERIOD	
D-121	E8ELOU		E8-C-Temperature (SKIN)	
D-124	E8SOUT		E8-A-Temperature (Sensor SKIN)	
B-007/5	SECPUS		Normal or redundant sector pulse generator	1 Redundant Ø Normal
D-001/7	SECGEN		Sectoring pulse generation	1 Yes, Ø NO
D-038	ECU-RH		Calibration of A/D-converter	
C-009	SUN C9A		Angle MFP1 and See-Sun-Pulse	
C-009	MFP 1SA		Angle MFP 1 and See-Sun-Pulse	

9. *COMMANDS*

The experiment may be commanded into different modes by utilizing the following commands:

Octal Address	MBB Acronym	Meaning
120	8NON	S1 ON
131	E8ON	E8 POWER ON
141	8COF	E8 IFC OFF
162	8DFB	E8 EDF-B ON
215	8DFA	E8 EDF-A ON
236	8CON	E8 IFC ON
214	E8OF	E8 POWER OFF
257	8NOF	S1 OFF
036	NLON	NON ESSENTIAL LOAD ON
164	NLOF	NON ESSENTIAL LOAD OFF
341	NLOR	NON ESSENTIAL LOADS ON

74-097A-10A DR/DS004590

File 1: 12/10/74 – 3/31/75
2: 6/1/75 – 3/13/79
3: 1/1/79 – 6/21/80
4: 6/1/80 – 12/31/80

RECORD 1 OF FILE 1
LENGTH = 4464 BYTES

	1974	344							
00002049	000007B6	00000158	00000009	00000000	0000003C	00000000	000003E9	0000374C	00000000
00000001	00000000	00000000	00000000	414F26E5	4116A3D7	40B4EB32	4116A3D7	00000000	4116A3D7
00000000	4116A3D7	00000000	4116A3D7	00000000	4116A3D7	4121EC19	4116A3D7	41169D66	4116A3D7
40B4EB32	4116A3D7	41169D66	4116A3D7	00000000	4116A3D7	41169D66	4116A3D7	41388980	4116A3D7
40B4EB32	4116A3D7	41388980	4116A3D7	4165C44C	4116A3D7	412D3ACD	4116A3D7	41169D66	4116A3D7
00000000	4116A3D7	00000000	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7	4121EC19	4116A3D7
4143D832	4116A3D7	40B4EB32	4116A3D7	40B4EB32	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7
412D3ACD	4116A3D7	41169D66	4116A3D7	412D3ACD	4116A3D7	41A99C7E	4116A3D7	412D3ACD	4110FAE1
411E2733	4110FAE1	00000000	4110FAE1	40F13998	4110FAE1	00000000	4110FAE1	00000000	4110FAE1
414B61FF	4110FAE1	412D3ACD	4110FAE1	40F13998	4110FAE1	00000000	4110FAE1	00000000	4110FAE1
00000000	4110FAE1	40F13998	4110FAE1	412D3ACD	4110FAE1	411E2733	4110FAE1	4187B064	4110FAE1
412D3ACD	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	412D3ACD	40B51EB8	00000000	40B51EB8
00000000	40B51EB8	41169D66	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8	412D3ACD	40B51EB8
419E4DCA	40B51EB8	412D3ACD	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
00000000	40B51EB8	00000000	40B51EB8	412D3ACD	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8
41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
41169D66	40B51EB8	419E4DCA	40B51EB8	412D3ACD	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	41B4EB32	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	41B4EB32	405A8F5C	41B4EB32	405A8F5C	415A7599	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
412D3ACD	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C
412D3ACD	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	4187B064	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	41B4EB32	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	4187B064	405A8F5C
4165C44C	4116A3D7	41169D66	4116A3D7	40B4EB32	4116A3D7	00000000	4116A3D7	00000000	4116A3D7
40B4EB32	4116A3D7	40B4EB32	4116A3D7	412D3ACD	4116A3D7	40B4EB32	4116A3D7	40B4EB32	4116A3D7
40B4EB32	4116A3D7	40B4EB32	4116A3D7	4121EC19	4116A3D7	00000000	4116A3D7	412D3ACD	4116A3D7
4143D832	4116A3D7	40B4EB32	4116A3D7	41388980	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7
00000000	4116A3D7	4121EC19	4116A3D7	40B4EB32	4116A3D7	412D3ACD	4116A3D7	00000000	4116A3D7
00000000	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7	41388980	4116A3D7	40B4EB32	4116A3D7
00000000	4116A3D7	414F26E5	4116A3D7	41698932	4110FAE1	00000000	4110FAE1	40F13998	4110FAE1
00000000	4110FAE1	00000000	4110FAE1	40F13998	4110FAE1	40F13998	4110FAE1	412D3ACD	4110FAE1
40F13998	4110FAE1	40F13998	4110FAE1	411E2733	4110FAE1	412D3ACD	4110FAE1	412D3ACD	4110FAE1
00000000	4110FAE1	411E2733	4110FAE1	41698932	4110FAE1	412D3ACD	40B51EB8	00000000	40B51EB8
00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	41169D66	40B51EB8
4143D832	40B51EB8	41169D66	40B51EB8	415A7599	40B51EB8	41CB8898	40B51EB8	41169D66	40B51EB8
00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
00000000	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	4143D832	40B51EB8	417112FF	40B51EB8
415A7599	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C
4187B064	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	4187B064	405A8F5C	412D3ACD	405A8F5C
00000000	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	41B4EB32	405A8F5C	412D3ACD	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	415A7599	405A8F5C

RECORD 2421 OF FILE 1
LENGTH = 4464 BYTES

1975 90

00002AD6	000007B7	0000005A	00000016	00000000	0000003C	00000001	00002A94	00004F87	00000000
00000001	00371003	00000000	002D1025	409B2FD2	41D326E8	4026CBF5	41D326E8	00000000	41D326E8
00000000	41D326E8	4026CBF5	41D326E8	40C1FBC6	41D326E8	41122F9B	41D326E8	4138FB8F	41D326E8
40AE95CC	41D326E8	409B2FD2	41D326E8	4110F93B	41D326E8	409B2FD2	41D326E8	41245F35	41D326E8
4110F93B	41D326E8	412BA573	41D326E8	41965652	41D326E8	409B2FD2	41D326E8	00000000	41D326E8
4026CBF5	41D326E8	00000000	41D326E8	401365FA	41D326E8	404D97E9	41D326E8	40E8C7BA	41D326E8
413A31EF	41D326E8	40C1FBC6	41D326E8	409B2FD2	41D326E8	40FC2DB4	41D326E8	409B2FD2	41D326E8
412CDBD3	41D326E8	4115D2BA	41D326E8	411F85B7	41D326E8	416F8A5F	41D326E8	404D97E9	41D326E8
4026CBF5	41D326E8	401365FA	41D326E8	401365FA	41D326E8	401365FA	41D326E8	4026CBF5	41D326E8
40D561C0	41D326E8	41307EF2	41D326E8	403A31EF	41D326E8	40E8C7BA	41D326E8	40AE95CC	41D326E8
40C1FBC6	41D326E8	41245F35	41D326E8	40AE95CC	41D326E8	412BA573	41D326E8	418CA356	41D326E8
4087C9D6	41D326E8	00000000	41D326E8	00000000	41D326E8	403A31EF	41D326E8	4026CBF5	41D326E8
41BD2248	41D326E8	40D561C0	41D326E8	414041CD	41D326E8	403A31EF	41D326E8	4087C9D6	41D326E8
41122F9B	41D326E8	4110F93B	41D326E8	412F4892	41D326E8	409B2FD2	41D326E8	41245F35	41D326E8
41793D5C	41D326E8	409B2FD2	41D326E8	403A31EF	41D326E8	403A31EF	41D326E8	401365FA	41D326E8
00000000	41D326E8	40AE95CC	41D326E8	40C1FBC6	41D326E8	412A6F13	41D326E8	404D97E9	41D326E8
409B2FD2	41D326E8	4087C9D6	41D326E8	40C1FBC6	41D326E8	41280254	41D326E8	40E8C7BA	41D326E8
412328D6	41D326E8	418426B8	41D326E8	40FC2DB4	41D326E8	401365FA	41D326E8	401365FA	41D326E8
00000000	41D326E8	401365FA	41D326E8	4087C9D6	41D326E8	40C1FBC6	41D326E8	41342211	41D326E8
40C1FBC6	41D326E8	41122F9B	41D326E8	404D97E9	41D326E8	4110F93B	41D326E8	412BA573	41D326E8
4110F93B	41D326E8	412328D6	41D326E8	41965652	41D326E8	4060FDE3	41D326E8	401365FA	41D326E8
4026CBF5	41D326E8	401365FA	41D326E8	00000000	41D326E8	403A31EF	41D326E8	41122F9B	41D326E8
41355870	41D326E8	40C1FBC6	41D326E8	40AE95CC	41D326E8	4110F93B	41D326E8	40D561C0	41D326E8
41280254	41D326E8	41149C5A	41D326E8	411D18F7	41D326E8	4181B9F8	41D326E8	404D97E9	41D326E8
401365FA	41D326E8	401365FA	41D326E8	4026CBF5	41D326E8	4026CBF5	41D326E8	4060FDE3	41D326E8
40E8C7BA	41D326E8	412328D6	41D326E8	4087C9D6	41D326E8	40C1FBC6	41D326E8	40AE95CC	41D326E8
40C1FBC6	41D326E8	412A6F13	41D326E8	41183F79	41D326E8	412A6F13	41D326E8	419B2FD2	41D326E8
403A31EF	41D326E8	00000000	41D326E8	4026CBF5	41D326E8	4026CBF5	41D326E8	401365FA	41D326E8
401365FA	41D326E8	41122F9B	41D326E8	41280254	41D326E8	409B2FD2	41D326E8	4110F93B	41D326E8
41122F9B	41D326E8	40AE95CC	41D326E8	4132EBB1	41D326E8	40AE95CC	41D326E8	4126CBF5	41D326E8
417806FC	41D326E8	403A31EF	41D326E8	401365FA	41D326E8	401365FA	41D326E8	403A31EF	41D326E8
401365FA	41D326E8	409B2FD2	41D326E8	40AE95CC	41D326E8	412E1232	41D326E8	40D561C0	41D326E8
40FC2DB4	41D326E8	411365FA	41D326E8	40FC2DB4	41D326E8	41280254	41D326E8	40C1FBC6	41D326E8
4126CBF5	41D326E8	41AC290C	41D326E8	4060FDE3	41D326E8	4026CBF5	41D326E8	403A31EF	41D326E8
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4026CBF5	41D326E8	401365FA	41D326E8	00000000	41D326E8	4026CBF5	41D326E8	4026CBF5	41D326E8
40E8C7BA	41D326E8	4126CBF5	41D326E8	40C1FBC6	41D326E8	40E8C7BA	41D326E8	409B2FD2	41D326E8
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4087C9D6	41D326E8	00000000	41D326E8	00000000	41D326E8	401365FA	41D326E8	4026CBF5	41D326E8
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409B2FD2	41D326E8	40C1FBC6	41D326E8	40D561C0	41D326E8	41259595	41D326E8	4110F93B	41D326E8
412328D6	41D326E8	418A3696	41D326E8	403A31EF	41D326E8	00000000	41D326E8	401365FA	41D326E8
4026CBF5	41D326E8	4026CBF5	41D326E8	407463DD	41D326E8	40AE95CC	41D326E8	413C9EAE	41D326E8
4087C9D6	41D326E8	40AE95CC	41D326E8	40AE95CC	41D326E8	40FC2DB4	41D326E8	4126CBF5	41D326E8

RECORD 1 OF FILE 2
LENGTH = 4464 BYTES

1975 91

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4033BA9B	419E5D2E	00000000	419E5D2E	40CEEA6C	419E5D2E	40E8C7BA	419E5D2E	413D6D99	419E5D2E
40815284	419E5D2E	40E8C7BA	419E5D2E	409B2FD2	419E5D2E	409B2FD2	419E5D2E	412A079E	419E5D2E
411365FA	419E5D2E	412869C9	419E5D2E	41848E2E	419E5D2E	00000000	419E5D2E	00000000	419E5D2E
4019DD4E	419E5D2E	00000000	419E5D2E	4019DD4E	419E5D2E	40815284	419E5D2E	40E8C7BA	419E5D2E
413A31EF	419E5D2E	40E8C7BA	419E5D2E	40677536	419E5D2E	4111C825	419E5D2E	40815284	419E5D2E
41321CC7	419E5D2E	411B7B23	419E5D2E	411D18F7	419E5D2E	41A344FA	419E5D2E	4033BA9B	419E5D2E
00000000	419E5D2E	4019DD4E	419E5D2E	00000000	419E5D2E	00000000	419E5D2E	404D97E9	419E5D2E
409B2FD2	419E5D2E	412BA573	419E5D2E	41102A51	419E5D2E	409B2FD2	419E5D2E	4111C825	419E5D2E
41102A51	419E5D2E	412BA573	419E5D2E	41102A51	419E5D2E	411D18F7	419E5D2E	419E6B7A	419E5D2E
4026CBF5	41699374	00000000	41699374	00000000	41699374	00000000	41699374	00000000	41699374
414B2B29	41699374	411365FA	41699374	412938B4	41699374	404D97E9	41699374	407463DD	41699374
4115D2BA	41699374	411365FA	41699374	411AAC38	41699374	40C1FBC6	41699374	413C9EAE	41699374
41965652	41699374	407463DD	41699374	00000000	41699374	4026CBF5	41699374	00000000	41699374
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411365FA	41699374	40C1FBC6	41699374	40E8C7BA	41699374	412E1232	41699374	409B2FD2	41699374
41245F35	41699374	41793D5C	41699374	409B2FD2	41699374	00000000	41699374	00000000	41699374
4026CBF5	41699374	00000000	41699374	404D97E9	41699374	409B2FD2	41699374	412938B4	41699374
40C1FBC6	41699374	40E8C7BA	41699374	00000000	41699374	409B2FD2	41699374	4121F276	41699374
411D18F7	41699374	412BA573	41699374	4180839A	41699374	404D97E9	419E5D2E	00000000	419E5D2E
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412EE11D	419E5D2E	40B50D1E	419E5D2E	404D97E9	419E5D2E	40E8C7BA	419E5D2E	4111C825	419E5D2E
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4019DD4E	419E5D2E	4019DD4E	419E5D2E	4019DD4E	419E5D2E	4019DD4E	419E5D2E	404D97E9	419E5D2E
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409B2FD2	419E5D2E	411B7B23	419E5D2E	4119DD4E	419E5D2E	4119DD4E	419E5D2E	41B033A0	419E5D2E
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409B2FD2	419E5D2E	40CEEA6C	419E5D2E	4121F276	419E5D2E	411503CF	419E5D2E	412BA573	419E5D2E
41848E2E	419E5D2E	404D97E9	419E5D2E	00000000	419E5D2E	4033BA9B	419E5D2E	4019DD4E	419E5D2E
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40CEEA6C	419E5D2E	40677536	419E5D2E	41102A51	419E5D2E	411EB6CC	419E5D2E	40CEEA6C	419E5D2E
4121F276	419E5D2E	4187C9D6	419E5D2E	40677536	419E5D2E	4019DD4E	419E5D2E	00000000	419E5D2E
4033BA9B	419E5D2E	00000000	419E5D2E	4019DD4E	419E5D2E	40815284	419E5D2E	4136F645	419E5D2E
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4116A1A4	419E5D2E	4119DD4E	419E5D2E	4169130B	419E5D2E	404D97E9	41699374	00000000	41699374
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413A31EF	41699374	409B2FD2	41699374	409B2FD2	41699374	407463DD	41699374	40E8C7BA	41699374
412BA573	41699374	40C1FBC6	41699374	4126CBF5	41699374	4193E994	41699374	40C1FBC6	41699374
404D97E9	41699374	404D97E9	41699374	00000000	41699374	00000000	41699374	40E8C7BA	41699374
409B2FD2	41699374	412938B4	41699374	40E8C7BA	41699374	409B2FD2	41699374	40C1FBC6	41699374
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411365FA	41699374	00000000	41699374	00000000	41699374	00000000	41699374	4026CBF5	41699374
404D97E9	41699374	40E8C7BA	41699374	412938B4	41699374	409B2FD2	41699374	40E8C7BA	41699374
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409B2FD2	419E5D2E	40677536	419E5D2E	4111C825	419E5D2E	4126CBF5	419E5D2E	409B2FD2	419E5D2E
411D18F7	419E5D2E	419E6B7A	419E5D2E	40815284	419E5D2E	4019DD4E	419E5D2E	00000000	419E5D2E
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40CEEA6C	419E5D2E	409B2FD2	419E5D2E	40677536	419E5D2E	4116A1A4	419E5D2E	412054A1	419E5D2E

HELIOS - 1

12/10/74-3/31/75

DUMP OF TAPE BR1

INPUT TAPE BR1 MT3
DATA INPUT H? ... EL 1 1 1

HR. FROM LAUNCH 1974 YR 344 DAY 9 HR

FILE 1 RECORD 1 LENGTH 4464BYTES

(0)	00002049	000007B6	00000158	00000009	00000000	0000003C	00000000	000003E9	0000374C	00000000
(40)	00000001	00000000	00000000	00000000	414F26E5	4116A3D7	40B4EB32	4116A3D7	00000000	4116A3D7
(80)	00000000	4116A3D7	00000000	4116A3D7	00000000	4116A3D7	4121EC19	4116A3D7	41169D66	4116A3D7
(120)	40B4EB32	4116A3D7	41169D66	4116A3D7	00000000	4116A3D7	41169D66	4116A3D7	41388980	4116A3D7
(160)	40B4EB32	4116A3D7	41388930	4116A3D7	4165C44C	4116A3D7	412D3ACD	4116A3D7	41169D66	4116A3D7
(200)	00000000	4116A3D7	00000000	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7	4121EC19	4116A3D7
(240)	4143D832	4116A3D7	40B4EB32	4116A3D7	40B4EB32	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7
(280)	412D3ACD	4116A3D7	41169D66	4116A3D7	412D3ACD	4116A3D7	41A99C7E	4116A3D7	412D3ACD	4110FAE1
(320)	411E2733	4110FAE1	00000000	4110FAE1	40F13998	4110FAE1	00000000	4110FAE1	00000000	4110FAE1
(360)	414B61FF	4110FAE1	412D3ACD	4110FAE1	40F13998	4110FAE1	00000000	4110FAE1	00000000	4110FAE1
(400)	00000000	4110FAE1	40F13998	4110FAE1	412D3ACD	4110FAE1	411E2733	4110FAE1	4187B064	4110FAE1
(440)	412D3ACD	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
(480)	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	412D3ACD	40B51EB8	00000000	40B51EB8
(520)	00000000	40B51EB8	41169D66	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8	412D3ACD	40B51EB8
(560)	419E4DCA	40B51EB8	412D3ACD	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
(600)	00000000	40B51EB8	00000000	40B51EB8	412D3ACD	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8
(640)	41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
(680)	41169D66	40B51EB8	419E4DCA	40B51EB8	412D3ACD	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C
(720)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	41B4EB32	405A8F5C
(760)	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(800)	00000000	405A8F5C	00000000	405A8F5C	41B4EB32	405A8F5C	41B4EB32	405A8F5C	415A7599	405A8F5C
(840)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(880)	412D3ACD	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C
(920)	412D3ACD	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(960)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(1000)	00000000	405A8F5C	4187B064	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(1040)	00000000	405A8F5C	41B4EB32	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	41873064	405A8F5C
(1080)	4165C44C	4116A3D7	41169D66	4116A3D7	40B4EB32	4116A3D7	00000000	4116A3D7	00000000	4116A3D7
(1120)	40B4EB32	4116A3D7	40B4EB32	4116A3D7	412D3ACD	4116A3D7	40B4EB32	4116A3D7	40B4EB32	4116A3D7
(1160)	40B4EB32	4116A3D7	40B4EB32	4116A3D7	4121EC19	4116A3D7	00000000	4116A3D7	412D3ACD	4116A3D7
(1200)	4143D832	4116A3D7	40B4EB32	4116A3D7	41388980	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7
(1240)	00000000	4116A3D7	4121EC19	4116A3D7	40B4EB32	4116A3D7	412D3ACD	4116A3D7	00000000	4116A3D7
(1280)	00000000	4116A3D7	00000000	4116A3D7	40B4EB32	4116A3D7	41388980	4116A3D7	40B4EB32	4116A3D7
(1320)	00000000	4116A3D7	414F26E5	4116A3D7	41698932	4110FAE1	00000000	4110FAE1	40F13998	4110FAE1
(1360)	00000000	4110FAE1	00000000	4110FAE1	40F13998	4110FAE1	40F13998	4110FAE1	412D3ACD	4110FAE1
(1400)	40F13998	4110FAE1	40F13998	4110FAE1	411E2733	4110FAE1	412D3ACD	4110FAE1	412D3ACD	4110FAE1
(1440)	00000000	4110FAE1	411E2733	4110FAE1	41698932	4110FAE1	412D3ACD	40B51EB8	00000000	40B51EB8
(1480)	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
(1520)	41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	41169D66	40B51EB8
(1560)	4143D832	40B51EB8	41169D66	40B51EB8	415A7599	40B51EB8	41C88898	40B51EB8	41169D66	40B51EB8
(1600)	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
(1640)	00000000	40B51EB8	41169D66	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8
(1680)	00000000	40B51EB8	00000000	40B51EB8	00000000	40B51EB8	4143D832	40B51EB8	417112FF	40B51EB8
(1720)	415A7599	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(1760)	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(1800)	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C
(1840)	4187B064	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C
(1880)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	4187B064	405A8F5C	412D3ACD	405A8F5C
(1920)	00000000	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(1960)	00000000	405A8F5C	41B4EB32	405A8F5C	412D3ACD	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C
(2000)	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2040)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	415A7599	405A8F5C
(2080)	415A7599	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(2120)	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C
(2160)	415A7599	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(2200)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	4213C939	405A8F5C
(2240)	4187B064	405A8F5C	4213C9B9	405A8F5C	415A7599	405A8F5C	412D3ACD	405A8F5C	4187B064	405A8F5C
(2280)	00000000	405A8F5C	412D3ACD	405A8F5C	415A7599	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C

(2320)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2360)	42300E79	405A8F5C	421F186D	405A8F5C	421C44C0	405A8F5C	41873064	405A8F5C	4184EB32	405A8F5C
(2400)	415A7599	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2440)	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2480)	00000000	405A8F5C	42410465	405A8F5C	4235D2C	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2520)	41E225FE	405A8F5C	415A7599	405A8F5C	41878064	405A8F5C	4221EC19	405A8F5C	421F186D	405A8F5C
(2560)	415A7599	405A8F5C	412D3ACD	405A8F5C	41878064	405A8F5C	41E225FE	405A8F5C	4184EB32	405A8F5C
(2600)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2640)	4213C989	405A8F5C	42197113	405A8F5C	4235D2C	405A8F5C	42279373	405A8F5C	421C44C0	405A8F5C
(2680)	415A7599	405A8F5C	4184EB32	405A8F5C	4210F60D	405A8F5C	42169D66	405A8F5C	42169D66	405A8F5C
(2720)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2760)	421C44C0	405A8F5C	41878063	405A8F5C	412D3ACD	405A8F5C	42358503	405A8F5C	42197113	405A8F5C
(2800)	41E225FE	405A8F5C	4213C989	405A8F5C	415A7599	405A8F5C	4213C989	405A8F5C	415A7599	405A8F5C
(2840)	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(2880)	422A6720	405A8F5C	42279373	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	4246A5DF	405A8F5C
(2920)	41878064	405A8F5C	41878064	405A8F5C	42169D66	405A8F5C	4210F60D	405A8F5C	4210F60D	405A8F5C
(2960)	00000000	405A8F5C	00000000	405A8F5C	4184EB32	405A8F5C	415A7599	405A8F5C	415A7599	405A8F5C
(3000)	422D3ACD	405A8F5C	42197113	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(3040)	41E225FE	405A8F5C	41878064	405A8F5C	4224BFC6	405A8F5C	42169D66	405A8F5C	41878064	405A8F5C
(3080)	41878064	405A8F5C	412D3ACD	405A8F5C	4213C989	405A8F5C	4213C989	405A8F5C	41E225FE	405A8F5C
(3120)	00000000	405A8F5C	423E30D9	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(3160)	4210F60D	405A8F5C	41E225FE	405A8F5C	42300E79	405A8F5C	421F186D	405A8F5C	42197113	405A8F5C
(3200)	412D3ACD	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(3240)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(3280)	4221EC19	405A8F5C	41E225FE	405A8F5C	42497E8C	405A8F5C	4224BFC6	405A8F5C	4221EC19	405A8F5C
(3320)	412D3ACD	405A8F5C	41878064	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(3360)	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(3400)	415A7599	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	4251FA92	405A8F5C	421C44C0	405A8F5C
(3440)	415A7599	405A8F5C	41878064	405A8F5C	412D3ACD	405A8F5C	415A7599	405A8F5C	41878064	405A8F5C
(3480)	00000000	405A8F5C	00000000	405A8F5C	415A7599	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(3520)	4221EC19	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	422D3ACD	405A8F5C
(3560)	412D3ACD	405A8F5C	4184EB32	405A8F5C	42169D66	405A8F5C	4184EB32	405A8F5C	41878064	405A8F5C
(3600)	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	4184EB32	405A8F5C	41878064	405A8F5C
(3640)	4232E226	405A8F5C	422A6720	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(3680)	41878064	405A8F5C	41878064	405A8F5C	4213C989	405A8F5C	4184EB32	405A8F5C	4184EB32	405A8F5C
(3720)	41878064	405A8F5C	00000000	405A8F5C	4184EB32	405A8F5C	41E225FE	405A8F5C	415A7599	405A8F5C
(3760)	00000000	405A8F5C	42279373	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(3800)	4184EB32	405A8F5C	421C44C0	405A8F5C	4221EC19	405A8F5C	4213C989	405A8F5C	4213C989	405A8F5C
(3840)	4184EB32	405A8F5C	41878064	405A8F5C	4210F60D	405A8F5C	4210F60D	405A8F5C	421C44C0	405A8F5C
(3880)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	412D3ACD	405A8F5C	00000000	405A8F5C
(3920)	415A7599	405A8F5C	415A7599	405A8F5C	4210F60D	405A8F5C	4184EB32	405A8F5C	4184EB32	405A8F5C
(3960)	41878064	405A8F5C	41878064	405A8F5C	415A7599	405A8F5C	41878064	405A8F5C	415A7599	405A8F5C
(4000)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(4040)	4184EB32	405A8F5C	41878064	405A8F5C	00000000	405A8F5C	4184EB32	405A8F5C	421F186D	405A8F5C
(4080)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	415A7599	405A8F5C	00000000	405A8F5C
(4120)	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C	00000000	405A8F5C
(4160)	422355F1	414F3D6D	421D1365	414F3D6D	00000000	405A8F5C	00000000	405A8F5C	421DE248	414F3D6D
(4200)	421E7D58	414F3D6D	421DE248	414F3D6D	421D7AE7	414F3D6D	421C1110	414F3D6D	4221510*	414F3D6D
(4240)	421BDD5F	414F3D6D	421EB10C	414F3D6D	421D4736	414F3D6D	421D7AE7	414F3D6D	4224BC17	414F3D6D
(4280)	4252BFF2	413E428E	427C6184	41389999	421F7FD0	414F3D6D	421F7FD0	414F3D6D	421D7AE7	414F3D6D
(4320)	42E468F2	41389999	42F6F6E4	413E428E	4290F0CC	413E428E	42CFC61E	41389999	42E57D42	413E428E
(4360)	429C3F7E	413E428E	427DCF8E	41389999	42E2FF1C	41389999	4286B7BA	413E428E	42937A20	41389999
(4400)	423BEDEA	41389999	4174023D	429328E6	42807E52	413E428E	425169D7	41389999	42537CC2	413E428E
(4440)	40001F20	3D047000	40001EF0	68C04000	40817096	429328E6	40A54336	429328E6	41372E28	42*07FF2
					1F4460C0	40001F20				

FILE 1 RECORD 2421 1975 LENGTH 90 4464 BYTES 23

(0)	00002AD7	000007B7	0000005A	00000017	00000000	0000003C	00000002	00002A94	00004F87	00000000
(40)	00000001	00371003	00000000	002D1025	404D97E9	419E5D2E	4019DD4E	419E5D2E	4019DD4E	419E5D2E
(80)	00000000	419E5D2E	4033BA9B	419E5D2E	40677536	419E5D2E	4116A1A4	419E5D2E	41252E20	419E5D2E
(120)	40815284	419E5D2E	40B50D1E	419E5D2E	40962FD2	419E5D2E	411E3F79	419E5D2E	412E69C9	419E5D2E
(160)	40CEEA6C	419E5D2E	411D18F7	419E5D2E	41A9BC4C	419E5D2E	4019DD4E	419E5D2E	4019DD4E	419E5D2E
(200)	4033BA9B	419E5D2E	4019DD4E	419E5D2E	4019DD4E	419E5D2E	404D97E9	419E5D2E	40CEEA6C	419E5D2E
(240)	4136F645	419E5D2E	40CEEA6C	419E5D2E	40815284	419E5D2E	40E8C7BA	419E5D2E	40CEEA6C	419E5D2E
(280)	41307EF2	419E5D2E	40CEEA6C	419E5D2E	412054A1	419E5D2E	418BD580	419E5D2E	40815284	419E5D2E
(320)	00000000	419E5D2F	00000000	419E5D2E	00000000	419E5D2E	00000000	419E5D2E	40E8C7BA	419E5D2E
(360)	40CEEA6C	419E5D2E	41307EF2	419E5D2E	40815284	419E5D2E	40E8C7BA	419E5D2E	41102A51	419E5D2E