Data Set Catalog # 193

Explorer 41, Count Rate Data

69-053A-00E, 69-053A-03A, 03B, & 03C

14 tapes

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 This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system.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

XXNO 00333

IMP-G

CHICAGO MULTI-COORD EPHEM TAPES

69-053A-00E

This data set has been restored. There were originally 9 7-track, 800 BPI tapes written in Binary. There are two restored tapes. The DR tapes are 3480 cartridges and the DS tapes are 9-track, 6250 BPI. The original tapes were created on a 930 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	
DR004676	DS004676	D006946	1 - 44	06/21/69 - 11/16/69	
		D006947	45 - 88	11/16/69 - 04/20/70	(a)
		D006948	89 - 132	04/20/70 - 09/08/70	
		D012148	133 - 176	09/08/70 - 02/03/71	
DR004677	DS004677	D011931	1 - 44	02/03/71 - 07/01/71	(b)
		D011930	45 - 85	07/01/71 - 11/15/71	(c)
		D018350	86 - 125	12/12/71 - 04/22/72	
		D018351	126 - 169	04/22/72 - 09/17/72	
		D018352	170 - 198	09/17/72 - 12/23/72	

(a) D006947: Read error occurred in record 97 of file 3.
(b) D011931: Read error occurred in record 18 of file 1.
(c) D011930: Read error occurred in record 7 of file 1.

SPHE 00520

IMP-G

RATES FOR ALL NONOVERLAP SEQUENCE

69-053A-03A

This data set has been restored. There were originally 13 7-track, 800 BPI tapes written in Binary. There are two restored tapes. The DR tapes are 3480 cartridges and the DS tapes are 9-track, 6250 BPI. The original tapes were created on a 930 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
DR004681	DS004681	D006950	1 - 30	06/21/69 - 09/29/69
		D006949	31 - 60	09/30/69 - 01/09/70
		D006951	61 - 90	01/09/70 - 04/20/70
		D006952	91 -120	04/20/70 - 07/30/70
		D011906	121 -150	07/30/70 - 11/07/70
		D011907	151 -180	11/07/70 - 02/16/71
		D011908	181 -210	02/16/71 - 05/28/71
DR004682	DS004682	D011909	1 - 30	05/28/71 - 09/06/71
		D018353	31 - 52	09/06/71 - 12/16/71
		D018354	53 - 82	12/16/71 - 01/16/72
		D018355	83 -112	01/16/72 - 04/26/72
		D018356	113 -142	04/28/72 - 08/04/72
		D018357	143 -163	08/04/72 - 10/14/72

SPHE 00134

IMP-G

PHA EVENT SUMMARIES (NONOVERLAP)

69-053A-03B

This data set has been restored. There were originally 20 7-track, 800 BPI tapes written in Binary. There are four restored tapes. The DR tapes are 3480 cartridges and the DS tapes are 9-track, 6250 BPI. The original tapes were created on a 930 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	
DR004791	DS004791	D006941	1 - 20	06/21/69 - 08/27/69	(a)
		D006940	21 - 40	08/27/69 - 11/02/69	(b)
		D006942	41 - 60	11/02/69 - 01/09/70	
		D006943	61 - 80	01/09/70 - 03/17/70	
		D006944	81 -100	03/17/70 - 05/23/70	(c)
DR004792	DS004792	D006945	1 - 20	05/23/70 - 07/30/70	
		D011900	21 - 40	07/30/70 - 10/04/70	
		D011901	41 - 60	10/04/70 - 12/10/70	
DR004793	DS004793	D011902	1 - 20	12/11/70 - 02/16/71	
		D011903	21 - 40	02/16/71 - 04/25/71	(d)
		D011904	41 - 60	04/25/71 - 07/01/71	(e)
		D011905	61 - 80	07/01/71 - 09/05/71	
		D018358	81 -100	09/06/71 - 11/12/71	
DR004794	DS004794	D018359	1 - 13	11/12/71 - 01/18/72	
		D018360	14 - 33	01/18/72 - 03/26/72	
		D018361	34 - 53	03/26/72 - 06/01/72	
		D018362	54 - 73	06/01/72 - 08/07/72	
		D018363	74 - 93	08/07/72 - 10/13/72	
		D018364	94 -113	10/13/72 - 12/20/72	
		D018365	114	12/20/72 - 12/23/72	

(a) D006941: Read errors occurred in record 70 of file 1, record 185 of file 2, record 107 of file 18.
(b) D006940: Read error occurred in record 167 of file 1.
(c) D006944: Read error occurred in record 57 of file 3.
(d) D011903: Read errors occurred in record 185 of file 5 & record 124 of file 16.
(e) D011904: Read errors occurred in record 222 & 225 of file 7.

IMP-G SPHE 00733

5-MIN AVE COUNT RATES(NONOVERLAP)

69-053A-03C

This data set has been restored. There were originally four 7-track, 800 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 GE365 computer and the restored tapes were created on a MRS computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN	
DR005916	DS005916	D006939	1 - 100	06/12/69 - 05/23/70	(a)
		D011910	101 - 200	05/23/70 - 04/25/71	(b)
		D018366	201 - 293	04/25/71 - 03/26/72	
		D018367	294 - 374	03/26/72 - 12/23/72	(c)

(a) D006939: Read error occurred in record 15 of file 6.
(b) D011910: Read error occurred in record 14 of file 100.
(c) D018367: Read error occurred in record 1 of file 81.

REQ. AGENT
PAR
ROP

RASH NO.
RB8610

ACQ. AGENT
JJB

EXPLORER 41

COUNT RATE DATA

69-053A-00E

69-053A-03A, 03B & 03C

This data set catalog contains Explorer 41 Rate Packed, Pulse Height Analysis Event, Rate Summary and Orbit Parameter data. The tapes are 800 BPI, 7-track, binary with the exception of the Rate Summary data which is BCD. They were created on an XDS 930 computer.

The record size and number of files on each of the tapes in each data set can be found on table 17 in the following supplement from the Univ. of Chicago.

The time spans for the tapes are:

Rate Packed Data (RAPT) 69-053A-03A

D#	C#	TIME SPAN
D-06949	C-08129	9/30/69 - 1/09/70
D-06950	C-08130	6/21/69 - 9/29/69
D-06951	C-08131	1/09/70 - 4/20/70
D-06952	C-08132	4/20/70 - 7/30/70
D-11906	C-09322	7/30/70 - 11/07/70
D-11907	C-09323	11/07/70 - 2/16/71
D-11908	C-09324	2/16/71 - 5/28/71
D-11909	C-09325	5/28/71 - 9/06/71

Pulse Height Analysis Event Data (PHAEST) 69-053A-03B

D-06940	C-08120	8/27/69 - 11/02/69
D-06941	C-08121	6/21/69 - 8/27/69
D-06942	C-08122	11/02/69 - 1/09/70
D-06943	C-08123	1/09/70 - 3/17/70
D-06944	C-08124	3/17/70 - 5/23/70
D-06945	C-08125	5/23/70 - 7/30/70
D-11900	C-09379	7/30/70 - 10/04/70

Pulse Height Analysis Event Data (PHAEST) 69-053A-03B (Con't)

D#	C#	TIME SPAN
D-11901	C-09380	10/04/70 - 12/10/70
D-11902	C-09381	12/11/70 - 2/16/71
D-11903	C-09382	2/16/71 - 4/25/71
D-11904	C-09383	4/25/71 - 7/01/71
D-11905	C-09384	7/01/71 - 9/05/71

Rate Summary Data (RAST) 69-053A-03C

D-06939	C-08119	6/21/69 - 5/23/70
D-11910	C-09377	5/23/70 - 4/25/71

Orbit Parameter Data (orpt) 69-053A-00E

D-06946	C-08126	6/21/69 - 11/16/69
D-06947	C-08127	11/16/69 - 4/20/70
D-06948	C-08128	4/20/70 - 9/08/70
D-12148	C-09428	9/08/70 - 2/03/71
D-11931	C-09378	2/03/71 - 7/01/71
D-11930	C-09321	7/01/71 - 11/15/71

2.5.2b Post-launch

An appendix to this document, which will be submitted at a later date, will contain the post launch performance of the IMP-5 instrument, as well as a comparison of pre-launch and post-launch response to protons and electrons.

3. Data Format of the Magnetic Tapes

3.1 General Description

All magnetic tapes were generated on an XDS 930 computer at a density of 800 BPI on seven track tape. Each tape is labelled with an appropriate mnemonic of the type of data recorded on it: 'RAST' for RAte Summary Tape, 'RAPT' for RAte Packed Tape, 'PHAEST' for Pulse Height Analysis Event Summary Tape, and 'ORPT' for ORbit Parameter Tape. In addition, a number representing the sequential order of the tape in its respective category appears on the tape label.

An end of file mark terminates each orbit and a double end of file mark terminates the last orbit of each tape. An orbit contains a variable number of physical records. 'ORPT', 'PHAEST', and 'RAPT' are written in binary, odd parity. The 'RAST' is written in blocked BCD, even parity, 6 bits per character.

Table 17 summarizes the logical and physical segmentation of the magnetic tapes.

TABLE 17

Summary of Tape Format Physical and Logical Divisions

Tape Type	RAST	RAPT	PHAEST	ORPT
Format Type	Blocked BCD	Binary	Binary	Binary
Number of Orbits per Magnetic Tape	100	30	20	33 IMP-4 44 IMP-5
Number of Logical Records per Physical Record	57	102	200	40
Number of Words* per Physical Record	1881 ‡	816	600	1000
Number of Words* per Logical Record	33	8	3	25
Total Number of Magnetic Tapes in IMP-4 Submission	2	6	9	5

* XDS 930 binary, 24 bits per word.

‡ Short records do occur, but only immediately before an EØF.

The data on all tapes are ordered so that time and PSC are monotonically increasing, with discontinuities only at points where no data was received or where the data quality* of a particular sequence was other than good or fair.

The following word-bit placement convention is used in the data format descriptions. The lowest word and bit number is located closest to the beginning of the physical record, the beginning of the file, and the beginning of the tape. Similarly, 'File 1' of a tape is located immediately after the load point marker at the beginning of that tape. Furthermore, the

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* See GSFC X-563-69-292 section 2.7.

TABLE 18

RAPT LOGICAL RECORD SPECIFICATION

Item Number	Item Name	Location Within Logical Record		COMMENTS
		WORD	BITS	
1	Calibrate/Normal Flag	1	0	Value = {0, In Calibrate Mode; 1, In Normal Mode}
2	End of Orbit Flag	1	1	Value = {1, Normally; 0, At end of orbit where all remaining logical records in the last physical record are filled with zeros.}
3	Pseudo Sequence Count	1	2 thru 23	See Section 2.4.
4	Accumulator 7C Frame 2	2	0 " 11	See Tables 9 and 10.
5	Accumulator 7C Frame 6	2	12 " 23	
6	Accumulator 7C Frame 10	3	0 " 11	
7	Accumulator 7C Frame 14	3	12 " 23	
8.	Prescale Flag Frame 2	4	0 " 1	Value = {0, Not in Prescale Mode; 1, $DID_2\overline{D3}D6$ is prescaled; 2, $DID_2\overline{D6}$ is prescaled; 3, Both DID_2D6 and $DID_2\overline{D3}D6$ are prescaled.}
9.	" " " 6	4	2 " 3	
10.	" " " 10	4	4 " 5	
11.	" " " 14	4	6 " 7	
12.	Data Quality Flag Frame 2	4	8	Flag Value = {0, All data items have good quality; 1, One or more items had fair quality; or one item had poor quality, so, all data items are filled, with ones.}
13.	Data Quality Flag Frame 6	4	9	
14.	Data Quality Flag Frame 10	4	10	
15.	Data Quality Flag Frame 14	4	11	
16.	Geocenctric Distance of Satellite	4	12 thru 20	In tenths of earth Radii
17.	Overlap elimination flag	4	21 " 23	A value of '5' indicates the elimination of overlap.
18.	PHA Duplicate event Flag Frame 14	5	0	Value = {0, there is a record of this frame on the PHAEST; 1, There is not a record of this frame on the PHAEST, because there were no events collected during this frame.}
19.	Frame 10	5	1	
20.	Frame 6	5	2	
21.	Frame 2	5	3	
22.	Accumulator 7A Frame 2	5	4 thru 13	See Tables 9 and 10
23.	Accumulator 7A Frame 6	5	14 " 23	
24.	Accumulator 7A Frame 10	6	0 " 9	
25.	Accumulator 7A Frame 14	6	14 " 23	
26.	Accumulator 7B Frame 2	7	0 thru 9	
27.	Accumulator 7B Frame 6	7	14 " 23	
28.	Accumulator 7B Frame 10	8	0 " 9	
29.	Accumulator 7B Frame 14	8	14 " 23	
30.	Sun Time	6, 7, 8,	10 " 13	In milli-seconds. Word 6 contains most significant part, and word 8 contains the least significant part.

bit significance increases as the bit position number decreases; e.g., for a value stored completely in bits 9 through 14 of a word, bit 9 (when it is on) holds the value 2^5, bit 10 holds 2^4, and so on until bit 14 which represents 2^0.

3.2 RAte Packed Tape--RAPT

The RAte Packed Tapes contain the S-T Accumulator readouts and related data exactly as telemetered from the spacecraft. As can be seen in Table 17 all physical records on the RAPT are 816 words in length, divided into 102 logical records of 8 binary packed words. Table 18 specifies the data item to word and bit correspondence.

3.2.1 S-T Accumulators

There are three Scaler-Timer accumulators: two 10-bit (7a and 7b) and one 12-bit (7c). Each S-T accumulator operates as a scaler until the high order bit is set, e.g. 512 counts in a 10-bit accumulator, then the accumulator ceases to accept data pulses and starts to operate as a timer which measures the residual accumulation time from a spacecraft clock. For the 10-bit accumulators the clock has a frequency of 100 Hz and for the 12-bit accumulator 400 Hz; whence for the nominal accumulation time of 4.8 seconds, the high order bit, once set for time-mode (T-mode), is not reset until the end of readout when the accumulators are always zeroed.

3.22 Sun Time

The sun time is the time interval in milliseconds starting at the beginning of channel 0 of frame 0 of the given sequence and ending at the first detection of the sun by the Optical Aspect sensor.

Table 19

RAST LOGICAL RECORD SPECIFICATION

Item Number	Item Name	Format *	Description
1	Day	I3	This Data pertains to the Last point of the interval from which the following rate averages were computed.
2	Hour	I2	
3	Minute	F4.1	
4	Chicago Sequence Count	I8	
5	Satellite Geocentric Distance in Earth Radii	F4.1	
6	D5/D6 analog Ratemeter Average Rate	E12.5	All Rate Averages are in counts/second
7	Accumulator 7B Frames 2 thru 14	E12.5	For specific detector coincidences see Tables 9 and 10.
8	Accumulator 7B, Frames 6 and 14	E12.5	
9	Accumulator 7A Frames 6 & 14	E12.5	
10	Accumulator 7B Frames 2 & 10	E12.5	
11	Accumulator 7A, Frame 10	E12.5	
12	Accumulator 7A, Frame 2	E12.5	
13	Temperature	F6.2	In Degrees Centigrade
14	Number of Good Frames	I3	Only frames in which all the Data qualities were 'Good' are used in computing rate averages
15	Total Number of Frames	I3	If a frame contains even one data quality below 'Good', it is discarded, or if an 'overlap' condition is encountered, the second CSC or poorer quality CSC is discarded. This item is the total of all types of frames encountered in the 15 sequence count interval.

* Each item is led by a space 1X.

TABLE 20

PHAEST LOGICAL RECORD SPECIFICATION

Item Number	Item Name	Location Within Location Record		Comments
		Word	Bits	
1.	PSC	1	0 thru 23	See Section 2.4.
2.	PHA Accumulator 1	2	0 thru 7	See Tables 9 and 10.
3.	" " 2	2	8 " 15	
4.	" " 3	2	16 " 23	
5.	Range ID	3	0 " 2	See Section 2.
6.	Angular Sector	3	3 " 5	
7.	Frame Number	3	6 " 7	Instead of 2, 6, 10, and 14 we have respectively 0, 1, 2, 3.
8.	Data Quality Flag	3	8	Value = {0, all data qualities are good 1, at least one data quality was fair but none were lower than fair.
9.	Orbit Number	3	9 thru 15	Least significant part of orbit number (for orbits 1 through 127)
10.	Orbit Number	3	16	Most significant bit(for orbits 128 through 255.)
11.	PHA Accumulator 2	3	17	The most significant bit of item 3. (This bit was added to accomodate the 512 channel D2 PHA analyzer on IMP-5.)
12.	End of orbit flag	3	18 thru 23	Value = {1, during orbit 0, at end of orbit (the remaining logical records in the last physical record are filled with zeroes.)

TABLE 21

ORPT LOGICAL RECORD FORMAT

Word Number Within Logical Record	Parameter Name	Description and Comment
1	Pseudo Sequence Count	This is the PSC for which the following orbit data is applicable.
2	Coordinate recomputation flag.	If non zero, then items 13 and 15-18 were in error and have been corrected at the University of Chicago.
3	Geocentric Distance of Satellite	In thousandths of an earth radius.
4 5 6	Day of Year Hour of Day MSEC of Hour	Time for which orbit data is valid. (January 1 = day 1)
7	Satellite-Earth-Sun Angle	In thousandths of a degree.
8 9	In the geomagnetic reference frame: Geomagnetic Longitude of Satellite Geomagnetic Latitude of Satellite	In all the geomagnetic reference frames, the assume location of the north magnetic pole is 69.0° west longitude, 78.2° north latitude. In thousandths of a degree.
10 11 12	In the Solar Magnetospheric Coordinate System: X Coordinate Y Coordinate Z Coordinate	In thousandths of an earth radius.
13 14	Geomagnetic Longitude of the Sun Geomagnetic Latitude of the Sun	In thousandths of a degree.
15 16	Geocentric Longitude of the Satellite Geocentric Latitude of the Satellite	In thousandths of a degree.
17 18	Geocentric Longitude of the Sun Geocentric Latitude of the Sun	In thousandths of a degree.
19	Speed of Satellite	In meters/second
20	L, McIlwain Parameter	In thousandths of an earth radius.
21	B, Field Strength	In milligauss
22	B/B_o	Dimensionless x 100
23 24 25	Theoretical Geomagnetic Field in Solar Ecliptic Coordinate System: X Coordinate Y Coordinate Z Coordinate	In milligauss

3.3 RAte Summary Tape--RAST

The RAte Summary Tapes contain counting rates averaged over consecutive time intervals of 15 PSC's (~ 5 minutes) using only data of good quality. The last PSC in the period averaged over is assigned to the rate average. The physical and logical record size are given in Table 17.

Each logical record is generated with the following Fortran II format.

ITEM:	1	2	3	4	5	6 - 12	13	14	15
FORMAT	(1X, I3, 1X, I2, 1X, F4.1, 1X, I8, 1X, F4.1, 7 (1X, E12.5), 1X, F6.2, 1X, I3, 1H/I3)								

The item names, units, and other specifications are displayed in Table 19.

3.3.1 Exceptions to the Standard Format

When reading the data from the tape, the above format statement is used except when reading the first logical record of each orbit which logical record is a heading. The second logical record of each orbit, although written in the above data format is not a data line and contains the following substitutions:

1) ITEMS 1 through 4 contain the Day, Hour, Minute and PSC for the first good data of the orbit.
2) ITEM 5 contains the orbit number.
3) ITEM 6 contains the geocentric distance of the satellite in kilometers.
4) All other ITEMS are filled with zeroes.

Similarly the last logical record of an orbit does not contain experiment data, but has the following substitutions:

1) ITEMS 1 through 3 contain the time of the last good data of the orbit.
2) ITEM 4 = -1, thus acting as a sentinnel flag for the orbit.

3) ITEM 6 contains the total number of frames in the orbit.

4) ITEM 11 contains the total number of frames used (only good quality) to compute the rate averages in the orbit.

5) ITEM 12 is superceded by ITEM 6.

6) All other ITEMS are filled with zeroes.

The last physical record of a file terminates at the end of the orbit contained in that file. Hence, the number of logical records in the last physical record is usually less than the normal 57.

3.3.2 Calibrate Mode

When the instrument is in calibrate mode all counting rates are zeroed, except the D5/D6 Analog Ratemeter.

3.3.3 Analog Ratemeter

Although the Analog Ratemeter alternates between the D5 and D6 (see telemetry formats), these modes are not mixed when averaging is performed for the RAST. The mode the instrument is in at the beginning of the interval is the mode for that entire interval; ie., if the satellite switches mode during the interval, the new mode readouts are discarded.

3.4 Pulse Height Analysis Event Summary Tape--PHAEST

These tapes contain, among other pertinent data, the pulse height analyzer accumulator readouts as telemetered by the spacecraft. Only events with associated data qualities of 'good' or 'fair' are recorded on these tapes. As stated in Table 17 all physical records contain 600 words, divided into 200 logical records of 3 binary packed words. Each logical record contains all the data for one event.

If no events are collected during a frame, then there is no record of that frame on the PHAEST.

Table 20 itemizes the data item to word-and-bit correspondence within a logical record.

3.5 ORbit Farameter Tape--ORPT

These tapes contain trajectory data furnished by GSFC. Referring to Table 17 a physical record consists of 1000 binary packed words, divided into 40 logical records of 25 words. The complete set of orbit data contained in each logical record applies to the PSC appearing in that logical record.

Between consecutive logical records there normally is an increment of three PSC's (~ 1 min.). Table 21 contains the correspondence between data items and words within a logical record.

The parameter values are written in standard XDS 930 Integer format. That is, eight octal digits (one XDS 24-bit word) are allocated for each value. The most significant octal digit has only two bits since its leading bit (bit position zero of the word) represents the sign. If the sign bit is off (value: zero), the number is positive and represented in binary integer form with the most significant bit having the lowest bit position ('bit 1' is the lowest bit position). This is identical to the data representation used on the RAPT and PHAEST, except that every parameter now has a sign bit, and every value has exactly 23 bits. However, if the sign bit is on (vaiue: one), the number is negative and represented in two's complement form.

THE UNIVERSITY OF CHICAGO
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AREA CODE 312-753-8507

Laboratory for Astrophysics and Space Research

30 March 1972

Mr. Julius Brecht
Code 601.1
National Space Sciences Data Center
Goddard Space Flight Center
Greenbelt, Maryland 20441

Dear Julius:

The following equation renders the Time (T) corresponding to any Pseudo Sequence Count (PSC) on the University of Chicago data tapes for satellites IMP A, B, C, F, and G:

$$T = T_{BASE} + (PSC - PSC_{BASE}) R_{TIME/SEQ}$$

The enclosed table specifies T_{BASE}, PSC_{BASE}, and $T_{TIME/SEQ}$ for each satellite.

The error in T for IMP A, B, C will not be greater than $\pm$ 2.5 minutes, and for IMP F and G will not exceed $\pm$ .5 minutes.

Sincerely,

Eugene M. Murphy

EMM:am

Formula Used to Determine Day and
Year for Explorer 34.

A data card that was read in by the program(s) contain the start day of the orbit (144) for the year 1967.

In the program when the PSC* is calculated the following check was used.

1. When the PSC* is 0 to 221 the calculation was:

   PSC* + 144 which had the day count of 144 to 365 for the year 1967.

2. When the PSC* is 222 to 587 the calculation was:

   PSC* + 144 - 365 which had the day count of 1 to 366 for the year 1968.

3. When the PSC* is 588 and greater the calculation was:

   PSC* + 144 - 731 which had the day count of 1 and up to the final day on the input tapes for the year 1968.

*PSC = PSEUDO SEQUENCE COUNT

SEQUENCE COUNT FORMULA

Use Sequence Count in data format to obtain data and time of measurement (start time of first orbit corresponds to sequence count 44, 651,L.E., Day 144 (May 24, 1967) at 14:26.1 UT). Each sequence was 20.45439 Sec. Long. experimenter says time span of data is 5/3/69.

Total number of intervals on sequence count minus intervals at launch on sequence count equals intervals since launch on sequence count.

Intervals since launch on sequence count times 20.45439 Sec/intervals equals sec. from launch.

Sec. from launch divided by NO. OF SEC. in a day equals days from launch.

EXAMPLE

2238356	Sequence Count
- 44651	Sequence Count at launch (base)
2193705	Sequence Interval since launch
2193705	Sequence interval since launch
x20.45439	Sec. long per internal
44870897.61495	Sec From launch

44870897.61495 ÷ 86400 sec. in day = 519.33909 Days since launch

Satellite	T_{BASE}				PSC_{BASE}	$R_{TIME/SEQ}$ (seconds)
	Day	Hr.	Min.	Year		
IMP-A	331	4	10.2	1963	96	81.91697
IMP-B (Orbits 1 to 90)	278	3	59.7	1964	39	81.84857
IMP-B (Orbits 91 to 12[illegible]	62	13	40.2	1965	158807	81.84356
IMP-C	149	12	41.5	1965	50	81.91690
IMP-F	144	14	26.1	1967	44651	20.45437
IMP-G	172	9	28.1	1969	28464	20.454764

1DAY HR MIN SEQUENCE RE RATEMETER D1ND2ND6 D1D2ND3ND6 D1234ND5ND6 D2345CKND6 D12N36 REC 1, LENGTH 7524
-7A D2345NCK6 TEMP IMP 5 172 9 28.1 28464 1.0 .11356E 05 .00000E 00 .00000E 00
.00000E 00 .00000E 00 .00000E 00 .00000E 00 .00 0/ 0 172 9 32.2 28478 2.0 .30206E
03 .15528E 02 .97222E-01 .69444E-02 .23611E 00 .26667E 02 .13889E 00 19.73 50/ 60 172
9 37.3 28493 2.2 .32220E 03 .89259E 02 .36859E 00 .80128E-02 .17628E 00 .12308E 02
.25641E 00 19.41 52/ 60 172 9 43.8 28512 2.5 .40475E 03 .93743E 03 .48785E 01 .347
22E-01 .23438E 00 .17778E 02 .20833E 00 18.97 48/ 60 172 9 48.9 28527 2.8 .56284E 03
.40901E 04 .11160E 02 .13889E-01 .26389E 00 .23111E 02 .22222E 00 18.47 60/ 60 172 9
54.0 28542 3.0 .72998E 03 .12539E 05 .23153E 02 .27778E-01 .27778E 00 .39111E 02 .
18056E 00 18.20 60/ 60 172 9 59.1 28557 3.3 .35769E 03 .32301E 05 .13195E 03 .71839E-
01 .30172E 00 .14476E 03 .19444E 00 17.98 58/ 60 172 10 4.3 28572 3.5 .35058E 03 .6
0604E 05 .53860E 03 .19345E 00 .25298E 00 .60190E 03 .22321E 00 17.62 56/ 60 172 10 9.4
28587 3.7 .35659E 03 .76601E 05 .14674E 04 .29167E 00 .31944E 00 .15022E 04 .5694
4E 00 17.25 60/ 60 172 10 14.5 28602 3.9 .34740E 03 .83043E 05 .24131E 04 .49306E 00
.32639E 00 .24444E 04 .52778E 00 17.09 60/ 60 172 10 19.6 28617 4.1 .34479E 03 .89163
E 05 .30996E 04 .68966E 00 .40230E 00 .31086E 04 .66667E 00 16.81 58/ 60 172 10 24.7
28632 4.3 .34382E 03 .96836E 05 .32700E 04 .66667E 00 .41667E 00 .32889E 04 .58036E 0
0 16.50 59/ 60 172 10 29.8 28647 4.5 .34757E 03 .97291E 05 .37561E 04 .61782E 00 .45
833E 00 .37778E 04 .55556E 00 16.37 59/ 60 172 10 34.9 28662 4.7 .34641E 03 .94286E 05
.46065E 04 .89286E 00 .49851E 00 .46343E 04 .77381E 00 16.19 56/ 60 172 10 40.1 2867
7 4.9 .58737E 05 .93704E 05 .49305E 04 .99306E 00 .48611E 00 .49316E 04 .84722E 00 1
5.94 60/ 60 172 10 45.2 28692 5.1 .59555E 05 .93428E 05 .47893E 04 .87054E 00 .58908E
00 .47810E 04 .87500E 00 15.66 57/ 60 172 10 50.3 28707 5.3 .58246E 05 .92643E 05 .
48523E 04 .84722E 00 .56250E 00 .48551E 04 .70833E 00 15.50 60/ 60 172 10 55.4 28722 5
.5 .59313E 05 .92656E 05 .49607E 04 .86806E 00 .54861E 00 .49724E 04 .73611E 00 15.39
60/ 60 172 11 .5 28737 5.7 .57566E 05 .93799E 05 .47336E 04 .84877E 00 .47619E 00
.47010E 04 .75893E 00 15.06 55/ 60 172 11 5.6 28752 5.8 .52831E 05 .94162E 05 .4299
6E 04 .57471E 00 .49851E 00 .43010E 04 .62500E 00 15.06 57/ 60 172 11 10.7 28767 6.0
.51866E 05 .93116E 05 .40913E 04 .62500E 00 .55556E 00 .40871E 04 .79167E 00 14.81 60
/ 60 172 11 15.9 28782 6.2 .52792E 05 .93379E 05 .41524E 04 .71121E 00 .41667E 00 .4
1564E 04 .73611E 00 14.62 59/ 60 172 11 21.0 28797 6.4 .52122E 05 .95144E 05 .41323E 0
4 .73925E 00 .56250E 00 .41333E 04 .63889E 00 14.62 61/ 61 172 11 26.1 28812 6.5 .52
193E 05 .96265E 05 .41633E 04 .65278E 00 .57471E 00 .41600E 04 .69940E 00 14.25 59/ 60
172 11 31.2 28827 6.7 .48870E 05 .97130E 05 .37522E 04 .58036E 00 .47414E 00 .37448
E 04 .70833E 00 14.19 57/ 60 172 11 36.3 28842 6.9 .50788E 05 .95945E 05 .38826E 04
.70685E 00 .56548E 00 .38895E 04 .61012E 00 14.19 56/ 60 172 11 41.4 28857 7.0 .44748E
05 .96661E 05 .32265E 04 .56944E 00 .44444E 00 .32053E 04 .50000E 00 14.07 60/ 60 172
11 46.5 28872 7.2 .43470E 05 .92080E 05 .30456E 04 .43478E 00 .41667E 00 .30400E 04
.88542E 00 13.78 46/ 60 172 11 51.6 28887 7.3 .44052E 05 .90220E 05 .29644E 04 .625
00E 00 .52443E 00 .29600E 04 .61012E 00 13.78 58/ 60 172 11 56.8 28902 7.5 .42659E 05
.90213E 05 .28076E 04 .60764E 00 .34722E 00 .27711E 04 .52083E 00 13.78 48/ 60 172 12
1.9 28917 7.6 .36795E 05 .88540E 05 .22922E 04 .51006E 00 .36638E 00 .23048E 04 .
45833E 00 13.47 58/ 60 172 12 7.0 28932 7.8 .35879E 05 .89515E 05 .22865E 04 .53571E
00 .49851E 00 .22762E 04 .61012E 00 13.34 56/ 60 172 12 12.1 28947 7.9 .32034E 05 .9
1222E 05 .19545E 04 .45139E 00 .40972E 00 .19413E 04 .47222E 00 13.34 60/ 60 172 12 17.2
28962 8.1 .27892E 05 .89984E 05 .16715E 04 .35920E 00 .42385E 00 .16667E 04 .4166
7E 00 13.34 58/ 60 172 12 22.3 28977 8.2 .25047E 05 .87607E 05 .14345E 04 .33333E 00
.37202E 00 .14248E 04 .38690E 00 13.09 58/ 72 172 12 27.4 28992 8.4 .22636E 05 .84918
E 05 .13270E 04 .33654E 00 .24840E 00 .13251E 04 .20833E 00 12.97 52/ 60 172 12 32.6
29007 8.5 .19985E 05 .82232E 05 .11226E 04 .20115E 00 .33333E 00 .11076E 04 .62500E 0
0 12.91 59/ 60 172 12 37.7 29022 8.7 .18391E 05 .78017E 05 .97417E 03 .25641E 00 .20
833E 00 .97111E 03 .26042E 00 12.91 50/ 60 172 12 43.5 29039 8.8 .19098E 05 .77916E 05
.97179E 03 .40625E 00 .23958E 00 .98400E 03 .35417E 00 12.91 40/ 48 172 12 48.6 2905
4 9.0 .18422E 05 .80938E 05 .10655E 04 .23810E 00 .37809E 00 .10626E 04 .47619E 00 1
2.63 55/ 60 172 12 53.7 29069 9.1 .17285E 05 .79555E 05 .97581E 03 .26389E 00 .22917E
00 .96889E 03 .30556E 00 12.47 60/ 60 172 12 59.1 29085 9.2 .15279E 05 .73630E 05 .
86711E 03 .18849E 00 .28770E 00 .86667E 03 .24621E 00 12.47 42/ 60 172 13 4.3 29100 9
.4 .14042E 05 .67002E 05 .75727E 03 .20139E 00 .27778E 00 .77511E 03 .33333E 00 12.47
60/ 60 172 13 9.4 29115 9.5 .12471E 05 .58552E 05 .69351E 03 .23611E 00 .23707E 00
.69689E 03 .22321E 00 12.32 59/ 60 172 13 14.5 29130 9.6 .12050E 05 .62224E 05 .6604
8E 03 .19444E 00 .30556E 00 .57911E 03 .40278E 00 12.14 60/ 60 172 13 19.6 29145 9.8
.10342E 05 .77041E 05 .59318E 03 .15278E 00 .27778E 00 .65244E 03 .26389E 00 12.03 60
/ 60 172 13 24.7 29160 9.9 .86133E 04 .84246E 05 .50233E 03 .15972E 00 .23611E 00 .5

EXPLORER 41
67053A-03C
D-6939
6/21/69 - 5/23/70

7422E 03 .40278E 00 12.03 60/ 60 172 13 29.8 29175 10.0 .61125E 04 .82118E 05 .38023E 0
3 .97222E-01 .2916 E 00 .44089E 03 .34722E 00 12.03 60/ 60 172 13 35.6 29192 10.2 .36
665E 04 .70788E 05 .23494E 03 .11458E 00 .21825E 00 .27733E 03 .30303E 00 11.96 41/ 60
172 13 40.7 29207 10.3 .33858E 04 .66858E 05 .21524E 03 .83333E-01 .26389E 00 .24889
E 03 .13889E 00 11.78 60/ 60 172 13 47.2 29226 10.5 .29132E 04 .68277E 05 .18864E 03
.54348E-01 .25568E 00 .21818E 03 .26515E 00 11.59 45/ 60 172 13 54.4 29247 10.6 .23876E
04 .74395E 05 .15345E 03 .74405E-01 .20833E 00 .18286E 03 .14881E 00 11.59 28/ 48 172
14 .9 29266 10.8 .19173E 04 .83313E 05 .12201E 03 .69444E-01 .29514E 00 .14667E 03
.22569E 00 11.53 48/ 60 172 14 6.0 29281 10.9 .16449E 04 .91917E 05 .97680E 02 .543
48E-01 .27174E 00 .12121E 03 .15625E 00 11.37 46/ 60 172 14 11.1 29296 11.0 .12997E 04
.88379E 05 .64299E 02 .28409E-01 .17045E 00 .92121E 02 .24621E 00 11.37 44/ 60 172 14
16.9 29313 11.1 .12394E 04 .87883E 05 .63346E 02 .85784E-01 .27574E 00 .84706E 02 .
23284E 00 11.16 68/ 84

172 14 22.0 29328 11.3 .10798E 04 .81435E 05 .48507E 02 .20833E-01 .17361E 00 .65778 REC 2. LENGTH 7524
E 02 .11111E 00 11.16 60/ 60 172 14 27.1 29343 11.4 .89881E 03 .70155E 05 .27514E 02
.83333E-01 .25000E 00 .46222E 02 .23611E 00 11.16 60/ 60 172 14 32.2 29358 11.5 .99339E
03 .70723E 05 .35578E 02 .28409E-01 .21825E 00 .48485E 02 .27083E 00 11.16 43/ 60 172
14 37.3 29373 11.6 .87776E 03 .61957E 05 .27493E 02 .48611E-01 .20833E 00 .46222E 02
.27778E 00 10.97 60/ 60 172 14 42.4 29388 11.7 .87157E 03 .50330E 05 .30499E 02 .520
83E-01 .24554E 00 .43810E 02 .19345E 00 10.94 56/ 60 172 14 47.6 29403 11.8 .78493E 03
.36106E 05 .23257E 02 .48611E-01 .17241E 00 .38095E 02 .16667E 00 10.84 59/ 60 172 14
52.7 29418 12.0 .57678E 03 .15079E 05 .12326E 02 .41667E-01 .28472E 00 .26667E 02 .
27778E 00 10.72 60/ 60 172 14 57.8 29433 12.1 .45571E 03 .78235E 04 .50087E 01 .00000E
00 .29356E 00 .16970E 02 .20833E 00 10.72 46/ 54 172 15 2.9 29448 12.2 .49045E 03 .6
07178E 04 .81971E 01 .16026E-01 .22500E 00 .20000E 02 .14423E 00 10.72 51/ 60 172 15 8.0
29463 12.3 .48766E 03 .75661E 04 .82708E 01 .69444E-02 .21528E 00 .17778E 02 .2222
2E 00 10.72 60/ 64 172 15 13.1 29478 12.4 .37074E 03 .25497E 04 .38472E 01 .20833E-01
.22222E 00 .17778E 02 .22222E 00 10.72 60/ 60 172 15 18.2 29493 12.5 .36151E 03 .11871
E 04 .23750E 01 .69444E-02 .24306E 00 .12444E 02 .33333E 00 10.47 60/ 60 172 15 23.4
29508 12.6 .40388E 03 .28324E 04 .49777E 01 .22321E-01 .17241E 00 .17143E 02 .22222E 0
0 10.61 57/ 71 172 15 28.5 29523 12.7 .30163E 03 .27331E 02 .48611E-01 .13889E-01 .24
554E 00 .26667E 02 .20833E 00 10.28 58/ 60 172 15 33.6 29538 12.8 .29705E 03 .13463E 03
.11905E 00 .74405E-02 .23810E 00 .19048E 01 .23810E 00 10.28 56/ 60 172 15 38.7 2955
3 12.9 .32573E 03 .56907E 03 .86806E 00 .69444E-02 .16667E 00 .14222E 02 .18056E 00 1
0.28 60/ 60 172 15 43.8 29568 13.0 .34214E 03 .16441E 03 .39583E 00 .69444E-02 .30172E
00 .15238E 02 .23611E 00 10.28 59/ 64 172 15 48.9 29583 13.1 .33129E 03 .71559E 02 .
10031E 00 .15432E-01 .25463E 00 .22554E 02 .41667E 00 10.28 54/ 80 172 15 54.0 29598 13
.2 .33948E 03 .89831E 01 .34722E-01 .41667E-01 .27299E 00 .26667E 02 .26786E 00 10.28
59/ 60 172 15 59.1 29613 13.3 .33969E 03 .29849E 01 .14368E-01 .21552E-01 .22270E 00
.26667E 02 .16667E 00 10.11 58/ 60 172 16 3.9 29627 13.4 .33591E 03 .29613E 01 .7440
5E-02 .14881E-01 .26786E 00 .26667E 02 .25298E 00 9.99 56/ 58 172 16 9.0 29642 13.5
.33335E 03 .28785E 01 .13889E-01 .69444E-01 .31944E 00 .26667E 02 .23611E 00 9.87 60
/ 68 172 16 14.5 29658 13.6 .33025E 03 .29297E 01 .19531E-01 .19531E-01 .24740E 00 .1
6667E 02 .23438E 00 9.87 64/ 68 172 16 19.6 29673 13.7 .33752E 03 .25735E 01 .16026E-0
1 .16026E-01 .19167E 00 .00000E 00 .27778E 00 9.87 51/ 66 172 16 24.4 29687 13.8 .33
956E 03 .28009E 01 .13021E-01 .19531E-01 .22177E 00 .00000E 00 .19444E 00 9.87 63/ 64
172 16 29.5 29702 13.9 .29787E 03 .29062E 01 .00000E 00 .69444E-02 .21528E 00 .00000
E 00 .22222E 00 9.87 60/ 60 172 16 34.6 29717 14.0 .29329E 03 .27083E 01 .00000E 00
.16667E-01 .26042E 00 .00000E 00 .20833E 00 9.87 49/ 74 172 16 39.0 29730 14.1 .29262E
03 .26190E 01 .00000E 00 .37202E-01 .29018E 00 .00000E 00 .23810E 00 9.73 56/ 76 172
16 44.1 29745 14.2 .29920E 03 .25521E 01 .71839E-02 .21552E-01 .20833E 00 .00000E 00
.23810E 00 9.75 56/ 68 172 16 49.3 29760 14.3 .29737E 03 .24740E 01 .21552E-01 .718
39E-02 .28549E 00 .00000E 00 .19231E 00 9.69 56/ 68 172 16 54.4 29775 14.4 .29285E 03
.24053E 01 .14368E-01 .21552E-01 .22436E 00 .00000E 00 .17361E 00 9.56 55/ 64 172 16
59.5 29790 14.5 .29881E 03 .21085E 01 .71839E-02 .21552E-01 .35201E 00 .00000E 00 .
12500E 00 9.50 58/ 72 172 17 4.6 29805 14.6 .29075E 03 .25625E 01 .34722E-01 .41667E-
01 .32639E 00 .00000E 00 .12500E 00 9.50 60/ 68 172 17 9.7 29820 14.7 .29061E 03 .2
4690E 01 .34722E-01 .34722E-01 .19022E 00 .00000E 00 .26515E 00 9.50 47/ 69 172 17 15.2
29836 14.8 .29753E 03 .27119E 01 .20161E-01 .26882E-01 .20833E 00 .00000E 00 .1442
3E 00 9.50 59/ 69 172 17 20.3 29851 14.9 .29112E 03 .28145E 01 .24038E-01 .00000E 00
.24691E 00 .00000E 00 .25641E 00 9.50 53/ 60 172 17 25.4 29866 15.0 .29124E 03 .26042
E 01 .22321E-01 .14881E-01 .16369E 00 .00000E 00 .26389E 00 9.50 56/ 60 172 17 30.5

7422E 03 .40278E 00 12.03 60/ 60 172 13 29.8 29175 10.0 .61125E 04 .82118E 05 .38023E 0
3 .97222E-01 .29167E 00 .44089E 03 .34722E 00 12.03 60/ 60 172 13 35.6 29192 10.2 .36
665E 04 .70788E 05 .23494E 03 .11458E 00 .21825E 00 .27733E 03 .30303E 00 11.96 41/ 60
172 13 40.7 29207 10.3 .33858E 04 .66858E 05 .21524E 03 .83333E-01 .26389E 00 .24889
E 03 .13889E 00 11.78 60/ 60 172 13 47.2 29226 10.5 .29132E 04 .68277E 05 .18864E 03
.54348E-01 .25568E 00 .21818E 03 .26515E 00 11.59 45/ 60 172 13 54.4 29247 10.6 .23876E
04 .74395E 05 .15345E 03 .74405E-01 .20833E 00 .18286E 03 .14881E 00 11.59 28/ 48 172
14 .9 29266 10.8 .19173E 04 .83313E 05 .12201E 03 .69444E-01 .29514E 00 .14667E 03
.22569E 00 11.53 48/ 60 172 14 6.0 29281 10.9 .16449E 04 .91917E 05 .97680E 02 .543
48E-01 .27174E 00 .12121E 03 .15625E 00 11.37 46/ 60 172 14 11.1 29296 11.0 .12997E 04
.88379E 05 .64299E 02 .28409E-01 .17045E 00 .92121E 02 .24621E 00 11.37 44/ 60 172 14
16.9 29313 11.1 .12394E 04 .87883E 05 .63346E 02 .85784E-01 .27574E 00 .84706E 02 .
23284E 00 11.16 68/ 84

172 14 22.0 29328 11.3 .10798E 04 .81435E 05 .48507E 02 .20833E-01 .17361E 00 .65778 REC 2. LENGTH 7524
E 02 .11111E 00 11.16 60/ 60 172 14 27.1 29343 11.4 .89881E 03 .70155E 05 .27514E 02
.83333E-01 .25000E 00 .46222E 02 .23611E 00 11.16 60/ 60 172 14 32.2 29358 11.5 .99339E
03 .70723E 05 .35578E 02 .28409E-01 .21825E 00 .48485E 02 .27083E 00 11.16 43/ 60 172
14 37.3 29373 11.6 .87776E 03 .61957E 05 .27493E 02 .48611E-01 .20833E 00 .46222E 02
.27778E 00 10.97 60/ 60 172 14 42.4 29388 11.7 .87157E 03 .50330E 05 .30499E 02 .520
83E-01 .24654E 00 .43810E 02 .19345E 00 10.94 56/ 60 172 14 47.6 29403 11.8 .78493E 03
.36106E 05 .23257E 02 .48611E-01 .17241E 00 .38095E 02 .16667E 00 10.84 59/ 60 172 14
52.7 29418 12.0 .57678E 03 .15079E 05 .12326E 02 .41667E-01 .28472E 00 .26667E 02 .
27778E 00 10.72 60/ 60 172 14 57.8 29433 12.1 .45571E 03 .78235E 04 .50087E 01 .00000E
00 .29356E 00 .16970E 02 .20833E 00 10.72 46/ 64 172 15 2.9 29448 12.2 .49045E 03 .6
07178E 04 .81971E 01 .16026E-01 .22500E 00 .20000E 02 .14423E 00 10.72 51/ 60 172 15 8.0
29463 12.3 .48766E 03 .75661E 04 .82708E 01 .69444E-02 .21528E 00 .17778E 02 .2222
2E 00 10.72 60/ 64 172 15 13.1 29478 12.4 .37074E 03 .25497E 04 .38472E 01 .20833E-01
.22222E 00 .17778E 02 .22222E 00 10.72 60/ 60 172 15 18.2 29493 12.5 .36151E 03 .11871
E 04 .23750E 01 .69444E-02 .24306E 00 .12444E 02 .33333E 00 10.47 60/ 60 172 15 23.4
29508 12.6 .40388E 03 .28324E 04 .49777E 01 .22321E-01 .17241E 00 .17143E 02 .22222E 0
0 10.61 57/ 71 172 15 28.5 29523 12.7 .30163E 03 .27331E 02 .48611E-01 .13889E-01 .24
554E 00 .26667E 02 .20833E 00 10.28 58/ 60 172 15 33.6 29538 12.8 .29705E 03 .13463E 03
.11905E 00 .74405E-02 .23810E 00 .19048E 01 .23810E 00 10.28 56/ 60 172 15 38.7 2955
3 12.9 .32573E 03 .56907E 03 .86806E 00 .69444E-02 .16667E 00 .14222E 02 .18056E 00 1
0.28 60/ 60 172 15 43.8 29568 13.0 .34214E 03 .16441E 03 .39583E 00 .69444E-02 .30172E
00 .15238E 02 .23611E 00 10.28 59/ 64 172 15 48.9 29583 13.1 .33129E 03 .71559E 02 .
10031E 00 .15432E-01 .25463E 00 .22564E 02 .41667E 00 10.28 54/ 80 172 15 54.0 29598 13
.2 .33948E 03 .89831E 01 .34722E-01 .41667E-01 .27299E 00 .26667E 02 .26786E 00 10.28
59/ 60 172 15 59.1 29613 13.3 .33969E 03 .29849E 01 .14368E-01 .21552E-01 .22270E 00
.26667E 02 .16667E 00 10.11 58/ 60 172 16 3.9 29627 13.4 .33591E 03 .29613E 01 .7440
5E-02 .14881E-01 .26786E 00 .26667E 02 .25298E 00 9.99 56/ 58 172 16 9.0 29642 13.5
.33335E 03 .28785E 01 .13889E-01 .69444E-01 .31944E 00 .26667E 02 .23611E 00 9.87 60
/ 68 172 16 14.5 29658 13.6 .33025E 03 .29297E 01 .19531E-01 .19531E-01 .24740E 00 .1
6667E 02 .23438E 00 9.87 64/ 68 172 16 19.6 29673 13.7 .33752E 03 .25735E 01 .16026E-0
1 .16026E-01 .19167E 00 .00000E 00 .27778E 00 9.87 51/ 66 172 16 24.4 29687 13.8 .33
966E 03 .28009E 01 .13021E-01 .19531E-01 .22177E 00 .00000E 00 .19444E 00 9.87 63/ 64
172 16 29.5 29702 13.9 .29787E 03 .29062E 01 .00000E 00 .69444E-02 .21528E 00 .00000
E 00 .22222E 00 9.87 60/ 60 172 16 34.6 29717 14.0 .29329E 03 .27083E 01 .00000E 00
.16667E-01 .26042E 00 .00000E 00 .20833E 00 9.87 49/ 74 172 16 39.0 29730 14.1 .29262E
03 .26190E 01 .00000E 00 .37202E-01 .29018E 00 .00000E 00 .23810E 00 9.73 56/ 76 172
16 44.1 29745 14.2 .29920E 03 .25521E 01 .71839E-02 .21552E-01 .20833E 00 .00000E 00
.23810E 00 9.75 56/ 68 172 16 49.3 29760 14.3 .29737E 03 .24740E 01 .21552E-01 .718
39E-02 .28549E 00 .00000E 00 .19231E 00 9.69 56/ 68 172 16 54.4 29775 14.4 .29285E 03
.24053E 01 .14368E-01 .21552E-01 .22436E 00 .00000E 00 .17361E 00 9.56 55/ 64 172 16
59.5 29790 14.5 .29881E 03 .21085E 01 .71839E-02 .21552E-01 .35201E 00 .00000E 00 .
12500E 00 9.50 58/ 72 172 17 4.6 29805 14.6 .29075E 03 .25625E 01 .34722E-01 .41667E-
01 .32639E 00 .00000E 00 .12500E 00 9.50 60/ 68 172 17 9.7 29820 14.7 .29061E 03 .2
4690E 01 .34722E-01 .34722E-01 .19022E 00 .00000E 00 .26515E 00 9.50 47/ 69 172 17 15.2
29836 14.8 .29753E 03 .27119E 01 .20161E-01 .26882E-01 .20833E 00 .00000E 00 .1442
3E 00 9.50 59/ 69 172 17 20.3 29851 14.9 .29112E 03 .28145E 01 .24038E-01 .00000E 00
.24691E 00 .00000E 00 .25641E 00 9.50 53/ 60 172 17 25.4 29866 15.0 .29124E 03 .26042
E 01 .22321E-01 .14881E-01 .16369E 00 .00000E 00 .26389E 00 9.50 56/ 60 172 17 30.5

29881 15.1 .30602E 03 .21629E 01 .74405E-02 .37202E-01 .27778E 00 .14359E 02 .23810E 0
0 9.38 55 60 172 17 35.6 29896 15.1 .29445E 03 .23144E 01 .00000E 00 .22321E-01 .28
549E 00 .35667E 02 .13393E 00 9.27 55/ 60 172 17 40.7 29911 15.2 .29003E 03 .24533E 01
.71839E-02 .14368E-01 .14368E 00 .26667E 02 .19345E 00 9.25 58/ 60 172 17 45.9 2992
6 15.3 .29289E 03 .26196E 01 .24038E-01 .16026E-01 .23065E 00 .26667E 02 .18056E 00
9.22 54/ 60 172 17 51.0 29941 15.4 .29066E 03 .26356E 01 .19531E-01 .65104E-02 .21505E
00 .26667E 02 .23611E 00 9.12 63/ 63 172 17 56.1 29956 15.5 .30065E 03 .29340E 01 .
69444E-02 .20833E-01 .29861E 00 .26667E 02 .25000E 00 9.12 60/ 60 172 18 1.2 29971 15
.6 .29193E 03 .29670E 01 .28736E-01 .21552E-01 .30172E 00 .26667E 02 .22222E 00 9.12
58/ 62 172 18 6.3 29986 15.7 .29655E 03 .32471E 01 .57471E-01 .35920E-01 .22989E 00
.26667E 02 .22222E 00 9.12 58/ 68 172 18 11.4 30001 15.8 .28846E 03 .30580E 01 .5401
2E-01 .23148E-01 .18678E 00 .26667E 02 .23611E 00 9.12 56/ 60 172 18 16.5 30016 15.8
.29022E 03 .29431E 01 .32552E-01 .19531E-01 .23522E 00 .26667E 02 .18056E 00 9.12 63
/ 75 172 18 21.7 30031 15.9 .29639E 03 .27535E 01 .13889E-01 .27778E-01 .24306E 00 .2
6667E 02 .27778E 00 9.12 60/ 60 172 18 26.8 30046 16.0 .29523E 03 .26736E 01 .27778E-0
1 .69444E-02 .29167E 00 .14222E 02 .18056E 00 9.08 60/ 64 172 18 31.9 30061 16.1 .29
552E 03 .29965E 01 .20833E-01 .13889E-01 .25000E 00 .00000E 00 .20833E 00 9.02 60/ 60
172 18 37.0 30076 16.2 .29881E 03 .30764E 01 .20833E-01 .27778E-01 .31944E 00 .00000
E 00 .16667E 00 8.98 60/ 60 172 18 42.1 30091 16.3 .29849E 03 .27339E 01 .71839E-02
.21552E-01 .30506E 00 .00000E 00 .20833E 00 8.87 57/ 60 172 18 47.2 30106 16.4 .29434E
03 .29241E 01 .22321E-01 .22321E-01 .20089E 00 .00000E 00 .23810E 00 8.80 56/ 60 172
18 52.7 30122 16.4 .29666E 03 .27827E 01 .00000E 00 .00000E 00 .22321E 00 .00000E 00
.19345E 00 8.80 56/ 64 172 18 57.8 30137 16.5 .29713E 03 .27187E 01 .41667E-01 .138
89E-01 .20139E 00 .00000E 00 .22222E 00 8.75 60/ 60 172 19 2.9 30152 16.6 .30140E 03
.28460E 01 .13889E-01 .00000E 00 .21552E 00 .00000E 00 .18056E 00 8.75 59/ 68 172 19
8.0 30167 16.7 .29678E 03 .27191E 01 .14368E-01 .35920E-01 .26580E 00 .00000E 00 .
14881E 00 8.75 58/ 68

172 19 13.1 30182 16.8 .29135E 03 .27535E 01 .20833E-01 .34722E-01 .19444E 00 .00000 REC 3, LENGTH 7524
E 00 .16667E 00 8.75 60/ 60 172 19 18.2 30197 16.9 .29347E 03 .29861E 01 .00000E 00
.00000E 00 .17361E 00 .00000E 00 .25000E 00 8.75 60/ 60 172 19 23.4 30212 16.9 .30470E
03 .29025E 01 .20833E-01 .00000E 00 .26580E 00 .11429E 02 .16667E 00 8.75 59/ 64 172
19 28.5 30227 17.0 .29066E 03 .29687E 01 .17361E-01 .26042E-01 .26910E 00 .26667E 02
.15625E 00 8.75 48/ 64 172 19 33.9 30243 17.1 .29022E 03 .30756E 01 .20833E-01 .138
89E-01 .30172E 00 .26667E 02 .16667E 00 8.75 59/ 80 172 19 39.0 30258 17.2 .29724E 03
.29340E 01 .46296E-01 .34722E-01 .23148E 00 .26667E 02 .13021E 00 8.75 36/ 60 172 19
43.5 30271 17.2 .29455E 03 .27983E 01 .90580E-02 .27174E-01 .27778E 00 .26667E 02 .
22727E 00 8.75 44/ 69 172 19 49.3 30288 17.3 .29581E 03 .29167E 01 .83333E-02 .83333E-
02 .18333E 00 .26667E 02 .19231E 00 8.70 50/ 70 172 19 54.4 30303 17.4 .28744E 03 .2
6972E 01 .14881E-01 .22321E-01 .27530E 00 .26667E 02 .16369E 00 8.59 56/ 60 172 19 59.2
30317 17.5 .29523E 03 .28213E 01 .27778E-01 .69444E-02 .22989E 00 .26667E 02 .1666
7E 00 8.48 59/ 60 172 20 4.6 30333 17.6 .29688E 03 .27295E 01 .28736E-01 .14368E-01
.29861E 00 .26667E 02 .18056E 00 8.47 59/ 68 172 20 9.7 30348 17.6 .29260E 03 .25039
E 01 .15432E-01 .00000E 00 .28846E 00 .26667E 02 .19231E 00 8.37 53/ 68 172 20 14.2
30361 17.7 .29000E 03 .26875E 01 .69444E-02 .20833E-01 .20139E 00 .26667E 02 .13889E 0
0 8.43 60/ 60 172 20 19.3 30376 17.8 .29003E 03 .29278E 01 .74405E-02 .29752E-01 .27
530E 00 .26667E 02 .16369E 00 8.37 56/ 64 172 20 24.4 30391 17.8 .29948E 03 .29236E 01
.20833E-01 .27778E-01 .26389E 00 .26667E 02 .18056E 00 8.37 60/ 60 172 20 29.8 3040
7 17.9 .29724E 03 .29362E 01 .13021E-01 .13021E-01 .26693E 00 .11667E 02 .15625E 00
8.37 64/ 72 172 20 34.9 30422 18.0 .30159E 03 .29496E 01 .74405E-02 .22321E-01 .22270E
00 .00000E 00 .19444E 00 8.37 57/ 66 172 20 40.1 30437 18.1 .29615E 03 .28919E 01 .
69444E-02 .20833E-01 .28736E 00 .00000E 00 .10417E 00 8.37 59/ 60 172 20 45.2 30452 18
.2 .29619E 03 .27431E 01 .69444E-02 .13889E-01 .31944E 00 .00000E 00 .25000E 00 8.37
60/ 60 172 20 50.3 30467 18.2 .29476E 03 .26458E 01 .20833E-01 .41667E-01 .22222E 00
.00000E 00 .18056E 00 8.37 60/ 60 172 20 55.4 30482 18.3 .29176E 03 .26944E 01 .2777
8E-01 .41667E-01 .22917E 00 .00000E 00 .26389E 00 8.37 60/ 65 172 21 .5 30497 18.4
.29427E 03 .27992E 01 .14881E-01 .37202E-01 .23148E 00 .00000E 00 .13393E 00 8.37 55
/ 68 172 21 5.6 30512 18.4 .58661E 03 .23867E 01 .14368E-01 .71839E-02 .20833E 00 .0
0000E 00 .23810E 00 8.37 57/ 61 172 21 10.7 30527 18.5 .30074E 03 .23998E 01 .80128E-0
2 .24038E-01 .24038E 00 .00000E 00 .14423E 00 8.37 52/ 64 172 21 15.9 30542 18.6 .29
176E 03 .24514E 01 .69444E-02 .13889E-01 .22917E 00 .00000E 00 .11111E 00 8.37 60/ 60
173 21 21.0 30557 18.6 .29360E 03 .25590E 01 .27778E-01 .34722E-01 .26389E 00 .00000
E 00 .22222E 00 8.32 60/ 72 172 21 26.1 30572 18.7 .29599E 03 .26667E 01 .20833E-01

.31540E 03 .45288E 01 .20833E 00 .18939E-01 .20833E 00 .00000E 00 .37037E 00 14.92 42
/ 60 143 9 27.9 1447714 14.6 .31580E 03 .45008E 01 .92593E-01 .77160E-02 .24840E 00 .2
6667E 02 17361E 00 25.67 53/ 60 143 9 33.1 1447729 14.5 .31509E 03 .45549E 01 .10417E 0
0 .18939E-01 .27462E 00 .14545E 02 .26515E 00 14.89 44/ 60 143 9 38.2 1447744 14.4 .31
472E 03 .47192E 01 .12500E 00 .20833E-01 .18429E 00 .00000E 00 .86806E-01 14.87 46/ 60
143 9 43.3 1447759 14.3 .31855E 03 .47731E 01 .14137E 00 .14881E-01 .22321E 00 .24615
E 02 .22222E 00 14.75 56/ 60 143 9 48.4 1447774 14.2 .31767E 03 .47316E 01 .13194E 00
.13889E-01 .28736E 00 .13333E 02 .31944E 00 14.95 59/ 60 143 9 53.5 1447789 14.1 .31315E
03 .44345E 01 .13393E 00 .00000E 00 .17857E 00 .00000E 00 .89286E-01 14.62 28/ 48 143
9 58.6 1447804 14.0 .31643E 03 .45621E 01 .17361E 00 .27778E-01 .18678E 00 .20952E 02
.25000E 00 14.84 59/ 60 143 10 3.7 1447819 14.0 .32629E 03 .447..E 01 .69444E-01 .694
44E-02 .20032E 00 .26667E 02 .19097E 00 14.77 56/ 60 143 10 8.8 1447834 13.9 .32131E 03
.44109E 01 .12213E 00 .14368E-01 .23707E 00 .71111E 01 .26786E 00 14.81 58/ 60 143 10
14.0 1447849 13.8 .31783E 03 .44217E 01 .12213E 00 .43103E-01 .25144E 00 .88889E 01 .
26786E 00 14.94 58/ 60 143 10 19.1 1447864 13.7 .32234E 03 .46042E 01 .11111E 00 .27778E-
01 .18750E 00 .26667E 02 .13889E 00 14.84 60/ 60 143 10 24.2 1447879 13.6 .31226E 03 .4
5249E 01 .16204E 00 .30864E-01 .37500E 00 .14222E 02 .26389E 00 14.94 57/ 60 143 10 29.3
1447894 13.5 .31858E 03 .49708E 01 .12500E 00 .34722E-01 .27778E 00 .00000E 00 .1636
9E 00 14.81 57/ 60 143 10 34.4 1447909 13.4 .32397E 03 .45941E 01 .12500E 00 .69444E-02
.24554E 00 .19048E 02 .13393E 00 14.87 58/ 60 143 10 39.5 1447924 13.3 .31727E 03 .46893
E 01 .11161E 00 .22321E-01 .20115E 00 .26667E 02 .26389E 00 14.84 57/ 60 143 10 44.6 14
47939 13.2 .31982E 03 .46111E 01 .11806E 00 .69444E-02 .25000E 00 .17778E 01 .13889E 0
0 14.75 60/ 60 143 10 49.8 1447954 13.1 .31494E 03 .43862E 01 .10417E 00 .00000E 00 .23
065E 00 .00000E 00 .26786E 00 14.69 56/ 60 143 10 54.5 1447968 13.0 .32482E 03 .46300E 01
.12500E 00 .20833E-01 .24554E 00 .20513E 02 .22222E 00 14.95 58/ 60 143 10 59.6 144798
3 12.9 .31800E 03 .47153E 01 .13889E 00 .13889E-01 .22917E 00 .24889E 02 .16667E 00 1
4.94 60/ 60 143 11 4.8 1447998 12.8 .32064E 03 .52326E 01 .15972E 00 .13889E-01 .29167E
00 .00000E 00 .19444E 00 14.90 60/ 60 143 11 9.9 1448013 12.7 .31519E 03 .57639E 01 .
90278E-01 .27778E-01 .27778E 00 .17778E 02 .26389E 00 14.75 60/ 60 143 11 15.0 1448028 12
.6 .31297E 03 .47737E 01 .10417E 00 .29762E-01 .38194E 00 .26667E 02 .83333E-01 14.90
58/ 60 143 11 20.1 1448043 12.5 .31404E 03 .13419E 02 .13393E 00 .74405E-02 .26042E 00
.38095E 01 .11905E 00 14.81 56/ 60 143 11 25.2 1448058 12.4 .32234E 03 .10159E 02 .1319
4E 00 .20833E-01 .22270E 00 .17143E 02 .18056E 00 15.01 59/ 60 143 11 30.3 1448073 12.2
.31649E 03 .19687E 02 .22222E 00 .20833E-01 .26389E 00 .23111E 02 .18056E 00 14.94 60
/ 60 143 11 35.4 1448088 12.1 .32179E 03 .19285E 02 .20139E 00 .13889E-01 .29167E 00 .0
0000E 00 .20833E 00 14.90 60/ 60 143 11 40.9 1448104 12.0 .31627E 03 .16256E 02 .15046E 0
0 .11574E-01 .35880E 00 .23704E 02 .27778E 00 14.67 41/ 60 143 11 46.0 1448119 11.9 .32
301E 03 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 14.62 19/ 60
143 11 51.1 1448134 11.8 .32015E 03 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000
E 00 .00000E 00 14.90 60/ 60 143 11 56.2 1448149 11.7 .31746E 03 .00000E 00 .00000E 00
.00000E 00 .00000E 00 .00000E 00 14.88 59/ 60 143 12 1.4 1448164 11.6 .32435E
03 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 14.62 52/ 60 143
12 6.5 1448179 11.5 .32352E 03 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00
.00000E 00 14.83 53/ 60 143 12 11.6 1448194 11.4 .32538E 03 .00000E 00 .00000E 00 .000
00E 00 .00000E 00 .00000E 00 .00000E 00 14.69 52/ 60 143 12 16.7 1448209 11.3 .31417E 03
.00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 14.75 56/ 60 143 12
21.8 1448224 11.1 .31401E 03 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .00000E 00 .
00000E 00 14.84 59/ 60

143 12 26.9 1448239 11.0 .30329E 03 .54241E 01 .12649E 00 .14881E-01 .60268E 00 .26667 REC 9. LENGTH 7524
E 02 .13393E 00 14.87 60/ 60 143 12 32.0 1448254 10.9 .30923E 03 .54687E 01 .83333E-01
.13889E-01 .19444E 00 .12444E 02 .30556E 00 14.95 60/ 60 143 12 37.1 1448269 10.8 .30159E
03 .59626E 01 .93391E-01 .71839E-02 .27299E 00 .00000E 00 .26389E 00 14.81 58/ 60 143
12 42.3 1448284 10.7 .30390E 03 .62604E 01 .12500E 00 .13889E-01 .24306E 00 .88889E 01
.23611E 00 14.95 60/ 64 143 12 47.4 1448299 10.6 .29622E 03 .61921E 01 .10417E 00 .480
77E-01 .21577E 00 .26667E 02 .22321E 00 14.92 54/ 64 143 12 53.2 1448316 10.4 .30420E 03
.49346E 01 .66667E-01 .41667E-01 .29647E 00 .20513E 02 .19231E 00 14.81 51/ 60 143 12
58.3 1448331 10.3 .30547E 03 .50104E 01 .76389E-01 .27778E-01 .32639E 00 .00000E 00 .
22222E 00 14.75 60/ 60 143 13 3.4 1448346 10.2 .30676E 03 .53924E 01 .83333E-01 .69444E-
02 .28472E 00 .00000E 00 .69444E-01 14.95 60/ 60 143 13 8.5 1448361 10.1 .31985E 03 .5
4687E 01 .11111E 00 .34722E-01 .23611E 00 .24889E 02 .19444E 00 14.94 60/ 60 143 13 14.3
1448378 9.9 .32374E 03 .57292E 01 .11364E 00 .28409E-01 .18939E 00 .21818E 02 .2840
9E 00 14.92 44/ 48 143 13 19.4 1448393 9.8 .31885E 03 .56215E 01 .69444E-01 .41667E-01

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FILE 0001 REC 0001 CH 2400

0001	011426250100	240453012401	011426250000	740003212401	011426250100	300562412401	011426250160	300307612401
0049	011426260100	140206212401	011426260140	140200412401	011426260100	240026612401	011426270001	100007012401
0097	011426270140	501152212401	011426270100	000012412401	011426270100	000015612401	011426300440	441062012401
0145	011426300100	000013212401	011426300100	140304412401	011426300341	501044612401	011426310140	140361012401
0193	011426310661	740030212401	011426310120	200032412401	011426310100	440662612401	011426320120	200202012401
0241	011426320100	140365212401	011426320060	000014412401	011426320100	000011612401	011426330360	341105012401
0289	011426330001	100007212401	011426330100	140461412401	011426330100	000014612401	011426340000	140244012401
0337	011426340060	000017212401	011426340100	000012412401	011426340100	240303612401	011426350100	000015012401
0385	011426350100	140305212401	011426350100	000013412401	011426350060	000015612401	011426360000	200446012401
0433	011426360100	000015212401	011426360100	340034612401	011426370060	000016012401	011426370100	000014212401
0481	011426370120	200031412401	011426370100	000012612401	011426400100	000011012401	011426400060	000014212401
0529	011426400140	140306412401	011426400100	200026612401	011426410100	300024012401	011426410100	000017212401
0577	011426410060	000012412401	011426410100	240027612401	011426420100	000017012401	011426420100	000012212401
0625	011426420060	000015412401	011426420100	000017612401	011426430140	541545012401	011426430100	000015212401
0673	011426430160	240034412401	011426430100	000012612401	011426440100	000015012401	011426440100	000010212401
0721	011426440100	000013412401	011426440100	000015612401	011426450100	000010012401	011426450100	000013212401
0769	011426450100	400034412401	011426450100	000011612401	011426460060	000013012401	011426460100	000016212401
0817	011426460100	000011412401	011426460060	000014612401	011426470100	000017012401	011426470220	441147212401
0865	011426470060	200020412401	011426470100	200346612401	011426570100	300027012401	011426570060	000012212401
0913	011426570100	200024412401	011426570100	200023612401	011426600100	000012012401	011426600100	200027212401
0961	011426600100	200022412401	011426600060	140023612401	011426610100	200025012401	011426610100	200027212401
1009	011426610140	540033412401	011426610100	000016612401	011426620100	240021012401	011426620100	140025212401
1057	011426620100	200021412401	011426620100	200021612401	011426630100	200024012401	011426630100	200020212401
1105	011426630060	200021412401	011426630100	200024612401	011426720100	200022012401	011426720100	200023212401
1153	011426720060	200025412401	011426720120	140021612401	011426730100	200024012401	011426730100	200025212401
1201	011426730120	240021412401	011426730100	140024612401	011426740100	200026012401	011426740100	200021212401
1249	011426740060	200023412401	011426740100	140020612401	011426750100	200026012401	011426750100	200025212401
1297	011426750100	200026412401	011426750060	240023612401	011426760120	240025012401	011426760100	200027212401
1345	011426760100	200022412401	011426760100	200027612401	011426770100	200027012401	011426770100	200022212401
1393	011426770100	140025412401	011426770100	200027612401	011427000100	200023012401	011427000100	200025212401
1441	011427000100	140020412401	011427000120	200023612401	011427010100	200026012401	011427010120	200020212401
1489	011427010100	200023412401	011427010100	200025612401	011427020100	200020012401	011427020060	140024212401
1537	011427020060	140026412401	011427020060	200031612401	011427030060	200023012401	011427030100	140020212401
1585	011427030100	200021412401	011427030120	200024612401	011427040120	200027012401	011427040100	200021212401
1633	011427040120	140024412401	011427040100	200027612401	011427050140	240021012401	011427050060	140024212401
1681	011427050120	140027412401	011427050120	200022612401	011427060100	200024012401	011427060140	200027212401
1729	011427060100	200022412401	011427060100	140025612401	011427070140	200027012401	011427070100	200022212401
1777	011427070100	200025412401	011427070100	200020612401	011427100120	240023012401	011427100060	140025212401
1825	011427100100	240020412401	011427100100	200023612401	011427110100	200025012401	011427110120	200020212401
1873	011427110060	200023412401	011427110120	240026612401	011427120100	200021012401	011427120100	140023212401
1921	011427120060	200026412401	011427120100	140021612401	011427130100	200024012401	011427130100	200027212401
1969	011427130100	200022412401	011427130120	200024612401	011427140120	200027012401	011427140140	240021212401
2017	011427140060	140024412401	011427140120	200027612401	011427150100	240022012401	011427150100	200025212401
2065	011427150100	200027412401	011427150140	200022612401	011427160120	200025012401	011427160120	200020212401
2113	011427160140	200022412401	011427160120	240025612401	011427170060	140020012401	011427170100	140023212401
2161	011427170140	240025412401	011427170100	200020612401	011427200100	140023012401	011427200120	140026212401
2209	011427200100	200020412401	011427200060	100023612401	011427210060	140026012401	011427210120	200021212401
2257	011427210060	200024412401	011427210100	200026612401	011427220100	140021012401	011427220060	200024212401
2305	011427220120	200027412401	011427220060	140021612401	011427230140	240024012401	011427230040	140027212401
2353	011427230100	140022412401	011427230140	240024612401	011427240060	140027012401	011427240100	140022212401

FILE 0001 REC 0002 CH 2400

0001	011427240060	200025412401	011427240140	200027612401	011427250060	140022012401	011427250060	140025212401
0049	011427250100	200020412401	011427250100	200023612401	011427260120	140025012401	011427260100	240020212401
0097	011427260120	140023412401	011427260100	200026612401	011427270120	200020012401	011427270120	200023212401
0145	011427270060	140026412401	011427270060	140021612401	011427300100	200023012401	011427300100	140026212401
0193	011427300160	200021412401	011427300100	200034612401	011427310100	140026012401	011427310120	240021212401
0241	011427310100	200024412401	011427310060	140027612401	011427550100	140024012401	011427550040	200026212401
0289	011427550120	240021412401	011427550140	200024612401	011427560100	140027012401	011427560100	200021212401
0337	011427560060	140024412401	011427560120	200027612401	011427570020	040022012401	011427570120	140025212401
0385	011427570040	140027412401	011427570100	240022612401	011427600120	200025012401	011427600120	240020212401
0433	011427600120	200022412401	011427600120	200025612401	011427610060	140020012401	011427610160	200023212401
0481	011427610040	100025412401	011427610060	200020612401	011427620060	200023012401	011427620160	140026212401

FILE 0001 REC 0002 CH 2400

0529	011427620140	200020412401	011427620140	240023612401	011427630040	200026012401	011427630060	300021212401
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0625	011427640060	140027412401	011427640040	200031612401	011427650120	240024012401	011427650100	140027212401
0673	011427650060	140022412401	011427650060	140024612401	011427660120	200027012401	011427660160	240022212401
0721	011427660140	240025412401	011427660040	200027612401	011427670100	200032012401	011427670060	140025212401
0769	011427670120	200020412401	011427670060	140022612401	011427700140	200025012401	011427700040	200020212401
0817	011427700100	200023412401	011427700120	140026612401	011427710200	200020012401	011427710140	240023212401
0865	011427710040	240036412401	011427710060	200021612401	011427720100	140023012401	011427720100	140026212401
0913	011427720060	140021412401	011427720020	140024612401	011427730160	200026012401	011427730160	240021212401
0961	011427730100	140024412401	011427730120	140027612401	011427740120	200021012401	011427740020	140024212401
1009	011427740060	200027412401	011427740060	240022612401	011427750100	140025012401	011427750120	140027212401
1057	011427750020	140022412401	011427750100	200025612401	011427760160	240020012401	011427760060	140022212401
1105	011427760100	100025412401	011427760060	200020612401	011430020140	200024012401	011430020140	200027212401
1153	011430020140	140021412401	011430020100	140024612401	011430030140	200027012401	011430030060	040022212401
1201	011430030160	140024412401	011430030120	140027612401	011430040120	140022012401	011430040060	200025212401
1249	011430040020	140027412401	011430040040	200022612401	011430050160	200025012401	011430050120	200020212401
1297	011430050040	140023412401	011430050100	240025612401	011430060120	100020012401	011430060140	200023212401
1345	011430060160	200026412401	011430060060	100020612401	011430070040	200023012401	011430070060	140026212401
1393	011430070120	140021412401	011430070040	200023612401	011430100100	200026012401	011430100140	240021212401
1441	011430100020	140024412401	011430100040	140026612401	011430110120	240021012401	011430110160	200024212401
1489	011430110020	140027412401	011430110060	100022612401	011430120120	200024012401	011430120060	140027212401
1537	011430120060	140022412401	011430120060	140025612401	011430130120	240027012401	011430130060	140022212401
1585	011430130120	240025412401	011430130060	240020612401	011430140060	300022012401	011430140140	140025212401
1633	011430140160	140020412401	011430140140	240023612401	011430150120	200025012401	011430150100	140020212401
1681	011430150120	140023412401	011430150140	200026612401	011430210060	200022012401	011430210100	240024212401
1729	011430210200	140027412401	011430210100	240022612401	011430220060	140025012401	011430220140	200027212401
1777	011430220160	140022412401	011430220140	200025612401	011430230200	140020012401	011430230020	140023212401
1825	011430230120	200025412401	011430230160	240020612401	011430240060	240023012401	011430240100	140026212401
1873	011430240120	300020412401	011430240100	200023612401	011430250020	140026012401	011430250100	240021212401
1921	011430250200	140023412401	011430250140	240026612401	011430260100	240021012401	011430260000	140024212401
1969	011430260120	240027412401	011430260120	200021612401	011430270200	240024012401	011430270120	140027212401
2017	011430270120	140022412401	011430270120	140024612401	011430300220	200027012401	011430300120	240022212401
2065	011430300120	140025412401	011430300100	140027612401	011430310040	200022012401	011430310140	140025212401
2113	011430310160	240020412401	011430310100	140022612401	011430320060	140025012401	011430320020	200020212401
2161	011430320140	200023412401	011430320040	140025612401	011430330120	240020012401	011430330060	140023212401
2209	011430330060	200026412401	011430330200	340021612401	011430340100	140023012401	011430340120	140026212401
2257	011430340100	200021412401	011430340040	200024612401	011430350140	200026012401	011430350100	140021212401
2305	011430350120	240024412401	011430350120	140027612401	011430360160	140021012401	011430360140	100024212401
2353	011430360100	300027412401	011430360040	140022612401	011430370140	240024012401	011430370140	140027212401

FILE 0001 REC 0003 CH 2400

0001	011430370020	040022412401	011430370100	140025612401	011430400160	300020012401	011430400120	200022212401
0049	011430400100	140025412401	011430400140	200020612401	011430410140	140023012401	011430410060	240025212401
0097	011430410020	200020412401	011430410020	200023612401	011430420120	200026012401	011430420160	300020212401
0145	011430420100	200023412401	011430420100	200026612401	011430430040	100021012401	011430430020	140023212401
0193	011430430120	200026412401	011430430120	140021612401	011430440120	200024012401	011430440100	140027212401
0241	011430440120	140021412401	011430440120	240024612401	011430450040	200027012401	011430450100	200022212401
0289	011430450200	140024412401	011430450060	140027612401	011430460100	140022012401	011430460060	140025212401
0337	011430460140	140027412401	011430460120	240022612401	011430470160	200025012401	011430470140	100020212401
0385	011430470120	200022412401	011430470100	200025612401	011430500100	140020012401	011430500140	200023212401
0433	011430500120	140026412401	011430500140	240020612401	011430510100	140023012401	011430510120	140026212401
0481	011430510100	140021412401	011430510040	100023612401	011430520060	100026012401	011430520120	140021212401
0529	011430520100	200024412401	011430520140	200026612401	011430530140	140021012401	011430530100	140024212401
0577	011430530040	140027412401	011430530060	200021612401	011430540100	140024012401	011430540120	140027212401
0625	011430540120	200022412401	011430540120	240024612401	011430550100	200027012401	011430550120	140022212401
0673	011430550060	200025412401	011430550120	200020612401	011430560120	100022012401	011430560060	140025212401
0721	011430560100	140020412401	011430560040	140023612401	011430570160	200025012401	011430570040	140020212401
0769	011430570100	200023412401	011430570100	140026612401	011430600160	240020012401	011430600060	200023212401
0817	011430600020	200026412401	011430600060	140021612401	011430610120	140023012401	011430610100	200026212401
0865	011430610100	200021412401	011430610160	200024612401	011430620140	140027012401	011430620140	200021212401
0913	011430620040	140024412401	011430620200	300027612401	011430630140	140022012401	011430630060	200024212401
0961	011430630100	140027412401	011430630160	240022612401	011430640040	200025012401	011430640140	240027212401
1009	011430640160	140022412401	011430640160	200025612401	011430650240	140020012401	011430650060	140022212401

FILE 0001 REC 0003 CH 2400

1057	011430650140	300025412401	011430650040	100020612401	011430660100	140023012401	011430660140	140026212401
1105	011430660120	140020412401	011430660040	140023612401	011430670120	240026012401	011430670040	140021212401
1153	011430670100	140023412401	011430670100	240026612401	011430700120	240021012401	011430700140	240024212401
1201	011430700100	200026412401	011430700200	140021612401	011430710160	100024012401	011430710000	140037212401
1249	011430710020	100021412401	011430710220	200024612401	011430720100	140027012401	011430720060	100022212401
1297	011430720160	240024412401	011430720060	200027612401	011430730200	200022012401	011430730100	140025212401
1345	011430730160	240020412401	011430730060	100022612401	011430740060	200025012401	011430740300	200020212401
1393	011430740120	140023412401	011430740040	140025612401	011430750060	140020012401	011430750040	140023212401
1441	011430750120	200026412401	011430750020	140020612401	011430760140	200023012401	011430760040	140026212401
1489	011430760040	140021412401	011430760120	140023612401	011430770020	100026012401	011430770040	200021212401
1537	011430770140	140024412401	011430770160	240027612401	011431000060	240021012401	011431000100	200024212401
1585	011431000220	240027412401	011431000120	140022612401	011431010040	140024012401	011431010140	140027212401
1633	011431010100	140022412401	011431010100	140025612401	011431020100	140027012401	011431020060	140022212401
1681	011431020140	140025412401	011431020040	140020612401	011431030040	200022012401	011431030020	140025212401
1729	011431030140	240020412401	011431030060	140023612401	011431040120	140026012401	011431040100	200020212401
1777	011431040140	140023412401	011431040000	140026612401	011431050100	140021012401	011431050060	140023212401
1825	011431050140	200026412401	011431050120	140021612401	011431100100	140022012401	011431100120	200025212401
1873	011431100060	140027412401	011431100060	140022612401	011431110160	240025012401	011431110100	240020212401
1921	011431110040	140022412401	011431110140	140025612401	011431120020	200020012401	011431120060	140023212401
1969	011431120060	100025412401	011431120100	140020612401	011431130140	200023012401	011431130040	100026212401
2017	011431130100	200020412401	011431130120	140023612401	011431140140	140026012401	011431140100	200021212401
2065	011431140140	140023412401	011431140040	100026612401	011431150060	200021012401	011431150220	140024212401
2113	011431150120	200027412401	011431150060	140021612401	011431160060	140024012401	011431160120	200027212401
2161	011431160040	200022412401	011431160140	240024612401	011431170040	140027012401	011431170160	140022212401
2209	011431170100	200025412401	011431170060	200027612401	011431220040	140020012401	011431220040	140033212401
2257	011431220100	140026412401	011431220200	200021612401	011431230100	140023012401	011431230100	140026212401
2305	011431230100	240021412401	011431230120	200024612401	011431240060	140026012401	011431240120	140021212401
2353	011431240040	140024412401	011431240120	140027612401	011431250100	140021012401	011431250100	140024212401

FILE 0001 REC 0004 CH 2400

0001	011431250100	200027412401	011431250120	100022612401	011431260120	300025012401	011431260140	140027212401
0049	011431260140	200022412401	011431260100	140025612401	011431270100	200020012401	011431270140	100022212401
0097	011431270060	040025412401	011431270100	140020612401	011431300120	140023012401	011431300140	140025212401
0145	011431300020	140020412401	011431300140	140023612401	011431310040	100026012401	011431310120	200020212401
0193	011431310000	140023412401	011431310140	240026612401	011431320120	200021012401	011431320140	300023212401
0241	011431320120	200026412401	011431320060	140021612401	011431330040	140024012401	011431330140	240027212401
0289	011431330120	240021412401	011431330020	200024612401	011431340000	140027012401	011431340160	300022212401
0337	011431340060	240024412401	011431340200	200027612401	011431350100	140022012401	011431350100	240025212401
0385	011431350060	200027412401	011431350120	200022612401	011431360060	140025012401	011431360160	140020212401
0433	011431360100	140022412401	011431360040	200025612401	011431370040	140020012401	011431370240	200023212401
0481	011431370060	140026412401	011431370040	140030612401	011431400100	200023012401	011431400120	200026212401
0529	011431400100	140021412401	011431400120	140023612401	011431410200	140026012401	011431410160	100021212401
0577	011431410060	200024412401	011431410040	140026612401	011431420060	200021012401	011431420120	140024212401
0625	011431420160	200027412401	011431420140	240021612401	011431430060	200024012401	011431430160	140027212401
0673	011431430140	200022412401	011431430040	200025612401	011431440160	140027012401	011431440120	140022212401
0721	011431440120	140025412401	011431440140	200020612401	011431450060	240022012401	011431450100	240025212401
0769	011431450000	140020412401	011431450140	240023612401	011431460100	140025012401	011431460100	200020212401
0817	011431460220	300023412401	011431460200	200026612401	011431470120	140020012401	011431470140	140023212401
0865	011431470100	140026412401	011431470100	140021612401	011431500200	200023012401	011431500100	140026212401
0913	011431500060	140021412401	011431500060	140024612401	011431510120	100027012401	011431510120	140021212401
0961	011431510100	240024412401	011431510020	140027612401	011431520040	140022012401	011431520060	200024212401
1009	011431520200	140027412401	011431520140	240022612401	011431530120	200025012401	011431530040	100027212401
1057	011431530120	200022412401	011431530020	200025612401	011431540100	140020012401	011431540140	140022212401
1105	011431540060	200025412401	011431540140	240020612401	011431550040	140023012401	011431550100	200026212401
1153	011431550200	240020412401	011431550100	100023612401	011431560160	340026012401	011431560100	200021212401
1201	011431560160	140023412401	011431560100	200026612401	011431570100	200021012401	011431570020	140024212401
1249	011431570040	140026412401	011431570200	200021612401	011431600060	200024012401	011431600060	140027212401
1297	011431600060	240021412401	011431600100	140024612401	011431610060	240027012401	011431610060	140022212401
1345	011431610160	240025412401	011431610100	200027612401	011431620060	100022012401	011431620100	200025212401
1393	011431620060	140020412401	011431620140	300022612401	011431630060	200025012401	011431630100	240020212401
1441	011431630240	300023412401	011431630160	200025612401	011431640040	140020012401	011431640140	140023212401
1489	011431640140	240026412401	011431640220	200020612401	011431650060	200023012401	011431650100	200026212401
1537	011431650120	300021412401	011431650200	200023612401	011431660160	340026012401	011431660100	200021212401

FILE 0001 REC 0001 CH 2400

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7/01/71 - 9/05/71 100, P.M. Thr, 20 Hz

0001	140206270100	200027056601	140206270060	200021256601	140206270100	200025456601	140206270100	200021656601
0049	140206300100	200021056601	140206300100	200023256601	140206300361	001562456601	140206300100	200020656601
0097	140206310100	000012056601	140206310100	000014256601	140206310100	200352456601	140206310120	200021656601
0145	140206320060	200020056601	140206320060	000015256601	140206320100	200020456601	140206320100	000012656601
0193	140206330100	000014056601	140206330100	300025256601	140206330100	000011456601	140206330100	000013656601
0241	140206340100	200026056601	140206340100	000010256601	140206340100	000012456601	140206340060	000014656601
0289	140206350000	200441056601	140206350100	000011256601	140206350100	000013456601	140206350120	000016656601
0337	140206360100	000010056601	140206360621	300024256601	140206360120	400752456601	140206360100	200027656601
0385	140206370100	000011056601	140206370100	240021256601	140206370220	000015456601	140206370200	000010656601
0433	140206400100	240023056601	140206404564	473740256701	140206400100	000017456601	140206400140	200027656601
0481	140206410740	600021056601	140206410100	200020256601	140206410060	000010456601	140206410160	700021656601
0529	140206420100	000014056601	140206420100	000017256601	140206420420	300026456601	140206420100	000013656601
0577	140206430100	000016056601	140206430100	000010256601	140206430100	340023456601	140206430100	000014656601
0625	140206440140	501444056601	140206440100	000011256601	140206440100	140063456601	140206440100	000016656601
0673	140206450342	300037056601	140206450100	000012256601	140206450100	000014456601	140206450160	000017656601
0721	140206460100	300022056601	140206460100	200031256601	140206460000	240245456601	140206460340	000017656601
0769	140206470100	000012056601	140206470100	000015256601	140206470100	200023456601	140206470060	000011656601
0817	140206500100	000014056601	140206500120	000016256601	140206500000	200033456601	140206500100	000012656601
0865	140206510100	000015056601	140206510220	000017256601	140206510140	200036456601	140206510100	240544656601
0913	140206520100	000016056601	140206520100	000016256601	140206520140	000013456601	140206520100	000015656601
0961	140206530120	140467056601	140206530120	000012256601	140206530100	000014456601	140206530100	000016656601
1009	140206540120	200450056601	140206540100	200027256601	140206540260	000015456601	140206540740	540020656601
1057	140206550100	241146056601	140206550100	000014256601	140206550100	300023456601	140206550320	000011656601
1105	140206562020	000012056601	140206560200	240024256601	140206560260	000017456601	140206560100	200027656601
1153	140206570160	000014056601	140206570100	000016256601	140206570220	000011456601	140206570100	200037656601
1201	140206600140	000015056601	140206600140	240026256601	140206600100	200027456601	140206600160	000014656601
1249	140206610100	200023056601	140206610100	000011256601	140206610100	000013456601	140206610320	000016656601
1297	140206620100	140442056601	140206620060	000012256601	140206620120	000014456601	140206620100	000017656601
1345	140206630100	000011056601	140206630100	000013256601	140206630060	000016456601	140206630120	000010656601
1393	140206640100	000012056601	140206640641	140020256601	140206640100	000016456601	140206640140	000011656601
1441	140206650440	000013056601	140206650161	242263256601	140206650100	000010456601	140206650100	000012656601
1489	140206660060	000014056601	140206660120	000017256601	140206660140	501146456601	140206660241	101760656601
1537	140206670100	000015056601	140206670120	200020256601	140206670140	140402456601	140206670100	000014656601
1585	140206700641	300023056601	140206700100	000011256601	140206700140	000013456601	140206700100	200027656601
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EXPLORER 41
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44 Files

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FILE 0001 REC 0002 CH 4002

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0145	777712140030	544200052215	001174477766	175700065236	000556230001	234400016250	002444510000	205300203364
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FILE 0001 REC 0001 CH 4002

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FILE 0001 REC 0002 CH 4002

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1729	004655517762	752300000421	000047257777	062400253617	000226020026	727777655342	000411700002	142300011410
1777	000302750016	455700007215	000266020011	617277654336	047020340001	000000010642	000004260000	354377770007
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FILE 0001 REC 0002 CH 4002

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2353	000232720026	512477661252	000362130002	142500011176	000272100014	305600005300	000241600010	643077675330
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2449	002503100002	335600264621	776517440003	561600021425	000111500002	707100140406	000051030002	365200105247
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2977	000263740012	543300004143	000221140007	756177712014	047021000001	000000011517	000005270000	446177767423
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3169	000214270001	073500026210	001212770000	367400021370	000755017771	564604702106	000100000001	163000000542
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3745	777702220024	213500024604	002575567767	102700027352	000214300001	055200025555	001063230000	306500017537
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3841	000065027777	020700241541	000246700025	723177671433	000267520002	143100010527	000255050010	462200003000
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3937	000006100000	655477770174	002411460002	475400256704	776720340002	635200021431	000105050002	543600103156
3985	000027150001	711200065427	777322320000					

FILE 0001 REC 0003 CH 4002

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0097	777346670470	214400010000	000123740000	063000005400	777670640024	720400454241	776463570000	063000006747
0145	777701350023	756300025210	002555007767	341200024753	000214320001	042000025270	000766230000	250500016303
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0625	002467200043	137677651613	000006740000	736577770035	002343440002	574200252620	776764510002	150200021433
0673	000102400002	500600066235	000021260001	467400055264	777450250470	217300010000	000130060000	070100006037
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FILE 0001 REC 0011 CH 4002

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3937	000003570000	271000005647	003423110000	125300424600	002207660013	234400013247	000132070004	375600465005
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FILE 0001 REC 0012 CH 4002

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Data Formats for Library Magnetic Tapes and Microfilm from The University of Chicago Charged Particle Experiments on the Satellites IMP-4 and IMP-5*

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CONTENTS

1. Introduction

We are submitting to the NSSDC the final processed data obtained from the University of Chicago instruments on the eccentric polar orbiting satellites IMP-4 and IMP-5. IMP-4 data coverage is from the launch date of May 24, 1967 through April 29, 1969. IMP-5 data coverage is from the launch date of June 21, 1969, and continues until the present time (March, 1971). These data are presented on microfilm and on magnetic tape. On microfilm are time-intensity plots for the averaged counting rates with each plot corresponding to a Bartel's Solar Rotation. There are four categories of magnetic tape:

1) Averaged counting rates,
2) Raw accumulator readouts,
3) Pulse height analysis readouts, and
4) Orbit parameters.

This document describes the instruments, the formats of the data and the relationship between the data and the physical parameters the instruments were recording. A reference list of scientific publications by the University of Chicago group based on the IMP-4 and IMP-5 data is attached.

2. Instrumentation and Performance

The University of Chicago instruments on the satellites IMP-4 and IMP-5 are sufficiently similar that their characteristics can be described in parallel. The performance of the IMP-5 instrument will be reported when the data are submitted.

2.1 General Description

The University of Chicago instrument occupies one whole facet of the right octagonal cylinder of the IMP-4 (5) main body. Figures

1 and 2 show the location of the instruments and the orientation of the spacecrafts for IMP-4 and 5, respectively. The weight and power consumption of these instruments are listed in Table 1.

TABLE 1

Instrument Weight and Power

	IMP-4	IMP-5
WEIGHT (lb)	9.3	10.8
POWER (Watt)	2.1	2.3

2.2 Detector array

The instrument on IMP-4 has two telescopes, a composition telescope and an electron telescope, whereas the instrument on IMP-5 has only a composition telescope.

2.2.1 IMP-4:

2.2.1a Composition telescope:

A schematic of the composition telescope is shown in Figure 3. The anti-coincidence scintillation counter D6 and detector D1 define a geometrical factor of 1.6 cm^2-ster. An aluminized mylar window protects the detectors from sunlight. The thickness of the telescope absorbers are tabulated in Table 2.

Composition Telescope Absorbers

Absorber name	IMP-4		IMP-5	
	THICKNESS (gm/cm^2)	MATERIAL	THICKNESS (gm/cm^2)	MATERIAL
Mylar Window	1.24×10^{-3}	Aluminized Mylar	1.24×10^{-3}	Aluminized Mylar
D_1 Depletion depth	8.81×10^{-2}	Li-drifted Si	9.47×10^{-2}	Li-drifted Si
D_1 Dead layer	2.26×10^{-2}		7.6×10^{-3}	
D1-D2 shield	5.2×10^{-3}	Titanium	8.2×10^{-3}	Titanium
D_2 Dead layer	3.19×10^{-2}	Li-drifted Si	1.33×10^{-2}	Li-drifted Si
D_2 Depletion depth	3.50×10^{-1}		3.62×10^{-1}	
D_3 Depletion depth	1.93×10^{-1}	Li-drifted Si	1.97×10^{-1}	Li-drifted Si
D_3 Dead layer	3.98×10^{-2}		1.98×10^{-2}	
D4 Housing	2.21×10^{-2}	Magnesium	2.21×10^{-2}	Magnesium
D_4	1.15×10^{1}	CsI (Tl)	1.15×10^{1}	CsI (Tl)
D4-D5 Housing	1.55×10^{-1}	Magnesium	1.77×10^{-1}	Magnesium
D_5	6.48×10^{-1}	Plastic	5.72	CsI (Tl)
D5-CK Housing	Not Applicable		2.56×10^{-1}	Magnesium
Cerenkov detector	Not Applicable		3.98	Sapphire (RCA-8664 PM tube)

TABLE 2

2.2.1b Electron telescope:

A schematic of the electron telescope is shown in Figure 3. This range total-energy telescope comprises an aluminized mylar window and a windowless Li-drifted silicon detector. The 44^{o} acceptance cone and geometrical factor of 0.05 cm^2 sr are defined by an aluminum collimator which also serves as omni-directional shielding. The pertinent thicknesses are tabulated in Table 3.

TABLE 3

IMP-4 Electron Telescope Absorbers		
Absorber name	Thickness (gm/cm^2)	Material
Mylar window	1.24×10^{-3}	Aluminized Mylar
Detector Depletion depth Dead layer	 0.3 0.03	 Li-drifted Silicon
Omni-directional Shield	1.8	Aluminum

2.2.2 IMP-5

The IMP-5 composition telescope is shown schematically in Figure 4. The anti-coincidence scintillation counter D6 defines a geometrical factor of 1.6 cm^2- sr for the 55° opening cone, and a geometrical factor of 1.1 cm^2- sr for the 36° opening cone. An aluminized mylar window protects the detectors from sunlight. Absorber thicknesses are shown in Table 2.

2.3 Logic

Logic diagrams of the two instruments are shown in Figures 5 and 6 respectively. The logic of each instrument has two modes (c.f. tables 9 and 10):

1) Normal mode, and

2) Calibrate mode.

2.3.1 IMP-4:

2.3.1a Composition Telescope

Normal Mode. Signals from all the detectors are utilized to give information concerning the flux of cosmic ray particles. This information is derived from six counting rates and three pulse-height analysis (PHA) readings from the composition telescope and two counting rates from the electron telescope. The eight counting rates and their readout frequencies are listed in Table 4. $D1\overline{D2D6}$ is pre-scaled by 8 when the counting rate $\gtrsim$ 22 KHz; $D1D2\overline{D3D6}$ is pre-scaled by 128 when the counting rate $\gtrsim$ 1.5 KHz.

TABLE 4

IMP-4 Counting Rates

Counting Rate	Readout Frequency
$D1_H\overline{D2D6}$	Four times per sequence*
$D1_H\overline{D2D3D6}$	Twice per sequence
$D1_H D2D3D4\overline{D5_L D6}$	"
$D1_L D2D3D4\overline{D5_L D6}$	"
D5 (Analog count rate meter)	Once per sequence, 128 consecutive sequences every 1024 sequences
D6 (Analog count rate meter)	Once per sequence, 896 consecutive sequences every 1024 sequences
E1 (cf sec. 2.3.1b)	Once per sequence
E2 (cf sec. 2.3.1b)	"
*c.f. Sec. 2.4 for sequence time Note: Settings of $D1_L$, $D1_H$, $D5_L$ and $D5_H$ are explained in 2.5.1a	

During each frame (cf.sec. 2.4), one incident particle may be pulse-height analyzed and recorded together with its angular sector (AS) and range identification (ID) information. The three 256-channel pulse-height analyzers are assigned to detectors D1, D2 and D4 respectively. The angular sector information comes from the Optical Aspect package on the spacecraft and signifies an octant in a plane* perpendicular to the spin axis in which the PHA occurred (see Figure 7). The range identification indicates the number of detectors the PHA event has triggered, i.e. a particle that penetrated D1 and D2 and stopped in D3 would be an ID = 3

* Essentially the ecliptic.

event and correspondingly the PHA reading from D4 should be zero. The definition of the ID's and the corresponding proton and electron energies are given in Table 5.

TABLE 5

IMP-4 Composition Telescope Energy Ranges

ID	Definition	Proton Energy (MeV)	Electron Energy (MeV)*
0	Calibrate mode	--	--
1	$D1_H\overline{D2D6}$	0.78 - 9.55 ($\pm$ 0.07)	0.17 ~ 1.0
2	$D1_H D2\overline{D3D6}$	9.6 - 18.8 ($\pm$ 0.2)	0.75 ~ 1.6
3	$D1_H D2D3\overline{D4D6}$	18.8 - 29.5 ($\pm$ 0.7)	1.4 ~ 3.0
4	$D1_H D2D3D4\overline{D5D6}$	29.5 - 94.2 ($\pm$ 1.5)	14 ~ 45
5	$D1_L D2D3D4D5_L\overline{D6}$	> 170 $\pm$ 10	$\gtrsim$ 40
6	$D1_L D2D3D4D5_L D5_H\overline{D6}$	94 - 170	--
7	Not defined	--	--

* electron energies are approximate because of range straggling.

Not all ID's have an equal chance of being read out. When the stored PHA event is either an ID = 1 ($D1\overline{D2D6}$) or ID = 5 or 6 ($D1D2D3D4D5_L\overline{D6}$), then prior to readout another PHA event may replace it. However, when the stored event is either an ID = 2 ($D1D2\overline{D3D6}$), ID = 3 ($D1D2D3\overline{D4D6}$) or ID = 4 ($D1D2D3D4\overline{D5D6}$), the storage will be locked and no event may replace this event prior to readout. In other words, ID = 2, 3 and 4 type of events have priority over ID = 1, 5 and 6 events for storage and readout.

Calibrate Mode. When the instrument is in calibrate mode, the ID

is set to zero. For every 8192 sequences, there are 128 consecutive sequences of calibrate mode, during which: (1) all coincidence requirements for the counting rates are removed so that individual detector counting rates may be monitored, and (2) in the final three readouts of a sequence each of the three analyzers are calibrated with pulses of different fixed amplitudes to monitor possible gain-shifts in the system.

2.3.1b Electron telescope

Normal Mode. The signal from the detector is analyzed with a two-channel pulse height analyzer and the counting rate of each channel is telemetered (cf. sec 2.4). Table 6 summarizes energy ranges of this telescope and Table 4 the readout frequency.

TABLE 6

IMP-4 Electron Telescope Energy Ranges

Designation	Electron Energy Interval (keV)	Proton* Energy Interval (keV)
E1	85 - 135	$\sim 750^{+}$
E2	160 - 370	$\sim 850^{+}$

* For the detection of protons with energies > 32 MeV, which penetrate the Al shielding, the effective omni-directional geometrical factor is 0.2 cm^2 sr.

$^{+}$ Collimated protons are counted only in a narrow energy band width ($\sim$ 40 keV) just above the window penetration energy.

Calibrate Mode. During calibrate mode the electron telescope is unaffected except that one pulse (count) is added to the E1 channel for the last three readouts of each calibrate sequence.

2.3.2 IMP-5:

Normal Mode. Signals from all the detectors are utilized to give information concerning the flux of cosmic ray particles. This information is derived from six counting rates and three pulse-height analysis (PHA) readings. The counting rates and their readout frequencies are listed in Table 7.

TABLE 7

IMP-5 Counting Rates

Counting Rate	Readout Frequency‡
$D1\overline{D2D6}$	Four times per sequence*
$D1D2\overline{D3D6}$	Twice per sequence
$D1D2\overline{D3D6}$ (prescaled by 128)	Once per sequence
$D1D2D3D4\overline{D5_L D6}$	Twice per sequence
$D2D3D4D5_L\overline{CKD6}$	Once per sequence
$D2D3D4D5_L CK\overline{D6}$	Twice per sequence
D5 (Analog count rate meter)	Once per sequence, 128 consecutive sequences every 1024 sequences
D6 (Analog count rate meter)	Once per sequence, 896 consecutive sequences every 1024 sequences

‡ Nominal accumulation time for all but analog rates is 4.80 seconds immediately preceding readout.

* IMP-5 Sequence time will be included in post launch performance report.

Note: Settings of $D5_L$ and $D5_H$ are explained in Sec. 2.5.2

The rate $D1\overline{D2D6}$ is prescaled by 8 when this counting rate is $\gtrsim$ 22 KHz. Accumulation periods when this prescaling is in effect are indicated by setting RR1 (cf. Table 10) to 1. The rate $D1D2\overline{D3D6}$ collected in accumulator 7b is prescaled by 128 whenever this rate is greater than $\gtrsim$ 1.3 KHz. As there is no separate indication of whether the $D1D2\overline{D3D6}$ rate is prescaled, this must be determined by comparing this rate with the permanently prescaled $D1D2\overline{D3D6}$ rate, which

collects in accumulator 7a. The prescaling on the $D1D2\overline{D3}D6$ (7a) rate is such that it collects the 1st count, then the 129th count, etc.

During the 4.8 seconds of each accumulation interval, one PHA event may be registered together with its angular sector (AS) and range identification (ID) information. The PHA comes from three pulse height analyzers: PHA1, 256 channels, assigned to D1 for ID = 0 to 5, and assigned to CK for ID = 6 and 7; PHA2, 512 channels, assigned to D2; PHA4, 256 channels, assigned to D4. The angular sector information comes from the Optical Aspect Sensor on the spacecraft and signifies an octant in the ecliptic* plane in which the PHA occurred (cf. figure 7). The range identification indicates the number of detectors the PHA event has triggered; i.e. a particle that penetrated D1 and D2 and stopped in D3 would be an ID = 3 event, and correspondingly the PHA reading from D4 should be zero. The definition of the IDs and the corresponding proton energies are given in Table 8.

* Actually in a plane perpendicular to the spacecraft spin axis which is approximately normal to the ecliptic plane.

TABLE 8

IMP-5 Energy Ranges

ID	Definition	Proton Energy (MeV)
0*	Calibrate mode, analyze D1, D2, D4	
1	$D1\overline{D2D6}$	0.78 - 8.45 ($\pm$ 0.25)
2	$D1D2\overline{D3D6}$	8.45 - 18.7 ($\pm$ 0.3)
3	$D1D2D3\overline{D4D6}$	18.7 - 30.9 ($\pm$ 2)
4	$D1D2D3D4\overline{D5_L D6}$	30.9 - 94.8 ($\pm$ 1)
5	$D1D2D3D4D5_L\overline{CKD6}$	94.8 - 119 +
6	$D1D2D3D4D5_L CK\overline{D6}$	> 119
7	Calibrate mode, analyze CK, D2, D4	

+ Since some particle trajectories pass through the D5, but do not hit CK (see Figure 4), ID5 events include a percentage of particles with energies > 119 MeV.
*Also see 2.5.2a.

Not all events have an equal chance of being readout. If an event satisfies the condition $D1D2\overline{D6}\ (\overline{D5_L} + D5_H)$, the analysis gates are locked (high priority event) and no other event will be analyzed during the accumulation period in progress. If this priority condition is not met (low priority event), each succeeding event will be analyzed until the end of the accumulation period. Thus, ID = 1 events are low priority; ID = 2, 3 or 4 events are high priority; ID = 5 or 6 events may be high or low priority (cf. sec.2.5.2a).

Calibrate Mode. When the instrument is in calibrate mode, the ID is 0 or 7. For every 8192 sequences, there are 128 consecutive sequences of calibrate mode, during which:

(1) coincidence requirements for the counting rates are modified as indicated in Table 10, and

(2) in the latter three readouts of a sequence each of the three analyzers are calibrated with pulses of different fixed amplitudes to monitor possible gain-shifts in the system.

2.4 Telemetry Format

The IMP-4 and IMP-5 spacecrafts transmit one complete set of readouts every 20.48 seconds‡, and this is called one SEQUENCE. Every SEQUENCE is divided into 16 FRAMES (0 through 15) and each FRAME into 16 CHANNELS (0 through 15). The main portion of the University of Chicago output is contained in CHANNELS 8 through 15 of FRAMES 2, 6, 10, and 14 of each SEQUENCE. The analog ratemeter that monitors the D5 and D6 counting rates alternatively has its output in CHANNEL 15 of FRAME 4 of every SEQUENCE while the temperature of the University of Chicago instrument is in CHANNEL 14 of FRAME 12 of every even numbered SEQUENCE. The voltage delivered to the University of Chicago experiment is read out in CHANNEL 11 of FRAME 4

‡ This is the nominal value. The University of Chicago uses a value of 20.45439 seconds for IMP-4.

of every SEQUENCE. Tables 9 and 10 show the telemetry format of the University of Chicago experiment on IMP-4 and IMP-5 respectively. The rate accumulators are open only for 60 channels: from the beginning of channel 12 to the end of channel 7 four frames later; also the PHA registers are open for 59 channels: from the beginning of channel 0 to the end of channel 10 three frames later.

Each SEQUENCE telemetered during the life of the satellite is assigned a unique number called the pseudo-sequence count (PSC). The PSC is the same as the Satellite Clock immediately after launch, and the PSC is increased by 1 for each sequence thereafter. The Decommutation program run at the Goddard Space Flight Center handles the PSC assignment, including corrections for data gaps, recycling the satellite clock, and any abnormalities that might occur to the satellite clock. Thus the PSC is a linearly increasing clock which measures time in units of readout sequences. The PSC is used as the basic time monitor for all the University of Chicago data described in this document.

2.5 Performance

2.5.1 IMP-4

2.5.1a Pre-launch

The instruments have been carefully calibrated prior to launch on its electronic characteristics and its response to protons and electrons. Table 11 shows the thresholds of the detectors and Table 12 tabulates the pulser calibration of the PHA's.

TABLE 9

THE UNIVERSITY OF CHICAGO *IMP-4 TELEMETRY FORMAT*

Channel		8	9	10	11	12	13	14	15
Number of bits		10	10	12	3 | 1 | 1 | 3	8	8	...8
Accumulator		7a (S-T)	7b (S-T)	7c (S-T)	← Chicago Digital Scan →			
	2	E-2	$D_{1L}D_2D_3D_4D_5\overline{D}_6$ cal: D_{5L}	$D_{1H}\overline{D}_2\overline{D}_6$ cal: D_{1H} prescale: 1/8	ID | RR1 | RR2 | AS	D_1 PHA	D_2 PHA	D_4 PHA
F R A M E	6	$D_{1H}D_2D_3D_4\overline{D}_{5L}\overline{D}_6$ cal: D_4	$D_{1H}D_2\overline{D}_3D_6$ prescale: 1/128 cal: D_3	"	"	"	"	"	"
	10	E-1 prescale: 2	$D_{1L}D_2D_3D_4D_{5L}\overline{D}_6$ cal: D_{5L}	"	"	"	"	"	"
	14	$D_{1H}D_2D_3D_4\overline{D}_{5L}\overline{D}_6$ cal: D_4	$D_{1H}D_2\overline{D}_3\overline{D}_6$ cal: D_2 prescale: 1/128	"	"	"	"	"	"

Analog Outputs:

1. D_{5L}/D_6 in PP10 (once per sequence)
   D_6 During sequences 0 through 895 + 1024n ($n \geq 0$)
   D_{5L} During sequences 896 through 1023 + 1024n
2. Telescope temp. in PP19 (once per two sequences)

Calibrate: ID = 0
Sequence normally within 7936 through 8063 + 8192n ($n \geq 0$)

Prescaling: None except if: 1. RR1 = 1, $D_{1H}\overline{D}_2\overline{D}_6$ and D_{1H} cal. prescaled by factor of 8
2. RR2 = 1, $D_{1H}D_2\overline{D}_3\overline{D}_6$ and D_2 cal. prescaled by factor of 128

TABLE 10

THE UNIVERSITY OF CHICAGO
IMP-5 TELEMETRY FORMAT

Channel		8	9	10	11	12	13	14	15
Bit Accumulator		0 1 2 3 4 5 6 7 | 0 1 7a (S-T)	2 3 4 5 6 7 | 0 1 2 3 7b (S-T)	4 5 6 7 | 0 1 2 3 4 5 6 7 7c (S-T)		0 1 2 3 4 5 6 7 ← Chicago Digital Scan →	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7	0 1 2 3 4 5 6 7 →
FRAME	2	$D_2D_3D_4D_5L\overline{CK}$ $\overline{D_6}$	$D_2D_3D_4D_5LC_K$ $\overline{D_6}$ Cal: C_K	$D_1\overline{D_2D_6}$ Cal: D_1 Prescale: 1 if RR1 = 0, 8 if RR1 = 1		ID HR1 RR1 AS	PHA 1 Cal: Background	PHA 2 (D2) Bits 0-7 Cal: Background	PHA 4 (D4) Cal: Background
	6	$D_1D_2D_3D_4\overline{D_5L}$ $\overline{D_6}$ Cal: D_4D_5L	$D_1D_2\overline{D_3D_6}$ Prescale: 1/128 Cal: D_3	"		" 2 " "	PHA 1 Cal: Onboard pulser	PHA 2 (D2) Cal: Onboard pulser	PHA 4 (D4) Cal: Onboard pulser
	10	$D_1D_2\overline{D_3D_6}$ Cal: D_2 Prescale: 128	$D_2D_3D_4D_5LC_K$ $\overline{D_6}$ Cal: C_K	"		" bit " "	"	"	"
	14	$D_1D_2D_3D_4\overline{D_5L}$ $\overline{D_6}$ Cal: D_4D_5L	$D_1D_2\overline{D_3D_6}$ Cal: D_2 Prescale 1/128	"		" 8 " "	"	"	"

Analog outputs: 1) D_{5L}/D_6 in PP12 (once per sequence); D_6 during sequences 0 through 895 + 1024 n ($n \geq 0$); D_{5L} during sequences 896 through 1023 + 1024n.
2) Telescope temperature in PP 19 (once per 2 sequences)

Calibrate: ID = 0 and 7 in alternate sequences, during sequences from 7936 through 8063 + 8192 n ($n \geq 0$)
PHA 1 - C_K if ID = 6 or 7; D_1 if ID = 0, 1, 2, 3, 4, or 5.

Prescale of $D1D2\overline{D3}D6$ in 7b (6, 14) and D2 cal in 7b (14) is 1 unless at high rates (≈ 2 KC), 7a (10) ≈ 7b (6, 14), in which case prescale is 128.

TABLE 11

IMP-4 Detector Thresholds

$D1_L$	$D1_H$	D2	D3	D4	$D5_L$	$D5_H$	D6
(mV)	(mV)	(mV)	(mV)	(mV)	(V)	(V)	(mV)
0.34	0.65	1.20	0.81	0.37	.196	1.56	14.1

Threshold is defined as one-half of full triggering.

$D1_L$ and $D5_L$ are set to include minimum ionizing protons; $D5_H$ is set to exclude lower than minimum ionizing He^4; and $D1_H$ is set just above minimum ionizing protons.

Calibrations of the PHA by using a beam of accelerated protons between 15 and 200 MeV and cosmic ray muons give energy to pulse-height conversion factors which are compared with those obtained after launch in Table 13.

2.5.1b Post-launch

The satellite IMP-4 was launched on 24 May 1967 and terminated its life on 3 May 1969. During its mission the University of Chicago instrument went through temperature variations (seasonal and secular) as shown in Figure 8 which did not exceed the thermal specifications of the instrument, except for the severe temperature drops, not shown on the curve, during the two ~ 7-hour shadows.

Figures 9a, b and c show the shifts in the D1, D2 and D4 PHA systems, respectively, as indicated by the in-flight pulser calibrations. The shifts of the analyzers also can be checked for any part of the mission by

TABLE 12. IMP-4 PHA Calibration

Pulser Input (mV)	Channel Numbers D_1	D_2	D_4
			Threshold at 0.39 mV
0.4			1.4
0.5			2.3
0.6			3.3
0.7	Threshold at 0.71 mV		3.8
0.8	2.7		3.9
0.9	2.9		4.6
1.0	3.0	Threshold at 1.27 mV	5.4
1.5	3.5	2.2	8.2
2.0	4.1	2.5	11.4
3.0	6.0	3.0	18.0
4.0	7.0	3.4	24.8
5.0	9.0	4.0	30.9
6.0	10.0	4.3	37.3
7.0	11.9	5.0	44.4
8.0	13.0	5.0	50.7
9.0	14.9	6.0	57.3
10.0	16.0	6.0	64.1
12.0	19.0	7.0	76.8
14.0	22.0	8.0	90.2
16.0	25.0	8.5	102.4
18.0	28.0	9.0	116.3
20.0	31.0	10.0	129.4
30.0	45.7	14.0	159.0
40.0	60.1	18.1	163.3

Pulser Input (mV)	Channel Number D_1	D_2	D_4
50.0	75.3	22.0	167.8
60.0	90.1	26.1	171.7
70.0	105.3	30.8	176.0
80.0	120.8	35.0	180.2
90.0	128.6	38.8	184.0
100.0 mV	130.9	43.0	188.0
0.15V	139.0	63.4	208.3
0.20	146.4	84.0	228.5
0.25	154.2	105.0	245.8
0.30	161.2	126.0	249.0
0.35	169.2	140.4	250.0
0.40	176.9	143.1	Limit
0.50	191.8	148.2	
0.60	207.0	153.4	
0.70	222.0	158.5	
0.75	229.5	161.2	
0.80	237.0	163.5	
0.90	249.0	168.2	
1.00	252.0	173.5	
1.50	253.0	191.2	
2.00	Limit	222.5	
2.25		234.5	
2.50		246.0	
3.00 V		252.0	
		Limit	

noting the positions of the proton and He^4 tracks. Using the latter method, the energy to pulse-height conversion factors from orbits 1-36 are shown in Table 13.

TABLE 13

IMP-4 Conversion Factors

PHA	Pre-launch		Orbits 1 thru 36		Units
	Muon	Proton	Proton	He^4	
D1	-	191 ± 18	193 ± 16	200 ± 16	keV/mV
D2	-	214 ± 18	204 ± 16	201 ± 16	keV/mV
D4	20.8 ± 2.9	25.4 ± 2.2	22.0 ± 2.0	20.8 ± 2.0	MeV/mV

The PHA system as a whole was quite steady throughout the mission, except the D3 detector malfunctioning disturbed the range ID and the deterioration of the D4 system caused an ID = 4 analysis difficulty toward the end of 1967. A list of historical events in the life of the instrument is shown in Table 14.

TABLE 14

IMP-4 Satellite History

IMP-4 1967-51-A Explorer 34

Launch: WTR May 24, 1967 (Day 144)

First Quick-look data received: June 1, 1967 (Day 152)

First Production data received: Aug. 2, 1967 (Day 214)

Last Production Data received: Oct. 7, 1969 (Day 280)

Day	Orbit	Description
May 30, 1967 (Day 150)	2	E2 rate fails, returns all zeros.
Sept. 21, 1967 (Day 264)	28	E1 rate goes noisy.
Nov. 16, 1967 (Day 320)	41	D3 begins to go noisy*
Dec. 11, 1967 (Day 345)	47	D4 calibrate peak begins to spread.
Jan. 15, 1968 (Day 15)	55	D4 proton track begins to degrade.
Mar. 5, 1968 (Day 65)	67	Begin getting 2 peaks in D3 calibrate.
Mar. 7, 1968 (Day 67)	67	First Shadow, ~ 7 hours long, electron telescope dies.
Sept. 17, 1968 (Day 261)	112	D3 noisy at ~ 7×10^4 c/sec from here to end of mission.
Oct. 16, 1968 (Day 290)	119	ID2 proton track shifted one channel.
March 4, 1969 (Day 63)	151	Second shadow, ~ 7 hours long; there is no valid optical aspect data after this.
May 3, 1969 (Day 123)	164	Last day of data.

* Fairly quiet from 110'68 to 149'68 (orbits 77-87). Then noisy to end.

2.5.2 IMP-5:

2.5.2a Pre-launch

The instrument has been carefully calibrated prior to launch on its electronic characteristics and its response to protons and electrons. Table 15 shows the thresholds of the detectors and Table 16 tabulates the pulser calibration of the PHA's.

TABLE 15

IMP-5 Detector Thresholds

D1	D2	D3	D4	$D5_L$	$D5_H$	CK	D6
(mV)	(mV)	(mV)	(mV)	(mV)	(mV)	(mV)	(mV)
0.685	1.35	0.640	0.275	0.105	1.39	2.08	19.6

Threshold is defined as one-half of full triggering. Thresholds are measured at room temperature.

All detector thresholds are set to include minimum ionizing protons, except:

D1: includes only about 1/3 of minimum ionizing protons. If a particle fails to trigger D1 but does trigger CK, it is analyzed as a low priority event with ID = 0. In this case, PHA1 is assigned to CK.

CK: does not trigger on most protons moving backwards through the telescope. If such events trigger D1, they will be analyzed as ID = 5 events.

$D5_H$ threshold: This threshold determines whether or not an event of ID = 5 or 6 will be high or low priority. Particles that do not pass through one of the D5 photodiodes must deposit ~ 63 MeV in the D5 CsI crystal to trigger $D5_H$. If a particle passes through a photodiode, it will always trigger $D5_H$ if its charge is ≥ 2. Summarizing, for ID = 5 or 6,

1) Z = 1 all particles have low priority.

2) Z = 2 a) Forward moving particles of incident energy < 220 MeV/nucleon are high priority.

b) Forward moving particles ($\gtrsim$ 220 MeV/nucleon) and backward moving particles (all energies) have high priority 34.5 $\pm$ 2% of the time, since they hit a photodiode (this applies to 36° cone only).

3) $Z \geq 3$ all particles have high priority.

TABLE 16. IMP-5 PHA Calibration

Pulser Input (mV)	Channel Numbers			
	D1	D2	D4	CK
			Threshold at .27 mV	
0.3			1.9	
0.4			2.3	
0.5			2.7	
0.6	Threshold at 0.69 mV		3.1	
0.7	3.2		3.5	
0.8	3.4		3.9	
0.9	3.6		4.3	
1.0	3.7	Threshold at 1.35 mV	4.7	
1.5	4.5	2.5	6.6	
2.0	5.3	3.0	8.6	Threshold at 2.1 mV
3.0	6.9	3.9	12.5	4.9
4.0	8.5	4.9	16.5	5.6
5.0	10.1	5.8	20.5	6.2
6.0	11.7	6.8	25.5	6.8
7.0	13.3	7.7	30.0	7.5
8.0	14.9	8.7	34.0	8.1
9.0	16.4	9.6	38.5	8.7
10.0	18.0	10.5	42.0	9.3
12.0	21.0	12.3	50.0	10.6
14.0	24.5	14.2	58.0	11.9
16.0	27.0	16.1	66.0	13.1
18.0	31.0	17.0	75.0	14.5
20.0	34.5	19.8	82.5	15.7
30.0	51.0	29.5	124.0	22
40.0	67.0	39.0	162	28
50.0	84.0	47.5	168	35

Pulser Input (mV)	Channel Numbers			
	D1	D2	D4	CK
60.0	100.0	57.0	172.5	42
70.0	116.0	63.0	177	48
80.0	130.0	75.5	181.5	54
90.0	133.0	84.0	186	62
100.0	134.0	94.0	190.5	68
150.0	142.0	140.0	214	102
170.0	144.5	159	223	111
180.0	146.0	168	228	113
190.0	147.5	177	232.5	116
200.0	149.0	187	237	119
280.0	160.5	260	248	141
300.0	163.5	268	250	147
320.0	166.5	273	Limit	152
340.0	169.0	276		157
400.0	178.0	282		173
500.0	192.5	292		201
600.0	207.0	302		231
700.0	221.5	312		243
800.0	237	321		244
900.0	245	331		Limit
1.0 V	Limit	341		
1.5 V		388		
2.0 V		435		
2.5 V		482		
3.0 V		500		
3.5 V		Limit		

2.5.2b Post-launch

An appendix to this document, which will be submitted at a later date, will contain the post launch performance of the IMP-5 instrument, as well as a comparison of pre-launch and post-launch response to protons and electrons.

3. Data Format of the Magnetic Tapes

3.1 General Description

All magnetic tapes were generated on an XDS 930 computer at a density of 800 BPI on seven track tape. Each tape is labelled with an appropriate mnemonic of the type of data recorded on it: 'RAST' for RAte Summary Tape, 'RAPT' for RAte Packed Tape, 'PHAEST' for Pulse Height Analysis Event Summary Tape, and 'ORPT' for ORbit Parameter Tape. In addition, a number representing the sequential order of the tape in its respective category appears on the tape label.

An end of file mark terminates each orbit and a double end of file mark terminates the last orbit of each tape. An orbit contains a variable number of physical records. 'ORPT', 'PHAEST', and 'RAPT' are written in binary, odd parity. The 'RAST' is written in blocked BCD, even parity, 6 bits per character.

Table 17 summarizes the logical and physical segmentation of the magnetic tapes.

TABLE 17

Summary of Tape Format Physical and Logical Divisions

Tape Type	RAST	RAPT	PHAEST	ORPT
Format Type	Blocked BCD	Binary	Binary	Binary
Number of Orbits per Magnetic Tape	100	30	20	33 IMP-4 44 IMP-5
Number of Logical Records per Physical Record	57	102	200	40
Number of Words* per Physical Record	1881 ‡	816	600	1000
Number of Words* per Logical Record	33	8	3	25
Total Number of Magnetic Tapes in IMP-4 Submission	2	6	9	5

* XDS 930 binary, 24 bits per word.

‡ Short records do occur, but only immediately before an EØF.

The data on all tapes are ordered so that time and PSC are monotonically increasing, with discontinuities only at points where no data was received or where the data quality* of a particular sequence was other than good or fair.

The following word-bit placement convention is used in the data format descriptions. The lowest word and bit number is located closest to the beginning of the physical record, the beginning of the file, and the beginning of the tape. Similarly, 'File 1' of a tape is located immediately after the load point marker at the beginning of that tape. Furthermore, the

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* See GSFC X-563-69-292 section 2.7.

TABLE 18

RAPT LOGICAL RECORD SPECIFICATION

Item Number	Item Name	Location Within Logical Record		COMMENTS
		WORD	BITS	
1	Calibrate/Normal Flag	1	0	Value = {0, In Calibrate Mode; 1, In Normal Mode}
2	End of Orbit Flag	1	1	Value = {1, Normally; 0, At end of orbit where all remaining logical records in the last physical record are filled with zeros.}
3	Pseudo Sequence Count	1	2 thru 23	See Section 2.4.
4	Accumulator 7C Frame 2	2	0 " 11	See Tables 9 and 10.
5	Accumulator 7C Frame 6	2	12 " 23	
6	Accumulator 7C Frame 10	3	0 " 11	
7	Accumulator 7C Frame 14	3	12 " 23	
8.	Prescale Flag Frame 2	4	0 " 1	Value = {0, Not in Prescale Mode; 1, $D1D2\overline{D3}\overline{D6}$ is prescaled; 2, $D1\overline{D2}\overline{D6}$ is prescaled; 3, Both $D1\overline{D2}\overline{D6}$ and $D1D2\overline{D3}\overline{D6}$ are prescaled.}
9.	" " " 6	4	2 " 3	
10.	" " " 10	4	4 " 5	
11.	" " " 14	4	6 " 7	
12.	Data Quality Flag Frame 2	4	8	Flag Value = {0, All data items have good quality.; 1, One or more items had fair quality; or one item had poor quality, so, all data items are filled, with ones.}
13.	Data Quality Flag Frame 6	4	9	
14.	Data Quality Flag Frame 10	4	10	
15.	Data Quality Flag Frame 14	4	11	
16.	Geocenctric Distance of Satellite	4	12 thru 20	In tenths of earth Radii
17.	Overlap elimination flag	4	21 " 23	A value of '5' indicates the elimination of overlap.
18.	PHA Duplicate event Flag			Value = {0, there is a record of this frame on the PHAEST.; 1, There is not a record of this frame on the PHAEST, because there were no events collected during this frame.}
	Frame 14	5	0	
19.	Frame 10	5	1	
20.	Frame 6	5	2	
21.	Frame 2	5	3	
22.	Accumulator 7A Frame 2	5	4 thru 13	See Tables 9 and 10
23.	Accumulator 7A Frame 6	5	14 " 23	
24.	Accumulator 7A Frame 10	6	0 " 9	
25.	Accumulator 7A Frame 14	6	14 " 23	
26.	Accumulator 7B Frame 2	7	0 thru 9	
27.	Accumulator 7B Frame 6	7	14 " 23	
28.	Accumulator 7B Frame 10	8	0 " 9	
29.	Accumulator 7B Frame 14	8	14 " 23	
30.	Sun Time	6, 7, 8,	10 " 13	In milli-seconds. Word 6 contains most significant part, and word 8 contains the least significant part.

bit significance increases as the bit position number decreases; e.g., for a value stored completely in bits 9 through 14 of a word, bit 9 (when it is on) holds the value 2^5, bit 10 holds 2^4, and so on until bit 14 which represents 2^0.

3.2 RAte Packed Tape--RAPT

The RAte Packed Tapes contain the S-T Accumulator readouts and related data exactly as telemetered from the spacecraft. As can be seen in Table 17 all physical records on the RAPT are 816 words in length, divided into 102 logical records of 8 binary packed words. Table 18 specifies the data item to word and bit correspondence.

3.2.1 S-T Accumulators

There are three Scaler-Timer accumulators: two 10-bit (7a and 7b) and one 12-bit (7c). Each S-T accumulator operates as a scaler until the high order bit is set, e.g. 512 counts in a 10-bit accumulator, then the accumulator ceases to accept data pulses and starts to operate as a timer which measures the residual accumulation time from a spacecraft clock. For the 10-bit accumulators the clock has a frequency of 100 Hz and for the 12-bit accumulator 400 Hz; whence for the nominal accumulation time of 4.8 seconds, the high order bit, once set for time-mode (T-mode), is not reset until the end of readout when the accumulators are always zeroed.

3.22 Sun Time

The sun time is the time interval in milliseconds starting at the beginning of channel 0 of frame 0 of the given sequence and ending at the first detection of the sun by the Optical Aspect sensor.

Table 19

RAST LOGICAL RECORD SPECIFICATION

Item Number	Item Name	Format *	Description
1	Day	I3	This Data pertains to the Last point of the interval from which the following rate averages were computed.
2	Hour	I2	
3	Minute	F4.1	
4	Chicago Sequence Count	I8	
5	Satellite Geocentric Distance in Earth Radii	F4.1	
6	D5/D6 analog Ratemeter Average Rate	E12.5	All Rate Averages are in counts/second
7	Accumulator 7B Frames 2 thru 14	E12.5	For specific detector coincidences see Tables 9 and 10.
8	Accumulator 7B, Frames 6 and 14	E12.5	
9	Accumulator 7A Frames 6 & 14	E12.5	
10	Accumulator 7B Frames 2 & 10	E12.5	
11	Accumulator 7A, Frame 10	E12.5	
12	Accumulator 7A, Frame 2	E12.5	
13	Temperature	F6.2	In Degrees Centigrade
14	Number of Good Frames	I3	Only frames in which all the Data qualities were 'Good' are used in computing rate averages
15	Total Number of Frames	I3	If a frame contains even one data quality below 'Good', it is discarded, or if an 'overlap' condition is encountered, the second CSC or poorer quality CSC is discarded. This item is the total of all types of frames encountered in the 15 sequence count interval.

* Each item is led by a space 1X.

TABLE 20

PHAEST LOGICAL RECORD SPECIFICATION

Item Number	Item Name	Location Within Location Record		Comments
		Word	Bits	
1.	PSC	1	0 thru 23	See Section 2.4
2.	PHA Accumulator 1	2	0 thru 7	See Tables 9 and 10.
3.	" " 2	2	8 " 15	
4.	" " 3	2	16 " 23	
5.	Range ID	3	0 " 2	See Section 2.
6.	Angular Sector	3	3 " 5	
7.	Frame Number	3	6 " 7	Instead of 2, 6, 10, and 14 we have respectively 0, 1, 2, 3.
8.	Data Quality Flag	3	8	Value = {0, all data qualities are good 1, at least one data quality was fair but none were lower than fair.
9.	Orbit Number	3	9 thru 15	Least significant part of orbit number (for orbits 1 through 127)
10.	Orbit Number	3	16	Most significant bit(for orbits 128 through 255.)
11.	PHA Accumulator 2	3	17	The most significant bit of item 3. (This bit was added to accomodate the 512 channel D2 PHA analyzer on IMP-5.)
12.	End of orbit flag	3	18 thru 23	Value = {1, during orbit 0, at end of orbit (the remaining logical records in the last physical record are filled with zeroes.)

TABLE 21

ORPT LOGICAL RECORD FORMAT

Word Number Within Logical Record	Parameter Name	Description and Comment
1	Pseudo Sequence Count	This is the PSC for which the following orbit data is applicable.
2	Coordinate recomputation flag.	If non zero, then items 13 and 15-18 were in error and have been corrected at the University of Chicago.
3	Geocentric Distance of Satellite	In thousandths of an earth radius.
4 5 6	Day of Year Hour of Day MSEC of Hour	X, Y, Z of satellite in geocentric Solar ecliptic reference frame Time for which orbit data is valid. (January 1 = day 1)
7	Satellite-Earth-Sun Angle	In thousandths of a degree.
8 9	In the geomagnetic reference frame: Geomagnetic Longitude of Satellite Geomagnetic Latitude of Satellite	In all the geomagnetic reference frames, the assume location of the north magnetic pole is 69.0° west longitude, 78.2° north latitude. In thousandths of a degree.
10 11 12	In the Solar Magnetospheric Coordinate System: X Coordinate Y Coordinate Z Coordinate	In thousandths of an earth radius.
13 14	Geomagnetic Longitude of the Sun Geomagnetic Latitude of the Sun	In thousandths of a degree.
15 16	Geocentric Longitude of the Satellite Geocentric Latitude of the Satellite	In thousandths of a degree.
17 18	Geocentric Longitude of the Sun Geocentric Latitude of the Sun	In thousandths of a degree.
19	Speed of Satellite	In meters/second
20	L, McIllwain Parameter	In thousandths of an earth radius.
21	B, Field Strength	In milligauss
22	B/B_o	Dimensionless x 100
23 24 25	Theoretical Geomagnetic Field in Solar Ecliptic Coordinate System: X Coordinate Y Coordinate Z Coordinate	In milligauss

3.3 RAte Summary Tape--RAST

The RAte Summary Tapes contain counting rates averaged over consecutive time intervals of 15 PSC's (~ 5 minutes) using only data of good quality. The last PSC in the period averaged over is assigned to the rate average. The physical and logical record size are given in Table 17.

Each logical record is generated with the following Fortran II format.

ITEM:	1	2	3	4	5	6 - 12	13	14	15
FORMAT	(1X, I3, 1X, I2, 1X, F4.1, 1X, I8, 1X, F4.1, 7 (1X, E12.5), 1X, F6.2, 1X, I3, 1H/I3)								

The item names, units, and other specifications are displayed in Table19.

3.3.1 Exceptions to the Standard Format

When reading the data from the tape, the above format statement is used except when reading the first logical record of each orbit which logical record is a heading. The second logical record of each orbit, although written in the above data format is not a data line and contains the following substitutions:

1) ITEMS 1 through 4 contain the Day, Hour, Minute and PSC for the first good data of the orbit.
2) ITEM 5 contains the orbit number.
3) ITEM 6 contains the geocentric distance of the satellite in kilometers.
4) All other ITEMS are filled with zeroes.

Similarly the last logical record of an orbit does not contain experiment data, but has the following substitutions:

1) ITEMS 1 through 3 contain the time of the last good data of the orbit.
2) ITEM 4= -1, thus acting as a sentinnel flag for the orbit.

3) ITEM 6 contains the total number of frames in the orbit.

4) ITEM 11 contains the total number of frames used (only good quality) to compute the rate averages in the orbit.

5) ITEM 12 is superceded by ITEM 6.

6) All other ITEMS are filled with zeroes.

The last physical record of a file terminates at the end of the orbit contained in that file. Hence, the number of logical records in the last physical record is usually less than the normal 57.

3.3.2 Calibrate Mode

When the instrument is in calibrate mode all counting rates are zeroed, except the D5/D6 Analog Ratemeter.

3.3.3 Analog Ratemeter

Although the Analog Ratemeter alternates between the D5 and D6 (see telemetry formats), these modes are not mixed when averaging is performed for the RAST. The mode the instrument is in at the beginning of the interval is the mode for that entire interval; ie., if the satellite switches mode during the interval, the new mode readouts are discarded.

3.4 Pulse Height Analysis Event Summary Tape--PHAEST

These tapes contain, among other pertinent data, the pulse height analyzer accumulator readouts as telemetered by the spacecraft. Only events with associated data qualities of 'good' or 'fair' are recorded on these tapes. As stated in Table 17 all physical records contain 600 words, divided into 200 logical records of 3 binary packed words. Each logical record contains all the data for one event.

If no events are collected during a frame, then there is no record of that frame on the PHAEST.

Table 20 itemizes the data item to word-and-bit correspondence within a logical record.

3.5 ORbit Parameter Tape--ORPT

These tapes contain trajectory data furnished by GSFC. Referring to Table 17 a physical record consists of 1000 binary packed words, divided into 40 logical records of 25 words. The complete set of orbit data contained in each logical record applies to the PSC appearing in that logical record.

Between consecutive logical records there normally is an increment of three PSC's (~ 1 min.). Table 21 contains the correspondence between data items and words within a logical record.

The parameter values are written in standard XDS 930 Integer format. That is, eight octal digits (one XDS 24-bit word) are allocated for each value. The most significant octal digit has only two bits since its leading bit (bit position zero of the word) represents the sign. If the sign bit is off (value: zero), the number is positive and represented in binary integer form with the most significant bit having the lowest bit position ('bit 1' is the lowest bit position). This is identical to the data representation used on the RAPT and PHAEST, except that every parameter now has a sign bit, and every value has exactly 23 bits. However, if the sign bit is on (value: one), the number is negative and represented in two's complement form.

4. Format for the Counting Rate Plots on Microfilm

The plots were computer generated on a Cal/Comp 563 plotter with the vertical axis representing the rate in counts per second, and the horizontal axis representing a time period of 30 days beginning on the first day of a Bartels Solar Rotation and ending three days into the following Solar Rotation. The horizontal scale is one day per division, and the vertical logarithmic scale varies for each range interval. Every horizontal fiducial is labelled with the PSC and the day of year (January 1 = Day No. 1). The year is printed at the origin and whenever it changes. Each plotted point represents a rate averaged over 45 sequences .

The heading of each plot contains the satellite number*, the Bartels Solar Rotation number, the range interval expressed as detector coincidence, and the date of generation of the plot**.

Table 22 specifies the time and solar rotation intervals covered.

TABLE 22

Microfilm Data Coverage

IMP-No.	Bartel's Solar Rotation No.	Dates (UT)
1	1783 - 1790	11-27-63 to 5-29-64
2	1795 - 1802	10-4-64 to 4-5-65
3	1804 - 1830	5-29-65 to 5-2-67
4	1831 - 1856	5-24-67 to 4-29-69
5	1859 -	6-21-69 to (> 3/71)

* Plots are being submitted for IMP 1, 2, 3 and 4 in microfilm form. (One roll of microfilm per satellite.)

** This date has no connection with the data.

Acknowledgments: We are grateful to R. Jacquet, Dr. M. G. Munoz and the staff of the Laboratory for Astrophysics and Space Research under the direction of J. Lamport for their contributions to the design and fabrication of these instruments. We wish to thank L. Littleton, M. Spencer, R. Herman, R. Taft, R. Martin and the entire data group under the direction of G. Lentz. In particular, we thank D. Shuman for his many important programming contributions and H. Crawford for his data processing assistance.

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FIGURE CAPTIONS

Figure 1 — Location and orientation of University of Chicago experiment on IMP-4, showing position of acceptance cones of the composition and electron telescopes.

Figure 2 — Location and orientation of University of Chicago experiment on IMP-5. Note that there is no electron telescope on this experiment. Only the 55^{o} acceptance cone of the telescope is indicated (see Figure 4).

Figure 3 — Schematic drawing of detector layout in IMP-4 Composition and Electron telescopes. Detector housings and mountings are not shown.

Figure 4 — Schematic drawing of Composition telescope on IMP-5.

Figure 5 — Simplified logic diagram of the IMP-4 experiment. This diagram shows only the normal mode operation of the instrument.

Figure 6 — Simplified IMP-5 logic diagram for normal mode operation.

Figure 7 — Orientation of the angular sectors for IMP's 4 and 5.

Figure 8 — Temperature history of IMP-4 experiment. The semi-sinusoidal variations are due to seasonal variation of the distance to the sun, while the overall rising trend is due to ultra-violet degradation of white thermal paint on the experiment facet.

Figure 9 — Location of IMP-4 in flight calibrator pulsar peaks throughout the mission. Note increasing spread of peaks in D4 PHA as the experiment aged.

a) D1

b) D2, and

c) D4

The University of Chicago
Composition Telescope, IMP-4

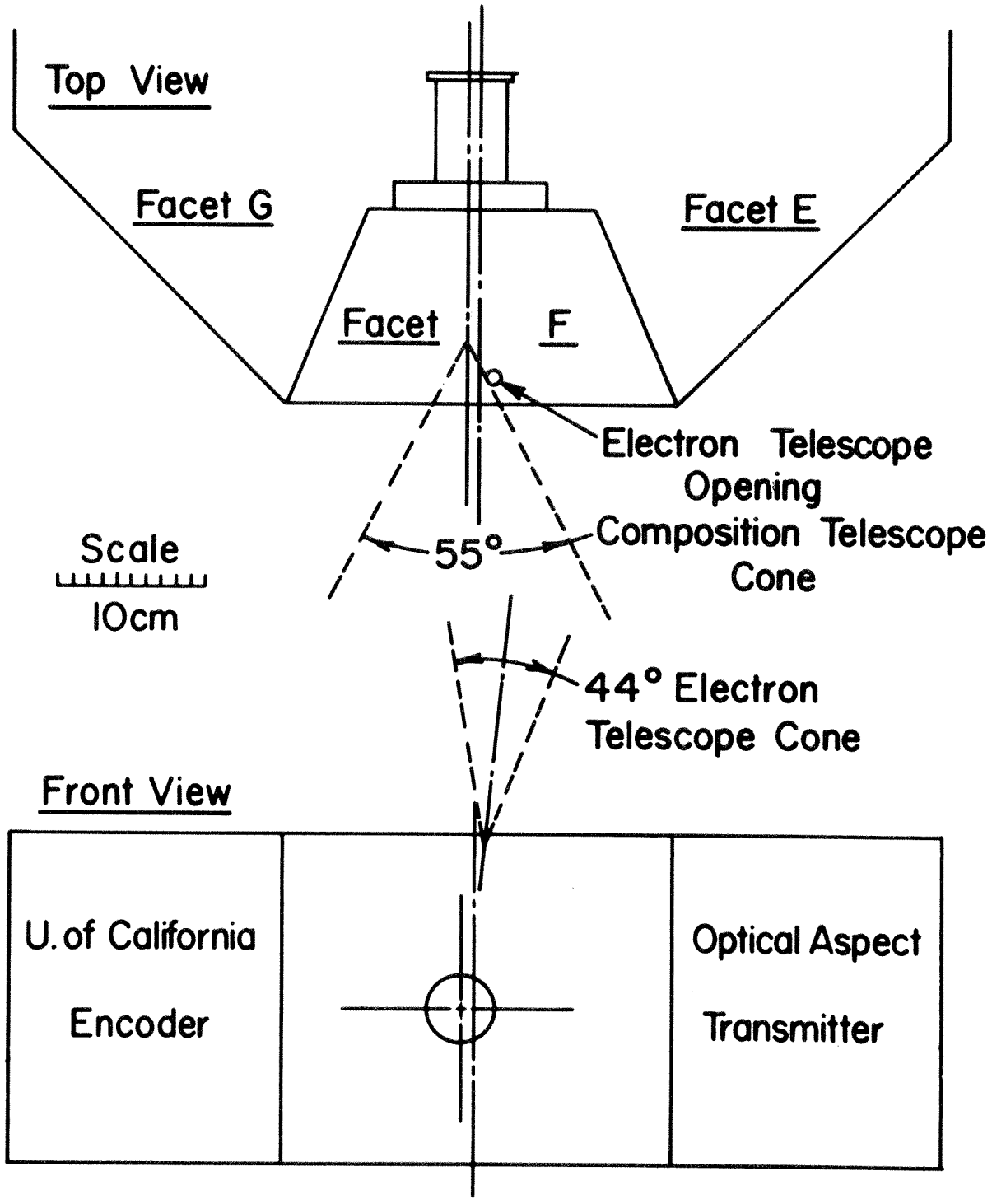
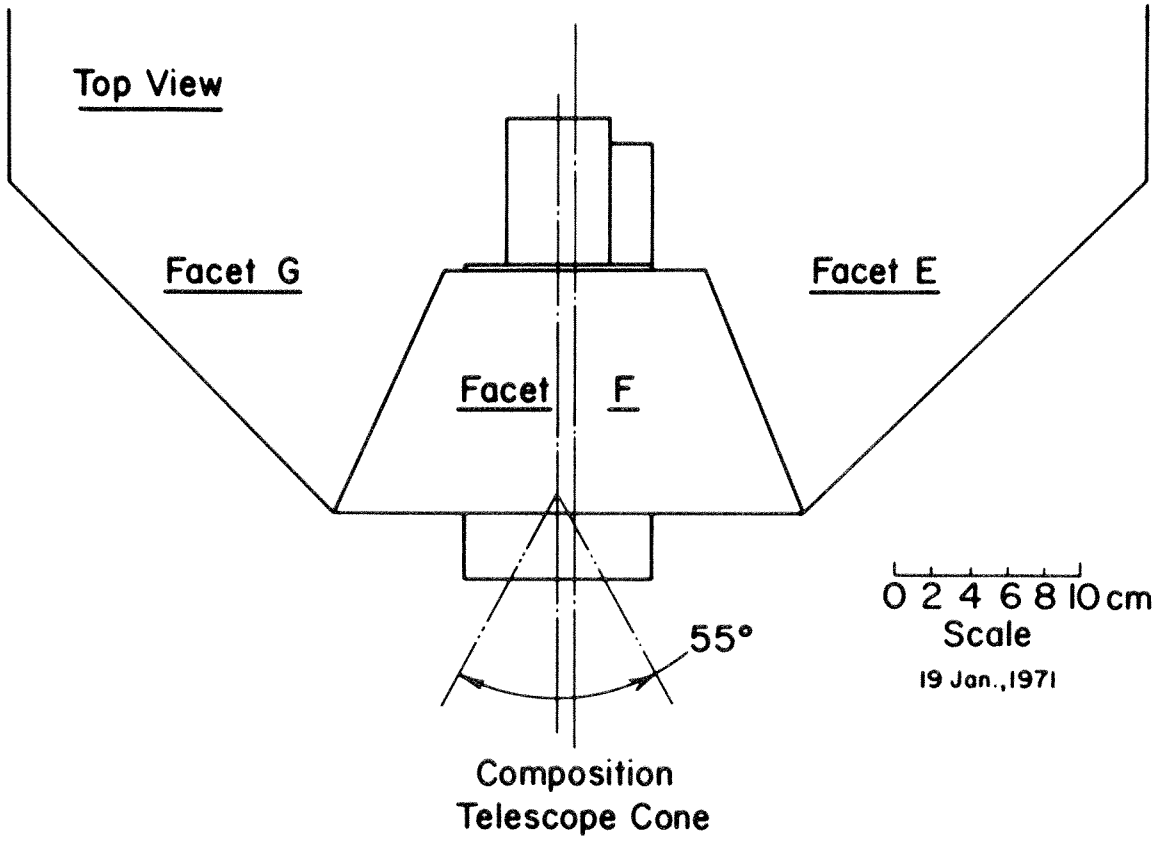


Figure 1

IMP-5
Location and Orientation of University of Chicago Experiment



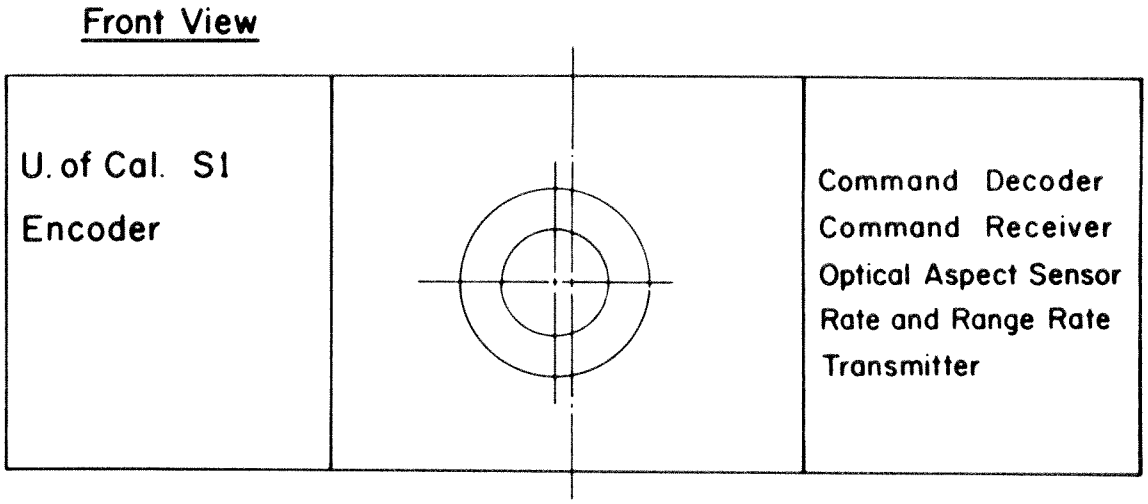
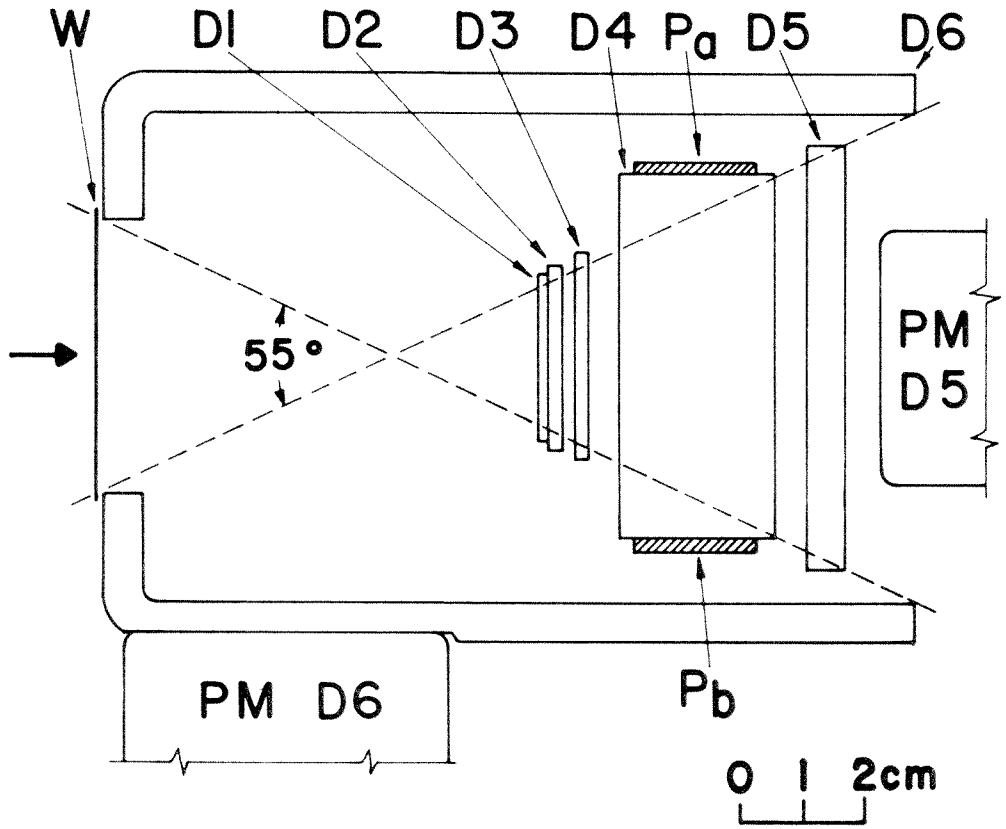


Figure 2



Composition Telescope

W — Al-Mylar Window

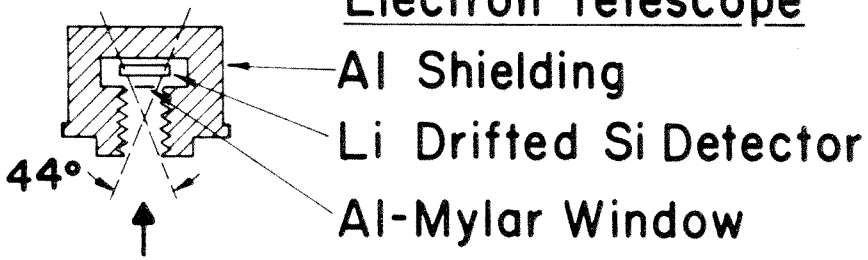
D1, D2, D3 — Li-Drifted Si Detectors

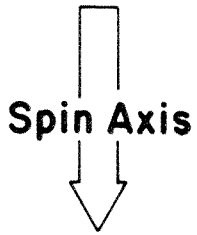
D4 — CsI(Tl) Crystal Viewed by Pa, Pb Au-Si Photo Diodes

D5 — Plastic Scintillator

D6 — Anti-Coincidence Plastic Scintillator

PM — Photomultiplier



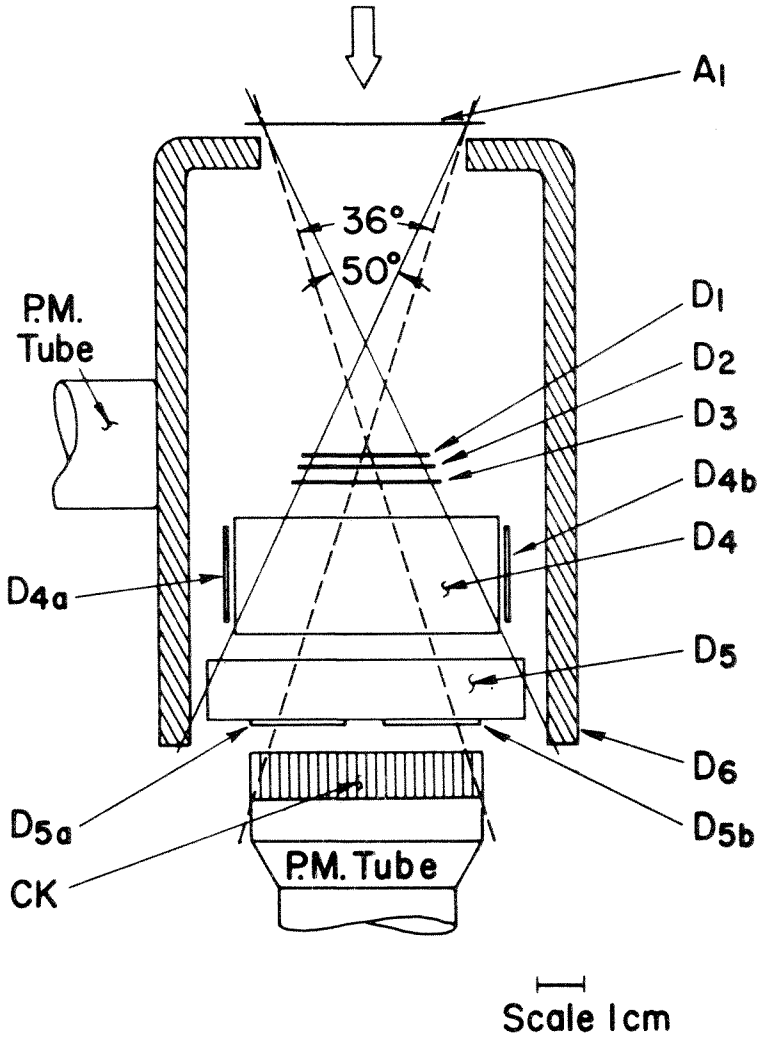


IMP-4 The University of Chicago

Figure 3

Composition Telescope

IMP 5 The University of Chicago



A_1 Al-Mylar Window

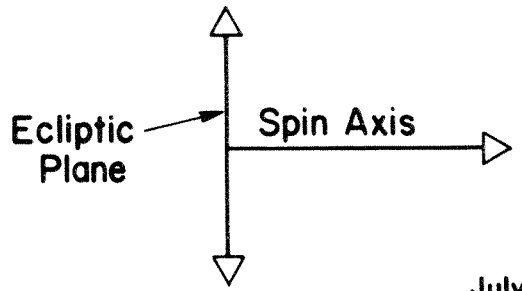
D_1, D_2, D_3 Li-Drifted Si Detectors

D_{4a}, D_{4b} Au-Si Photodiodes Coupled to D_4 CsI(Tl) Crystal

$D_{5a}, D_{5b}, D_{5c}, D_{5d}$ Au-Si Photodiodes Coupled to D_5 CsI(Tl) Crystal

CK Sapphire Cerenkov Detector

D_6 Plastic Anti-Coincidence Scintillator



July 1969

Figure 4

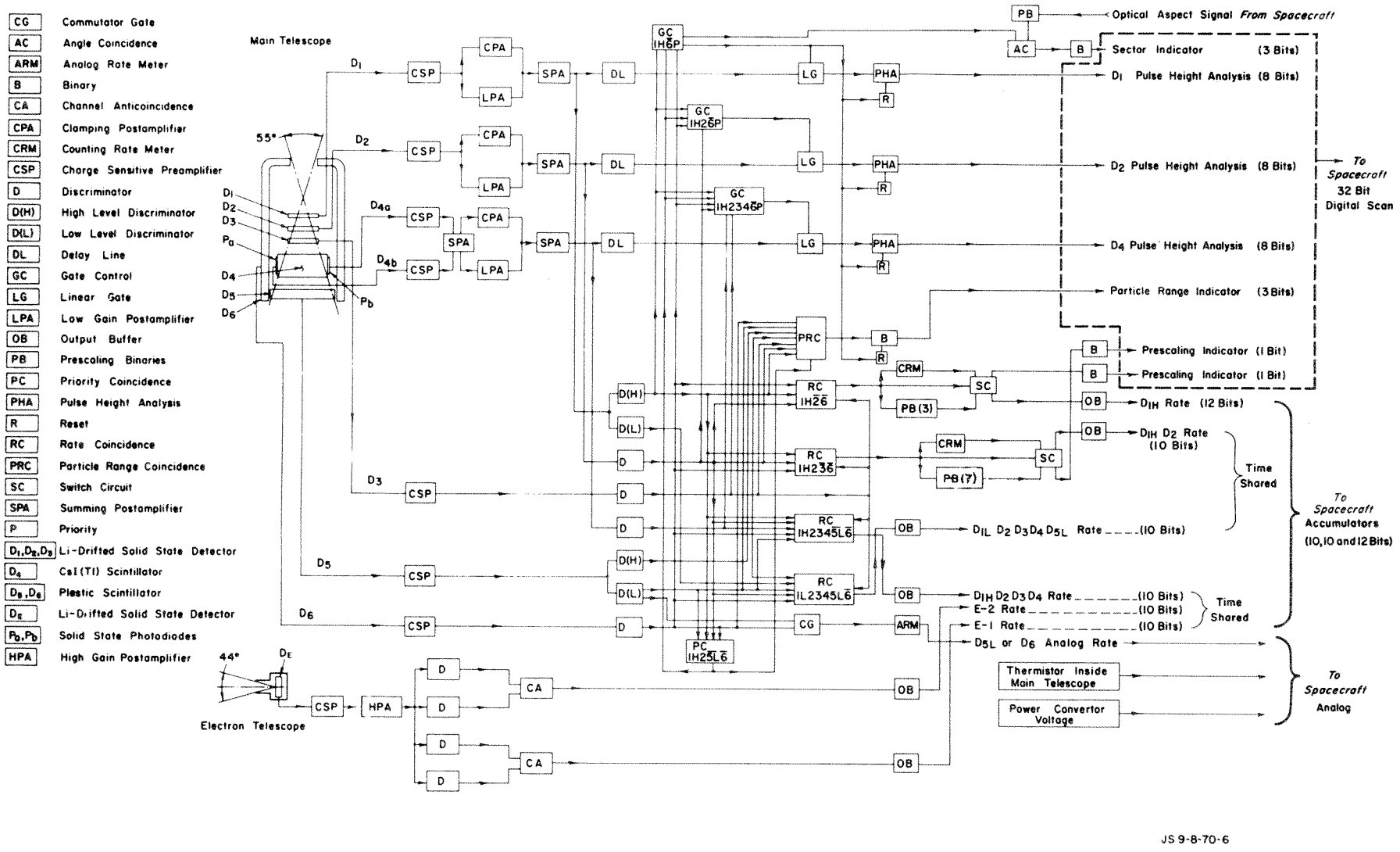

IMP-4 UNIVERSITY OF CHICAGO EXPERIMENT
CG Commutator Gate
AC Angle Coincidence
ARM Analog Rate Meter
B Binary
CA Channel Anticoincidence
CPA Clamping Postamplifier
CRM Counting Rate Meter
CSP Charge Sensitive Preamplifier
D Discriminator
D(H) High Level Discriminator
D(L) Low Level Discriminator
DL Delay Line
GC Gate Control
LG Linear Gate
LPA Low Gain Postamplifier
OB Output Buffer
PB Prescaling Binaries
PC Priority Coincidence
PHA Pulse Height Analysis
R Reset
RC Rate Coincidence
PRC Particle Range Coincidence
SC Switch Circuit
SPA Summing Postamplifier
P Priority
D1,D2,D3 Li-Drifted Solid State Detector
D4 CsI(Tl) Scintillator
D5,D6 Plastic Scintillator
DE Li-Drifted Solid State Detector
Pa,Pb Solid State Photodiodes
HPA High Gain Postamplifier
Main Telescope
55°
44°
Electron Telescope
Optical Aspect Signal From Spacecraft
Sector Indicator (3 Bits)
D1 Pulse Height Analysis (8 Bits)
D2 Pulse Height Analysis (8 Bits)
D4 Pulse Height Analysis (8 Bits)
Particle Range Indicator (3 Bits)
Prescaling Indicator (1 Bit)
Prescaling Indicator (1 Bit)
DIH Rate (12 Bits)
DIH D2 Rate (10 Bits)
DIL D2 D3 D4 D5L Rate (10 Bits)
DIH D2 D3 D4 Rate (10 Bits)
E-2 Rate (10 Bits)
E-1 Rate (10 Bits)
D5L or D6 Analog Rate
Thermistor Inside Main Telescope
Power Convertor Voltage
To Spacecraft 32 Bit Digital Scan
Time Shared
To Spacecraft Accumulators (10,10 and 12 Bits)
Time Shared
To Spacecraft Analog
JS 9-8-70-6
Incident Direction

Figure 5

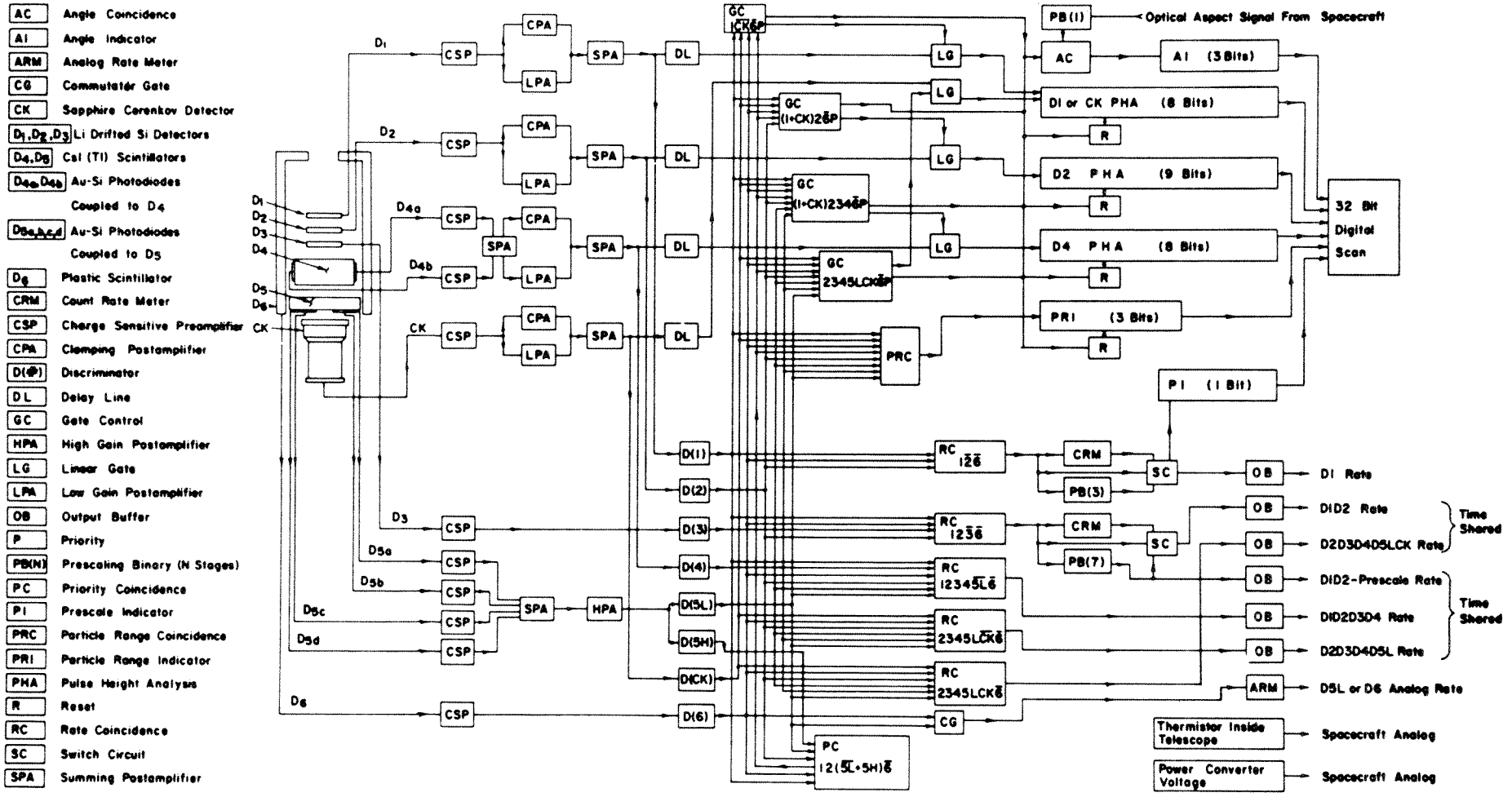

IMP 5 University of Chicago Experiment
AC Angle Coincidence
AI Angle Indicator
ARM Analog Rate Meter
CG Commutator Gate
CK Sapphire Cerenkov Detector
D1,D2,D3 Li Drifted Si Detectors
D4,D5 CsI (Tl) Scintillators
D4a,D4b Au-Si Photodiodes Coupled to D4
D5a,b,c,d Au-Si Photodiodes Coupled to D5
D6 Plastic Scintillator
CRM Count Rate Meter
CSP Charge Sensitive Preamplifier
CPA Clamping Postamplifier
D(Φ) Discriminator
DL Delay Line
GC Gate Control
HPA High Gain Postamplifier
LG Linear Gate
LPA Low Gain Postamplifier
OB Output Buffer
P Priority
PB(N) Prescaling Binary (N Stages)
PC Priority Coincidence
PI Prescale Indicator
PRC Particle Range Coincidence
PRI Particle Range Indicator
PHA Pulse Height Analysis
R Reset
RC Rate Coincidence
SC Switch Circuit
SPA Summing Postamplifier
Optical Aspect Signal From Spacecraft
AC
AI (3 Bits)
DI or CK PHA (8 Bits)
D2 PHA (9 Bits)
D4 PHA (8 Bits)
PRI (3 Bits)
PI (1 Bit)
32 Bit Digital Scan
DI Rate
DID2 Rate
D2D3D4D5LCK Rate
DID2-Prescale Rate
DID2D3D4 Rate
D2D3D4D5L Rate
D5L or D6 Analog Rate
Thermistor Inside Telescope
Power Converter Voltage
Spacecraft Analog
Spacecraft Analog
Time Shared
Time Shared

Figure 6

Angular Sector Orientation of The University of Chicago Composition Telescopes on IMP-4 and IMP-5

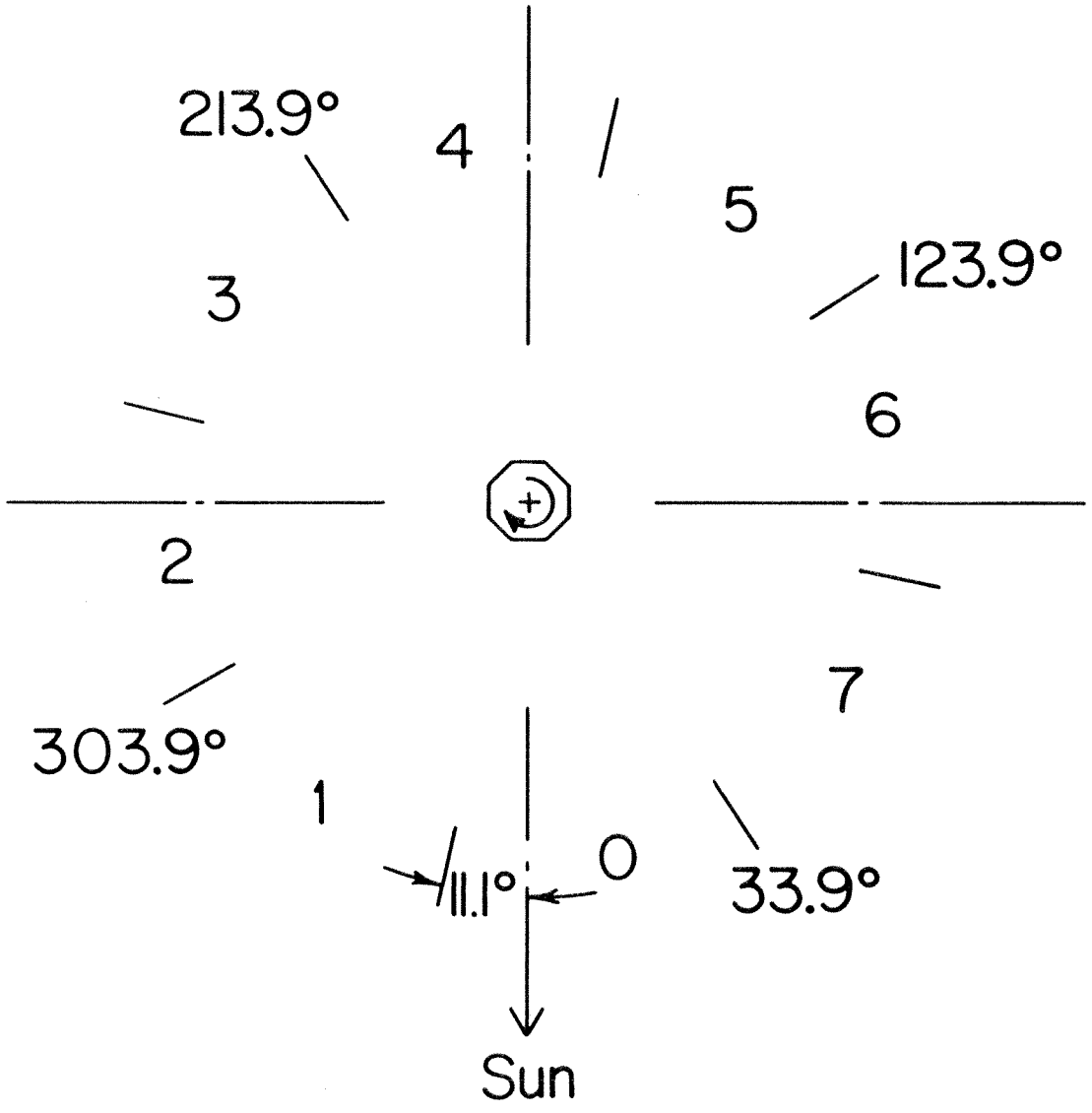


Figure 7

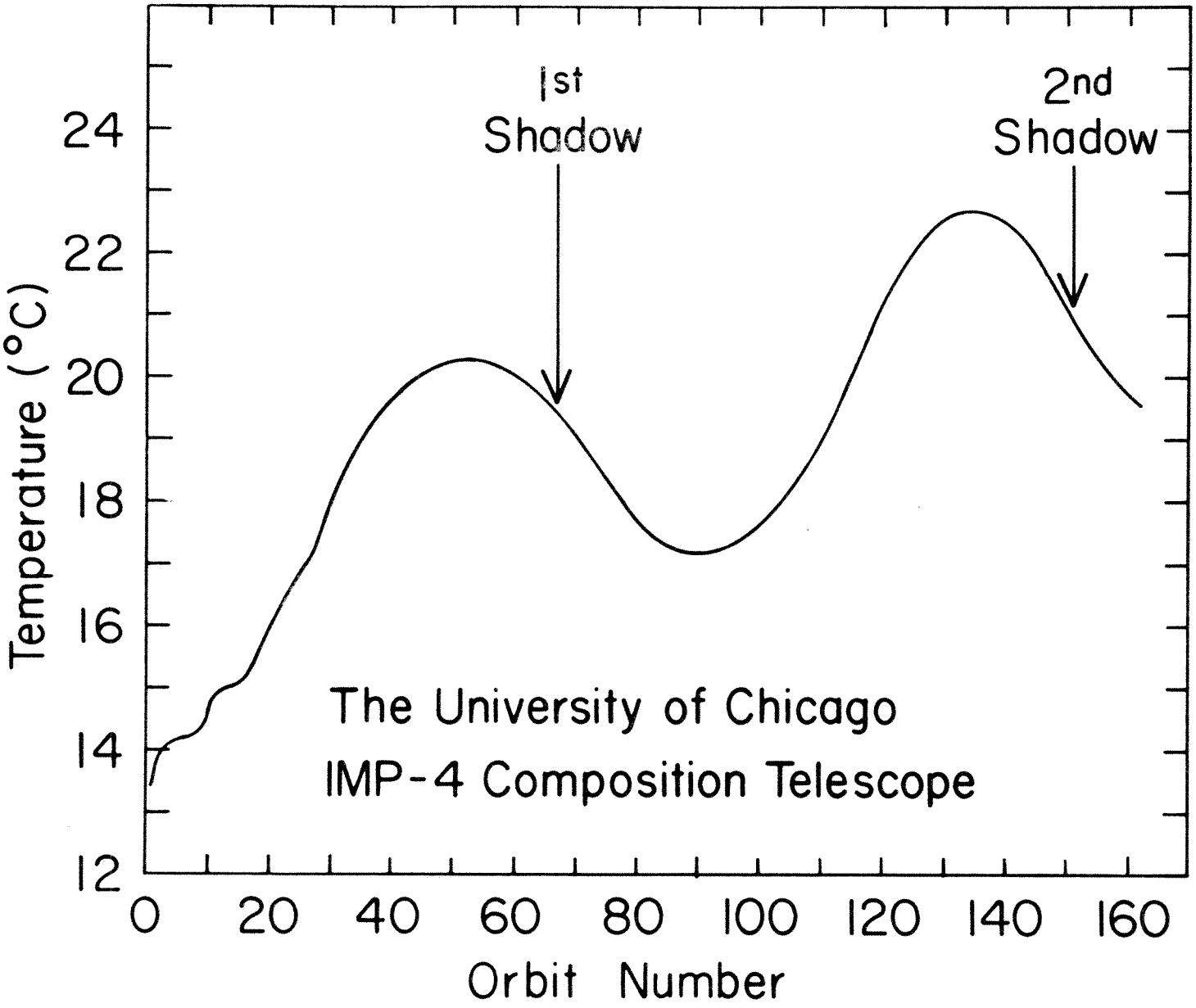

1st
Shadow
2nd
Shadow
24
22
20
18
16
14
12
Temperature (°C)
The University of Chicago
IMP-4 Composition Telescope
0
20
40
60
80
100
120
140
160
Orbit Number

Figure 8

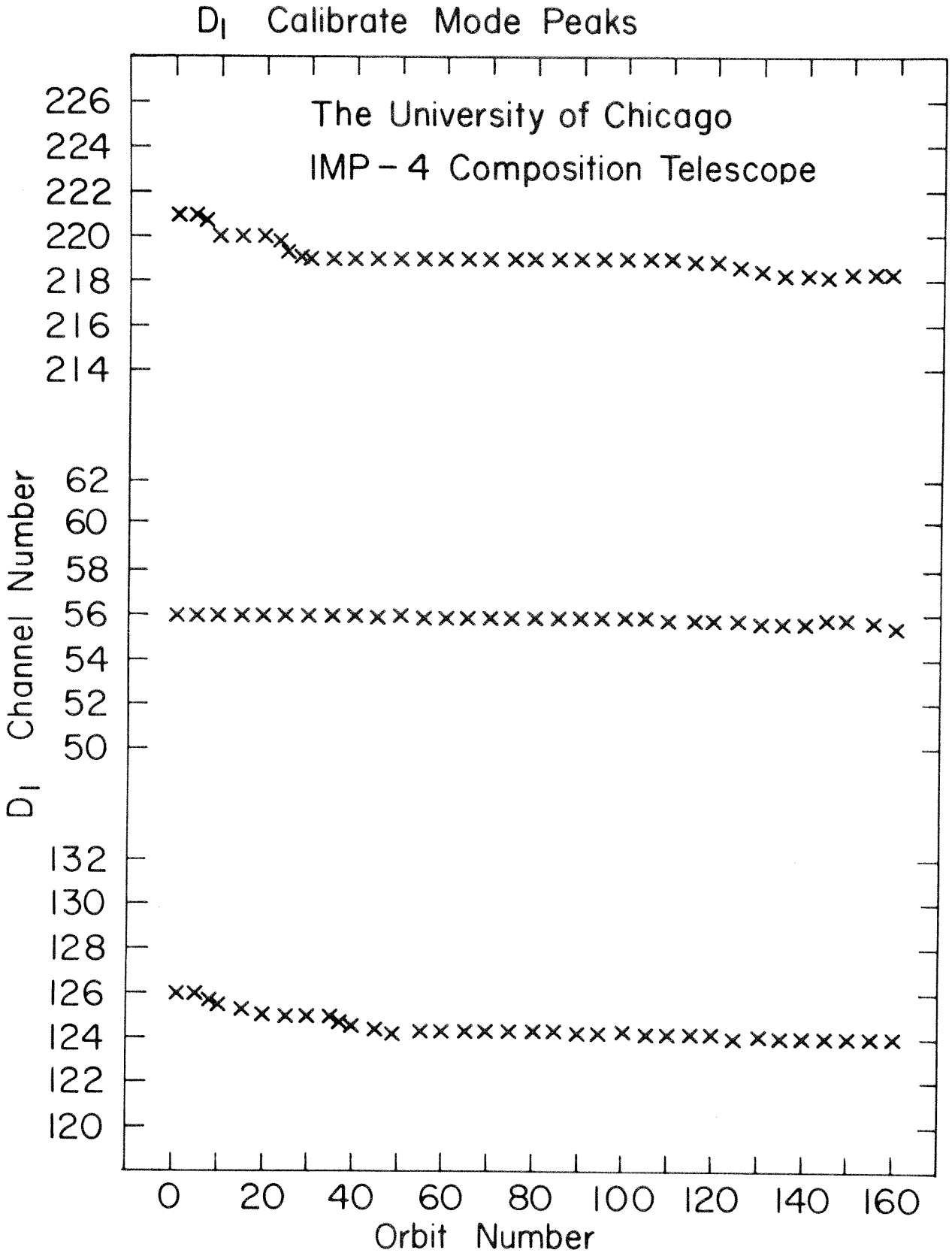

D1 Calibrate Mode Peaks
The University of Chicago
IMP – 4 Composition Telescope
D1 Channel Number
226
224
222
220
218
216
214
62
60
58
56
54
52
50
132
130
128
126
124
122
120
0
20
40
60
80
100
120
140
160
Orbit Number

Figure 9a

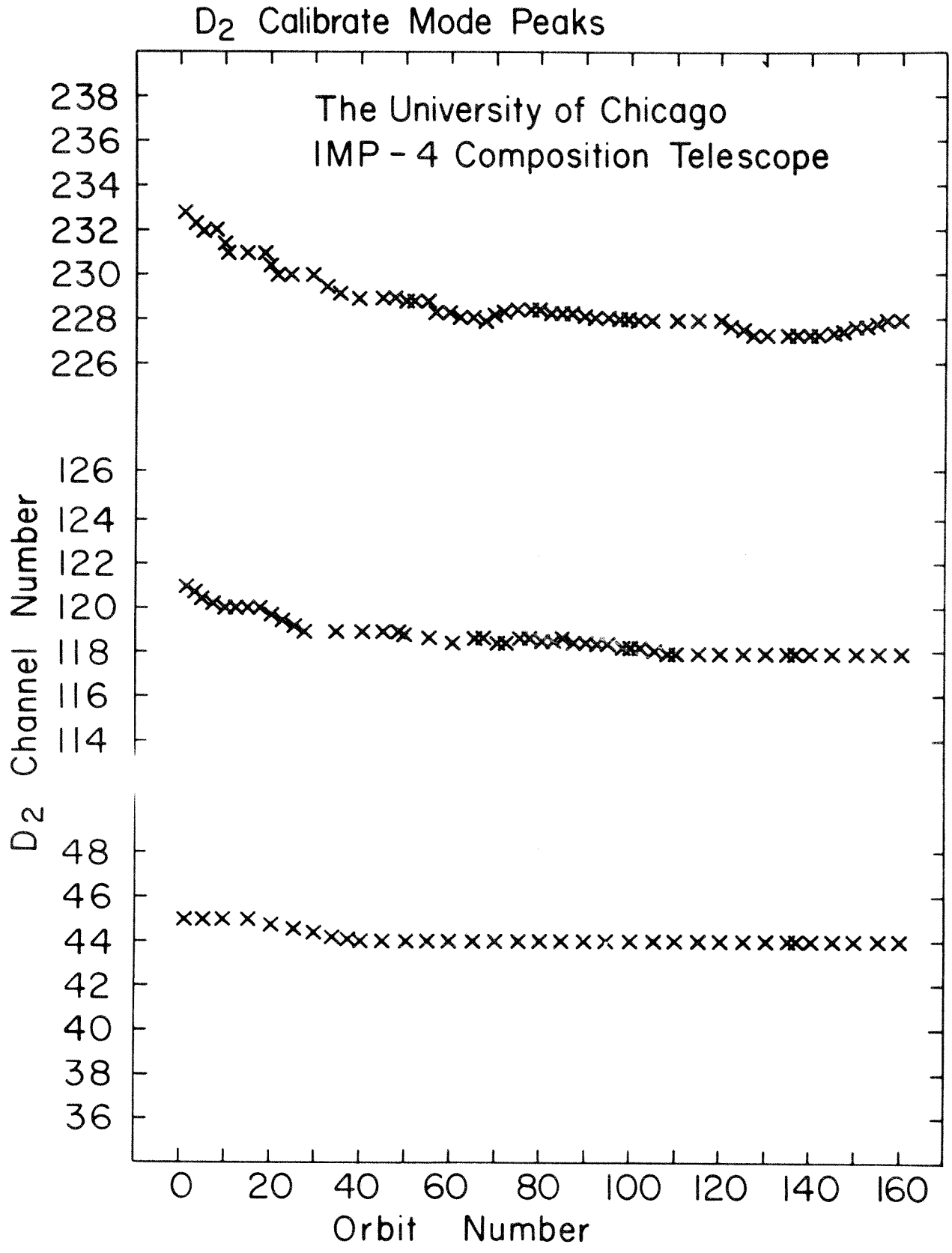

D2 Calibrate Mode Peaks
The University of Chicago
IMP - 4 Composition Telescope
D2 Channel Number
238
236
234
232
230
228
226
126
124
122
120
118
116
114
48
46
44
42
40
38
36
0
20
40
60
80
100
120
140
160
Orbit Number

Figure 9b

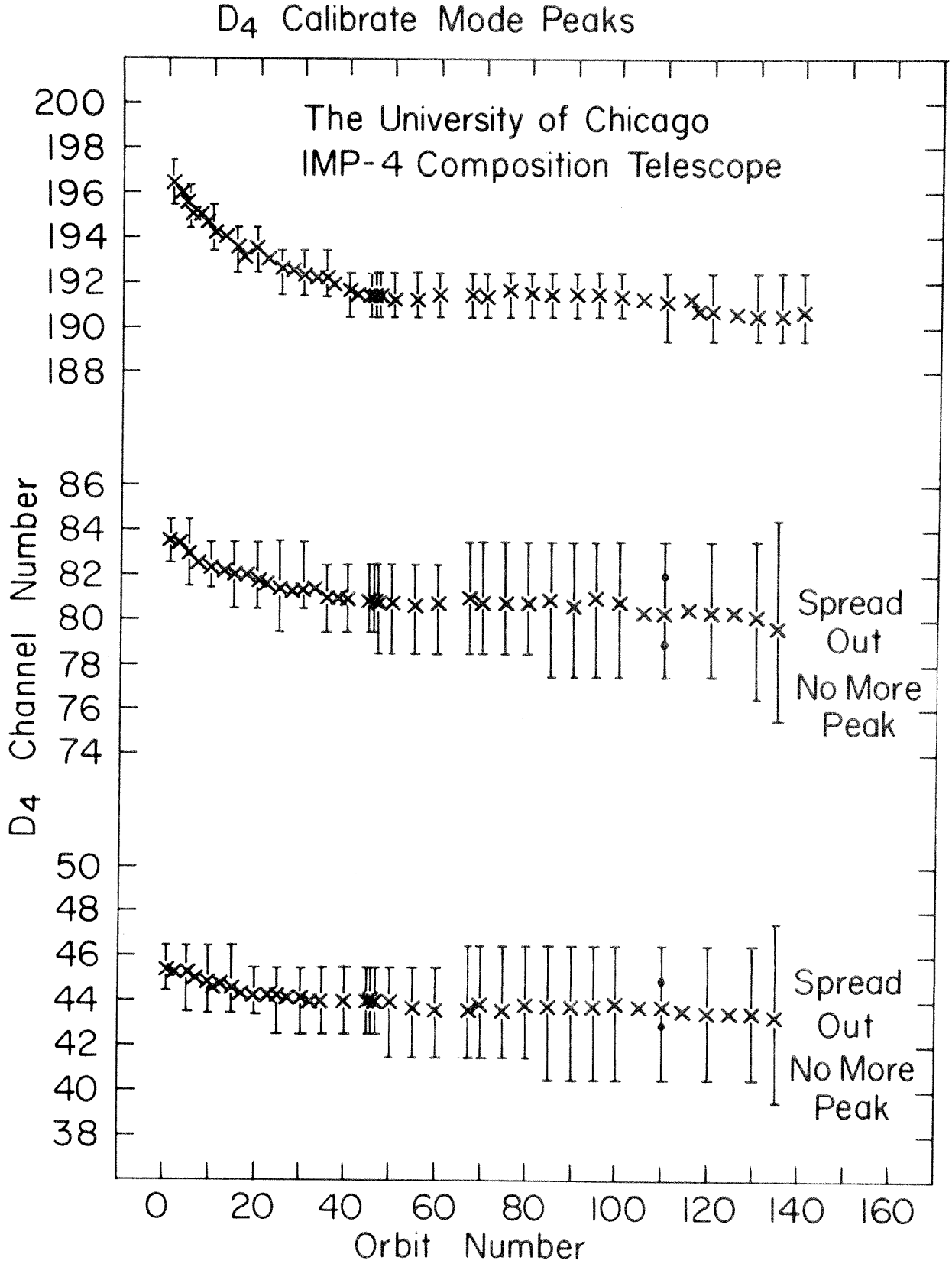

D4 Calibrate Mode Peaks
The University of Chicago
IMP-4 Composition Telescope
D4 Channel Number
200
198
196
194
192
190
188
86
84
82
80
78
76
74
50
48
46
44
42
40
38
Spread Out
No More Peak
Spread Out
No More Peak
0
20
40
60
80
100
120
140
160
Orbit Number

Figure 9c