Data Set Catalog # 218

Apollo 12 and 15, Plasma Parameter and Hourly Averaged Plasma Data

69-099C-02A	8 tapes
69-099C-02B	2 tapes
71-063C-02A	1 tape
71-063C-02B	1 tape

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 This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system.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

PSFP 00118

APOLLO 12 LM/ALSEP

PLASMA PARAM FINE RESOL ON MAG TAPE

69-099C-02A

This data set has been restored. There were originally 24 7-track, 800 BPI tapes written in BCD. There are four restored tapes written in ASCII. The DR tapes are 3480 cartridges and the DS tapes are 9-track, 6250 BPI. The original tapes were created on a 1108 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	
DR004970	DS004970	D013780	1	11/19/69 - 03/02/70	(a)
		D011865	2	11/19/69 - 04/01/70	(b)
		D013781	3	03/17/70 - 06/28/70	(c)
		D012596	4	04/15/70 - 08/26/70	
		D013783	5	07/12/70 - 10/24/70	(d)
		D012595	6	09/10/70 - 01/22/71	(e)
DR004971	DS004971	D013778	1	11/06/70 - 02/21/71	(f)
		D013779	2	03/05/71 - 06/18/71	
		D013782	3	06/30/71 - 10/16/71	
		D013777	4	10/28/71 - 02/10/72	
		D016703	5	02/23/72 - 06/07/72	(g)
		D016702	6	06/20/72 - 10/04/72	
DR004972	DS004972	D016701	1	10/15/72 - 01/29/73	(h)
		D023612	2	02/10/73 - 05/28/73	(i)
		D023613	3	06/08/73 - 09/22/73	(j)
		D023614	4	10/05/73 - 01/19/74	
		D023615	5	01/31/74 - 05/17/74	(k)
		D023616	6	05/29/74 - 09/12/74	(l)
DR004973	DS004973	D023617	1	09/24/74 - 12/31/74	
		D041547	2	09/24/74 - 01/07/75	
		D041548	3	01/20/75 - 05/06/75	(m)
		D041549	4	05/19/75 - 09/01/75	
		D041550	5	09/13/75 - 12/28/75	
		D041551	6	01/10/76 - 03/26/76	

(a) D013780: Read error occurred in record 5646 of file 1.
(b) D011865: Read errors occurred in records 815, 823, 831 of file 1.
(c) D013781: Read error occurred in record 878 of file 1.
(d) D013783: Read error occurred in record 5320 of file 1.
(e) D013795: Read errors occurred in records 877, 1494, 5830 of file 1.
(f) D013778: Read errors occurred in records 1101, 1653, 3233 of file 1.
(g) D016703: Read error occurred in record 6420 of file 1.
(h) D016701: Read error occurred in record 2417 of file 1.
(i) D023612: Read error occurred in record 1118 of file 1.

APOLLO 12 LM/ALSEP PSFP 00117

HR AVG PLASMA PARAM ON MAG TAPE

69-099C-02B

This data set has been restored. There were originally 7 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 1108 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	
DR004969	DS004969	D016704	1	11/19/69 - 01/29/73	
		D023611	2	02/10/73 - 12/31/73	
		D041552	3	09/24/74 - 01/07/75	
		D041553	4	01/20/75 - 05/06/75	(a)
		D041554	5	05/19/75 - 09/01/75	
		D041555	6	09/13/75 - 12/28/75	
		D041556	7	01/10/76 - 03/26/76	

(a) D041553: Read error occurred in record 1435 of file 1.

REQ. AGENT	RAND NO.	ACQ. AGENT
JCH	RB3921,RB4680	DJH
MAW	RB5434	
DLB,VJP	RC2208	

APOLLO 12 & 15

69-099C-02A,02B

71-063C-04A,04B

This data set catalog consists of 24 Apollo 12 and 3 Apollo 15 Full Time Resolution Plasma Parameters data tapes and 7 Apollo 12 and 1 Apollo 15 Hourly Averaged Plasma data tapes. The tapes are 7 track, 800 BPI, BCD with 1 file of data. The tapes were created on a 1108 computer.

Time spans are as follows:

Apollo 12 69-099C-02A

D#	C#	TIME SPAN
D-11865	C-09227	11/19/69 - 04/01/70
D-12596	C-09777	04/15/70 - 08/26/70
D-12595	C-09776	09/10/70 - 01/22/71
D-13780	C-11218	11/19/69 - 03/02/70
D-13871	C-11219	03/17/70 - 06/28/70
D-13783	C-11221	07/12/70 - 10/24/70
D-13778	C-11215	11/06/70 - 02/21/71
D-13779	C-11217	03/05/71 - 06/18/71
D-13782	C-11220	06/30/71 - 10/16/71
D-13777	C-11216	10/28/71 - 02/10/72
D-16703	C-18727	02/23/72 - 06/08/72
D-16702	C-12979	06/20/72 - 10/04/72
D-16701	C-12978	10/15/72 - 01/29/73
D-23612	C-17677	02/10/73 - 05/28/73

APOLLO 12 69-099C-02A

D#	C#	TIME SPAN
D-23613	C-17678	6/08/73 - 9/22/73
D-23614	C-17679	10/05/73 - 1/19/74
D-23615	C-17680	1/31/74 - 5/17/74
D-23616	C-17681	5/29/74 - 9/12/74
D-23617	C-17682	9/24/74 - 12/31/74
D-41547	C-21220	9/24/74 - 1/07/75
D-41548	C-21221	1/26/75 - 5/06/75
D-41549	C-21222	5/19/75 - 9/01/75
D-41550	C-21223	9/13/75 - 12/28/75
D-41551	C-21224	1/10/76 - 3/26/76

APOLLO 12 69-099C-02B

D-16704	C-14536	11/19/69 - 1/29/73
D-23611	C-17676	2/10/73 - 12/31/73
D-41552	C-21255	9/24/74 - 1/07/75
D-41553	C-21256	1/20/75 - 5/06/75
D-41554	C-21257	5/19/75 - 9/01/75
D-41555	C-21258	9/13/75 - 12/28/75
D-41556	C-21259	1/10/76 - 3/26/76

APOLLO 15 71-063C-04A

D-13774	C-11223	7/31/71 - 12/08/71
D-16706	C-13459	12/25/71 5/02/72
D-16705	C-12980	5/18/72 - 6/30/72

APOLLO 15 71-063C-04B

D-16707	C-19615	7/31/71 - 6/30/72

ALSEP SOLAR WIND SPECTROMETER PLASMA DATA AS OBSERVED AT THE APOLLO 12 AND 15 LANDING SITES

by

B. E. Goldstein, D. R. Clay

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This paper presents the results of one phase of research carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract No. NAS7-100, sponsored by the National Aeronautics and Space Administration.

TABLE OF CONTENTS

I. INTRODUCTION

The JPL Solar Wind Spectrometers are part of the Apollo Lunar Surface Experiment Packages operating at the Apollo 12 and 15 landing sites. The data are now available from the National Space Science Data Center in several forms. There are plots of hourly average values for solar wind bulk speed, direction, proton density, thermal speed, and alpha particle to proton ratio. Positive ion data are available on magnetic tape, both in the form of hourly averages and as unaveraged individual measurements. Plots of unaveraged data and electron data are not available from NSSDC; requests for this information should be directed to the experimenters.

II. INSTRUMENT DESCRIPTION

The basic sensor in the solar wind spectrometer is a Faraday cup that measures the charged particle flux entering the cup. By collecting these ions and using a sensitive current amplifier, the resultant current flow is determined. Energy spectra of positively and negatively charged particles are obtained by applying fixed sequences of square wave ac retarding potentials to a modulation grid and measuring the resulting changes in current. Similar detectors have been flown on a variety of space probes, and are described in Hundhausen (1968). Further descriptions of the solar wind spectrometer experiments are given in Snyder et al. (1970), and Clay et al. (1972).

To be sensitive to solar wind plasma from any direction (above the horizon of the Moon), and to ascertain the solar wind angular distribution, the solar wind spectrometer has an array of seven cups. Since the cups are identical, an isotropic particle flux would produce equal currents in each cup. If the flux is not isotropic but appears in more than one cup, analysis of the relative amounts of current in the collectors can provide information on the direction of plasma flow and its anisotropy. The central cup faces vertically, and the remaining six cups symmetrically surround the central cup (Fig. 1), facing 60° off vertical. The combined acceptance cones of all cups cover most of the upward hemisphere. Each cup has a circular opening, five circular grids, and a circular collector (Fig. 2). The functions of the grid structures are to apply an ac modulating field to incoming particles and to screen the modulating field from the inputs to the sensitive preamplifiers. The entrance apertures of the cups were protected from damage or dust by covers that remained in place until after

the departure of the lunar module. The angular sensitivity of the Faraday cup sensor to collimated ion beams has been measured by laboratory plasma calibration. The result, averaged over all seven cups, is shown in Fig. 3 and for positive ions, agrees quite well with the measured optical transparency.

The electronics for the solar-wind spectrometer is in a temperature controlled container that hangs below the sensor assembly. The electronics includes power supplies, a digital programmer that controls the voltages in the sensors as required, current measuring circuitry, and data conditioning circuits.

On the Moon, the instrument is hung from a pair of knife edges so that it is free to swing about an east-west horizontal axis and, hence, is self leveling in one dimension. Rotations about the north-south axis and the vertical axis are determined from shadow patterns on photographs and, for Apollo 12, from the effect of sunlight on a sensor.

III. INSTRUMENT SITE, OPERATION, DATA COVERAGE

The Apollo 12 Solar Wind Spectrometer is located 3° south and 23° west on the lunar surface. The Apollo 15 Solar Wind Spectrometer is 26° north and 4° east. Orientations of the instruments at the local sites are determined from photographs of instrument shadow patterns. The Apollo 12 orientation is known within 0.5° and the Apollo 15 orientation within 1.5°.

Data coverage for the Apollo 12 Solar Wind Spectrometer begins on day 323 of 1969; the instrument is still (day 60 of 1973) operational. The Apollo 15 SWS began operations on day 212 of 1971 and failed on day 182 of 1972. During these periods data coverage was essentially complete, but the data supplied to NSSDC exclude times during lunar night when no currents were measurable.

IV. DATA ACQUISITION SEQUENCE

The solar wind spectrometer operates in an invariable sequence in which a complete set of plasma measurements is made every 28.1 sec. The sequence consists of 14 energy steps spaced a factor of $\sqrt{2}$ apart for positive ions and seven energy steps spaced a factor of 2 apart for electrons. A large number of internal calibrations are provided, and every critical voltage is read out at intervals of 7.5 min or less.

In the reduced data records and the analyzed data that are supplied to the NSSDC, this data acquisition sequence does not appear, since only a small fraction of the readings in the 186-measurement sequence represent meaningful data at any given time. For most purposes of data analysis the details of this sequence are irrelevant, but they do become important when the precise time of a particular measurement is of interest. The following partial description of the sequence will enable the determination of the time of a measurement to a precision of about one second.

The sequence begins with the positive-ion measurements, the energy steps proceeding from the lowest to the highest. At each step 8 measurements are made. The first is the sum of the currents in all 7 cups; then the 7 cups are sampled in sequence. There are 112 measurements in the positive ion subsequence, followed by 16 calibration measurements and a 56-measurement electron subsequence. The sequence ends with two data words which provide a sequence counter. In the ground data processing each sequence is tagged with a time corresponding to the earth receipt time of the end of the last data word in the sequence. Application of a light-transit-time correction provides the time at which the sequence terminated on the Moon. In the reduced data records the time is rounded off to the nearest whole second.

The time at which the measurement of the plasma properties was actually made can be inferred as follows. Using the calibration data presented in Table 1 and knowing the gain state of the instrument, the proton bulk velocity will indicate which energy step provided the largest current readings. (If the plasma was incident at a large angle from the cup, a correction by the cosine of the incidence angle will be necessary.) Then knowing which cup or cups and which energy step or steps were involved in the measurement, the measurement time is obtained by subtracting from the sequence-end time the function Δt:

$$\Delta t = 28.13 - 0.1509\,4 \times (\text{STEP} \times 8 + \text{CUP}).$$

V. DATA ANALYSIS

For each proton spectrum the cup with the greatest total current was found. The currents in the individual energy channels were then least squares fit to the data model. This model assumed a convected Maxwell-Boltzmann proton distribution with unknown parameters — bulk velocity, most probable thermal speed, and density. An alpha particle distribution with the same velocity and thermal speed as protons was assumed with alpha particle density unknown. For these preliminary estimates the velocity vector was assumed perpendicular to the collector plate. Due to the relatively broad energy channels it was difficult to distinguish between alpha particles and energetic protons when the ratio of most probable thermal speed to proton speed was greater than 0.25. Thus a jump in alpha/proton ratio across a shock might be estimated. The broad channels also prevented accurate measurement of thermal speeds less than 10% of the bulk speed.

The estimates as described above are uncorrected for angular direction of the plasma. Angles were estimated from examination of current in other cups as described later in this section. After the angle between the plasma beam and the cup axis was determined, corrections were made to all parameters to account for the angular response of the Faraday cup and aberration effects.

Several definitions are required as a preliminary to the description of the angular analysis. Side cups are all cups except cup 7 (the vertical cup). The side cup with the greatest current (summed over all channels) is referred to as Cup A. The adjacent cup in the counterclockwise direction from Cup A (as viewed from above) is Cup B, the clockwise cup is Cup C. A noise level was chosen based upon fluctuations in zero level currents. If Cup 7, Cup A, and Cup B or Cup C are above noise, the solar wind direction is determined. Otherwise, assumptions are required.

The angle between the plasma and the normal to Cup 7 is defined as β. The plasma direction projected downward onto the instrument and measured clockwise from a line between cups 1 and 7 is defined to be the azimuthal angle α (Fig. 4). If no current above noise is measured in Cup 7, the β angle required by assuming radial flow of the solar wind from the sun is assumed. If this assumption, however, implies that current should be measured in Cup 7, the assumed angle is limited to increasingly larger angles until the predicted current in Cup 7 decreases to the noise level value. Similarly, no current in Cup A leads to assuming β or limiting β to smaller values.

The α angle is similarly predicted, measured, or limited. If current is available only in Cup A, then the α angle for radial flow from

from the sun is assumed. If this requires currents above noise in Cups B or C, the assumed α angle is limited closer to the Cup A direction. If currents in Cup B or C are available, the α angle is measured directly. After angles were determined, conversion was made to solar ecliptic coordinates taking into account the known orientations of the instruments; i.e., the direction of the bulk velocity is given by DELE and DELNE, the angle in the ecliptic and the angle north of the ecliptic.

VI DESCRIPTION OF VARIABLES ON TAPE

The variables provided on the data tapes are listed here with a brief definition. Refer also to the discussion of variables in the previous section.

Symbol	Description
DP	Proton density (protons/cm^3).
AP	Ratio of alpha-particle density to proton density.
VEL	Solar wind proton speed (km/sec).
THERMV	Most probable thermal speed (km/sec)

Thus, the fitted proton distribution function, f_p, is

$$f_p(\bar{v}) = \frac{DP}{THERMV^3\sqrt{\pi}^3}\, e - (\bar{v} - VEL\bar{n})^2/THERMV^2 ,$$

where $\bar{n}$ is a unit vector in the solar wind direction.

DELE: East-West angle in solar ecliptic coordinates in degrees; no correction has been made for aberration due to orbital velocity. A positive value means a plasma velocity component directed opposite to the earth's orbital motion; i.e., an average +5° due to aberration is typical.

REQ. AGENT	RASH NO.	ACQ. AGENT
JCH	RB3921 RB4680	DJH

APOLLO 12

69-099C-02A

This data set consists of Apollo 12, Full Time Resolution Plasma Parameter data. It contains three experimenter - supplied tapes, which are seven track, 800 BPI, BCD format, with one file. All physical records contain 384 words which are blocked from 32 logical records of 12 words each. The tape format, which is complete and easily understood, is found on pages 11-13 in the documentation included in the catalog.

D#	C#	TIME SPAN
D-11865	C-09227	Nov. 19, 1969 - Apr. 1, 1970
D-12596	C-09777	Apr. 15, 1970 - Aug. 26, 1970
D-12595	C-09776	Sept. 10, 1970 - Jan. 22, 1971

REQ. AGENT	RASH NO.	ACQ. AGENT
JCH	RB3921 RB4680	DJH

APOLLO 12

69-099C-02B

This data set consists of Apollo 12, Hourly Averaged Plasma data. It contains two experimenter - supplied tapes which are seven track, 800 BPI, BCD format, with 1 file. The tapes have two logical records of 18 words for each hour of data analyzed, and are blocked two logical records per physical record of 36 words. The tape format, which is complete and easily understood, is found on pages 13-16 in the documentation included in the catalog.

D#	C#	TIME SPAN
D-11866	C-09228	Nov. 19, 1969 - Mar. 31, 1970
D-12597	C-09778	Nov. 19, 1969 - Jan. 22, 1971

REQ. AGENT	RASH NO.	ACQ. AGENT
JCH MAW	RB5434	DJH

Apollo 12 and 15

January 29,1974

69-099C-02A
69-099C-02B
71-063C-04A
71-063C-04B

The following tapes have been added to this data set. Each of these 10 tapes fits the data description previously stated for Apollo 12, in this catalog. For information concerning formats see pages 11 - 16.

APOLLO 12

D#	C#	TIME SPAN
D-13777	C-11216	10/28/71 - 2/10/72
D-13778	C-11215	11/06/71 - 2/21/71
D-13779	C-11217	3/05/71 - 6/18/71
D-13780	C-11218	11/19/69 - 3/02/70
D-13781	C-11219	3/17/70 - 6/28/70
D-13782	C-11220	6/30/71 - 10/16/71
D-13783	C-11221	7/12/70 - 10/24/70

HOURLY AVERAGED DATA

D-13776	C-11222	11/19/69 - 2/10/72

APOLLO 15

D-13774	C-11223	7/31/71 - 12/08/71

HOURLY AVERAGED DATA

D-13775	C-11224	7/31/71 - 12/08/71

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ALSEP SOLAR WIND SPECTROMETER PLASMA DATA AS OBSERVED AT THE APOLLO 12 AND 15 LANDING SITES

by

B. E. Goldstein, D. R. Clay

C. W. Snyder and M. Neugebauer

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This paper presents the results of one phase of research carried out at the Jet Propulsion Laboratory, California Institute of Technology, under contract No. NAS7-100, sponsored by the National Aeronautics and Space Administration.

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the departure of the lunar module. The angular sensitivity of the Faraday cup sensor to collimated ion beams has been measured by laboratory plasma calibration. The result, averaged over all seven cups, is shown in Fig. 3 and for positive ions, agrees quite well with the measured optical transparency.

The electronics for the solar-wind spectrometer is in a temperature controlled container that hangs below the sensor assembly. The electronics includes power supplies, a digital programmer that controls the voltages in the sensors as required, current measuring circuitry, and data conditioning circuits.

On the Moon, the instrument is hung from a pair of knife edges so that it is free to swing about an east-west horizontal axis and, hence, is self leveling in one dimension. Rotations about the north-south axis and the vertical axis are determined from shadow patterns on photographs and, for Apollo 12, from the effect of sunlight on a sensor.

III. INSTRUMENT SITE, OPERATION, DATA COVERAGE

The Apollo 12 Solar Wind Spectrometer is located 3° south and 23° west on the lunar surface. The Apollo 15 Solar Wind Spectrometer is 26° north and 4° east. Orientations of the instruments at the local sites are determined from photographs of instrument shadow patterns. The Apollo 12 orientation is known within 0.5° and the Apollo 15 orientation within 1.5°.

Data coverage for the Apollo 12 Solar Wind Spectrometer begins on day 323 of 1969; the instrument is still (day 60 of 1973) operational. The Apollo 15 SWS began operations on day 212 of 1971 and failed on day 182 of 1972. During these periods data coverage was essentially complete, but the data supplied to NSSDC exclude times during lunar night when no currents were measurable.

IV. DATA ACQUISITION SEQUENCE

The solar wind spectrometer operates in an invariable sequence in which a complete set of plasma measurements is made every 28.1 sec. The sequence consists of 14 energy steps spaced a factor of $\sqrt{2}$ apart for positive ions and seven energy steps spaced a factor of 2 apart for electrons. A large number of internal calibrations are provided, and every critical voltage is read out at intervals of 7.5 min or less.

In the reduced data records and the analyzed data that are supplied to the NSSDC, this data acquisition sequence does not appear, since only a small fraction of the readings in the 186-measurement sequence represent meaningful data at any given time. For most purposes of data analysis the details of this sequence are irrelevant, but they do become important when the precise time of a particular measurement is of interest. The following partial description of the sequence will enable the determination of the time of a measurement to a precision of about one second.

The sequence begins with the positive-ion measurements, the energy steps proceeding from the lowest to the highest. At each step 8 measurements are made. The first is the sum of the currents in all 7 cups; then the 7 cups are sampled in sequence. There are 112 measurements in the positive-ion subsequence, followed by 16 calibration measurements and a 56-measurement electron subsequence. The sequence ends with two data words which provide a sequence counter. In the ground data processing each sequence is tagged with a time corresponding to the earth receipt time of the end of the last data word in the sequence. Application of a light-transit-time correction provides the time at which the sequence terminated on the Moon. In the reduced data records the time is rounded off to the nearest whole second.

The time at which the measurement of the plasma properties was actually made can be inferred as follows. Using the calibration data presented in Table 1 and knowing the gain state of the instrument, the proton bulk velocity will indicate which energy step provided the largest current readings. (If the plasma was incident at a large angle from the cup, a correction by the cosine of the incidence angle will be necessary.) Then knowing which cup or cups and which energy step or steps were involved in the measurement, the measurement time is obtained by subtracting from the sequence-end time the function Δt:

$$\Delta t = 28.13 - 0.15094 \times (\text{STEP} \times 8 + \text{CUP}).$$

V. DATA ANALYSIS

For each proton spectrum the cup with the greatest total current was found. The currents in the individual energy channels were then least squares fit to the data model. This model assumed a convected Maxwell-Boltzmann proton distribution with unknown parameters — bulk velocity, most probable thermal speed, and density. An alpha particle distribution with the same velocity and thermal speed as protons was assumed with alpha particle density unknown. For these preliminary estimates the velocity vector was assumed perpendicular to the collector plate. Due to the relatively broad energy channels it was difficult to distinguish between alpha particles and energetic protons when the ratio of most probable thermal speed to proton speed was greater than 0.25. Thus a jump in alpha/proton ratio across a shock might be estimated. The broad channels also prevented accurate measurement of thermal speeds less than 10% of the bulk speed.

The estimates as described above are uncorrected for angular direction of the plasma. Angles were estimated from examination of current in other cups as described later in this section. After the angle between the plasma beam and the cup axis was determined, corrections were made to all parameters to account for the angular response of the Faraday cup and aberration effects.

Several definitions are required as a preliminary to the description of the angular analysis. Side cups are all cups except cup 7 (the vertical cup). The side cup with the greatest current (summed over all channels) is referred to as Cup A. The adjacent cup in the counterclockwise direction from Cup A (as viewed from above) is Cup B, the clockwise cup is Cup C. A noise level was chosen based upon fluctuations in zero level currents. If Cup 7, Cup A, and Cup B or Cup C are above noise, the solar wind direction is determined. Otherwise, assumptions are required.

The angle between the plasma and the normal to Cup 7 is defined as β. The plasma direction projected downward onto the instrument and measured clockwise from a line between cups 1 and 7 is defined to be the azimuthal angle α (Fig. 4). If no current above noise is measured in Cup 7, the β angle required by assuming radial flow of the solar wind from the sun is assumed. If this assumption, however, implies that current should be measured in Cup 7, the assumed angle is limited to increasingly larger angles until the predicted current in Cup 7 decreases to the noise level value. Similarly, no current in Cup A leads to assuming β or limiting β to smaller values.

The α angle is similarly predicted, measured, or limited. If current is available only in Cup A, then the α angle for radial flow from

from the sun is assumed. If this requires currents above noise in Cups B or C, the assumed α angle is limited closer to the Cup A direction. If currents in Cup B or C are available, the α angle is measured directly. After angles were determined, conversion was made to solar ecliptic coordinates taking into account the known orientations of the instruments; i.e., the direction of the bulk velocity is given by DELE and DELNE, the angle in the ecliptic and the angle north of the ecliptic.

VI DESCRIPTION OF VARIABLES ON TAPE

The variables provided on the data tapes are listed here with a brief definition. Refer also to the discussion of variables in the previous section.

Symbol	Description
DP	Proton density (protons/cm^3).
AP	Ratio of alpha-particle density to proton density.
VEL	Solar wind proton speed (km/sec).
THERMV	Most probable thermal speed (km/sec)

Thus, the fitted proton distribution function, f_p, is

$$f_p(\bar{v}) = \frac{DP}{THERMV^3\sqrt{\pi}^3}\, e - (\bar{v} - VEL\bar{n})^2/THERMV^2 ,$$

where $\bar{n}$ is a unit vector in the solar wind direction.

DELE: East-West angle in solar ecliptic coordinates in degrees; no correction has been made for aberration due to orbital velocity. A positive value means a plasma velocity component directed opposite to the earth's orbital motion; i.e., an average +5° due to aberration is typical.

DELNE: North-South angle in solar ecliptic coordinates in degrees. This number is positive if the plasma velocity has a northward component; i.e., positive values for flow coming from south of the ecliptic.

FLAG: FLAG is a 36 bit word, the definition of which is given in Table 2. Bits are numbered 0 to 35 with bit 0 being the high-order bit. Most of these bits will be of no interest to the users of the data; exceptions to this rule are explained here. Bits 15 and 16 are IA which has values from zero to three; bits 17 and 18 are IB. Bit 19 is IDISCP. IA is the angle code indicating how the angle α was derived as explained in the previous section. If IA = 0, α is measured. If IA = 1, α is assumed. If IA = 2, α is limited. If IA = 3, then also IB = 3 and the cup observing the protons is too far from the sun direction to be plausible. Similarly, IB is the angle code for the β angle. If IB = 0, β is measured, and so on. IDISCP = 1 indicates a side cup not adjacent to Cup A had current above noise and greater than current in Cup B or Cup C. Bit 30 indicates the instrument gain level that determines the value of the energy steps; 0 is low gain, 1 is high gain.

RMS: Percentage error in current fitting program.

KUPA: Cup with the largest current excluding Cup 7.

CURA: Current in picoamps in Cup A.

CURB: Current in picoamps in Cup B.

CURC: Current in picoamps in Cup C.

CUR7: Current in picoamps in Cup 7.

For definitions of A, B, and C, see the section on data analysis.

FACTD: Correction factor for Maxwell-Boltzmann least squares estimates of density to account for decrease in transparency of cup with increasing angle of plasma beam from cup normal; typical values range between 1.2 and 3.5.

PD is a product of the preliminary density estimate and the correction factor. VEL is similarly corrected for the cosine of the angle between the plasma beam and the cup normal.

XNOISE: Noise level in picoamperes used in estimating angles.

VII. FORMAT OF FULL TIME RESOLUTION DATA TAPES

The resultant parameters from analysis of each plasma spectrum (each 28 seconds) are written onto these tapes. Several months of data are placed on each digital magnetic tape. These tapes are written in BCD format on 7 tracks at 800 characters per inch and even parity.

All physical records contain 384 words which are blocked from 32 logical records of 12 words each. There are 4 types of logical records: (1) plasma data for one spectrum, (2) label information, (3) pseudo end of file, and (4) fill data.

The plasma data have the following format for each logical record. There are 72 BCD characters in the 12 words.

Character	Parameter
1 - 6	Not significant (used by input/output of specific computer)
7	BLANK
8 - 16	TIME DDHHMMSS
17 - 20	DP*10
21-22	AP*100
23 - 26	VEL
27 - 29	THERMV
30 - 33	DELE*10
34 - 37	DELNE*10

Character	Parameter
38 - 49	FLAG
50 - 51	RMS
52	KUPA
53 - 56	CURA
57 - 59	CURB
60 - 62	CURC
63 - 66	CUR7
67 - 69	FACTD*100
70 - 72	XNOISE*10

The 9 characters of TIME have the day-hour-minute-second of year at the end of spectrum measurement in form of (DDDHHMMSS). The first day of the year is Day 1. The 12 characters of FLAG are an octal representation of the 36 bit word.

One can use FORTRAN format controlled READ, and the following example could be successfully used:

```
      READ (Unit, 10) ITIM, DP, AP, VEL, THERMV, DELE, DELNE,
     *FLAG, RMS, KUPA, CURA, CURB, CURC, CUR7, FACTD, XNOISE
10    FORMAT (6X, 1X, I9, F4.1, F2.2, F4.0, F3.0, 2F4.1, ø12,
     *F2.0, I1, F4.0, 2F3.0, F4.0, F3.2, F3.1)
```

NOTE: The format supplied decimal points reduce the appropriate variables by factors of 10 to yield correct values.

The label records are used to identify the information contained on the tape and can be ignored by the general user. The first logical record will always be a label and may be followed by other label records.

Each label record has the same format as the plasma data with certain parameters redefined. Label records are identifiable by the illegal time of DDDHHHMMSS = 000999999. For this record, DP*10 is the spacecraft number (12 indicates Apollo 12 instrument and 15 indicates Apollo 15), AP*100 is the year for the first data (e.g., 70 indicates year 1970), VEL is the starting day for processing, THERMV is the starting hour of processing, DELE*10 is the last day of processing, and DELNE*10 is the last hour.

The pseudo-end-of-file record is a logical record with the illegal time of DDDHHMMSS = 499000000. All 15 remaining variables contain fill data. This record always follows the last plasma data and precedes the two hardware produced EOF marks on the tape.

Fill-data may be used at any time but its primary use is to complete the end block. Fill data has the illegal time of +0, -0 or all blanks. All other 15 variables also contain values of +0, -0, or blanks.

VIII. FORMAT OF DATA TAPES OF HOURLY AVERAGES

The averaged values of parameters from analysis of plasma spectra are placed on a digital magnetic tape. This tape is written in BCD format on 7 tracks, at 800 characters per inch and even parity. The averaged values are the result of combining individual spectral results into hourly averages.

There are 4 sets of criteria to determine which spectra to combine. The first set allows all spectra where results from analysis give an answer. The average values of 6 basic parameters (proton density, alpha-proton ratio, plasma velocity, plasma thermal speed, and plasma angle from the sun's direction in and out of ecliptic plane), their 6 RMS deviations and the number of spectra are included.

The second set of hourly averages are similar to the first except that each spectrum has been screened to pass the requirements of small RMS error on curve fitting (RMS < 20) and that thermal speed be less than 1/2 bulk velocity. This set is a subset of set one.

The third set is a subset of set two, and has the further requirement that one and only one of the angles be measured (as compared to merely consistent with assumed solar plasma direction).

The fourth set is also a subset of set two, and has the requirement that both angles are measured. This set is quite small for Apollo 12 data and is disjoint with subset three.

The hourly average tape has two logical records of 18 words for each hour of data analyzed, and is blocked 2 logical records per physical record of 36 words. There are two types of records: 1) data and 2) pseudo-end-of-file.

Data records have the following format for the 108 BCD characters of each logical record:

Logical Record One

Char.	Parameter	Comments
1 - 6	Not significant	Input/output control for computer used
7	Blank	
8 - 9	ISC	Spacecraft number
10 - 11	IYR	YEAR
12 - 18	TIME	Day-Hour-Min DDDHHMM
19 - 21	NSI	Number of spectra in average set one
22 - 25	DP1*10	Ten times average proton density (P/cm^3)

Logical Record One (cont.)

Char.	Parameter	Comments
26 - 27	AP1*100	100 times alpha-to-proton density ratio.
28 - 31	VEL1	Velocity of protons (km/sec)
32 - 34	THV1	Thermal velocity (km/sec)
35 - 38	DE1*10	Ten times DELE (degrees)
39 - 42	DNE1*10	Ten Times DELNE (degrees)
43 - 46	DDP1*10	Ten times the RMS deviation of DP1.
47 - 48	DAP1	RMS deviation of AP1*100
49 - 52	DVELI	RMS deviation of VEL1
53 - 55	DTHV1	RMS deviation of THV1
56 - 59	DDE1*10	Ten times RMS deviation of DE1
60 - 63	DDNE1*10	Ten times RMS deviation of DNE1
64 - 108	SAME 13 variables for Average set 2	

Logical Record Two

Char.	Parameter	Comments
1 - 6	Not significant	Used for I/O control
7	Blank	
8 - 18	Blank	
19 - 63	Same 13 variables for averages set 3.	
64 - 108	Same 13 variables for averages set 4.	

If one uses format control for reading each logical record, a FORTRAN READ statement to place data into ISC (Spacecraft), IYR (year), ITIM (Time = DDDHHMM), NS(4) (number of spectra in each of 4 averages), and AVE(2,6,4) (average values of parameter, its RMS deviation for 6 variables and for 4 average sets) is:

```
      READ(UNIT,10) ISC, IYR, ITIM, (NS(K), ((AVE(I,J,K),J=1,6),
     * I = 1,2),K = 1,4)
10    FORMAT(6X, 1X, 2I2, 2(I3, 2(F4.1, F 2.2, F4.0, F3.0, 2F4.1)),
     * 1, 6X, 12.X, 2(I3, 2(F4.1, F2.2, F4.0, F3.0, 2F4.1)) )
```

NOTE: The format supplied decimal point reduces the appropriate variables by factors of 10 to yield correct values.

The last physical record has the same format but is a psuedo end-of-file and has the illegal time of DDDHHMM = 4990000. ISC and IYR are the same as for data, but all 52 variables which follow have fill data of blanks. Following the psuedo end-of-file are 2 hardware EOF marks.

IX. FORMAT OF PLOTS

Plots provided to NSSDC show hourly averages of selected data (the second set of data described in the section on hourly average data tapes). Proton velocity is in km/sec. Most probable thermal speed, $v = \sqrt{2kT/m_p}$ is in km/sec. Density is measured in protons cm^{-3}. The angles DELE and DELNE are discussed in the section "Description of Variables on Tape," and are measured in degrees. Alpha/Proton ratio is the ratio of alpha particle number density to proton number density. January 1 is Day 1. Figure 5 is a sample plot that illustrates the available information.

X. USE OF DATA

Users should reject all fitted parameters for which RMS = 99., IA = 3, or DP = 0.0. A somewhat stronger set of criteria for rejecting bad data is RMS > 20, IA = 3, IDISCP = 1, THERMV > $\frac{1}{2}$ VP, or DP = 0.0.

Changes in assumptions involving angles can cause unrealistic discontinuities in plasma direction, speed, and density. The user is advised to study the section on data analysis. FACTD, CURA, CURB, CURC, CUR7, and XNOISE are provided to allow the user to remove the effects of changes in estimated angle if he so desires.

A final warning is that plasma velocities and densities measured at the Apollo 12 site are often perturbed from solar wind values. Velocity decreases of 50 km/sec and density increases of 30% due to the 38γ field at the Apollo 12 site have been observed. This topic is discussed by Neugebauer et al. (1972). At present we have no reason to believe that plasma parameters at the Apollo 15 site differ significantly from the values in the unperturbed solar wind.

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TABLE 1

Position and Width of SWS Energy Steps in Terms of Proton Velocity for Normal Incidence (Velocities expressed in km/sec).

SWS APOLLO 12					
	LOW GAIN			HIGH GAIN	
STEP	MEAN	WIDTH	MEAN	WIDTH	STEP
1	62	20	112	21	1
2	91	18	143	25	2
3	120	22	175	30	3
4	156	28	216	37	4
5	191	32	259	43	5
6	235	40	314	53	6
7	285	48	377	62	7
8	337	57	446	74	8
9	400	67	527	87	9
10	480	79	629	104	10
11	569	92	744	122	11
12	682	114	893	149	12
13	807	132	1055	172	13
14	968	157	1266	206	14

SWS APOLLO 15					
	LOW GAIN			HIGH GAIN	
STEP	MEAN	WIDTH	MEAN	WIDTH	STEP
1	66	13	105	20	1
2	90	17	135	25	2
3	120	20	169	28	3
4	151	26	208	35	4
5	188	31	252	42	5
6	230	38	305	51	6
7	280	46	370	60	7
8	333	55	439	71	8
9	395	64	519	83	9
10	469	77	616	103	10
11	557	91	730	119	11
12	666	109	874	144	12
13	791	130	1039	170	13
14	946	154	1235	218	14

TABLE 2 - SIGNIFICANCE OF FLAG WORD

Bit	Values	Significance
0	0	Unused
1	0	Unused
2	0,1	1 = no current detectable
3	0	Unused
4	0,1	1 = peak current too small to determine spectrum
5	0,1	1 = peak current in cup not near sun
6,7	0,1,2,3	Number of cups with measurable current (0 = 4 cups)
8	0,1	1 = no proton analysis (see other bits for reason)
9	0,1	1 = spurious negative currents at low energies
10	0,1	1 = spectrum too broad (hot) for meaningful analysis
11	0,1	1 = current in analyzed cup marginally small (<7 pa)
12	0,1	1 = RMS fit worse than 25%
13	0,1	1 = peak current in lowest or highest energy level
14	0,1	1 = proton energy levels 13 and 14 unused
15,16	0,1,2,3	Angle code for alpha (see text)
17,18	0,1.2.3	Angle code for beta (see text)
19	0,1	1 = discrepancy in cup currents (IDISC)
20	0,1	1 = RMS fit worse than 60%
21	0,1	1 = pickup current from modulator higher than normal
22	0,1	1 = value of DELE or DELNE > 30
23	0,1	1 = electrometer zero level shifted by > 0.8 pa
24	0,1	1 = no electron data for this time
25	0,1	1 = electron currents marginally small
26	0	Unused
27	0	Unused
28	0	Unused
29	0	Unused
30	0,1	0 = low gain, 1 = high gain
31	0,1	No proton data for this time
32	0,1	No proton data for this time (bit errors)
33	0,1	1 = no electron data for this time
34	0,1	1 = no electron data for this time (bit errors)
35	0	Unused

FIGURE CAPTIONS

FIGURE 1:

Orientation of Apollo 12 SWS on the lunar surface. The Apollo 15 SWS is rotated 180°.

FIGURE 2:

Faraday-cup sensor.

FIGURE 3:

Angular response of the Faraday cup.

FIGURE 4:

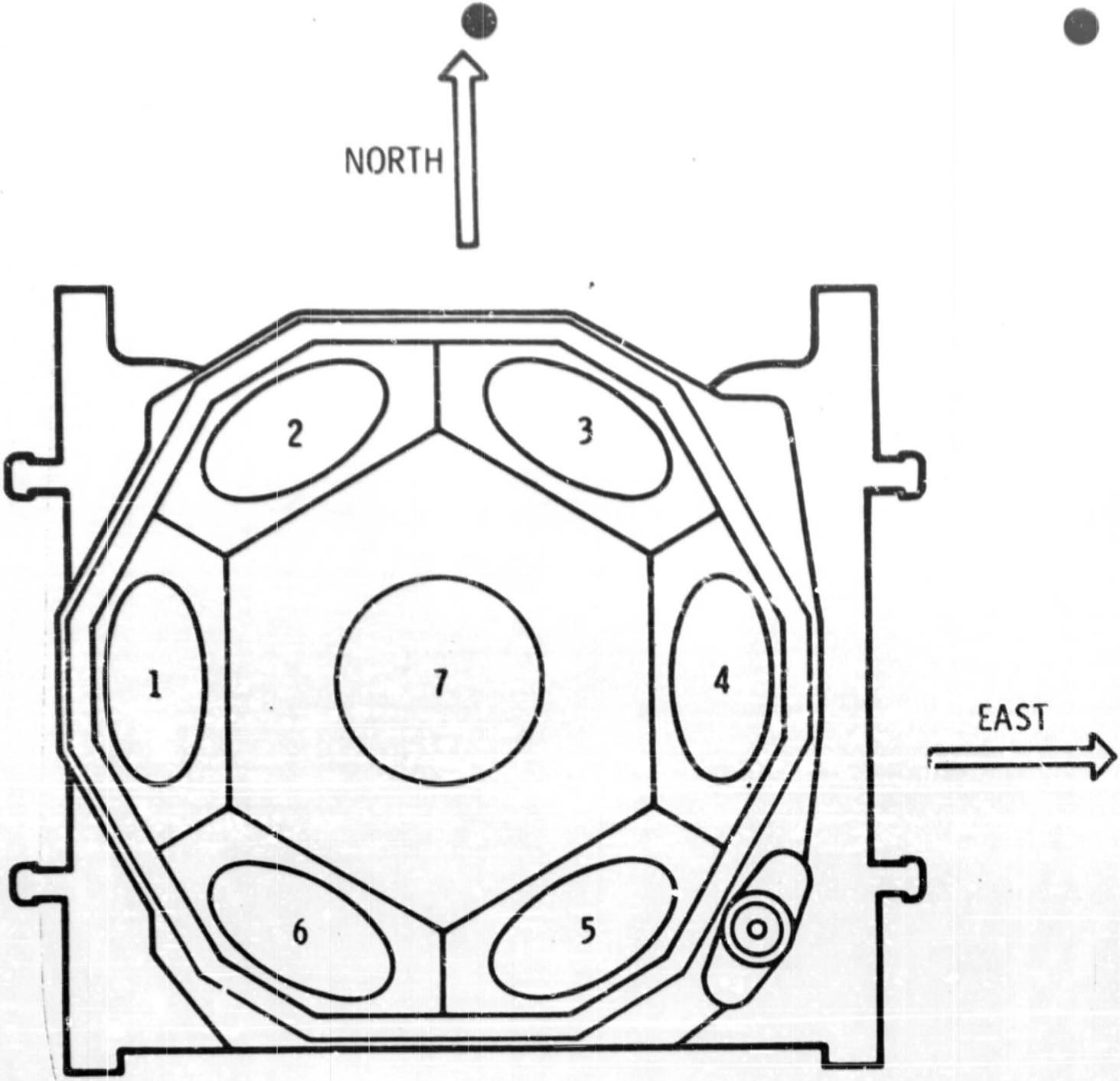
Illustrations of the α and β angles.

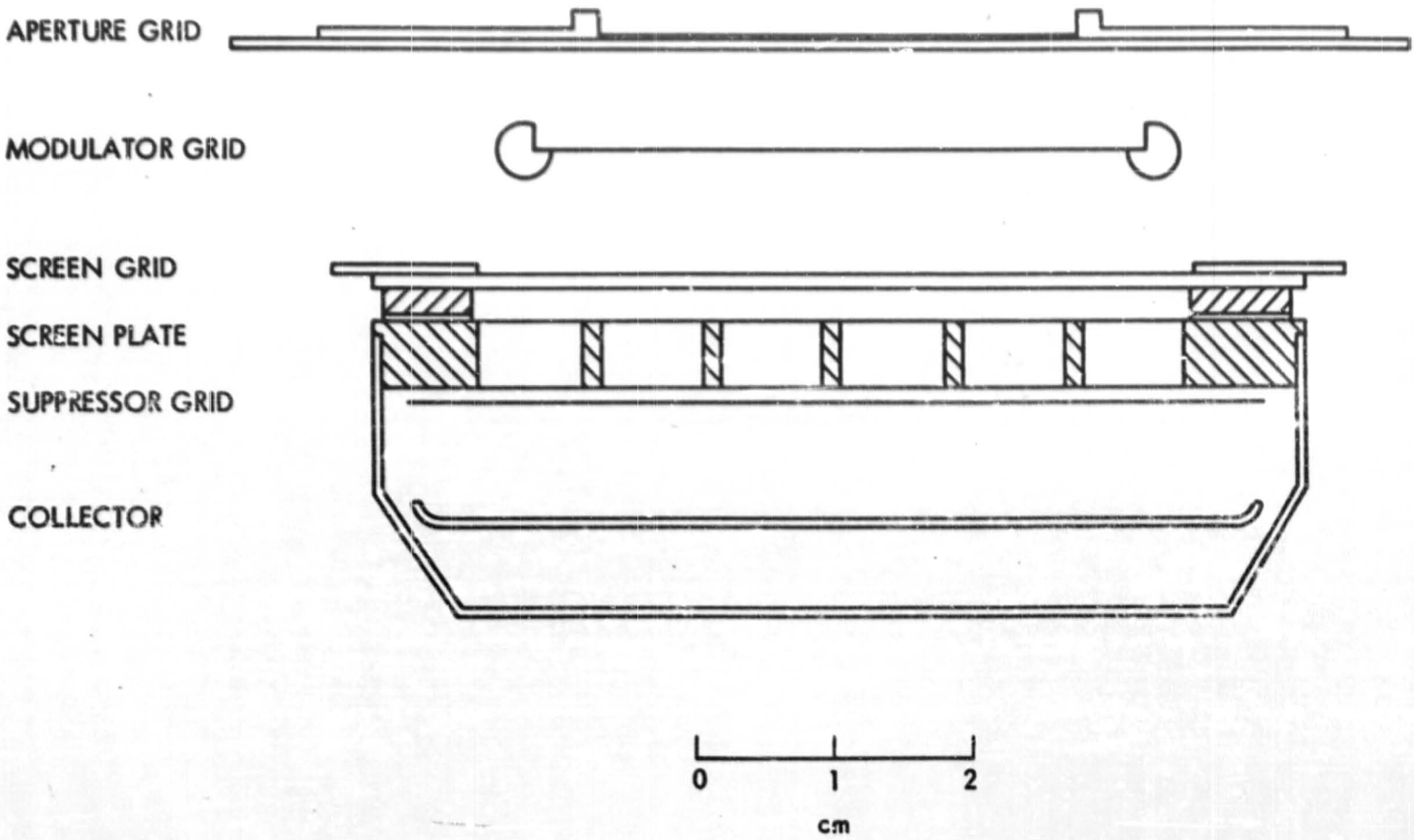
FIGURE 5:

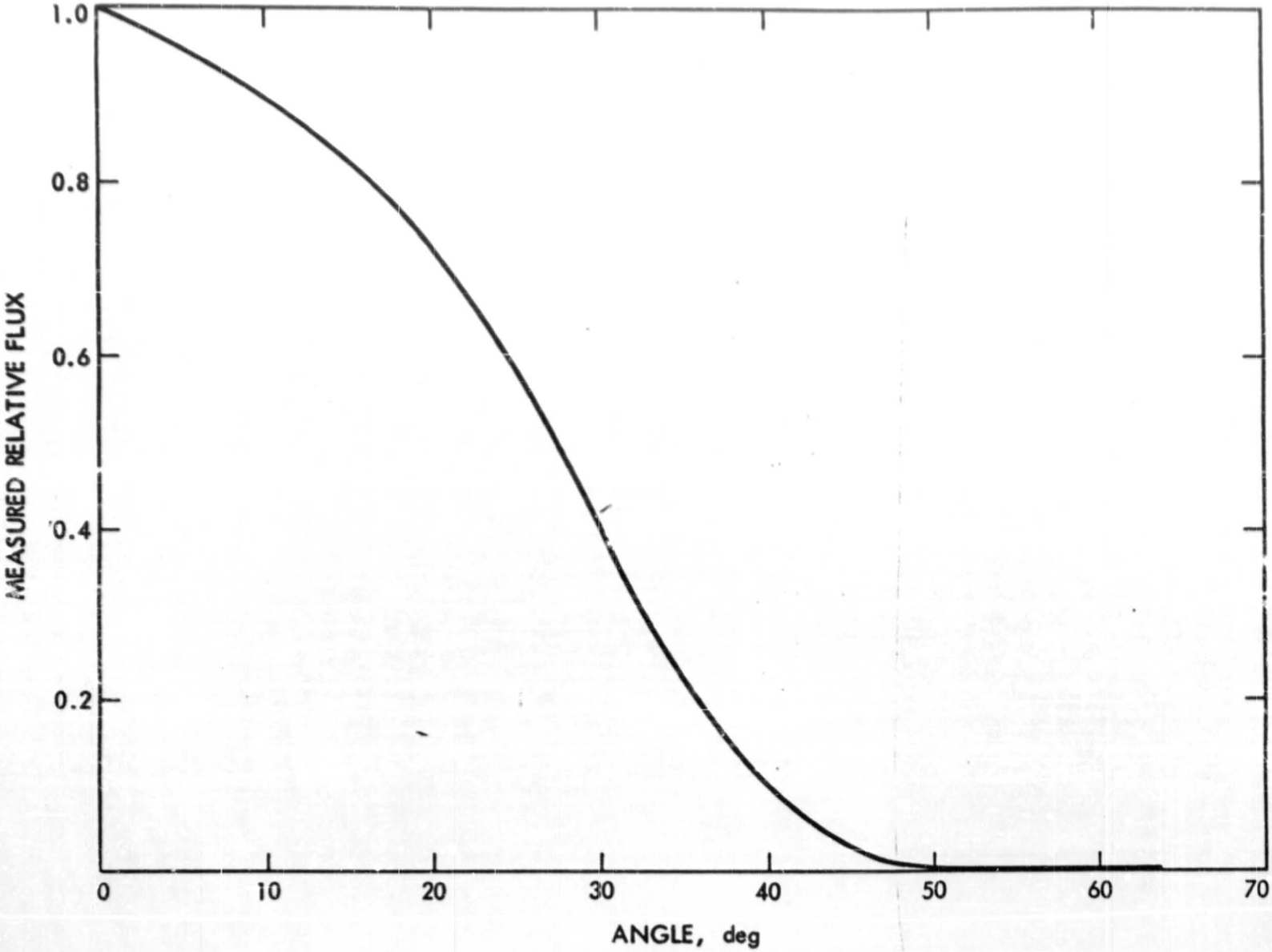
Sample plot of hourly averages.

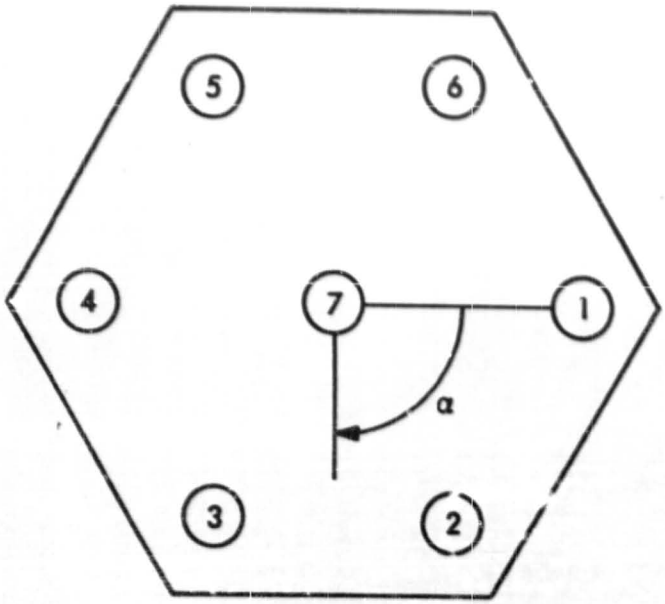
Lunation is the number of lunations following Apollo 12 turn-on in November 1969. Year and Day are the time for local noon at Apollo 12 site. Thermal speed is located below the bulk velocity in velocity graphs and Alpha/Proton density ratio is located below Proton density in Density graph.

Data are plotted only for hours which contain 25 or more spectra.

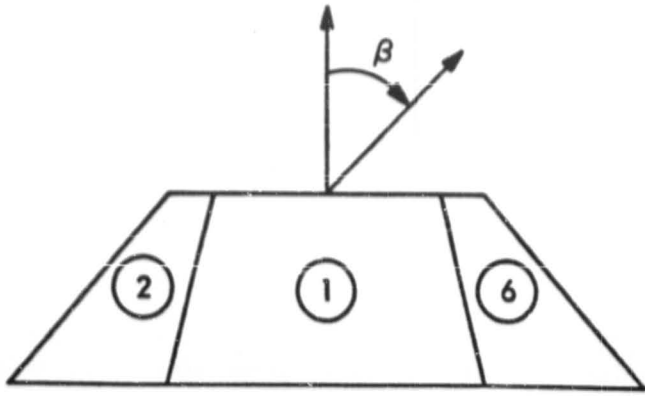

NORTH
EAST
1
2
3
4
5
6
7


APERTURE GRID
MODULATOR GRID
SCREEN GRID
SCREEN PLATE
SUPPRESSOR GRID
COLLECTOR
0
1
2
cm

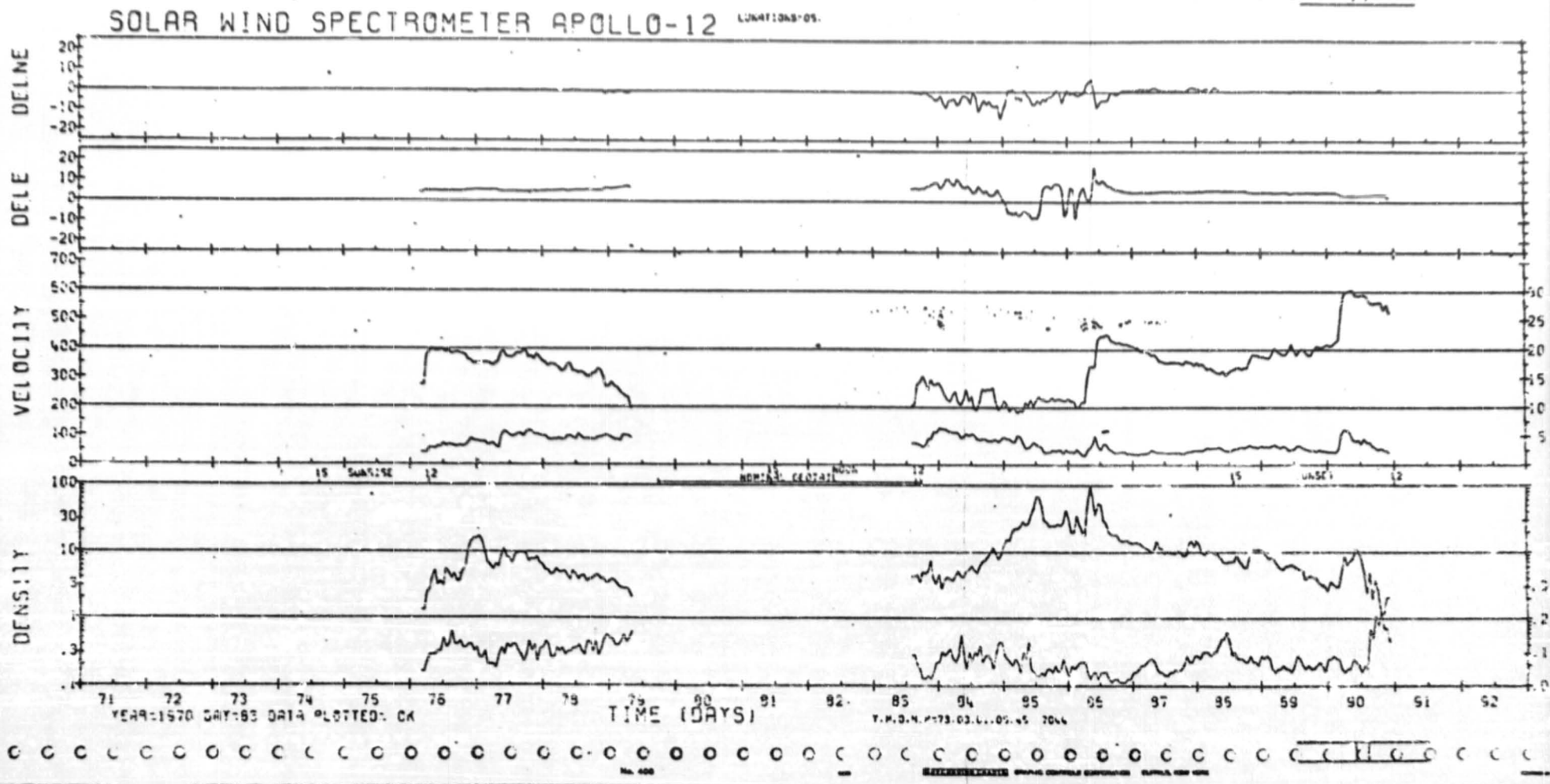

1.0
0.8
0.6
0.4
0.2
MEASURED RELATIVE FLUX
0
10
20
30
40
50
60
70
ANGLE, deg



TOP VIEW



SIDE VIEW


SOLAR WIND SPECTROMETER APOLLO-12
DELNE
DELE
VELOCITY
DENSITY
TIME (DAYS)
YEAR=1970 DAY=83 DATA PLOTTED= OK

000722 999999 1269 1 0 367 0 000722 323184213 18 0 49331 REC 1. LENGTH 2304
8 0 0012007412000192 13 0 2 3260 67000722 323184241 8 0 591256 0 0012007412000162 9
0 0 1190 72000722 3231843 9 4 0 734145 0 0012007412000172 10 0 2 0130 71000722 32318
4337 6 0 673187 0 0012007412000142 10 0 0 0146 67000722 3231844 5 10 0 591230 0 0012
007412000132 13 0 2 1176 67000722 323184433 7 0 645213 0 0012007402000142 10 0 1 115
8 63000722 3231845 1 7 0 645213 0 0012007402000142 10 0 2 0158 64000722 323184557 7 0 6
03200 0 0012007402000112 10 0 2 2159 61000722 323184626 9 0 552220 0 0012007402000142
11 0 2 0179 59000722 323184654 9 0 533236 0 0012007402000192 9 0 0 1193 61000722 3
23184722 6 0 602184 0 0012007402000132 8 0 1 1152 63000722 323184818 7 0 583191 0
0012007402000142 10 0 2 0158 61000722 323184846 418 593121 0 0012007402000232 8 0 1
3131 60000722 323184914 7 0 547187 0 0012007402000232 9 0 0 2162 61000722 323184942 6
0 556179 0 0012007402000232 9 0 1 0156 63000722 323185010 4 0 610114 0 0012007402000
0172 7 0 3 1129 56000722 3231851 6 6 0 598149 0 0012007402000192 9 0 2 2140 540007
22 323185134 13 0 463248 0 0012007402000222 10 0 3 0224 54000722 3231852 2 8 0 529209
0 0012007402000212 10 0 2 0178 51000722 323185231 6 0 576162 0 0012007402000202 8 0
3 0147 51000722 323185259 8 0 528209 0 0012007402000212 10 0 1 2178 52000722 323185451
8 0 528209 0 0012007400012212 10 0 1 2178 53000722 323185519 8 0 528209 0 00120074
00012212 10 0 1 2178 57000722 323185547 11 4 528218 0 0012007402000 82 13 0 1 2184 53
000722 323185615 612 576180 0 0012007402000252 9 0 3 3153 52000722 323185643 13 0 49226
4 0 0012007402000142 11 0 0 3225 53000722 323185711 6 6 592177 0 0012007402000162 9
0 3 0151 50000722 323185739 8 0 560207 0 0012007402000142 10 0 2 0170 49000722 32318
5835 9 0 559209 0 0012007402000142 11 0 2 0171 48000722 3231859 4 9 0 556213 0 0012
007402000132 11 0 2 0174 47000722 323185932 9 0 550220 0 0012007402000152 10 0 2 117
9 49

000722 323185960 511 605145 0 0012007402000112 9 0 3 1139 48000722 323190028 6 1 61414 REC 2. LENGTH 2304
1 0 0012007402000132 10 0 2 0137 47000722 323190056 6 0 625156 0 0012007402000122 10
0 1 0140 47000722 323190124 6 0 626156 0 0012007402000122 10 0 3 0141 47000722 32319
0152 7 0 599179 0 0012007402000142 10 0 4 0151 48000722 323190220 7 8 554214 0 0012
007402000152 10 0 3 0175 46000722 323190248 10 9 477245 0 0012007402000 92 10 0 4 021
7 43000722 323190316 8 0 543237 0 0012007402000 92 9 0 4 0192 43000722 323190344 6 6 5
58165 0 0012007402000192 9 0 2 0150 44000722 323190440 15 0 421304 0 0012007402000132
9 0 4 0262 44000722 3231905 9 5 0 562138 0 0012007402000102 8 0 2 0140 38000722 3
23190537 5 1 563135 0 0012007402000132 7 0 2 0138 39000722 3231906 5 6 0 559210 0
0012007402000102 8 0 1 0172 40000722 323190633 6 0 568201 0 0012007402000112 0 0 2
0165 41000722 3231907 1 6 0 523191 0 0012107402000212 6 0 3 0168 42000722 323190729 5
0 583184 0 0012107402000122 7 0 3 0154 40000722 323190757 6 0 535172 0 0012007402000
0162 7 0 2 0156 43000722 323190853 0 0 0 0 0 0030107402000992 5 0 2 1 0 420007
22 323190921 0 0 0 0 0 0032107402000992 5 0 0 0 0 41000722 323190949 5 3 573158
0 0012007402000102 9 2 2 0146 42000722 323191017 0 0 0 0 0 0032107402000992 6 0
2 0 0 42000722 323191113 0 0 0 0 0 0032107402000992 5 0 3 0 0 42000722 323191142
0 0 0 0 0 0032107402000992 7 0 2 1 0 39000722 323191210 0 0 0 0 0 00301074
02000992 5 0 2 0 0 38000722 323191238 0 0 0 0 0 0032107402000992 7 0 0 0 0 41
000722 3231913 6 0 0 0 0 0 0032107402000992 5 0 2 0 0 42000722 323191334 0 0 0
0 0 0032107402000992 6 0 3 0 0 43000722 3231914 2 0 0 0 0 0 0032107402000992 6
0 1 1 0 45000722 323191430 0 0 0 0 0 0010107402000992 4 0 2 0 0 49000722 32319
1458 0 0 0 0 0 0010107402000992 4 0 1 0 0 50000722 323191526 0 0 0 0 0 0010
107402000992 4 0 2 0 0 46000722 323191554 0 0 0 0 0 0010107402000992 4 0 0 0
0 43

000722 323191622 0 0 0 0 0 0032107402000992 5 0 0 0 0 41000722 323191650 0 0 0 REC 3. LENGTH 2304
0 0 0032107402000992 6 0 2 0 0 39000722 323191718 0 0 0 0 0 0010107402000992 3
0 1 0 0 43000722 323191747 0 0 0 0 0 0010107402000992 3 0 1 0 0 44000722 32319
1815 0 0 0 0 0 0010107402000992 3 0 2 0 0 43000722 323191843 0 0 0 0 0 0010
107402000993 2 2 0 0 0 37000722 323191911 0 0 0 0 0 0030107402000992 5 0 0 0
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23192131 0 0 0 0 0 0010107402000992 3 0 0 0 0 41000722 323192227 0 0 0 0 0
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09-099C 02A
7-11865
Full time resolution Plasma Parameter Tape
800, BCD, 7 track, 1 file
(1st & last records)
11/19/69 – 04/01/70

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3121   0 0   0  0   0   0010107402000993   3  2  0   0  0 35000722 323193149   0 0   0  0   0   0010
107402000995   1  0  0   0  0 36000722 323193217   0 0   0  0   0   0010107402000993   2  0  0   0
0 40

000722 323193245   0 0   0  0   0   0010107402000996   2  0  2   0  0 40000722 323193313   0 0   0    REC      4, LENGTH  2304
0   0   0010107402000995   2  0  1   0  0 36000722 323193341   0 0   0  0   0   0010107402000993   1
  0  0   0  0 35000722 323193437   0 0   0  0   0   0010107402000993   2  2  0   0  0 38000722 32319
35 5   0 0   0  0   0   0010107402000995   3  0  0   0  0 36000722 323193533   0 0   0  0   0   0010
107402000995   1  0  0   0  0 36000722 3231936 1   0 0   0  0   0   0010107402000995   2  0  0   0
0 37000722 323193630   0 0   0  0   0   0010107402000993   2  2  0   0  0 38000722 323193658   0 0
 0  0   0   0010107402000993   3  0  0   0  0 37000722 323193726   0 0   0  0   0   0010107402000993
   3  0  0   0  0 36000722 323193754   0 0   0  0   0   0010107402000993   2  0  0   0  0 38000722 3
23193850   0 0   0  0   0   0010107402000995   2  0  0   0  0 41000722 323193918   0 0   0  0   0
0010107402000993   2  0  0   0  0 36000722 323193946   0 0   0  0   0   0010107402000991   1  0  0
 0  0 39000722 323194014   0 0   0  0   0   0010120002000 07   0  0  0   1  0  0000722 323194042   0
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22 3231942 6   0 0   0  0   0   0010107402000992   2  0  0   0  0 37000722 323194234   0 0   0  0
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 0   0  0 39000722 323194331   0 0   0  0   0   0010107402000996   2  0  0   0  0 40000722 323194359
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02000993   3  3  1   0  0 37000722 323194455   0 0   0  0   0   0010107402000995   3  0  0   0  0 38
000722 323194523   0 0   0  0   0   0010107402000993   3  0  0   0  0 38000722 323194551   0 0   0
0   0   0010107402000993   4  0  0   0  0 36000722 323194619   0 0   0  0   0   0030107402000993   4
  0  0   0  0 41000722 323194647   0 0   0  0   0   0010107400012993   4  0  0   0  0 40000722 32319
4743   0 0   0  0   0   0010107400012993   4  0  0   0  0 40000722 323194811   0 0   0  0   0   0010
107402000993   2  0  0   0  0 43000722 323194839   0 0   0  0   0   0010107402000995   1  0  0   0
0 39

000722 3231949 8   0 0   0  0   0   0010107402000993   3  0  0   0  0 40000722 3231950 4   0 0   0    REC      5, LENGTH  2304
0   0   0010107402000993   3  0  0   0  0 39000722 323195032   0 0   0  0   0   0010107402000993   2
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5156   0 0   0  0   0   0010120002000 05   1  0  0   0  0 0000722 323195224   0 0   0  0   0   0010
107402000997   0  0  0   3  0 39000722 323195252   0 0   0  0   0   0010107402000991   1  0  0   0
0 46000722 323195320   0 0   0  0   0   0010107402000993   1  0  0   0  0 38000722 323195348   0 0
 0   0   0   0010107402000993   2  0  0   0  0 40000722 323195616   0 0   0  0   0   0010107402000993
   3  0  0   0  0 38000722 323195512   0 0   0  0   0   0010107402000993   2  0  0   0  0 40000722 3
23195541   0 0   0  0   0   0010107402000997   0  0  0   2  0 35000722 323195637   0 0   0  0   0
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 0  0 35000722 323195829   0 0   0  0   0   0010107402000993   2  0  0   0  0 36000722 323195857   0
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 0   0  0 36000722 323200242   0 0   0  0   0   0010107402000993   3  0  0   0  0 37000722 323200310
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02000993   1  0  0   0  0 36000722 3232004 6   0 0   0  0   0   0010107402000993   1  0  0   0  0 35
000722 323200434   0 0   0  0   0   0010107402000993   1  0  0   0  0 35000722 3232005 2   0 0   0
0   0   0010107402000995   2  0  0   0  0 40000722 323200558   0 0   0  0   0   0010107402000995   2
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0750   0 0   0  0   0   0010107402000995   1  0  0   0  0 38000722 323200819   0 0   0  0   0   0010
107402000993   2  0  0   0  0 38000722 323200915   0 0   0  0   0   0010107402000993   2  0  0   0
0 39

000722 323201011   0 0   0  0   0   0010107400012993   2  0  0   0  0 38000722 323201135   0 0   0    REC      6, LENGTH  2304
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107402000992   1  0  0   0  0 43000722 323201452   0 0   0  0   0   0010107402000992   1  0  0   0
0 44000722 323201520   0 0   0  0   0   0010107402000996   2  1  0   0  0 36000722 323201616   0 0
 0   0   0   0010107402000996   2  0  0   0  0 36000722 323201644   0 0   0  0   0   0010107402000992
   1  0  0   0  0 45000722 323201712   0 0   0  0   0   0010107402000995   1  0  0   0  0 36000722 3
232018 8   0 0   0  0   0   0010107402000996   2  0  0   0  0 38000722 323201836   0 0   0  0   0
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 0   0 37000722 323201932   0 0   0  0   0   0010107402000997   0  0  0   2  0 37000722 3232020 0   0
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  0  0   0  0 36000722 323202633   0 0   0  0   0   0010107402000992   2  0  0   0  0 39000722 32320
27 2   0 0   0  0   0   0010107402000993   1  0  0   0  0 36000722 323202758   0 0   0  0   0   0010
107402000995   2  0  0   0  0 38000722 323202854   0 0   0  0   0   0010107402000992   1  0  0   0
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000722 323202922   0 0   0  0   0   0010107402000996   2  0  0   0  0 36000722 323203046   0 0   0    REC      7, LENGTH  2304
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3238   0 0   0  0   0   0010107402000993   1  0  0   0  0 37000722 3232033 7   0 0   0  0   0   0010
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0 38000722 3232034 3   0 0   0  0   0   0010107402000997   1  0  0   1  0 37000722 323203431   0 0
 0   0   0010107402000992   2  0  0   0  0 39000722 323203459   0 0   0  0   0   0000107402000994
   1  0  0   0  0 40000722 323203527   0 0   0  0   0   0010107402000995   2  0  0   0  0 44000722 3
23203555   0 0   0  0   0   0010107402000993   3  0  2   0  0 37000722 323203623   0 0   0  0   0
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 0   0 42000722 323203815   0 0   0  0   0   0010107402000995   1  0  0   0  0 41000722 323203940   0
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000722 323204420   0 0   0  0   0   0010107402000992   3  0  0   0  0 36000722 323204448   0 0   0
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0 38

000722 323204737   0 0   0  0   0   0010107402000993   2  0  0   0  0 49000722 3232048 5   0 0   0    REC      8, LENGTH  2304
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22 2121947 3 0 0 0 0 0 0010107402000997 2 0 0 2 0 37000722 212194731 0 0 0 0
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0 0 0 38000722 212194827 0 0 0 0 0 0000107402000991 2 0 0 0 0 37000722 212194855
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0 50

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0 37

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0 0000722 212201852 0 0 0 0 0 0010107402000994 2 1 0 0 0 44000722 212201920 0 0
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0 0 0000722 212202237 0 0 0 0 0 0010120002000 03 2 0 0 0 0 0000722 2122024 1 0
0 0 0 0 0000107402000991 3 0 0 0 0 40000722 212202457 0 0 0 0 0 000012000200
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   0 0   0  0   0   0010107402000994   1  0  0   0  0 38000722 212202842   0 0   0  0   0   00101074
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000722 212202938   0 0   0  0   0   0000107402000992   1  0  0   1  0 37000722 2122030 6   0 0   0
0   0   0010107402000993   2  0  0   0  0 39000722 2122031 2   0 0   0  0   0   0010107402000993   2
  0  0   0  0 38000722 212203130  10 0 553 4C   0   0012007402000 27   0  0  0  18113 40000722 21220
3158   0 0   0  0   0   0010107402000997   C  0  0   2  0 37000722 212203226   0 0   0  0   0   0000
107402000992   2  0  0   1  0 43000722 212203322   0 C   0  0   0   0010107402000995   3  0  0   0
0 40

000722 212203351   0 0   0  0   0   0000107402000992   1  0  1   0  0 41000722 212203419   0 0   0    REC     4, LENGTH  2304
0   0   0000120002000 02   1  0  1   0  0  0000722 212203447   0 0   0  0   0   0010107402000997   0
  0  0   3  0 39000722 212203515   0 0   0  0   0   0010107402000997   0  0  0   1  0 39000722 21220
3611   0 0   0  0   0   0010107402000997   1  0  1   2  0 40000722 212203639   0 0   0  0   0   0010
107402000993   2  0  0   0  0 35000722 2122037 7   0 C   0  0   0   0010107402000993   2  0  0   0
0 36000722 212203735   0 0   0  0   0   0000107402000991   2  0  0   0  0 37000722 212203831   0 0
 0  0   0   0000107402000991   1  0  0   0  0 36000722 212203859   0 0   0  0   0   0000107402000992
   2  0  0   0  0 38000722 212203927   0 0   0  0   0   0010120002000 04   2  0  0   1  0  0000722 2
12203955   0 0   0  0   0   0010107402000997   0  0  0   2  0 41000722 212204024   0 0   0  0   0
0010120002000 07   0  0  0   1  0  0000722 212204120   0 0   0  0   0   0000120002000 01   2  0  0
 0  0  0000722 212204148   0 0   0  0   0   0010107402000994   2  0  0   0  0 39000722 212204216   0
 0   0  0   0   0010107402000993   1  0  0   0  0 37000722 212204244   0 0   0  0   0   0000107402000
0991   1  0  0   0  0 37000722 212204312   0 C   0  0   0   0010107402000997   1  0  0   2  0 410007
22 212204340   0 0   0  0   0   0000107402000992   1  0  0   0  0 39000722 2122044 8   0 0   0  0
0   0000107402000992   2  0  0   0  0 45000722 2122045 4   0 0   0  0   0   0010107402000993   1  0
 0   0  0 37000722 212204532   0 0   0  0   0   0000107402000991   2  0  0   0  0 43000722 2122046 0
   0 0   0  0   0   0010107402000995   3  0  0   0  0 42000722 212204629   0 0   0  0   0   00101200
02000 05   1  0  0   0  0  0000722 212204657   0 0   0  0   0   0000120002000 01   1  0  0   0  0  0
000722 212204725   0 0   0  0   0   0010107402000993   2  0  0   1  0 39000722 212204753   0 0   0
0   0   0010107402000997   1  0  0   2  0 37000722 212204821   0 0   0  0   0   0010107402000997   0
  0  0   1  0 36000722 212204849   0 0   0  0   0   0010107402000996   2  0  1   0  0 38000722 21220
5013   0 0   0  0   0   0010107402000993   1  0  0   0  0 38000722 212205041   0 0   0  0   0   0010
107402000997   0  0  0   1  0 36000722 2122051 9   0 0   0  0   0   0010107402000993   2  1  0   0
0 38

000722 212205137   0 0   0  0   0   0000107402000992   2  0  0   0  0 37000722 2122052 5   0 0   0    REC     5, LENGTH  2304
```

000722 342235632 697 3 325 17 49 -7002012400000 14 246 0 0 0317 78000722 3422357 1 660 3 328 1 REC 1, LENGTH 2304
6 49 -7002012400000 14 239 0 0 0316 80000722 342235729 712 3 324 18 49 -7002012400000 24 251
0 0 0317 63000722 342235757 727 3 325 18 49 -7002012400000 14 255 0 1 0317 63000722 34223
5825 674 3 325 17 49 -7002012400000 14 240 0 0 0317 61000722 342235853 671 3 328 16 49 -7002
012400000 14 243 0 0 0317 73000722 342235921 684 3 324 17 49 -7002012400000 14 240 0 0 031
7 68000722 342235949 694 2 324 17 49 -7002012410000 24 243 0 0 1317 88000722 343000017 673 3 3
25 17 49 -7002012400000 14 239 0 0 0317 72000722

000722 000722 000722 000722 000722 000722 000722 0007
22 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722

000722 499000000 000722 REC 2, LENGTH 2304
000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722

000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 0007
22 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722

000722 499000000 000722 REC 3, LENGTH 2304
000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722

000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 000722 0007

```
0 1082 12693231830 33  8 2 574199  0  0  3 4  53 42  1  1 0  0 0  0 0  0 0  0 0  0 0 REC  1, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693231930 16  7 2 554190  0  0  3 3  49 43  1  1 0  0 0  0 0  0 0  0 0  0 0 REC  2, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693232030  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  3, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693232130  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  4, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693232230  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  5, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693232330  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  6, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240030  1 79 0 197  0 76  0  1 0  0 0  1  1 1 79 0 197  0 76  0  1 0  0 0 REC  7, LENGTH  216
  1  1001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240130  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  8, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240230  1 78 0 195 13  0  0  0 0  0 0  1  1 0  0 0  0 0  0 0  0 0  0 0 REC  9, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240330  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  10, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240430  2 254 0 409 23  73 231 226 0 285 14  48 231  2 254 0 409 23  73 231 226 0 285 14 REC  11, LENGTH  216
 48 231001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240530  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  12, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240630  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  13, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240730  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  14, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 126?3240830  0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0 REC  15, LENGTH  216
  0  0001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0

0 1082 12693240930  1 64 0  92  7 76  0  1 0  0 0  1  1 1 64 0  92  7 76  0  1 0  0 0 REC  16, LENGTH  216
  1  1001082              0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0  0 0
0  0  0  0  0
```

64 099 526
D 11366
Hourly Averaged Plasma Tape
300, BCD, 7 track, 1 file
(1st 4 inst. records)
1/19/64 – 03/31/70

```
0 1082 12693241030  0   0 0   0 0   0  0   0 0   0 0   0  0  0   0 0   0 0   0  0   0 0   0 0  REC   17, LENGTH   216
   0   0001082              0   0 0   0 0   0   0   0 0   0 0   0  0   0 0   0 0   0  0   0   0   0
0   0 0   0   0
0 1082 12693241130  0   0 0   0 0   0  0   0 0   0 0   0  0  0   0 0   0 0   0  0   0 0   0 0  REC   18, LENGTH   216
   0   0001082              0   0 0   0 0   0   0   0 0   0 0   0  0   0 0   0 0   0  0   0   0   0
0   0 0   0   0
0 1082 12693241230  0   0 0   0 0   0  0   0 0   0 0   0  0  0   0 0   0 0   0  0   0 0   0 0  REC   19, LENGTH   216
   0   0001082              0   0 0   0 0   0   0   0 0   0 0   0  0   0 0   0 0   0  0   0   0   0
0   0 0   0   0
0 1082 12693241330  1  94 0 404 17   0  0   1 0   0 0   1  1  0   0 0   0 0   0  0   0 0   0 0  REC   20, LENGTH   216
   0   0001082              0   0 0   0 0   0   0   0 0   0 0   0  0   0 0   0 0   0  0   0   0   0
0   0 0   0   0
0 1082 12693241430  0   0 0   0 0   0  0   0 0   0 0   0  0  0   0 0   0 0   0  0   0 0   0 0  REC   21, LENGTH   216
   0   0001082              0   0 0   0 0   0   0   0 0   0 0   0  0   0 0   0 0   0  0   0   0   0
0   0 0   0   0
0 1082 12693241530 71  3513 293 67  59  14  10 6  30 13   8  33 71  3513 293 67  59  14  10 6  30 13 REC   22, LENGTH   216
      33  1 8                                                                                 0   0   0
```

```
001082 15712121930  1  17 1 407 23  44  -6   1 0   0 0   1  1  1  17 1 407 23  44  -6   1 0   0 0  REC    1. LENGTH  216
   1   1001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712122030  1  10 0 553 40   0   0   1 0   0 0   1  1  0   0 0   0 0   0 0   0 0   0 0  REC    2. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712122130  0   0 0   0 0   0 0   0 0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  REC    3. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712122230  2  11 0 621 39  27  -6   1 0  54 2   1  3  2  11 0 621 39  27  -6   1 0  54 2  REC    4. LENGTH  216
   1   3001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712122330  5  10 1 536 33   5  -1   1 1  40 2  10  4  1  12 0 573 33  25  -9   1 0   0 0  REC    5. LENGTH  216
   1   1001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130030  1  10 1 676 41 154 150   1 0   0 0   1  1  1  10 1 676 41 154 150   1 0   0 0  REC    6. LENGTH  216
   1   1001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130130  0   0 0   0 0   0 0   0 0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  REC    7. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130230  3  10 1 589 35   6  -6   2 1  39 2   9  9  1  12 1 573 34  18 -19   1 0   0 0  REC    8. LENGTH  216
   1   1001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130330  1  10 2 671 43  14 -22   1 0   0 0   1  1  1  10 2 671 43  14 -22   1 0   0 0  REC    9. LENGTH  216
   1   1001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130430  2   9 0 603 40   0   0   1 0  44 2   1  1  0   0 0   0 0   0 0   0 0   0 0  REC   10. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130530  1  12 2 638 99   8 -30   1 0   0 0   1  1  0   0 0   0 0   0 0   0 0   0 0  REC   11. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130630  3   8 0 640 57   0   0   1 0  12 18  1  1  0   0 0   0 0   0 0   0 0   0 0  REC   12. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130730  2  10 1 605107   0   0   1 0   4 3   1  1  0   0 0   0 0   0 0   0 0   0 0  REC   13. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130830  0   0 0   0 0   0 0   0 0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  REC   14. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712130930  1   8 0 818  0 121 115   1 0   0 0   1  1  1   8 0 818  0 121 115   1 0   0 0  REC   15. LENGTH  216
   1   1001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0

001082 15712131030  1   9 0 733130   0   0   1 0   0 0   1  1  0   0 0   0 0   0 0   0 0   0 0  REC   16. LENGTH  216
   0   0001082            0   0 0   0 0   0   0   0 0   0  0  0   0 0   0 0   0 0   0 0   0 0  0  0  0
0  0  0  0  0
```

Apollo 15
Dupe of
D-13775

71-063C-04B

7/31/71 - 12/5/71

```
001082 15712131130  0   0 0   0  0   0   0   0 0   0  0   0   0   0  0 0   0  0   0   0   0 0   0  0 REC    17, LENGTH   216
   0   0001082              0   0 0   0  0   0   0   0 0   0  0   0   0  0 0   0  0   0   0   0   0  0
0   0   0   0   0

001082 15712131230  0   0 0   0  0   0   0   0 0   0  0   0   0   0  0 0   0  0   0   0   0 0   0  0 REC    18, LENGTH   216
   0   0001082              0   0 0   0  0   0   0   0 0   0  0   0   0  0 0   0  0   0   0   0   0  0
0   0   0   0   0

001082 15712131330  2  23 0 395 82  45   8  12 0 294 77  45   8  1  35 0 101  5  90  16  1 0   0  0 REC    19, LENGTH   216
   1   1001082              0   0 0   0  0   0   0   0 0   0  0   0   0  0 0   0  0   0   0   0   0  0
0   0   0   0   0

001082 15712131430  0   0 0   0  0   0   0   0 0   0  0   0   0   0  0 0   0  0   0   0   0 0   0  0 REC    20, LENGTH   216
   0   0001082              0   0 0   0  0   0   0   0 0   0  0   0   0  0 0   0  0   0   0   0   0  0
0   0   0   0   0
```

```
001082 15713422130127 395 2 323 17  58  -3  84 0   5  1  16  26127 395 2 323 17  58  -3  84 0   5  1  REC     1, LENGTH   216
  16  26001082              2 985 2 357 17  52   4   6 0   1  0 124 209  0   0 0   0  0   0   0   0
0   0   0   0   0

001082 15713422230128 469 2 323 16  54  -6 132 0   6  1  18  31128 469 2 323 16  54  -6 132 0   6  1  REC     2, LENGTH   216
  18  31001082              31230 2 358 16  87 -63 143 0   3  0 114 192  0   0 0   0  0   0   0   0
0   0   0   0   0

001082 15713422330128 542 3 323 17  49  -8 126 1   7  6   1   1126 541 3 323 16  49  -7 125 1   3  1  REC     3, LENGTH   216
   1   1001082              0   0 0   0  0   0   0   0 0   0  0   0   0  0   0 0   0  0   0   0   0
0   0   0   0   0

001082 15764990000                                                                                    REC     4, LENGTH   216
        001082

001082 15764990000                                                                                    REC     5, LENGTH   216
        001082
```