#382

VIKING LANDER 1 & 2

75-075C-14A, 14B

75-083C-14A, 14B

REQ. AGENT	RAND NO.	ACQ. AGENT
CMP	RC7653	RNH

VIKING 1 & 2

EXPER. TRAJECTORY-ATTITUDE DATA

75-075C-14A & 75-083C-14A

RPA ION & ELECTRON DATA

75-075C-14B & 75-083C-14B

These data sets contain 1 tape each. The tapes are 9 track, 1600 BPI, and are multifiled. They are Binary and created on an IBM 360 computer. The physical record size is 24044. The time span is in seconds from deorbit (time of separation), in floating point.

D-29206 contains 4 files of data. #1 Viking Lander 1, Photoelectron Data (logical recs. 884); #2 Viking Lander 2, Photoelectron Data (logical recs. 888); #3 Viking Lander 1 Ion Data (logical recs. 39); #4 Viking Lander 2 Ion Data (logical recs. 40).

D-29207 contains 2 files of data; #1 viking lander 1 OA Data (logical rec 1191); #2 Viking Lander 2 OA Data (logical recs. 1241).

D#	C#	FILES	SATELLITE	TIME SPAN
D-29206	C-18942	4	Viking 1	07/20/76 - 07/20/76
			Viking 2	09/03/76 - 09/03/76
D-29207	C-18943	2	Viking 1	07/20/76 - 07/20/76
			Viking 2	09/03/76 - 09/03/76

VIKING 1 AND VIKING 2 IONOSPHERIC DATA (ENTRY SCIENCE) FROM RETARDING POTENTIAL ANALYZER

DATA SUMMARY FOR WORLD DATA CENTER

by

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DOCUMENTATION OF RPA DATA FROM VIKING 1 AND VIKING 2

Introduction

The geometry of Viking Retarding Potential Analyzer (RPA) sensor head is shown in Fig. 1. The two entrance grids (G_1 and G_2) are grounded to the vehicle. The next two grids (G_3 and G_4) inward are the retarding (sweep) grids, to which a time-varying electric potential is applied. The suppressor grid (G_5) is held at different fixed potentials. G_6 and G_7 are shield grids that protect the collector from capacitively coupled electrical transients.

A complete instrument operation cycle consists of four major frames each of 4 second duration. The retarding grid is stepped through 3 different voltage ramps during a major frame. During the one-second energetic electron flux phase the retarding grid voltage moves from -75 V to 0 V in 100 equal voltage increments of 0.75 V, as shown in Fig. 2(a). During the thermal electron flux phase, also one second long, the retarding grid voltage moves 100 equal steps from 1.5 volts to 0 V. In Phase III, the two-second thermal ion mode, the retarding grid goes from +15 V to 0 volts in 200 equal steps.

While the retarding grid potential cycles as described above, the suppressor grid potential changes as shown in Fig. 2(b). On alternate major frames the suppressor grid is held either at +15 V or -4 V during Phase I. On every major frame, the suppressor grid is held at +15 V for Phase II and -15 V for Phase III. Thus we have two basically different major frames as distinguished by the suppressor grid behavior. Following is a table of retarding grid potential, suppressor grid potential and electrometer sensitivity for different major frames.

The RPA electrometer is a linear automatic range changing device with 8 sensitivity ranges differing successively by a factor of 4. Before each

major frame the electrometer output is set to zero, while the retarding grids are at -75 volts and the suppressor is at +15 volts. On every fourth major frame the electrometer is rezeroed on sensitivity range 5, rather than on range 1 (the most sensitive range). Therefore, a complete operation cycle consists of four major frames, as detailed in Table I, where it can be seen that frames 1 and 3 are identical.

RPA Operation Profile

The RPA recorded data over the altitude range from approximately 16,000 km to 100 km for both landers, but the instrument operated intermittently over this range. The instrument was on for 64 sec, then off for 325 sec until 40 min before "entry" (800,000 ft altitude). During the final 45 minutes or so (below approximately 5000 km) operation was continuous.

Table 1

Major frame	Retarding grid potential	Suppressor grid potential	Electrometer sensitivity
0	Phase I: - 75 V to 0 V Phase II: -1.5 V to 0 V Phase III: +15 V to 0 V	Phase I: +15 V Phase II: +15 V Phase III: -15 V	Rezeroed on Range 5
1	Same as I, II, III above	Phase I: -4 V Phase II: +15 V Phase III: -15 V	Rezeroed on Range 1
2	Same as I, II, III above	Phase I: +15 V Phase II: +15 V Phase III: -15 V	Rezeroed on Range 1
3	Same as I, II, III above	Phase I: -4 V Phase II: +15 V Phase III: -15 V	Rezeroed on Range 1

1. Tape with deranged data vs time

The current vs retarding potential for Phase I of RPA operations is on tape #1. The Read statement is

```
READ(14) GCSC,SWPNO,MAJFR,NP,(I,V(I),AI(I),I=1,NP)
```

where GCSC = Time in seconds from deorbit at -75.0 V of retarding grid potential

SWPNO = Sequential frame no.

MAJFR = Major frame no.

NP = No. of pairs of Retarding potential (V(I)) vs current points (AI(I))

Data from Lander 1 is on File 1 of tape #1, and data from Lander 2 is on File 2 of tape #1. Therefore photoelectron data from Phase I is on File 1 and 2 of

DSN = A285.VKPHOTO

Record format, RECFM = VSB (variable size block), binary format

Logical record size, LRECL = 2404

Physical record size, BLKSIZE = 24044

UNIT = 9TRK

BPI = 1600 B.P.I.

LABEL = No Label

File 1 = Lander 1 data from Phase I, the total no. of records are 884.

File 2 = Lander 2 data from Phase I, the total no. of records are 888.

Next on File 3 and 4 of the same tape we have ion data from Phase III of RPA operations. On File 3 we have deranged data from Lander 1, i.e. retarding potential vs current from sweep no. 912 through 951 in the same format as above, i.e.

READ(14)GCSC, SWPNO, MAJFR, NP,(I,V(I),AI(I),I=1,NP)

where GSCS is the time (sec) after deorbit at 0.0V of the retarding grid potential. SWPNO varies from 912 to 951 and MAJFR cycles between 0 & 3, NP in the number of pairs of points with retarding potential V(I) and collector current AI(I).

File 4 contains similar data from Lander 2 from sweep No. 911 through 951. Hence File 3 = Lander 1 data from Phase III, the total number of records are 39.

File 4 = Lander 2 data from Phase III, the total number of records are 40.

The total number of files on tape #1 with DSN=A285.VKPHOTO are four. The total number of end of file marks are five.

Table 2

A. Number of bad sweeps on File 1 of DSN=A285.VKPHOTO for Lander 1 are:

10, 11, 20, 21, 27, 42, 45, 46, 47, 69, 71, 72, 79, 80, 89, 105, 106, 114, 115, 134, 138, 141, 148, 150, 151, 168, 174, 175, 176, 177, 184, 185, 209, 210, 212, 213, 219, 220, 241, 244, 246, 248, 262, 268, 274, 278, 287, 291, 294, 298, 304, 313, 317, 332, 347, 382, 404, 417, 424, 435, 439, 446, 452, 455, 460, 490, 540, 562, 575, 578, 596, 610, 620, 632, 648, 683, 707, 718, 736, 747, 754, 755, 758, 760, 767, 768, 770, 775, 778, 780, 783, 784, 794, 800, 802, 808, 809, 820, 824, 831, 842, 852, 854, 861, 874, 900, 906, 908, 910.

B. Number of bad sweeps on File 2 of DSN=A285.VKPHOTO for Lander 2 are:

12, 13, 20, 32, 52, 59, 63, 90, 98, 104, 111, 131, 133, 137, 139, 151, 176, 178, 204, 205, 212, 230, 258, 264, 270, 303, 304, 317, 320, 332, 340, 367, 375, 426, 463, 490, 495, 496, 498, 511, 516, 525, 530, 533, 598, 602, 619, 654, 674, 683, 689, 691, 692, 753, 779, 785, 795, 827, 831, 835, 839, 841, 842, 843.

2. Tape of OA data vs time

The following parameters have been listed with time (sec) from separation. The read statement for this tape (DSN=A285.VIKNGOA) is READ(11)(WORD(I),I=1,11).

where WORD(1) = Time in sec from deorbit

WORD(2) = Velocity in km/sec

WORD(3) = Flight angle in deg.

WORD(4) = Heading angle in deg.

WORD(5) = Altitude above Mars mean surface in km.

WORD(6) = Sub-lander latitude in deg.

WORD(7) = Sub-lander longitude in deg.

WORD(8) = R.P.A. angle of attack in deg.

WORD(9) = UMAS angle of attack in deg.

WORD(10) = RPA sun angle in deg.

WORD(11) = Vehicle zenith angle in deg.

The tape characteristics are:

DSN = A285.VIKNGOA

Record Format, RECFM = VSB (variable size block), Binary format

Logical record size, LRECL = 48

Physical record size, BLKSIZE = 24004

UNIT = 9 TRK

BPI = 1600 B.P.I.

LABEL = No label

File 1 = Lander 1 OA, no. of records = 1191

File 2 = Lander 2 OA, no. of records = 1241

There are total of two files on tape #2 (DSN=A285.VIKNGOA), and the total number of file marks are three.

3. Microfilm Plots of

(a) Deranged data from Phase I of RPA operations.

Enclosed are two rolls of microfilm, Roll #1 and Roll #2. Roll #1 contains plots of reduced data from Phase I from deorbit to 315 km of the Lander 1 height. A sample frame is shown in Fig. 3. On this figure frame

VL-2 TIMELINE OF MAJOR EVENTS THRU SOL 1 RELAY PLAYBACK

EVENT		TIME, PDT	
PRESEP C/O		THURSDAY	6:40 AM - 11:30 AM
XMIT SEP - 9.5 HR UPDATE		FRIDAY	3:00 AM
XMIT SEP - 3.5 HR UPDATE		FRIDAY	8:45 AM
GO/NO-GO MEETING	9/3/76	FRIDAY	9:00 AM - 9:30 AM
XMIT SEP CMD		FRIDAY	11:45 AM
SEPARATION		FRIDAY	12:40 PM
DEORBIT BURN		FRIDAY	12:47 AM - 1:09 PM
ENTRY		FRIDAY	3:52 PM
TOUCHDOWN		FRIDAY	3:58 PM
FIRST PICTURE ON TV (FOOTPAD)		FRIDAY	4:45 PM - 5:05 PM
SECOND PICTURE ON TV (PANORAMA)		FRIDAY	5:10 PM - 6:10 PM
SOL 1 RELAY PLAYBACK		SATURDAY	9:00 PM - 12:21 AM
FIRST COLOR PICTURE ON TV		SATURDAY	11:00 PM

VIKING 1 LANDER DEORBIT 7/30/76

```
$JOB  20:30:12
$ASS IN MS2
$NOP******************** HEX DUMP OF X-416 *********************
$NOTE 30J   20:30:37
$EXE DPHEX BS
 INPUT TAPE ON MS2
 DATA INPUT     1 2 2
  FILE  1       RECORD   1        LENGTH   24044BYTES
```

Launch VIKING 1 ~~9/2/75~~ 9/9/75

VIKING 1 start 38 MINS 13 SEC files 1+3 Launch VIKING 2 ~~8/20/76~~ 8/20/75 VIKING 2

VIKING 1 stop 3hrs 9 MINS 28 sec

start 38 MINS 13 SEC

stop 3hrs 8MINS 28 SEC

D-29206

(0)	5DEC0000	02D60000	438F50CC	00000003	00000002	0000003B	00000001	C238DA25	36232E39	00000002
(40)	C23653E9	3634C56C	00000003	C2321ED9	3634C56C	00000004	C2314770	3634C56C	00000005	C2307006
(80)	3634C56C	00000006	C22EC134	3634C56C	00000007	C22DE9CA	36465C6A	00000008	C22D1261	3634C56C
(120)	00000009	C22C3AF7	3634C56C	0000000A	C22B638E	3634C56C	0000000B	C22A8C24	36465C6A	0000000C
(160)	C229B4BB	36465C6A	0000000D	C228DD51	3634C56C	0000000E	C22805E8	3657F38B	0000000F	C2272E7E
(200)	3634C56C	00000010	C2257FAB	36698ACE	00000011	C224A842	367B21BD	00000012	C223D0D8	367B21BD
(240)	00000013	C222F96F	36698ACE	00000014	C2222206	367B21BD	00000015	C2214A9C	367B21BD	00000016
(280)	C2207333	367B21BD	00000017	C21F9BC9	367B21BD	00000018	C21EC460	367B21BD	00000019	C21DECF6
(320)	369E4FDC	0000001A	C21D158D	367B21BD	0000001B	C21C3E23	368CB8C8	0000001C	C21B66BA	367B21BD
(360)	0000001D	C21A8F50	369E4FDC	0000001E	C219B7E7	36C17DEF	0000001F	C2180914	36D31588	00000020
(400)	C21731AA	36D31588	00000021	C2165A41	36F64362	00000022	C21582D8	36F64362	00000023	C214AB6E
(440)	37107DB0	00000024	C213D405	37107DB0	00000025	C212FC9B	3712B087	00000026	C2122532	3714E379
(480)	00000027	C2114DC8	37182FBC	00000028	C210765F	371A62AF	00000029	C1F9EF50	371EC869	0000002A
(520)	C1EC78C0	372214D1	0000002B	C1DF0220	3729C6ED	0000002C	C1D18B90	373178EF	0000002D	C1C414F0
(560)	373B5E02	0000002E	C1A927D0	3756DA18	0000002F	C19BB130	376DF04B	00000030	C18E3AA0	3788532C
(600)	00000031	C180C400	37AECDED	00000032	C1734D70	37DBE082	00000033	C165D6D0	38122CAD	00000034
(640)	C1586040	38197F93	00000035	C14AE9A0	38245957	00000036	C13D7310	3832FF21	00000037	C12FFC70
(680)	38421F5D	00000038	C12285E0	3857D1A4	00000039	C1150F40	3873B6E4	0000003A	C0798B00	389D0ACF
(720)	0000003B	405DDF00	38B7E75D	04400000	438F90CC	00000004	00000003	00000059	00000001	C24DE371
(760)	3715FCDF	00000002	C24D0C07	3714E379	00000003	C24C349E	3714E379	00000004	C24B5D34	3714E379
(800)	00000005	C24A85CB	3714E379	00000006	C249AE61	37182FBC	00000007	C248D6F8	3715FCDF	00000008
(840)	C247FF8F	37182FBC	00000009	C2472825	37182FBC	0000000A	C24650BC	37182FBC	0000000B	C2457952
(880)	37194941	0000000C	C244A1E9	37194941	0000000D	C243CA7F	37182FBC	0000000E	C242F316	37194941
(920)	0000000F	C2421BAD	37194941	00000010	C2406CDA	37182FBC	00000011	C23F9571	371A62AF	00000012
(960)	C23EBE07	37182FBC	00000013	C23DE69E	371A62AF	00000014	C23D0F34	37194941	00000015	C23C37CB
(1000)	371A62AF	00000016	C23B6061	371A62AF	00000017	C23A88F8	371A62AF	00000018	C239B18F	371A62AF
(1040)	00000019	C238DA25	37194941	0000001A	C23802BC	371A62AF	0000001B	C2372B52	371B7C18	0000001C
(1080)	C23653E9	371A62AF	0000001D	C2357C7F	371B7C18	0000001E	C234A516	371A62AF	0000001F	C232F643
(1120)	371A62AF	00000020	C2321ED9	371DAF04	00000021	C2314770	371DAF04	00000022	C2307006	371A62AF
(1160)	00000023	C22F989D	371B7C18	00000024	C22EC134	371DAF04	00000025	C22DE9CA	371DAF04	00000026
(1200)	C22D1261	371EC869	00000027	C22C3AF7	371EC869	00000028	C22B638E	371EC869	00000029	C22A8C24
(1240)	371C959C	0000002A	C229B4BB	3720FB5C	0000002B	C228DD51	371EC869	0000002C	C22805E8	3720FB5C
(1280)	0000002D	C2272E7E	3720FB5C	0000002E	C2257FAB	3720FB5C	0000002F	C224A842	372214D1	00000030
(1320)	C223D0D8	372214D1	00000031	C222F96F	37232E2B	00000032	C2222206	372214D1	00000033	C2214A9C
(1360)	37232E2B	00000034	C2207333	372214D1	00000035	C21F9BC9	372447A9	00000036	C21EC460	37232E2B
(1400)	00000037	C21DECF6	372447A9	00000038	C21D158D	37267A86	00000039	C21C3E23	37267A86	0000003A
(1440)	C21B66BA	37267A86	0000003B	C21A8F50	37267A86	0000003C	C219B7E7	372793FD	0000003D	C2180914
(1480)	372AE051	0000003E	C21731AA	372AE051	0000003F	C2165A41	372BF9B9	00000040	C21582D8	372F4620
(1520)	00000041	C214AB6E	372D134C	00000042	C213D405	373178EF	00000043	C212FC9B	37305FA3	00000044
(1560)	C2122532	3734C558	00000045	C2114DC8	37392B32	00000046	C210765F	373D90CD	00000047	C1F9EF50
(1600)	3741F6B3	00000048	C1EC78C0	37465C97	00000049	C1DF0220	374EDE96	0000004A	C1D18B90	3757F36A
(1640)	0000004B	C1C414F0	376524F2	0000004C	C1A927D0	3787398C	0000004D	C19BB130	37A19C65	0000004E
(1680)	C18E3AA0	37C06488	0000004F	C180C400	37E91215	00000050	C1734D70	38115C4B	00000051	C165D6D0
(1720)	3816C92F	00000052	C1586040	381F31EC	00000053	C14AE9A0	382B216F	00000054	C13D7310	3838B178
(1760)	00000055	C12FFC70	383A978F	00000056	C12285E0	383A978F	00000057	C1150F40	383A978F	00000058
(1800)	C0798B00	383A978F	00000059	405DDF00	383ADD11	00800000	438FD0CC	00000005	00000000	00000009
(1840)	00000001	C165D6D0	38115140	00000002	C1586040	38115140	00000003	C14AE9A0	3833F3D3	00000004
(1880)	C13D7310	3833F3D3	00000005	C12FFC70	384544F5	00000006	C12285E0	3867E79D	00000007	C1150F40
(1920)	387938AF	00000008	C0798B00	389BDB14	00000009	405DDF00	38BE7E2B	04400000	439010CC	00000006
(1960)	00000001	00000059	00000001	C24DE371	3714E379	00000002	C24D0C07	371A62AF	00000003	C24C349E
(2000)	371A62AF	00000004	C24B5D34	371A62AF	00000005	C24A85CB	3715FCDF	00000006	C249AE61	37119717
(2040)	00000007	C248D6F8	37119717	00000008	C247FF8F	371A62AF	00000009	C2472825	3713C9FA	0000000A
(2080)	C24650BC	3715FCDF	0000000B	C2457952	3712B087	0000000C	C244A1E9	3712B087	0000000D	C243CA7F
(2120)	3712B087	0000000E	C242F316	371A62AF	0000000F	C2421BAD	3714E379	00000010	C2406CDA	3714E379
(2160)	00000011	C23F9571	3714E379	00000012	C23EBE07	3717165B	00000013	C23DE69E	37194941	00000014
(2200)	C23D0F34	37194941	00000015	C23C37CB	37194941	00000016	C23B6061	37194941	00000017	C23A88F8

```
$JOB  20:19:21
$ASS IN MS2
$NOP ********** DUMP OF X-430 **********
$NOTE BOJ   20:19:42
$EXEC DPHEX BS
 INPUT TAPE ON MS2  VIKING 1 start   1hr, 38mins, 10 sec   stop 3hrs, 3mins, 35sec
 DATA INPUT    2 2 2 VIKING 2 stop   38mins. 9 sec   stop 2 hrs, 58mins, 15sec
  FILE  1      RECORD  1      LENGTH   24004BYTES
  (    0)  5DC40000  00300000  438F4614  41139DB5  C24E88B3  4311202D  443DC6B6  C225A55B  C281604F  425A4B55
  (   40)  42592892  4285D372  42572A69  00300000  438F7614  41139163  C24E8D5A  4311209A  443DC31C  C225A551
  (   80)  C2816100  425A49E8  42592FEC  4285DCFB  425728D1  00300000  438FA614  41139211  C24E9201  43112106
  (  120)  443DBF85  C225A547  C28161B1  425A49C0  42593890  4285E752  42572739  00300000  438FD614  411392BF
  (  160)  C24E96A8  43112173  443DBBEC  C225A53D  C2816268  425A48D9  42594060  4285F261  425725A2  00300000
  (  200)  43900614  4113936D  C24E9B4F  431121E0  443DB852  C225A533  C2816319  425A48B7  425948D7  4285FCA5
  (  240)  4257240A  00300000  43906614  411394CB  C24EA49C  431122BC  443DB11F  C225A51E  C2816479  425A472E
  (  280)  42595877  428611F2  425720DA  00300000  43909614  4113957A  C24EA943  4311232B  443DAD85  C225A514
  (  320)  C2816532  425A4703  425960E0  42861CC0  42571F41  00300000  43900614  41139629  C24EADE9  4311239A
  (  360)  443DA9EC  C225A50A  C28165E3  425A4600  42596869  428627F6  42571DA9  00300000  43900614  411396D9
  (  400)  C24EB288  43112409  443DA652  C225A4FF  C2816694  425A45BF  425970A6  42863296  42571C10  00300000
  (  440)  43912614  4113978A  C24EB726  43112479  443DA2B8  C225A4F5  C2816745  425A4510  42597874  42863D84
  (  480)  42571A77  00300000  43915614  4113983A  C24EBBC3  431124E9  443D9F1F  C225A4EA  C28167F6  425A8D0C
  (  520)  4259C8EF  42862993  42571BDE  00300000  4391E614  41139A4B  C24EC9AF  4311263C  443D944D  C225A4CA
  (  560)  C2816A09  42536AB5  425ABFF3  4285F183  42571413  00300000  43921614  41139AFC  C24ECE54  431126AD
  (  600)  443D90B3  C225A4C0  C2816ABA  425BB4F2  425B129F  4285E03B  42571279  00300000  43924614  41139BAC
  (  640)  C24ED2FA  43112720  443D8D17  C225A4B5  C2816B6B  425BFEFC  425B6508  4285CF3B  425710DF  00300000
  (  680)  43927614  41139C5D  C24ED79F  43112792  443D897B  C225A4AA  C2816C1C  425C49A6  425BB80F  4285BE22
  (  720)  42570F45  00300000  4392A614  41139D0E  C24EDC44  43112805  443D85E1  C225A49F  C2816CC6  425C914E
  (  760)  425C07B6  4285ADA5  42570DAB  00300000  43930614  41139E71  C24EE58D  431128EC  443D7EA9  C225A489
  (  800)  C2816E28  425D2514  425CAC20  42859354  42570A76  00300000  43933614  41139F22  C24EEA32  43112960
  (  840)  443D7B0D  C225A47E  C2816ED9  425CC14E  425D702D  4286CBF5  425708DC  00300000  43A77614  4113EE9E
  (  880)  C250DA84  431165EE  443BF0DC  C2259E85  C281B326  425D5641  425D2F23  42883FDF  4256580A  00300000
  (  920)  43A7A614  4113EF65  C250DF10  4311669F  443BED2C  C2259E74  C281B3BD  425D7A58  425D5DD4  4288276D
  (  960)  4256565E  00300000  43A83614  4113F1BB  C250ECB1  431168B5  443BE217  C2259E3F  C281B57A  425DB9F7
  ( 1000)  425D81CD  42876DFA  42565159  00300000  43A86614  4113F283  C250F13B  43116968  443BDE66  C2259E2D
  ( 1040)  C281B60B  425DD46F  425D9381  42872FB1  42564FAD  00300000  43A89614  4113F34B  C250F5C5  43116A1D
  ( 1080)  443BDAB3  C2259E1C  C281B6A1  425DEE69  425DA53E  4286F106  42564E00  00300000  43A8C614  4113F414
  ( 1120)  C250FA4E  43116AD2  443BD703  C2259E0A  C281B732  425E07E1  425DB66C  4286B15B  42564C53  00300000
  ( 1160)  43A8F614  4113F4DC  C250FED8  43116B88  443BD34F  C2259DF8  C281B7C8  425E20B7  425DC713  42867247
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