#259

APOLLO 15 – [illegible]

SUB SATELLITE MAGNETOMETER

71-063D-02A

[illegible]

APOLLO 15

24-S VECTOR MAGNETIC FIELD TAPES

71-063D-02A

THIS DATA SET HAS BEEN RESTORED. THERE WERE ORIGINALLY 29 9-TRACK, 1600 BPI TAPES, WRITTEN IN BINARY. THERE ARE FOUR RESTORED TAPES. THE ORIGINAL TAPES WERE NOT STACKED IN TIME SEQUENTIAL ORDER. THE DR TAPES ARE 3480 CARTRIDGES AND THE DS TAPES ARE 9-TRACK, 6250 BPI. THE ORIGINAL TAPES WERE CREATED ON AN IBM 360 COMPUTER AND WERE RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND TIME SPANS ARE AS FOLLOWS:

DR#	DS#	DD#	FILES	TIME SPAN	
DR005260	DS005260	D013784	1	12/29/71 - 12/31/71	(a)
		D013785	2	08/19/71 - 08/27/71	(b)
		D013786	3	01/01/72 - 01/02/72	
		D015095	4	12/11/71 - 12/19/71	
		D015096	5	12/19/71 - 12/20/71	(c)
		D015097	6	11/01/71 - 11/08/71	
		D015098	7	11/09/71 - 11/17/71	
		D015099	8	12/03/71 - 12/11/71	(d)
DR005261	DS005261	D015100	1	11/30/71 - 12/09/71	
		D015101	2	01/11/72 - 01/19/72	
		D015102	3	01/20/72 - 01/25/72	
		D015103	4	10/27/71 - 11/01/71	
		D015104	5	09/27/71 - 10/04/71	
		D015105	6	02/03/72 - 02/03/72	
		D015106	7	08/27/71 - 09/02/71	(e)
		D015107	8	08/04/71 - 08/12/71	
DR005262	DS005262	D015108	1	08/13/71 - 08/19/71	(f)
		D015109	2	09/10/71 - 09/17/71	
		D015110	3	09/17/71 - 09/25/71	
		D015677	4	09/02/71 - 09/10/71	(g)
		D015678	5	09/25/71 - 09/26/71	(h)
		D015679	6	10/05/71 - 10/13/71	
		D015680	7	10/13/71 - 10/17/71	(i)
		D015681	8	10/19/71 - 10/27/71	

71-063D-02A

DR#	DS#	DD#	FILES	TIME SPAN	
DR005263	DS005263	D015683	1	11/25/71 - 11/30/71	(j)
		D015684	2	12/20/71 - 12/29/71	
		D015685	3	01/01/72 - 01/11/71	
		D015686	4	01/25/72 - 02/01/72	
		D015682	5	11/17/71 - 11/25/71	

(a) I/O ERRORS ON FILE 1, RECORDS, 54, 57, 63, 69, 75, 81, 87, 93, 111
(b) I/O ERROR ON FILE 1, RECORD, 276
(c) I/O ERROR ON FILE 1, RECORD, 19
(d) I/O ERRORS ON FILE 1, RECORDS, 20-22, 36, 48
(e) I/O ERROR ON FILE 1, RECORD, 129
(f) I/O ERRORS ON FILE 1, RECORDS, 8, 14, 15, 30
(g) I/O ERRORS ON FILE 1, RECORDS, 37, 109, 145
(h) I/O ERRORS ON FILE 1, RECORDS, 21, 33, 36, 48
(i) I/O ERRORS ON FILE 1, RECORDS, 125, 157, 160, 185, 189
(j) I/O ERRORS ON FILE 1, RECORDS, 68, 134, 140, 170, 205, 238

REQ. AGENT	RAND NO.	ACQ. AGENT
MAW	RB5471	DJH
CLB	RB5484	
WKD	RC0012	
Cmp		

APOLLO 15 & 16

SUBSATELLITE MAGNETOMETER

71-063D-02A

72-031D-02A

This data set catalog contains ~~28~~ 29 Apollo 15 and ~~9~~ 10 Apollo 16 Subsatellite Magnetometer data tapes. They are 800 BPI, binary, 7-track, with one file each and were created on a UNIVAC 1108 Computer.

The format of the data can be found in table 4 of the 'Instrument and Data Description' document from UCLA. The data on the tapes (excluding the first record of each tape) are written in arrays of 100 words per data item. The time spans for the tapes are as follows:

APOLLO 15 71-063D-02A

D#	C#	TIME SPAN
D-15107	C-11618	8/04/71 - 8/13/71
D-15108	C-11619	8/13/71 - 8/19/71
D-13785	C-11107	8/19/71 - 8/27/71
D-15106	C-11617	8/27/71 - 9/02/71
D-15677	C-12395	9/02/71 - 9/10/71
D-15109	C-11620	9/10/71 - 9/17/71
D-15110	C-11621	9/17/71 - 9/25/71
D-15678	C-12396	9/25/71 - 9/26/71
D-15104	C-11615	9/27/71 - 10/04/71
D-15679	C-12397	10/05/71 - 10/13/71
D-15680	C-12398	10/13/71 - 10/17/71
D-15681	C-12399	10/19/71 - 10/27/71
D-15103	C-11614	10/27/71 - 11/01/71

D#	C#	TIME SPAN
D-15097	C-11608	11/01/71 - 11/08/71
D-15098	C-11609	11/09/71 - 11/17/71
D-15682	C-14329	11/17/71 - 11/25/71
D-15683	C-12400	11/25/71 - 11/30/71
[redacted]	[redacted]	
D-15100	C-11611	11/30/71 - 12/08/71
D-15099	C-11610	12/09/71 - 12/11/71
D-15095	C-11606	12/11/71 - 12/19/71
D-15096	C-11607	12/19/71 - 12/20/71
D-15684	C-12401	12/20/71 - 12/29/71
D-13784	C-11106	12/29/71 - 12/31/71
D-13786	C-11108	1/01/72 - 1/02/72
D-15685	C-12402	1/03/72 - 1/11/72
D-15101	C-11612	1/11/72 - 1/19/72
D-15102	C-11613	1/20/72 - 1/25/72
D-15686	C-12403	1/25/72 - 2/01/72
D-15105	C-11616	2/03/72 - 2/03/72

APOLLO 16 72-031D-02A

D#	C#	TIME SPAN
D-14005	C-11226	4/25/72 - 4/28/72
D-14004	C-11225	4/28/72 - 4/29/72
D-14006	C-11227	4/29/72 - 5/02/72
D-14007	C-11228	5/02/72 - 5/06/72
D-14008	C-11229	5/06/72 - 5/10/72
D-14009	C-11230	5/10/72 - 5/17/72
D-14010	C-11231	5/17/72 - 5/21/72
D-14188	C-11357	5/21/72 - 5/27/72
D-14189	C-11358	5/27/72 - 5/29/72
D-28817	C-18722	4/25/72 - 5/29/72 ← 9trk, 1600, BIN, 5 files

71-063D-02A

Instrument and Data Description of the Particles and Fields Subsatellite Magnetometer Experiment for the Apollo Data User's Handbook

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1. The Experiment

1.1 Instrument Description

The subsatellite magnetometer consists of two fluxgate sensors mounted orthogonally at the end of a 1.83-m boom and an electronics unit housed in the main body of the spacecraft. The two sensors are mounted one parallel and one perpendicular to the spin axis. There are two automatically selected dynamic ranges 0 to $\pm 50\gamma$ and 0 to $\pm 200\gamma$. These are called the high sensitivity and low sensitivity ranges, respectively. The resolution of each measurement is 0.4 or 1.6γ depending on range. There are three sampling rates referred to as telemetry store normal (TSN), telemetry store fast (TSF) and real time (RT). In the former two modes, the magnetometer measures the magnitude and phase of the magnetic field in the spin plane and the vector component along the spin axis. The sample rates are one vector every 24 seconds and every 12 seconds, respectively. The magnitude in the spin plane is measured by filtering the transverse magnetometer output about the spin frequency, rectifying and filtering this. The sampled output has a ripple which can be corrected on the ground because the sampling time relative to the field direction is known. The phase is obtained by measuring both the time of the positive going zero crossing of the magnetometer output and the time of the sun crossing.

In eclipse, the sun crossing time is computed from a model of the eclipse spin up and from a knowledge of the spin frequency and phase during the sunlit portion of the orbit.

During real time operations, one sample of the spin plane output is returned every second and of the spin axis output every 2 seconds. Thus, there are about 5 samples of the spin plane signal per revolution. This signal is Fourier analyzed to obtain a magnitude and phase and referenced to the sun crossing time. Real time data is, of course, only obtained across the near side of the moon, whereas the recorded TSF and TSN data are available from both near and far sides. We note that the subsatellite did not store data while transmitting. Thus, there are gaps in the records every orbit when data was telemetered to earth. A summary of the magnetometer characteristics is given in Table 1. The only significant difference between the Apollo 15 and 16 magnetometers is an increase by a factor of 2 in the sensitivity of the Apollo 16 magnetometer increasing the resolution to 0.2 and 0.8γ and decreasing the range to ± 25 and $\pm 100\gamma$ for high and low sensitivity ranges, respectively.

1.2 Operating History

The Apollo 15 subsatellite was launched on August 4, 1971. A failure in the telemetry system after seven months of operation prevented further transmission of the magnetometer data. The Apollo 16 subsatellite was launched on April 24, 1972, into an approximately circular orbit at an altitude of 100 km, having an

TABLE 1.- APOLLO SUBSATELLITE MAGNETOMETER SPECIFICATIONS

Characteristic	Specification
Type	Second-harmonic, saturable core fluxgate
Sensor configuration	Two sensors, one sensor parallel B_P and one perpendicular B_T to the satellite-spin axis
Mounting	Sensor unit at end of 1.83-m boom; electronics unit in spacecraft body
Automatically selected dynamic ranges, γ	0 to ±50 at higher sensitivity, 0 to ±200 at lower sensitivity
Resolutions, γ	0.4 and 1.6, depending on range
Sampling rates:	
Real time	B_P every 2 seconds, B_T every second
High-rate storage	B_P and B_T magnitude and B_T phase once every 12 seconds
Low-rate storage	B_P and B_T magnitude and B_T phase once every 24 seconds
Power, W	0.70
Weight:	
Electronics unit, kg	≈0.8
Sensor unit, kg	≈0.2
Size:	
Electronics unit, cm	27.9 by 15.9 by 3.8
Sensor unit, cm	1.5 (diameter) by 7.6
Operating temperature range, °K	344 to 172

approximately circular orbit at an altitude of 100 km, having an orbital period of close to 2 hours. Due to the decision not to perform a shaping burn prior to jettisoning the subsatellite, the Apollo 16 subsatellite crashed into the moon after 34 days in lunar orbit.

During this period the magnetometers operated flawlessly. The minimum correlation technique of Hedgecock was used to measure sensor drift of the parallel axis on Apollo 15. (Final Apollo 16 data are not available as of the writing of this document). The drift rate was low and well within the range expected. Table 2 gives the offsets for each lunation. These numbers should be added to the values presently on the plots and tapes which were obtained from the preliminary calibration.

The orientation of the spin axis of the subsatellite was determined from the variation of the sun elevation angle with time during the first 30 days after launch. On Apollo 15 the predicted variation of this angle and the measured variation followed each other almost exactly until December 1971. Thereafter, measurable deviations occurred amounting to 1° in February 1972.

Table 2 Magnetometer Offsets

Lunation	Orbit Number	Offset
1	1 - 378	0.27γ
2	379 - 732	0.05
3	733 - 1086	-0.17
4	1087 - 1440	-0.38
5	1441 - 1784	-0.60
6	1785 - END	-0.81

2. The Data

2.1 Orbit Data

Three different displays of orbit data have been made plus one tape. These were all created at the Manned Spacecraft Center under the supervision of W. Wollenhaupt. The three orbit plots are altitude versus time, selenographic longitude versus latitude, and the ecliptic projection of the earth-moon system.

2.1.1 Altitude versus time

This plot shows altitude versus time for one orbit, but includes information on up to six consecutive orbits. At the top of the plot are the orbit number, the orbit start time (hours and minutes, day/month/year), the perilune time and altitude (km), the apolune time and altitude, and the time of sunrise and sunset. The plot includes two vertical shaded bars marking sunset and sunrise at the subsatellite. Time grids below the plot permit the use of this graph for up to six consecutive orbits. However, these grids may be up to four minutes off. Figure 1 shows a sample plot.

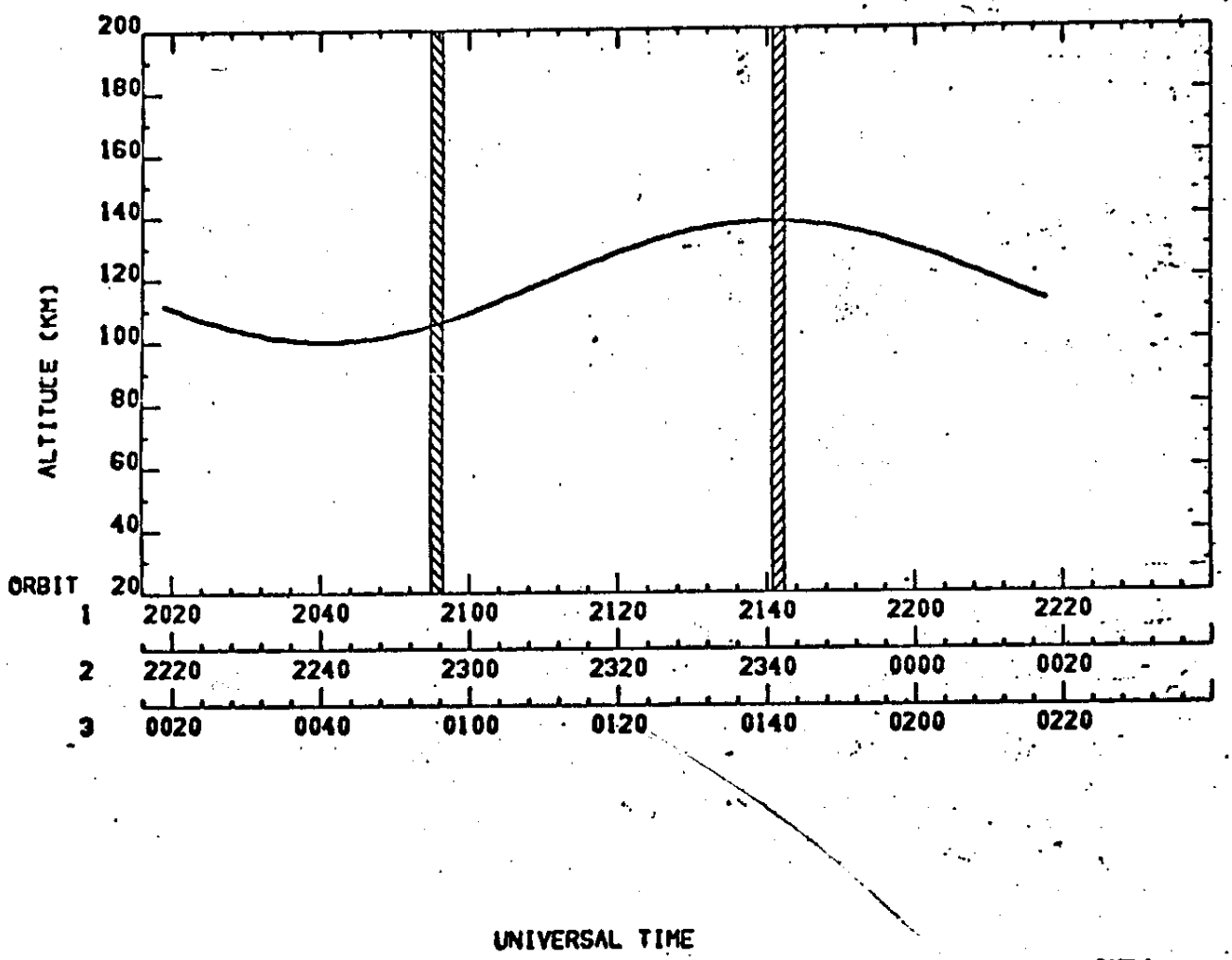
2.1.2 Latitude versus Longitude

This plot shows the track of the satellite across the lunar surface in selenographic coordinates. We note that the vertical and horizontal scale are different by a factor of two. The points of sunrise and sunset at the subsatellite are indicated by shaded vertical bars. Perilune and apolune are marked on

APOLLO 15 SUBSATELLITE

CALCULATED 8/04/71 TRACKING ORBIT = 1 PROCESSED 3/11/72

ORBIT	START		PERILUNE		APOLUNE		SUNRISE	SUNSET
1	2019	8/04/71	2041	100.4	2141	138.4	2141	2055
2	2219	8/04/71	2241	100.6	2340	138.1	2340	2254
3	18	8/05/71	40	100.9	140	137.8	140	54



the orbit track with an 'X' and labelled with P and A, respectively. The subsolar point is similarly marked with an 'X' and labelled with an S. The location of the Apollo 15 ALSEP is similarly shown and encircled by an ellipse showing the area within 15° of the ALSEP site. Underneath the plot are given orbit numbers, perilune and apolune times. Figure 2 shows a sample plot.

2.1.3 Earth-moon system plots

This plot gives the ecliptic plane projection of the earth-moon system and includes the expected position of the magnetopause and bow shock. One point is given per orbit. Distances are labelled in earth radii. Figure 3 shows a sample plot.

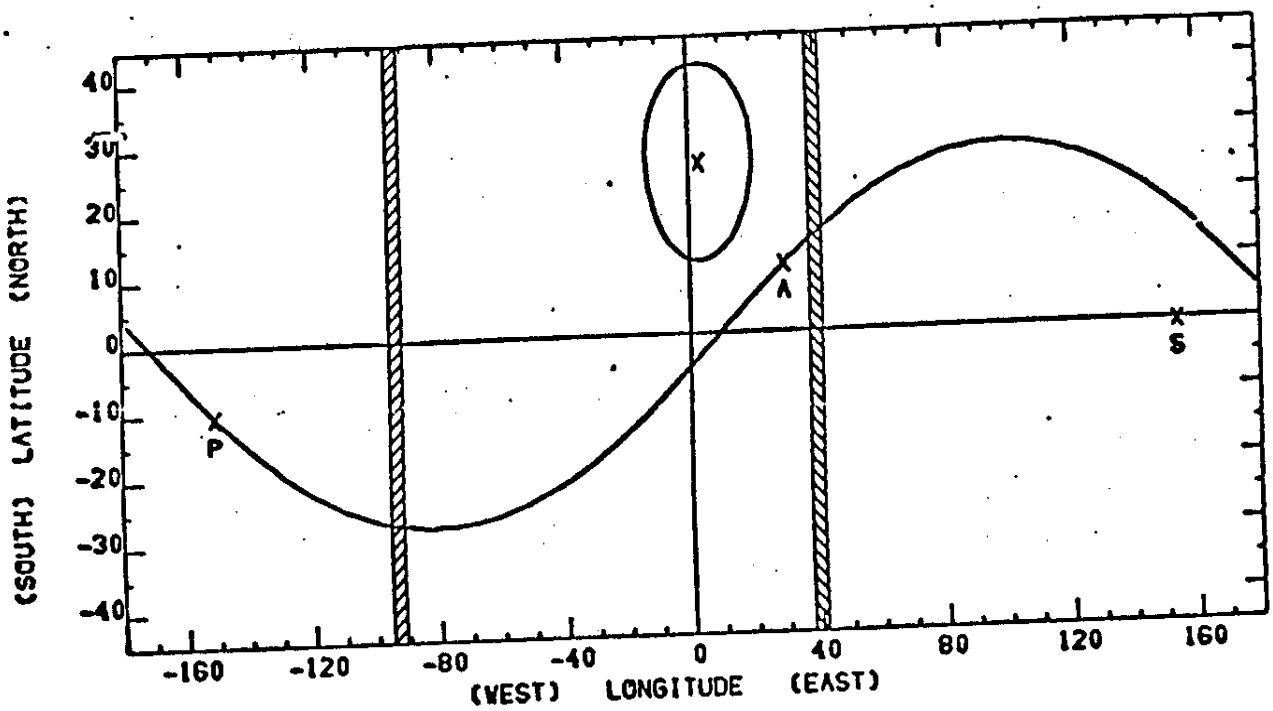
2.1.4 Magnetic tape

The orbit tape contains position and orientation information which changes slowly in a header record once per orbit and rapidly changing positional data every minute in a data record (one record per minute). The format of this tape is given in Table 3.

2.2 Magnetometer data

Two microfilm reels of data and one magnetic tape have been produced in preliminary processing of the data. The first reel contains two plots consisting of magnetometer measurements on the A plot and engineering data on the B plot. The second reel contains a computer listing of 192 second averages of the data. The magnetic tape contains 24 second averages of the data.

APOLLO 15 SUBSATELLITE SELENOGRAPHIC COORDINATES



ORBIT	2002	2003	2004	2005	2006	2007
PERILUNE	542	742	942	1142	1342	1541
APOLUNE	442	642	842	1042	1242	1442

START DAY-FIRST ORBIT 1/18/72 CALCULATED 1/18/72 PROCESSED 3/04/72

TRACKING ORBIT = 2013

SOLAR ECLIPTIC POSITION EARTH-MOON SYSTEM

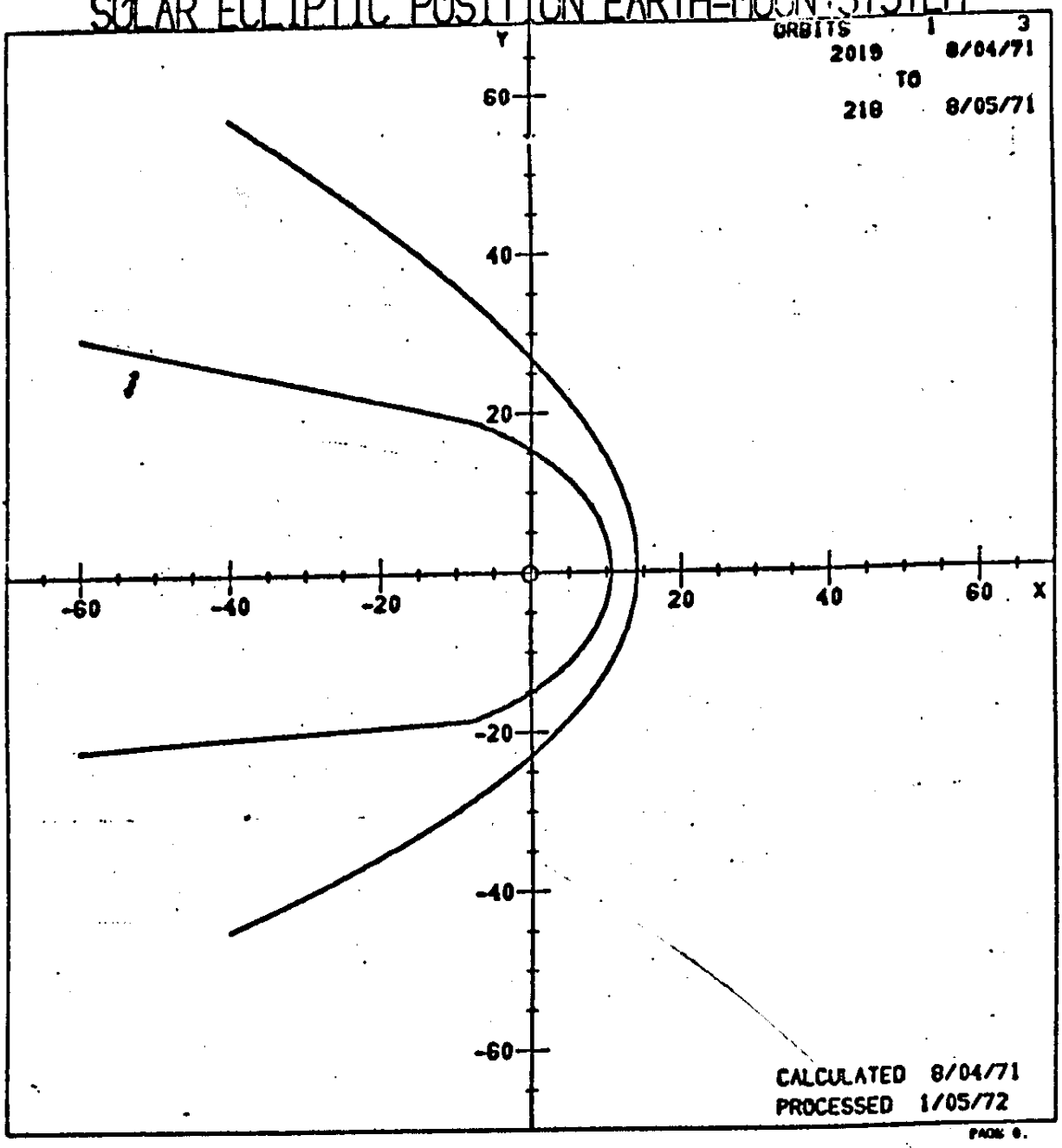


Table 3

Orbit Tape Contents

Header Record (Record 1)

Words 1-4 Integer, words 5 on Real.

1. Number of orbits on tape

2. Orbit number

3/4 Date calculated/processed

5/6 Altitude of perilune/apolune

7/8 Day of year of orbit start/year mod. 1900

9 Start time (seconds)

10 Number of points (records) in orbit

11/12 Time of perilune/apolune

13/14 Sunset time (start/stop)

15/16 Sunrise time (start/stop)

17/18 Earthrise/earthset times

19 End time of orbit

Transformation matrices of form A11 A12 A13, A21 A22 A23, A31 A32 A33

20-28	GEI to GSE	101-109	GEI to SG
29-37	GEI to GSM	110-118	SG to SSE
38-46	GEI to GSEQ	119-127	SG to SSEQ
47-55	GSM to GSE	128-136	SG to GSM
56-64	GSM to GSEQ	137-145	S/C to SSE
65-73	GSE to GSEQ	146-154	S/C to SSEQ
74-82	GEI to SSE	155-63	S/C to GSM
83-91	GEI to SSEQ	164-172	S/C to GSE
92-100	SSE to SSEQ	173-181	S/C to SG

Table 3 (continued)

GEI = geocentric equatorial inertial coordinates

GSE = geocentric solar eclipitic

GSM = geocentric solar magnetospheric

GSEQ = geocentric solar equatorial

SSE = selenocentric solar ecliptic

SG = selenographic

S/C = spacecraft coordinate

Data Record - Repeated N times - All real

1/2 Day of year/year mod. 1900

3 Seconds of day

4/5 Earth-sun/earth-moon distances

6/7 Sun-moon/subsatellite-moon distances

8-10 Unit vector to sun GEI

11-13 Unit vector to moon GEI

14-16 Unit vector parallel PFS spin axis GEI

17-19 Unit vector parallel earth's dipole GEI

20-22 Unit vector to earth SSE

23-25 Unit vector to subsatellite SSE

26-28 Unit vector parallel to PFS spin axis SSE

29-31 Unit vector to subsatellite SG

32-34 Unit vector to earth SG

35-37 Unit vector to sun SG

38-40 Unit vector parallel to PFS spin axis SG

41 Altitude of PFS

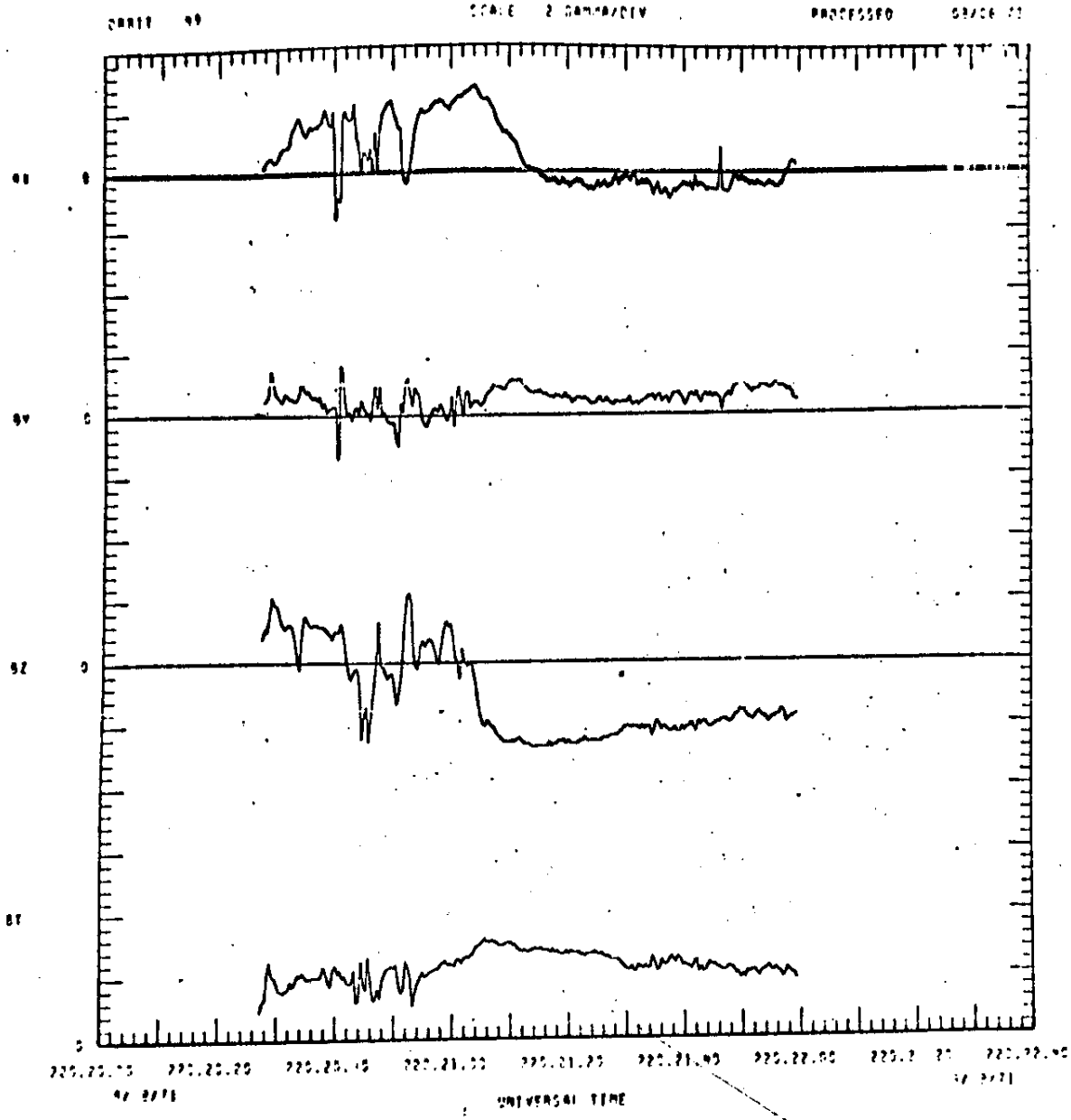
2.2.1 The A Plot

This plot shows the B_x, B_y, B_z components and B_T (total field) in spacecraft coordinates versus time for one orbit. The orbit start time is defined here and in the orbit data to be the time of the crossing of the lunar noon meridian. Spacecraft coordinates have X and Y in the spin plane with X along the projection of the earth-sun line in the spin plane and Y roughly antiparallel the direction of planetary motion. The Z direction is chosen to be parallel to the spin axis and points northward relative to the ecliptic plane. At launch the spin axes of both the Apollo 15 and 16 subsatellites were close to perpendicular to the ecliptic. Thus initially the data were returned in essentially solar ecliptic coordinates. Time on the horizontal scale is given in terms of day of year (Jan. 1=1), hour and minute. No sensor drift corrections have been applied to these data. Note that the scale of this plot varies to keep the data on scale. Figure 4 shows a sample plot.

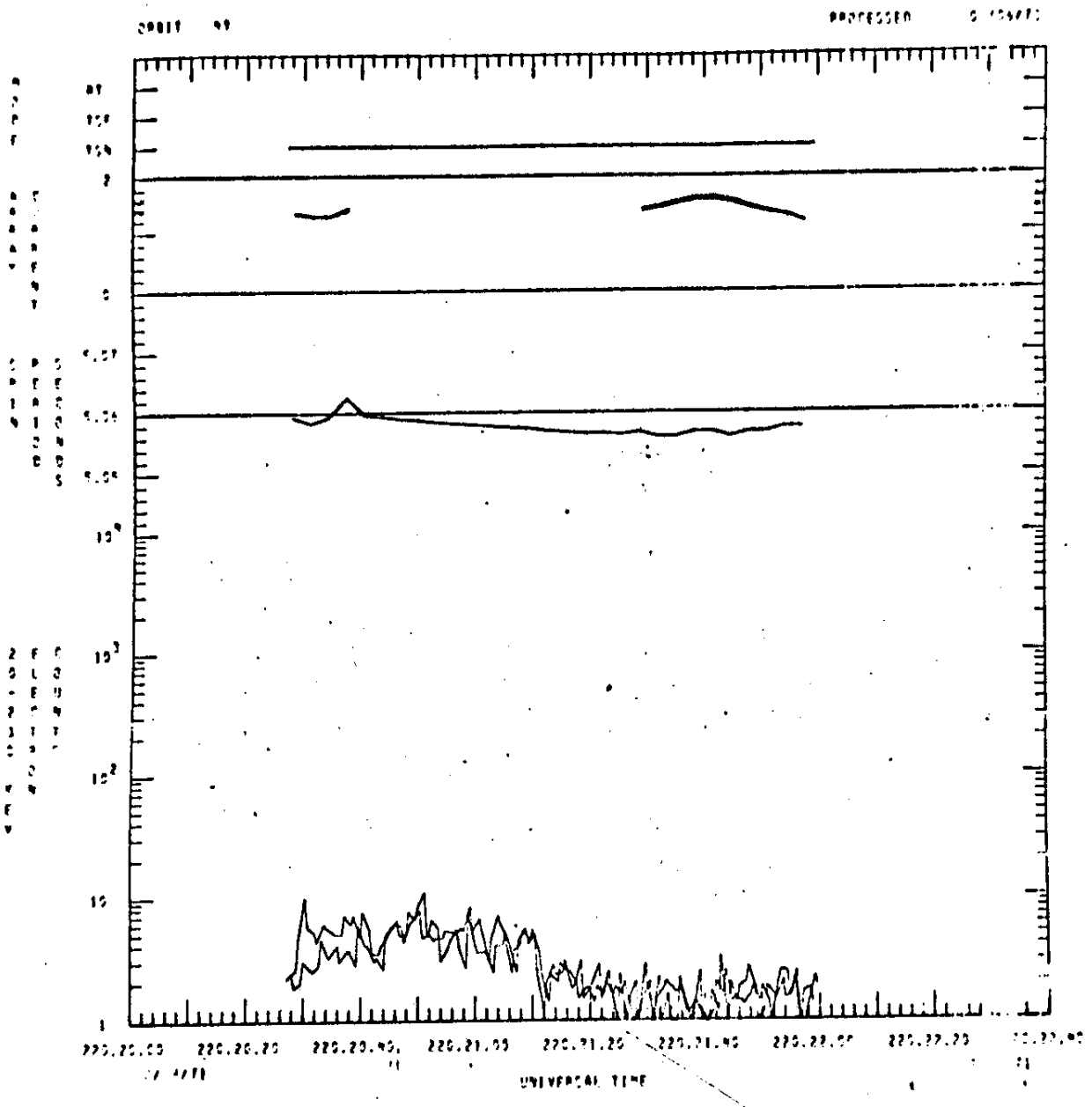
2.2.2 The B plot

The second plot contains relevant engineering and processing data and some data from the Berkeley particle experiment. The top line shows the telemetry mode TSN, TSF or RT. The second shows the array current in amps. The third shows the spin period in seconds. This is measured in sunlight and predicted in eclipse. Finally, on the bottom plotted on the same scale are Berkeley particle counts per accumulation period for the shielded and unshielded detectors. Figure 5 shows a sample plot,

APOLLO 15 PARTICLES AND FIELDS SUBSATELLITE
UCLA FLUXGATE MAGNETOMETER DATA
SPACECRAFT COORDINATES (PLOT A1)



APOLLO 15 PARTICLES AND FIELDS SUBSATELLITE
UCLA FLUXGATE MAGNETOMETER DATA
SPACECRAFT COORDINATES (PLOT 81)



2.2.3 The Printout

The microfilm reel containing the printout of the data first contains data and tables generated during the processing of the data. The printouts which follow are 192 second averages of the data (192 seconds is the basic repetition cycle of the data system). The data given are:

Day of year (Jan. 1=1)

Month/day

Elapsed time on spacecraft clock (1 tick=16 sec)

B_x, B_y, B_z, B_T (spacecraft coordinates, in gammas)

Open counts (Berkeley data)

Shielded counts (Berkeley data)

Sun elevation angle (degrees)

Spin period (seconds)

Spin count (from sun pulse or magnetometer pulse)

Magnetometer temperature (^{o}F)

Battery temperature (^{o}F)

Battery voltage (volts)

Battery current (amps)

Array current (amps)

Reference voltage of magnetometer (volts)

Flag 1 I Satellite ID (1=Apollo 15)

F Data format (0=Store mode, 1=Real time)

M Automatic/manual (0=Manual mode)

C Calibration (1=On)

T Transverse range (1=low sensitivity)

P Parallel range (1=low sensitivity)

Flag 2 not used (repeats elapsed time fine). Figure 6 shows a sample plot.

2.2.4 Magnetic tape

The magnetic tape contains magnetic field data every 24 seconds and associated engineering data every 192 seconds. Its format is given in Table 4.

PARTICLES AND FIELDS MAGNETOMETER DATA APOLLO 15 ----------ORBIT 49---------- PROCESSED 05/06/73

DAY	MN/DY	HRMN:SC	EL.TIME C F	MAGNETIC FIELD (GAMMAS) BX	BY	BZ	BT	PARTICLE COUNTS OPEN	SHIELDED	SUN ANG	SPIN PER.	SPIN COUNT	MAG TEMP	BATT TEMP	BATT VOLT	BATT CURR	ARRAY CRUR	REF VOLT	FLAG1 IFMCTR	FLAG2 RTF
220	8/ 8	2027:21	83193	2.18	3.75	7.30	8.58	2	-2	-.3	5.059	170	67.8	70.2	16.8	.57	1.31	2.50	111000	193
220	8/ 8	2030:33	83205	5.49	2.75	4.95	8.21	6	-3	-.3	5.058	208	67.8	70.7	16.8	.65	1.27	2.50	111000	205
220	8/ 8	2033:45	83217	7.27	3.63	5.20	10.03	5	-3	-.3	5.059	246	67.8	70.7	16.8	.67	1.27	2.50	111000	217
220	8/ 8	2036:57	83229	8.58	1.53	5.05	10.07	6	-3	-.5	5.062	28	67.8	71.1	16.8	.65	1.42	2.50	111000	229
220	8/ 8	2040:09	83241	3.35	1.37	1.86	9.90	5	-3	-.5	5.059	65	67.8	71.1	14.5	-.69	.00	2.50	111000	241
220	8/ 8	2043:21	83253	4.17	.86	-6.92	9.34	4	-4	.0	5.059	103	67.8	71.6	14.3	-.70	.00	2.50	111000	253
220	8/ 8	2046:33	84 9	6.69	.91	-.75	8.61	5	-5	.0	5.059	142	67.3	71.6	14.2	-.70	.00	2.50	111000	9
220	8/ 8	2049:45	84 21	4.79	.96	.94	10.24	7	-5	.0	5.059	180	67.3	71.6	14.0	-.70	.00	2.50	111000	21
220	8/ 8	2052:57	84 33	6.95	.96	2.57	8.38	4	-4	.0	5.058	218	66.8	71.6	14.0	-.70	.00	2.50	111000	33
220	8/ 8	2056:09	84 45	10.69	.53	2.85	11.28	5	-4	.0	5.058	0	66.2	71.1	13.8	-.72	.00	2.50	111000	45
220	8/ 8	2059:21	84 57	11.17	1.72	1.95	12.02	6	-3	.0	5.058	38	65.7	71.1	13.8	-.72	.00	2.50	111000	57
[illegible]	8/ 8	2102:33	84 69	12.67	2.02	-4.04	13.95	5	-3	.0	5.058	76	65.7	71.1	13.6	-.72	.00	2.50	111000	69
220	8/ 8	2105:45	84 81	9.62	4.21	-10.84	15.22	3	-3	.0	5.057	114	65.2	70.7	13.5	-.73	.00	2.50	111000	81
220	8/ 8	2108:57	84 93	5.55	5.30	-12.65	14.65	4	-3	.0	5.057	152	64.7	70.7	13.5	-.73	.00	2.50	111000	93
220	8/ 8	2112:09	84105	.69	3.95	-13.30	13.91	2	-2	.0	5.057	190	64.2	70.2	13.4	-.73	.00	2.50	111000	105
220	8/ 8	2115:21	84117	-1.38	3.11	-13.41	13.84	2	-2	.0	5.057	228	64.2	69.7	13.3	-.75	.00	2.50	111000	117
220	8/ 8	2118:33	84129	-2.27	2.62	-12.97	13.44	2	-1	.0	5.057	10	63.7	69.2	13.3	-.75	.00	2.50	111000	129
220	8/ 8	2121:45	84141	-2.66	2.26	-12.79	13.28	2	-1	.0	5.056	46	63.2	68.7	13.3	-.75	.00	2.50	111000	141
[illegible]	8/ 8	2124:57	84153	-2.59	2.10	-12.44	12.89	1	-1	.0	5.056	85	62.7	68.7	16.8	.30	.00	2.50	111000	153
[illegible]	8/ 8	2128:09	84165	-1.32	2.03	-11.15	11.43	1	-1	-.5	5.057	123	62.7	68.2	16.6	.88	1.25	2.50	111000	165
[illegible]	8/ 8	2131:21	84177	-1.49	2.19	-10.56	10.95	1	-1	-.3	5.056	161	62.7	67.7	16.5	.85	1.43	2.50	111000	177
[illegible]	8/ 8	2134:33	84189	-3.38	2.46	-10.75	11.58	1	-1	-.3	5.056	199	62.2	67.3	16.5	.79	1.51	2.50	111000	189
[illegible]	8/ 8	2137:45	84201	-3.24	2.63	-11.20	12.00	1	-1	-.3	5.057	237	62.7	66.8	16.6	.74	1.58	2.50	111000	201
[illegible]	8/ 8	2140:57	84213	-2.42	2.94	-10.25	10.94	1	-1	-.3	5.057	19	62.7	66.8	16.6	.77	1.59	2.50	111000	213
220	8/ 8	2144:09	84225	-2.48	2.48	-10.14	11.03	1	-1	-.3	5.056	57	62.7	66.3	16.8	.35	1.53	2.50	111000	225
220	8/ 8	2147:21	84237	-2.52	3.95	-9.14	10.28	1	-1	-.1	5.057	95	63.2	66.3	16.7	.92	1.41	2.50	111000	237
220	8/ 8	2150:33	84249	-1.35	4.12	-8.93	10.05	1	-1	-.3	5.057	133	63.2	66.3	14.6	.70	1.33	2.50	111000	249
220	8/ 8	2153:45	85 5	-2.49	4.33	-9.22	10.52	1	-1	-.3	5.058	171	63.7	66.3	16.6	.52	1.27	2.50	111000	5
220	8/ 8	2156:57	85 17	.28	3.35	-8.96	9.73	1	-1	-.1	5.058	209	64.2	66.3	16.6	.46	1.16	2.50	111000	17

DAY	MN/DY	HRMN:SC	EL.TIME C F	MAGNETIC FIELD (GAMMAS) BX	BY	BZ	BT	PARTICLE COUNTS OPEN	SHIELDED	SUN ANG	SPIN PER.	SPIN COUNT	MAG TEMP	BATT TEMP	BATT VOLT	BATT CURR	ARRAY CRUR	REF VOLT	FLAG1 IFMCTR	FLAG2 RTF

Table 4

SUBJECT: LUNAR SUBSATELLITE MAGNETOMETER DATA REDUCTION PROGRAM (SSMAGE)
PHASE 3 DATA TAPE FORMAT

PHYSICAL DESCRIPTION OF THE TAPE *

A. PARITY: ODD
B. DENSITY: 800 BPI
C. WORD LENGTH: 36 BITS
D. WORD MODES USED
   1. INTEGER
   2. FLOATING POINT
   3. FIELDATA
E. FORMAT

RECORD NO.	NO. OF WORDS	MODE	ARRAY	DESCRIPTION
1	5	MIXED		PROCESSING DATE AND ROUTINE VERSION
2	100	INTEGER	ORBIT(100)	Lunar orbit numbers for data contained on this tape
3	100	INTEGER	NOON(100)	Lunar noon meridians associated with the beginning of each of the above orbits
4	100	INTEGER	ECLIPSE(100)	Lunar eclipse time associated with the above orbits
5	100	INTEGER	SUNRIS(100)	Lunar sunrise time associated with the above orbits
6	200	INTEGER	ECL(100,2)	Lunar eclipse intervals (start and stop times) found from the data (last subscript denotes start or stop)
7	200	INTEGER	SUN(100,2)	Lunar sunlight intervals found from the data
8	200	INTEGER	ASUN(100,2)	Lunar sunlight intervals prior to lunar eclipse found from the data associated with the above orbits

WORD	MODE	DESCRIPTION
1	FIELDATA	Date processed "DDMMYY"
2	FIELDATA	Time of day processed "HHMMSS"
3	INTEGER	Routine version number
4	FIELDATA	Routine version generation date "DDMMYY"
5	FIELDATA	Routine version generation time of day "HHMMSS"

RECORD NO.	NO. OF WORDS	MODE	ARRAY	DESCRIPTION
9	200	INTEGER	NITE(100,2)	Lunar eclipse intervals found from the data associated with the above orbits
10	200	INTEGER	MSUN(100,2)	Lunar sunlight intervals after lunar eclipse found from the data associated with the above orbits
11	200	INTEGER	BN(100,2)	TSN data intervals found from the data
12	200	INTEGER	TSF(100,2)	TSF data intervals found from the data
13	200	INTEGER	RT(100,2)	Real time data intervals found from the data Note: All the above times are integer milliseconds (a) 1 Day = 86,400,000 milliseconds (b) 1 Hour = 3,600,000 milliseconds (c) 1 Minute = 60,000 milliseconds
14-N	560	MIXED	BUF(560)	24 second average data Note: The BUF array is described in terms of (a) 8 words per frame (b) 8 frames per data cycle (c) 16 extra words per data cycle (d) 80 total words per data cycle (e) 7 data cycles per record (f) ~~196~~ 192 seconds per data cycle SEE DESCRIPTION OF A DATA CYCLE BELOW

N - is the total number of records on the tape and is followed by 2 1108 software end-of-file marks, i.e., one word records containing an octal 17 in the 6 most significant bits and the remaining 30 least significant bits are zero.

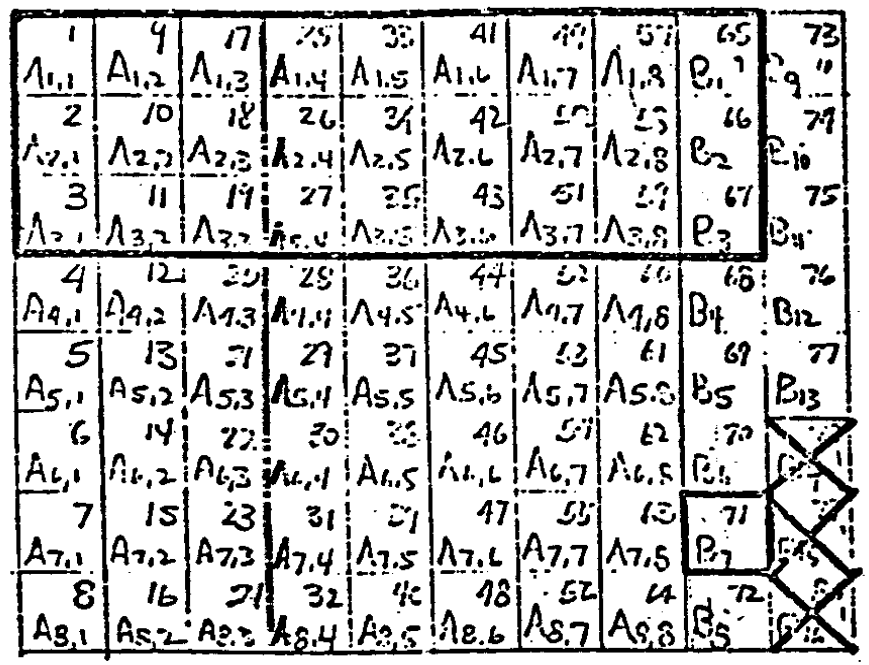
DATA CYCLE DESCRIPTION

1 Data Cycle is 80 words. It is considered as an array dimensioned 8 by 10.

Then for DATCYC(8,10) or DATCYC(I,J):

1. I implies A_I for I = 1 to I = 8.
2. J implies frame of A_1 for J = 1 to J = 8.
3. J is meaningless for A_I for J = 9 to J = 10, but the B_K data is contained in these cells.
   a. K takes on values 1 through 16.
   b. K = I + (J-9)*8 for I = 1 to I = 8, J = 9 and J = 10.

Graphically, DATCYC(8,10) looks as follows:



Integer Cells

Floating Point Cells

Cells Not Used

From the above chart it is evident that:

(1) ((A(I,J),I=1,3),J=1,8) are integer numbers

(2) ((A(I,J),I=4,8),J=1,8) are floating point numbers

(3) (B(K),K=1,3) and B(7) are integer numbers

(4) (B(K),K=4,6) and (B(K),K=8,13) are floating point numbers

(5) (B(K),K=14,16) are cells not used.

Quantity	Description
A(1,J)	Time (days)
A(2,J)	Time(milliseconds of day)
A(3,J)	Flag
A(4,J)	Transverse Field (Gammas)
A(5,J)	Parallel Field (Gammas)
A(6,J)	Sun Pulse Delay (seconds)
A(7,J)	Magnetometer Time Delay (seconds)
A(8,J)	Particle Counts
B(1)	Elapsed time coarse
B(2)	Elapsed time fine
B(3)	Flag
B(4)	Sun Elevation Angle (Degrees)
B(5)	Spin Period
B(6)	Sector Period
B(7)	Spin Count
B(8)	Magnetometer Temperature (^{o}F)
B(9)	Battery Temperature (^{o}F)
B(10)	Battery Current (amps)
B(11)	Battery Voltage (volts)
B(12)	Array Current (amps)
B(13)	Reference Voltage (volts)

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perilune time and altitude in kilometers, the apolune time and altitude, and the time of sunrise and sunset. The plot includes two vertical shaded bars marking sunset and sunrise at the subsatellite. Time grids below the plot permit the use of this graph for as many as six consecutive orbits. However, these grids may be up to 4 minutes off. Figure 33-15 is a sample plot.

Latitude as a function of longitude.- The plot of latitude as a function of longitude shows the track of the satellite across the lunar surface in selenographic coordinates. The vertical and horizontal scales are different by a factor of 2. The points of sunrise and sunset at the subsatellite are indicated by shaded vertical bars. Perilune and apolune are marked on the orbit track with an X and labeled with P and A, respectively. The subsolar point is similarly marked with an X and labeled with an S. The location of the Apollo 15 Apollo lunar surface experiments package (ALSEP) is similarly shown and encircled by an ellipse showing the area within 15° of the ALSEP site. Underneath the plot are given orbit numbers and perilune and apolune times. Figure 33-16 is a sample plot.

Earth-Moon system plots.- The Earth-Moon system plot contains the ecliptic plane projection of the Earth-Moon system and includes the expected position of the magnetopause and bow shock. One point is given per orbit. Distances are labeled in Earth radii. Figure 33-17 is a sample plot.

Magnetic tape.- The orbit tape contains position and orientation information that changed slowly in a header record once per orbit and contains rapidly changing positional data every minute in a data record (1 record/min). The format of this tape is given in table 33-X.

Magnetometer Data

Two microfilm reels of data and one magnetic tape were produced in preliminary processing of the data. The first reel contains two plots. Magnetometer measurements appear on the A plot and engineering data on the B plot. The second reel contains a computer listing of 192-sec averages of the data. The magnetic tape contains 24-sec averages of the data. Apollo 16 data submitted by JSC to the National Space Science Data Center (NSSDC) were processed with Apollo 15 calibration constants. Therefore, field scales on Apollo 16 plots are a factor of 2 too large. (For more details, see the section entitled "Converting Apollo 16 Data to Proper Units.")

6950 C-18722
9tk, BW, 5 Files

9. Spin count (from Sun pulse or magnetometer pulse)

10. Magnetometer temperature (degrees Fahrenheit)

11. Battery temperature (degrees Fahrenheit)

12. Battery voltage (volts)

13. Battery current (amperes)

14. Array current (amperes)

15. Reference voltage of magnetometer (volts)

16. Flag 1

    a. I - satellite identity (1 = Apollo 15)

    b. F - data format (0 = store mode, 1 = real time)

    c. M - automatic/manual (0 = manual mode)

    d. C - calibration (1 = on)

    e. T - transverse range (1 = low sensitivity)

    f. P - parallel range (1 = low sensitivity)

17. Flag 2 not used (repeats elapsed time, fine)

Figure 33-20 is a sample plot.

Magnetic tape.- The magnetic tape contains magnetic field data every 24 sec and associated engineering data every 192 sec. The magnetic tape format is given in table 33-XI.

Data Cycle Description

One data cycle consists of 80 words (an array dimensioned 8 by 10). Then, for DATCYC(8,10) or DATCYC(I,J), the symbols I and J have the following functions.

1. I implies A_I for I = 1 to I = 8.

2. J implies frame of A_1 for J = 1 to J = 8.

3. J is meaningless for A_I for J = 9 to J = 10, but the B_K data are contained in these cells.

a. K takes on values 1 to 16.

b. K = I + (J - 9)*8 for I = 1 to I = 8, J = 9 and J = 10.

Graphically, DATCYC(8,10) is shown in figure 33-21. From figure 33-21, the following information is evident.

1. ((A(I,J),I=1,3),J=1,8) are integer numbers.

2. ((A(I,J),I=4,8),J=1,8) are floating point numbers.

3. (B(K),K=1,3) and B(7) are integer numbers.

4. (B(K),K=4,6) and (B(K),K=8,13) are floating point numbers.

5. (B(K),K=14,16) are unused cells.

Quantity	Description
A(1,J)	Time (days)
A(2,J)	Time (milliseconds of day)
A(3,J)	Flag
A(4,J)	Transverse field (gammas)
A(5,J)	Parallel field (gammas)
A(6,J)	Sun pulse delay (seconds)
A(7,J)	Field longitude (radians)
A(8,J)	Particle counts

Quantity	Description
B(1)	Elapsed time, coarse
B(2)	Elapsed time, fine
B(3)	Flag
B(4)	Sun elevation angle (degrees)
B(5)	Spin period

B(6)	Sector period
B(7)	Spin count
B(8)	Magnetometer temperature (degrees Fahrenheit)
B(9)	Battery temperature (degrees Fahrenheit)
B(10)	Battery current (amperes)
B(11)	Battery voltage (volts)
B(12)	Array current (amperes)
B(13)	Reference voltage (volts)

Converting Apollo 16 Data to Proper Units

When the Apollo 16 subsatellite is in sunlight, the following formulas may be used to obtain proper values for data given on the magnetic tape. For the magnetic field transverse to the spin axis (stored mode), use

$$B_T = B_T(0.512 - 0.1013)$$

For the magnetic field transverse to the spin axis (real time), use

$$B_T = B_T \times 0.503$$

For the magnetic field parallel to the spin axis, use

$$B_P = 0.4981[(B_P + 51.95) - (0.0279 \times B8)] - 24.72$$

where B_T = transverse field, word A(4,J) in data cycle

B_P = parallel field, word A(5,J) in data cycle

B8 = magnetometer temperature, word B(8) in data cycle

Note: In real time, flag A3 = XOXXXX; in memory store, flag A3 = X1XXXX.

TIME SPAN IS found by orbits

FILE 0001 REC 0001 CH 0036

0001	626460716763	616761666165	000000000011	617060716763	606060606060	000000000000	

FILE 0001 REC 0002 CH 0600

Dupe of D-13784 H-17057

12/29/71-12/31/71

0001	000000003340	000000003341	000000003342	000000003343	000000003344	000000003345	000000003346	000000003347
0049	000000003350	000000003351	000000003352	000000003353	000000003354	000000003355	000000003356	000000003357
0097	000000003360	000000003361	000000003362	000000003363	000000003364	000000003365	000000003366	000000003367
0145	000000003370	000000003371	000000003372	000000003373	000000003374	000000003375	000000003376	000000003377
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0003 CH 0600

1536
192
32
12 | 1760 | 146.6
(8-10-71) START CIRCUIT
217
147
364

0001	351552211150	351605522460	351641041660	351674355140	351727666450	351763201730	352016513240	352052026520
0049	352105342000	352140653310	352174166570	352227500100	352263013360	352316322720	352351636200	352405147510
0097	352440461020	352473774300	352527305610	352562617120	352616132400	352651443710	352704755220	352740270500
0145	352773602010	353027113320	353062422660	353115734170	353151245500	353204557010	353240070320	353273403600
0193	353326715110	353362226420	353415537730	353451051240	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0004 CH 0600

add days to day Apollo 15 started lunar orbit 8/04/71

0001	351563027260	351616342540	351651652100	351705165360	351740500640	351774016070	352027331350	352062644630
0049	352116162060	352151475340	352205010620	352240326050	352273641330	352327143000	352362456260	352415771540
0097	352451305020	352504622250	352540135530	352573451010	352626766240	352662301520	352715615000	352751130260
0145	353004443540	353037760770	353073302140	353126615420	353162130700	353215444160	353250757440	353304272720
0193	353337606200	353373121460	353426434740	353461750220	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0005 CH 0600

0001	351575412500	351630725760	351664227430	351717544660	351753060140	352006375370	352041710650	352075226100
0049	352130541360	352164056610	352217372070	352252707320	352306222600	352341512440	352375027670	352430343150
0097	352463660400	352517173660	352552511110	352606024370	352641337650	352674655100	352730170360	352763505610
0145	353017021070	353052334350	353105657470	353141172750	353174506230	353230021510	353263334770	353316650250
0193	353352165500	353405500760	353441014240	353474327520	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0006 CH 1200

0001	351563105371	351616406125	351651765565	351705266325	351740567061	351774067615	352027370355	352062750011
0049	352205064757	352240365513	352273745153	352327245707	352362546443	352415711377	352447124037	352502503477
0097	352536004233	352572212113	352751175611	353004476351	353040056005	353073356545	353126657301	353162160041
0145	353215537475	353251040235	353304340771	353337661231	000000000000	000000000000	000000000000	000000000000

24

Dupe of D-137857 H-17058

8/19/71 - 8/27/71

FILE 0001 REC 0001 CH 0036 0973 0951 27 1809 73

0001	626460716763	607165616267	000000000011	617060716763	606060606060	000000000000

FILE 0001 REC 0002 CH 0600

0001	000000000261	000000000262	000000000263	000000000264	000000000265	000000000266	000000000267	000000000270
0049	000000000271	000000000272	000000000273	000000000274	000000000275	000000000276	000000000277	000000000300
0097	000000000301	000000000302	000000000303	000000000304	000000000305	000000000306	000000000307	000000000310
0145	000000000311	000000000312	000000000313	000000000314	000000000315	000000000316	000000000317	000000000320
0193	000000000321	000000000322	000000000323	000000000324	000000000325	000000000326	000000000327	000000000330
0241	000000000331	000000000332	000000000333	000000000334	000000000335	000000000336	000000000337	000000000340
0289	000000000341	000000000342	000000000343	000000000344	000000000345	000000000346	000000000347	000000000350
0337	000000000351	000000000352	000000000353	000000000354	000000000355	000000000356	000000000357	000000000360
0385	000000000361	000000000362	000000000363	000000000364	000000000365	000000000366	000000000367	000000000370
0433	000000000371	000000000372	000000000373	000000000374	000000000375	000000000376	000000000377	000000000400
0481	000000000401	000000000402	000000000403	000000000404	000000000405	000000000406	000000000407	000000000410
0529	000000000411	000000000412	000000000413	000000000414	000000000415	000000000416	000000000417	000000000420
0577	000000000421	000000000422	000000000423	000000000424				

FILE 0001 REC 0003 CH 0600

0001	225004031230	225037342540	225072656020	225126167330	225161502610	225215016070	225250327400	225303642660
0049	225337171720	225372503230	225426016510	225461330020	225514643300	225550154610	225603470070	225637001400
0097	225672312710	225725626170	225761137500	226014452760	226047764270	226103307410	226136620720	226172134200
0145	226225445510	226260757020	226314272300	226347603610	226403115120	226436430400	226471741710	226525253220
0193	226560564530	226614115540	226647427050	226702740360	226736253640	226771565150	227025076460	227060411740
0241	227113723250	227147234560	227202546070	227236061350	227271372660	227324704170	227360231260	227413544540
0289	227447060020	227502373300	227535706560	227571220070	227624533350	227660046630	227713362110	227746675370
0337	230002210650	230035522160	230071045300	230124356610	230157666150	230213177460	230246510770	230302020330
0385	230335331640	230370643150	230424152510	230457464020	230512775330	230546304670	230601614230	230635127510
0433	230670442770	230723756250	230757271530	231012603040	231046116320	231101431600	231134745060	231170260340
0481	231223573620	231257105130	231312420410	231345735640	231401247150	231434560460	231470071770	231523403300
0529	231556714610	231612226120	231645537430	231701050740	231734362250	231767673560	232023205070	232056530210
0577	232112043470	232145356750	232200672230	232234205510				

FILE 0001 REC 0004 CH 0600

0001	225014344100	225047653440	225103164750	225136476260	225172005620	225225317130	225260626470	225314140000
0049	225347443420	225402754730	225436264270	225471575600	225525105140	225560416450	225613726010	225647237320
0097	225702546660	225736056220	225771367530	226024677070	226060210400	226113525630	226147035170	226202346500
0145	226235656040	226271165400	226324476710	226360006250	226413315610	226446625150	226502136460	226535446020
0193	226570755360	226624310340	226657617700	226713127240	226746440550	227001750110	227035257450	227070567010
0241	227124100320	227157407660	227212717220	227246230530	227301540070	227335047430	227370364660	227423674220
0289	227457205530	227512517040	227546030350	227601341660	227634651220	227670162530	227723474040	227757005350
0337	230012316660	230045626220	230101163150	230134472510	230170000100	230223307440	230256615030	230312124370
0385	230345431760	230400741320	230434250660	230467556250	230523065610	230556373200	230611753550	230645265060
0433	230700574420	230734105730	230767417240	231022726600	231056240110	231111551420	231145062730	231200374240
0481	231233703600	231267215110	231322526420	231356071240	231411400600	231444710140	231500217500	231533527040
0529	231567036400	231622345740	231655655300	231711164640	231744474200	232000003540	232033313100	232066642140
0577	232122153450	232155464760	232211000240	232244311550				

FILE 0001 REC 0005 CH 0600

0001	225027016060	225062327370	225115636730	225151150240	225204461550	225237773060	225273304370	225326615700
0049	225362123270	225415434600	225450746110	225504255450	225537566760	225573100270	225626407630	225661721140
0097	225715232450	225750542010	226004053320	226037364630	226072674170	226126213370	226161524700	226215034240
0145	226250345550	226303655110	226337166420	226372475760	226426007270	226461320600	226514630140	226550141450
0193	226603451010	226637002020	226672311360	226725622670	226761132230	227014443540	227047753100	227103264410
0241	227136573750	227172105260	227225414620	227260726130	227314235470	227347547000	227403066200	227436377510
0289	227471711020	227525222330	227560533640	227614045150	227647356460	227702667770	227736201300	227771512610
0337	230025024120	230060335430	230113670410	230147177750	230202507310	230236014700	230271324240	230324633600
0385	230360143140	230413450530	230446760070	230502267430	230535576770	230571106330	230624451150	230657762460
0433	230713273770	230746605300	231002114640	231035426150	231070737460	231124250770	231157562300	231213073610
0481	231246405120	231301716430	231335227740	231370553060	231424062420	231457371760	231512701320	231546212630
0529	231601522170	231635031530	231670341070	231723652400	231757161740	232012471300	232046000640	232101314120
0577	232134627400	232170140710	232223454170	232256765500				

FILE 0001 REC 0006 CH 1200

0001	225047703255	225172102154	225225402704	225260703434	225314204164	225347504714	225403064350	22[illegible]
0049	225471665630	225525166360	225560467110	225613750102	225771445444	226024746174	226060246724	22[illegible]
0097	226147127110	226202644344	226235730370	226253103155	226271231120	226324511225	226413333347	22[illegible]
0145	226504476120	226537562144	226572646170	226625732214	226661016234	226714102260	226747166304	22[illegible]
0193	227035303706	227046130163	227125674300	227160760324	227213255330	227255020554	227302214414	22[illegible]
0241	227377632700	227423744114	227457323550	227546125030	227601407054	227670223754	227726773064	22[illegible]

Dupe of D-13786 H-17062

1/1/72 - 1/2/72

FILE 0001 REC 0001 CH 0036 09 73 17 22 14 18 09 73

0001	626760716763	616762626164	000000000011	617060716763	606060606060	000000000000

FILE 0001 REC 0002 CH 0600

0001	000000003404	000000003405	000000003406	000000003407	000000003410	000000003411	000000003412	000000003413
0049	000000003414	000000003415	000000003416	000000003417	000000003420	000000003421	000000003422	000000003423
0097	000000003424	000000003425	000000003426	000000003427	000000003430	000000003431	000000003432	000000003433
0145	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0003 CH 0600

0001	000530134550	000563446060	000616753450	000652264760	000705576270	000741107600	000774421110	001027730450
0049	001063241760	001116553270	001152064600	001205374140	001240705450	001274216760	001327530270	001363035660
0097	001416347170	001451656530	001505170040	001540477400	001574006740	001627320250	001662627610	001716141120
0145	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0004 CH 0600

0001	000541035500	000574350760	000627707660	000663223140	000716534450	000752047730	001005363210	001040674520
0049	001074210000	001127523260	001163034570	001216350050	001251663330	001305174640	001340510120	001374043100
0097	001427356360	001462667670	001516203150	001551514460	001605025770	001640341250	001673652560	001727164070
0145	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0005 CH 0600

0001	000553415000	000606730260	000642267160	000675602440	000731115720	000764431200	001017744460	001053257740
0049	001106571250	001142104530	001175420010	001230733270	001264246550	001317562030	001353075310	001406424350
0097	001441735660	001475251140	001530564420	001564075730	001617411210	001652722520	001706236000	001741551260
0145	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0006 CH 1200

0001	000541114100	000574414640	000627715370	000663275030	000716575570	000752076330	001005377060	001040756520
0049	001074257260	001127560010	001251740750	001305241500	001340542240	001374121700	001430211450	001462723170
0097	001516223730	001551603370	001605104130	001640404660	000000000000	000000000000	000000000000	000000000000
0145	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000

APOLLO 16

SUB-SATELLITE MAGNETOMETER

72-031D-02A

This data set have been restored. Originally there were nine 7-track, 800 BPI tapes, and one 9-track, 1600 BPI tape, written in Binary. There is one restored tape. The original tapes were created on a UNIVAC 1108 computer. The restored tape was created on the IBM 9021 computer. The DR tape is 3480 cartridge and the DS tape is 9-track, 6250 BPI. The DR and DS numbers along with their corresponding D numbers and time span is as follows:

DR#	DS#	DD#	FILES	TIME SPAN	
DR-004933	DS-004933	DD-014005	1	04/25/72 - 04/28/72	(a)
		DD-014004	2	04/28/72 - 04/29/72	
		DD-014006	3	04/29/72 - 05/02/72	(b)
		DD-014007	4	05/02/72 - 05/06/72	
		DD-014008	5	05/06/72 - 05/10/72	
		DD-014009	6	05/10/72 - 05/17/72	
		DD-014010	7	05/17/72 - 05/21/72	
		DD-014188	8	05/21/72 - 05/27/72	(c)
		DD-014189	9	05/27/72 - 05/29/72	(d)
		DD-028817	10-14	04/25/72 - 05/29/72	

(a) DD-014005: 5 errors, rec 34, 35, 36, 71 AND 71, File 1.

(b) DD-014006: 2 errors, rec 56 AND 79, File 1.

(c) DD-014188: 1 error, rec 176, File 1.

(d) DD-014189: 1 error, rec 109, File 1.

See

71-073D-02A

WORLD DATA CENTER A
ROCKETS and SATELLITES
Goddard Space Flight Center • Code 930.2
Greenbelt, Maryland 20771 • U.S.A.

TELEPHONE: (301) 286-6695 or FAX: (301) 286-4952

E-mail: NCF::REQUEST or request@nssdca.gsfc.nasa.gov

WORLD DATA CENTERS CONDUCT INTERNATIONAL EXCHANGES OF GEOPHYSICAL OBSERVATIONS IN ACCORDANCE WITH THE PRINCIPLES SET FORTH BY THE INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS. INITIATED FOR THE INTERANATIONAL GEOPHYSICAL YEAR 1957-58, THE DATA EXCHANGE CONTINUES UNDER RECOMMENDATION OF VARIOUS ICSU SCIENTIFIC ORGANIZATIONS. WDC-A IN THE UNITED STATES IS ESTABLISHED UNDER THE AUSPICES OF THE NATIONAL ACADEMY OF SCIENCES.

01010

16

Dupe of D-14005 first 15 rec's 4/25/72 - 4/28/72

FILE 0001 REC 0001 CH 0036

0001	606360616764	616663656562	000000000013	626161626763	616260606060	000000000000

FILE 0001 REC 0002 CH 0600

0001	000000000014	000000000015	000000000016	000000000017	000000000020	000000000021	000000000022	000000000023
0049	000000000024	000000000025	000000000026	000000000027	000000000030	000000000031	000000000032	000000000033
0097	000000000034	000000000035	000000000036	000000000037	000000000040	000000000041	000000000042	000000000043
0145	000000000044	000000000045	000000000046	000000000047	000000000050	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0003 CH 0600

0001	113132757000	113166130540	113221302300	113254456010	113307627550	113343001310	113376153050	113431324610
0049	113464470460	113517626440	113552766370	113606124350	113641262330	113674422260	113727560240	113762716220
0097	114016054200	114051214130	114104352110	114137510070	114172646050	114226057010	114261222660	114314366530
0145	114347532400	114402674300	114436040150	114471204020	114524347670	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0004 CH 0600

0001	113143400110	113176553620	113231727330	113265105010	113320260520	113353434230	113406611710	113441765420
0049	113475162600	113530324500	113563464430	113616626330	113651766260	113705130160	113740270110	113773432010
0097	114026573710	114061733640	114115075540	114150235470	114203377370	114236641640	114272011430	114325157250
0145	114360325070	114413472710	114446640530	114502006350	114535156140	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0005 CH 0600

0001	113156061730	113211237410	113244413120	113277570600	113332746260	113366121770	113421277450	113454455130
0049	113507644420	113543006320	113576150220	113631310150	113664452050	113717613750	113752755650	114006117550
0097	114041261450	114074423350	114127565250	114162727150	114216071050	114251323460	114304471300	114337641070
0145	114373006710	114426156500	114461324320	114514474110	114547641730	000000000000	000000000000	000000000000
0193	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0006 CH 1200

0001	113143620257	113201202410	113231764531	113265126460	113320272330	113353435533	113410314401	113441743530
0049	113475164550	113530330431	113563472320	113616636170	113652001433	113740342713	113773514630	114026700250
0097	114062042100	114115205750	114150351254	114203513520	114236657252	114272021270	114325165247	114360407143
0145	114413530140	114446673505	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000

Dupe of D-14086 first 15 recs 5/2/72 - 5/5/72

4/29/72 to 5/2/72

FILE 0001 REC 0001 CH 0036

0001	606460616764	617160626260	000000000013	626161626763	616260606060	000000000000

FILE 0001 REC 0002 CH 0600

0001	000000000076	000000000077	000000000100	000000000101	000000000102	000000000103	000000000104	000000000105
0049	000000000106	000000000107	000000000110	000000000111	000000000112	000000000113	000000000114	000000000115
0097	000000000116	000000000117	000000000120	000000000121	000000000122	000000000123	000000000124	000000000125
0145	000000000126	000000000127	000000000130	000000000131	000000000132	000000000133	000000000134	000000000135
0193	000000000136	000000000137	000000000140	000000000141	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0003 CH 0600

0001	115652645060	115706010730	115741152630	115774316500	116027462350	116062626220	116115770120	116151201060
0049	116204342760	116237506630	116272652500	116326014400	116361160250	116414324120	116447466020	116502631670
0097	116535775540	116571141410	116624303310	116657516220	116712662070	116746023770	117001167640	117034331540
0145	117067475410	117122637310	117156003160	117211145060	117244310730	117277452630	117332616500	117366000100
0193	117421143750	117454311570	117507455440	117542623260	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0004 CH 0600

0001	115663547760	115716717550	115752065370	116005233210	116040401030	116073546650	116126716440	116162105730
0049	116215253550	116250421370	116303567210	116336735030	116372104620	116425252440	116460420260	116513566100
0097	116546735670	116602103510	116635251330	116670436650	116723604470	116756752310	117012120130	117045265750
0145	117100433570	117133601410	117166747230	117222115050	117255262670	117310426540	117343574360	117376742200
0193	117432111770	117465261560	117520431350	117553601140	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

FILE 0001 REC 0005 CH 0600

0001	115676217770	115731365610	115764535400	116017703220	116053053010	116106220630	116141370420	116174540210
0049	116227706030	116263055620	116316223440	116351371260	116404541050	116437706670	116473056460	116526224300
0097	116561372120	116614541710	116647707530	116703055350	116736223170	116771371010	117024536630	117057704450
0145	117113052270	117146220110	117201365730	117234533550	117267701370	117323047210	117356215030	117411343150
0193	117444512740	117477662530	117533032320	117566202110	000000000000	000000000000	000000000000	000000000000
0241	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0289	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0337	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0385	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0433	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0481	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0529	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000
0577	000000000000	000000000000	000000000000	000000000000				

ILE 0001 REC 0006 CH 1200

0001	115663512530	115716776450	115752142227	116005323720	116073603610	116127024700	116162170620	116215333733
0049	116250476320	116303626361	116336776200	116425266030	117143563051	117166766631	117222164110	117255330106
0097	117310473112	117343635530	117377001112	117432143300	117465307110	000000000000	000000000000	000000000000
0145	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000	000000000000