DATA SET CATALOG # 16

EXPLORER 28 RECORDING POTENTIAL FIELD

65-042A-01A 1 1/2" tape

Table of Contents

---

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 This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system.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

IMP-C

ELECTRON I, N, V, PLUS ORBIT

65-042A-01A

THIS DATA SET HAS BEEN RESTORED. THERE WAS ORIGINALLY ONE 7-TRACK, 800 BPI TAPE, WRITTEN IN BCD. THERE IS ONE RESTORED TAPE, WRITTEN IN ASCII. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE ORIGINAL TAPE WAS CREATED ON AN IBM 7094 COMPUTER. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPAN IS AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR003496	DS003496	D001940	1	05/29/65 - 05/05/67

65-042A-01A
IMP-C
Explorer 28, Retarding Potential Analyzer

800 BPI, 7-track, BCD, 1 file, IBM 7094

D#	C#	START	STOP
D-01940	C-01194	05/29/65	05/05/67

D-01940-C-01194

DATA TAPE FOR THE RETARDING POTENTIAL ANALYZER EXPERIMENT AS FLOWN ON EXPLORER XXVIII

G. P. Serbu
Principal Investigator

E. J. R. Maier
Co-investigator

I. INTRODUCTION

The Interplanetary Monitoring Platform, IMP 3 or Explorer 28, was launched from the Atlantic Missile Range, Cape Kennedy, Florida, on May 29, 1965. The primary objective of this experiment viz. Retarding Potential Analyzer (R.P.A.), was to measure the electron and ion densities and energies as a function of orbital position. The integral spectrum of charged particle energies was obtained in two separate ranges: (1) a high-resolution thermal range from 0 to 15 volts and (2) a low-resolution range from 0 to 45 volts.

II. EXPERIMENTAL ARRANGEMENT

The sensor, shown schematically in Figure 1, is a Faraday cup of planar geometry so designed as to measure the integral spectrum in the thermal range of energies for both ions and electrons.

The ambient plasma can be considered as incident on the spacecraft at the sensor at the vector sum of the plasma streaming velocity and the spacecraft velocity. The spacecraft velocity is at all times small compared to the velocity of even at 0.1 eV ($1170^{o}K$) electron and thus can be ignored in the analysis of the electron data. When the spacecraft is near perigee, its velocity is comparable to ion velocities and it is necessary to include spacecraft attitude and velocity in the reduction of the ion data. The aperture is a hole of 5 cm^2 area over which is stretched a fine wire mesh having an optical transparency of 95 percent. Surrounding the aperture is a tungsten surface of 35 cm^2 area which is electrically connected to the aperture grid.

The accompanying table in Figure 1 shows the series of voltages

which are programmed on the various trap elements in order to define the six modes of operation. For example, the electron spectrum is obtained as follows: a +45 volt aperture potential will effectively separate out from the entering plasma those ions with energies below 45 electron volts. The negative voltage programmed on the retarding grid sequentially and in synchronism with the telemetry system then yields the integral spectrum of electron current as a function of retarding potential in the interval from +5 to -45 volts. The suppressor grid is used to suppress secondary electrons emitted from the collector. In the electron mode the collector is maintained positive in order to insure collection of all electrons which pass through the retarding and suppressor grids. The retarding potential is programmed in fifteen discrete voltage increments from +5 to -45 volts in a period of 5.2 seconds. The entire ion, electron and net current measurement cycle is completed every 648 seconds.

Examination of the potential on the suppressor illustrates that during the two electron modes of operation and during the low resolution mode the photoemission currents from the collector have been suppressed; however, photoelectrons emitted from the suppressor grid itself will reach the collector and register as a negative current component which varies as a function of the solar aspect. The magnitude of this current being directly proportional to the area of the grid wires is expected to be of the order of 10^{-9} amperes. In the analysis of the electron current use is made of the spacecraft optical aspect sensor to compute the precise times at which the sun vector lies in the plane defined by the spin axis and the sensor normal. Data obtained during the time when the sun is within ± 70 degrees of the trap normal are eliminated from the analysis. In practice this means that five data points are eliminated from the total spectrum of 15 data points. Due to the fact that the satellite spin rate is not synchronous with the retardation program the data points which are dropped in the analysis fortunately do not always fall in that portion of the spectrum which is changing rapidly. The net effect is that not all current voltage characteristics obtained can subsequently be analyzed to yield electron

temperatures and densities. However, the large amounts of data received still allow us to make a meaningful measurement at increments of 0.1 earth radius along nearly the entire orbit, the exception being at altitudes below 10,000 kilometers where the satellite velocity and orientation are changing much too rapidly in the time interval of 5.2 seocnds required to obtain one spectrum.

The collector current is measured by an electrometer whose sensitivity ranges from $1x10^{-11}$ amperes to $1x10^{-7}$ amperes full scale. The analog output of the electrometer is presented to the telemetry system as a voltage from 0 to 5 volts full scale. During the electron mode of operation the electrometer can respond only to negative currents, and during the ion mode the response is to positive currents.

Incorporated within the experiment is an internal calibration capability. One step in the data analysis procedure is to check this internal calibration and make appropriate corrections. For the first three months in orbit, the electrometer gain change was less than 5 percent. During January and February 1965 the satellite operation was intermittent due to an unfavorable sun-solar paddle aspect angle which gradually improved so that by March full time operation was again achieved. There were no significant gain changes in the electronics during this period.

III. DATA AND ANALYSIS

Figure 2 is a sample of the current voltage characteristics obtained with the Retarding Potential Analyzer experiment as flown on IMP III. Plotted on a logarithmic scale is the negative current as measured by the electrometer as a function of the linear abscissa which is the retarding potential in volts. Two spectrums obtained within 150 minutes of each other on 7 April, 1966 are illustrated in Figure 2. The dashed curve in the figures marks the time during the spectrum at which the sun is within the trap view angle, thus indicating that the five data points symmetric in time about the sun position contain photoemission currents and that these points should be discarded in the analysis. A smooth curve as shown can be drawn through the remaining 10 data points.

It has been found that the data can be well fitted by considering the plasma to consist of two components having Maxwellian energy distribution. It should be pointed out that both components are omnidirectional. One, the "thermal component", has a mean energy below 4 electron volts; the second, the so-called "high energy component" has a mean energy much higher than 4 electron volts. Separation of the two components results in the retardation spectrum for the "thermal component" as illustrated by the solid dot curve in Figure 2. The one hundred-to-one logarithmic decrease in electron current with increasing retarding voltage establishes that the energy distribution of the thermal component is Maxwellian. Note that the high energy tail is only partially retarded due to the limited range of the sweep voltage in the experiment. This limited retardation does not enable us to distinguish the true nature of the energy distribution of the "high energy" component; that is, an equally good fit to the data would be obtained using other functional relationships. The exponential is used primarily for convenience; its use in the case of the high energy component does not necessarily imply the existence of thermal equilibrium for that component.

A computer program has been generated in order to process the satellite telemetry information, convert this to current (I) - voltage (V) characteristics and eliminate the data points which contain a photocurrent component. Analysis of the selected, corrected data points is then carried out by the computer. The analysis consists of performing a least squares fit by an iterative process to an appropriate combination of exponential distributions, using only the data obtained in the retarding region of the basic I-V curve. The data fit to the computed exponential has typically a fractional root mean deviation in the range from 0.001 to 0.1. The temperatures of the two distributions are then directly obtained as the exponent coefficients of the best fitted exponentials. The density is computed from the value of the thermal current at the satellite potential and the temperature of the "thermal component". In this case the satellite potential is taken to be the negative value of the sweep voltage at the inflection of the curve.

At times, should the satellite be more negative than 0.5 volts, no inflection is obtained and thus, density values cannot be computed. In general, the satellite potential is positive between 0 and +2 volts with respect to the plasma for all parts of the orbit at distances greater than about 2 earth radii.

In most cases the analysis program has worked very well, the only difficulty experienced with this procedure has been for data obtained in the transition region (beyond $10R_e$) where the ratio of the maximum thermal electron current values to the mean of the high energy component value is less than three to one, thus making it somewhat difficult to meaningfully separate the two individual components.

Throughout much of the spacecraft orbit, the Debye length, and thus the "sheath thickness", is in excess of 10 cm. The proper interpretation of the probe characteristic in the unretarded portion of the sweep is extremely complex. Theoretical studies (Parker, 1965) assuming idealized, but reasonable, boundary conditions indicate that the enhancement of the effective area over the geometric area may be of the order of a factor 5 to 10. The factor of ten enhancement is predicted if the field in the vicinity of the trap is defined by Laplace's equation. This is evidently an upper limit for the enhancement. The presence of a sheath will screen the local field and yield a smaller enhancement factor.

Results obtained by programming different potentials on the entrance aperture do not indicate as severe an increase of observed saturation current with applied accelerating potential as is predicted for the idealized geometry. The observation of a nonlinear dependence on accelerating potential is evidence of the above-mentioned screening. Thus the minimum possible effective area is the geometric area of the aperture, A_G. The maximum possible effective area is that predicted for zero local charge density; its value is $10A_G$. Applying these two possible values for the area to our observed saturation electron currents yields upper and lower bounds for the electron density. By combining Parker's predicted enhancement factor and the observed effect of different acceleration potentials, we arrive at 4 as the best value for the enhancement. The densities presented on the magnetic tape are

obtained by using $1A_G$ as the effective area. Therefore, the density values as found on the tape should be divided by 4 in order to account for the enhancement factor. From the above considerations it is believed that this augmentation factor is known to within a factor of 2 so that the absolute values of densities may be in error by a factor of 2. It should be emphasized that relative errors are determined by the stability of the electronics, which is of the order of 5%.

No unusual developments occurred during the course of the experiment life-time.

IV. INSTRUMENT CALIBRATIONS

Plasma currents which arrive at the sensor collector are measured by a logarithmic electrometer in the current range from $1x10^{-11}$ to $1x10^{-6}$ amperes. Positive and negative currents are read according to whether the electrometer polarity is positive (ion mode of operation) or negative (electron mode), see Figure 1. In order to check the amplifier gain during flight, a real time current calibration scheme was used. For example, after the completion of the electron spectrum measurements, a known value of negative current was inserted at the electrometer input and the voltage output was received on telemetry. In this manner, a three point calibration check was performed on the electrometer in flight, for both positive and negative current polarities. In the data analysis program a computer subroutine was used to compute the electrometer gain from the calibration points telemetered, and from the spacecraft temperature reading. These curves were then compared with the predicted current values based on ground calibrations and on temperature calibrations. With allowance for maximum errors we have calculated that in the worst case the currents are known to better than 5%.

On the tape the measured parameters are divided into two categories: viz. L and H. L refers to "low energy" plasma component; in Figure 2 it is the portion of the curve between +0.5 volts and -6.5 volts. H refers to the "high energy" plasma component; in Figure 2 the current measured to the right of -6.5 volts retardation.

Depending upon the satellite potential, the analytical fit to the data points would begin at +0.4 volts, +0.1 volts or -0.5 volts. Then the analysis is labeled either 1, 2, or 3.

IH and IL refer to the value of measured currents at satellite potential. L is the temperature of the "low energy plasma" given in electron-volts

h - temperature of the "high-energy" component on electron-volts.

V_p - measured spacecraft potential in volts.

I_2 - average value of current in the saturation region.

N - computed density of low energy electrons as computed from the equation.

$I_- = 1/4\ N_e\ v_e\ e\ A\ A_G$

where I_- is measured negative current IL.

N_e - electron density

v_e - electron velocity at the electron temperature L.
i.e. $1/2\ m_e\ \bar{v}^2_e = kL$

e - electronic charge

A - area of sensor aperture

A_G - augumentation factor (see discussion in part II) on the data tape $A_G=1$, a better value is $A_G=4$.

I_t - is the value of current measured at the greatest value of retardation voltage fiz. the current value at extreme right in Fig. 2.

The above parameters are contained on the tape long with the pertinent orbital information listed.

The following information describes the World Data Center tape for the Retarding Potential Analyzer Experiment at flown on Explorer XXI. (& exp-28) This tape is called the "Electron analysis Merge Output Tape". All non-converging data or bad data has been eliminated and this tape represents the best available measurements only.

EXPLORER 28

IMP-C, ELECTRON ANALYSIS MERGE OUTPUT TAPE

FORMAT

The IMP-C. Electron analysis merge output tape is a 7 track even parity IBM compatible BCD tape where logical records are 155 bytes (characters) long. The word location assignments and formats are as follows: Blocksize is 2790 bytes, and density is 800 bp:

Character Numbers	Format	Description
1-2	A2	number of points used in fit
3-4	A2	type of fit-1H, 2L, 3H
5	I1	class of fit-1,2,3 channel at which fit start
6-15	E10.2	Ih intercept current at Up of high fit
16-25	E10.2	h slope of high energy fit
26-35	E10.2	Il intercept current at Vp of fit
36-45	E10.2	l slope of low energy fit
46-55	E10.2	Vp spacecraft potential
56-65	E10.2	I_2 current at 0-3 retarding volts
66-75	E10.2	N electron density
76-85	E10.2	I_t terminal (high voltage) current
86-95	E10.2	sd (standard deviation) of fit
96-105	E10.2	Lsep approx. sun-earth-probe angle
106-112	I7	Sequence number
113-116	I4	day of year (Julian)*
117-119	I3	hour of day
120-122	I3	minute of day
123-132	E10.2	A mag field in gamma units
133-142	E10.2	B mag L shell in earth radii
143-147	F5.1	distance from center of earth
148-151	I4	longitude
152-155	I4	latitude

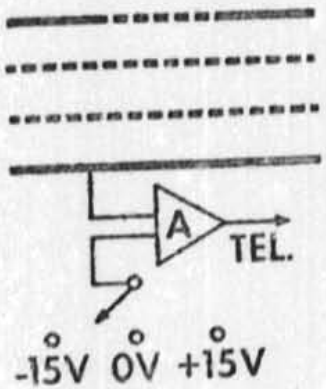
*data from 1965 is actual day of year
data from 1966 is actual day of year + 1000 for IMP C
data from 1967 is actual day of year + 2000

data from 1964 is actual day of year
data from 1965 is actual day of year for IMP-B no overlap of Jul day

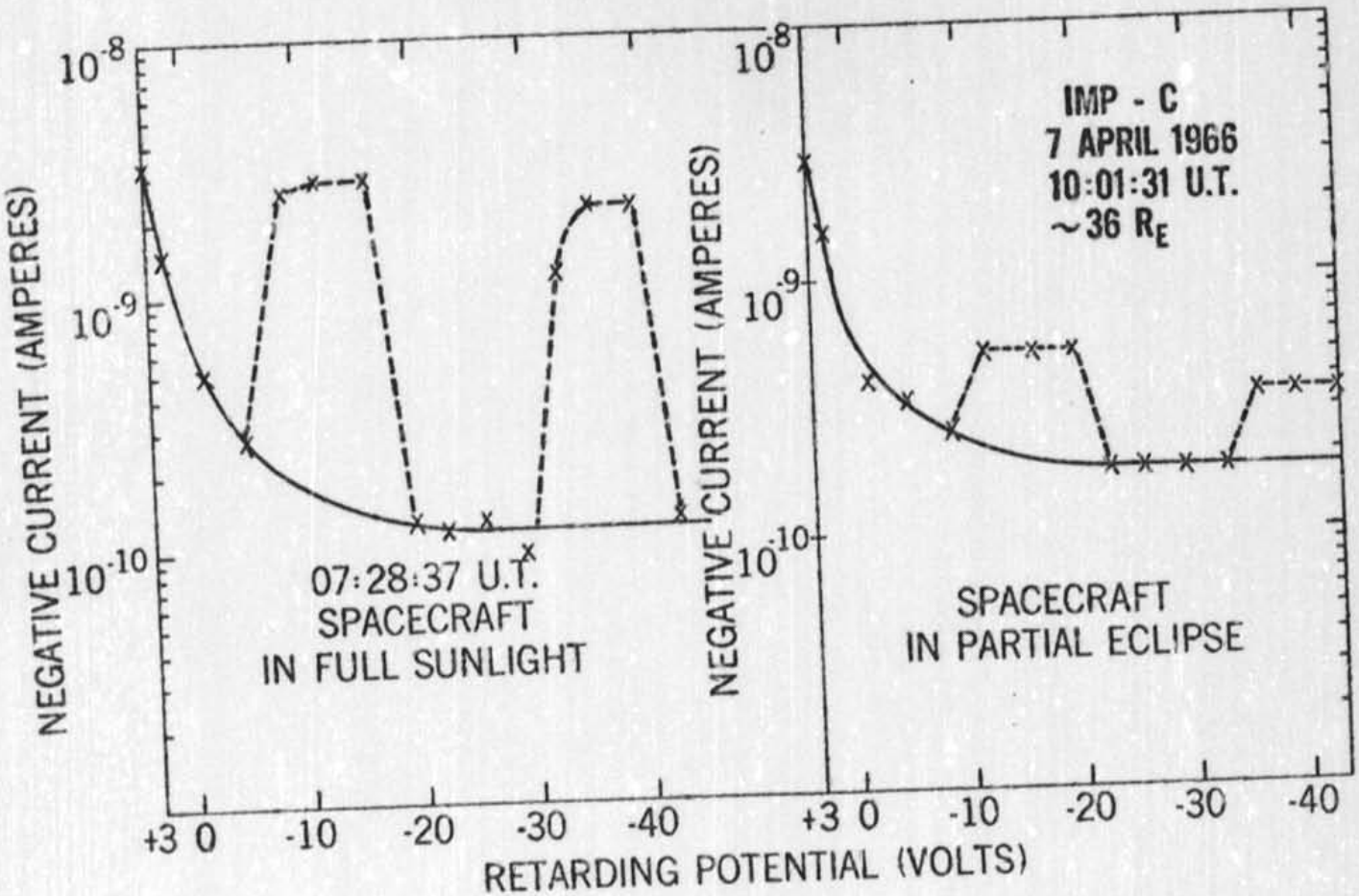
V. APPENDIX

Copies of publications to date.

IMP – C
RETARDING POTENTIAL ANALYSER



	ELECTRON		ION		NET CURRENT	
APERTURE	+50	+15	-50	-15	0	0
RETARDING	-45 → 0	-15 → 0	0 → +45	0 → +15	0	0
SUPPRESSOR	0	0	-50	-15	0	0
COLLECTOR	+15	+15	-15	-15	0	0
ELECTROMETER POLARITY	-	-	+	+	-	+


IMP - C
7 APRIL 1966
10:01:31 U.T.
~36 R_E
07:28:37 U.T.
SPACECRAFT
IN FULL SUNLIGHT
SPACECRAFT
IN PARTIAL ECLIPSE
NEGATIVE CURRENT (AMPERES)
NEGATIVE CURRENT (AMPERES)
10^{-8}
10^{-9}
10^{-10}
+3 0 -10 -20 -30 -40
RETARDING POTENTIAL (VOLTS)

DAY 149 = MAY 29, 1965

```
83H3  9.98E-11  4.67E 01  0.0          0.0          0.0          1.23E-08  0.0          4.
9E 02      70 149 13 11  7.82E 02  5.42E 00  3.8  91 -34123L2  6.47E-11  0.0
 -2.10E-01  1.07E-08  7.87E 02  6.41E-11  1.78E-01 -1.39E 02      71 149 13 13
.0  92 -34151L2  5.58E-11  0.0          1.44E-08  1.32E 00  5.70E-01  1.07E-08  6.
4E-01 -1.39E 02      71 149 13 13  6.68E 02  5.80E 00  4.0  92 -34133H1  1.92E-1
  2.41E 00  7.71E-01  7.00E-09  3.34E 02  8.80E-11  1.49E-01 -1.39E 02      102 1
41E 00  5.6  94 -36142H1  1.82E-10  5.31E 01  7.91E-09  2.79E 00  1.38E 00  6.
0E-11  1.53E-01 -1.39E 02      102 149 13 55  2.52E 02  8.41E 00  5.6  94 -36151H
  8.83E-09  3.25E 00  2.24E 00  6.57E-09  2.70E 02  8.80E-11  2.00E-01 -1.39E
.52E 02  8.41E 00  5.6  94 -36133L2  1.67E-10  0.0          2.80E-09  1.80E 00  6.
2E 02  1.73E-10  7.51E-02 -1.39E 02      103 149 13 56  2.52E 02  8.41E 00  5.6
  0.0          6.92E-09  1.91E 00  8.69E-01  6.57E-09  3.52E 02  1.73E-10  7.79E-
9 13 56  2.52E 02  8.41E 00  5.6  94 -36123H1  1.21E-10  8.54E 01  2.44E-09  2.
3E-09  3.24E 02  7.98E-11  1.38E-01 -1.39E 02      118 149 14 17  1.75E 02  9.47
  1.17E-10  1.04E 02  7.65E-09  2.60E 00  8.11E-01  5.03E-09  2.31E 02  7.98E-
  118 149 14 17  1.75E 02  9.47E 00  6.3  94 -35143L2  1.32E-10  0.0          2
0E-01  6.49E-09  3.66E 02  1.41E-10  5.92E-02 -1.39E 02      119 149 14 18  1.61
3 -35151L2  1.29E-10  0.0          7.46E-09  1.81E 00  7.18E-01  6.49E-09  3.57E
 -1.39E 02      119 149 14 18  1.61E 02  9.71E 00  6.5  93 -35153H1  7.42E-11  2
6E 00  1.68E 00  5.59E-09  2.71E 02  7.19E-11  1.49E-01 -1.39E 02      134 149 1
01  7.1  91 -35162H1  1.10E-10  8.63E 01  6.47E-09  2.54E 00  1.68E 00  0.0
  1.22E-01 -1.39E 02      134 149 14 39  1.19E 02  1.06E 01  7.1  91 -35 83H3  7
  0.0          0.0          4.95E-09  0.0          6.91E-11  1.52E-01 -1.39E 02
01  1.14E 01  7.8  89 -34143L2  9.10E-11  0.0          2.55E-09  2.04E 00  9.73E-
  1.11E-10  6.57E-02 -1.39E 02      151 149 15  2  8.58E 01  1.16E 01  7.9  88 -
  6.49E-09  2.02E 00  9.68E-01  6.38E-09  3.32E 02  1.11E-10  8.68E-02 -1
2  8.58E 01  1.16E 01  7.9  88 -34153H1  1.84E-10  6.33E 01  1.79E-09  2.14E
  3.59E 02  1.05E-10  1.65E-01 -1.39E 02      166 149 15 22  6.81E 01  1.22E 01

162H1  1.84E-10  6.55E 01  7.21E-09  2.31E 00  1.46E 00  0.0          3.59E 02
9E 02      166 149 15 22  6.81E 01  1.22E 01  8.5  86 -33 83H3  2.52E-10  2.38E
  0.0          5.19E-09  0.0          2.59E-10  5.95E-02 -1.39E 02      182 149 15 44
.1  83 -32163L2  2.10E-10  0.0          2.48E-09  2.07E 00  1.31E 00  7.25E-09
3E-01 -1.39E 02      183 149 15 46  5.53E 01  1.28E 01  9.1  83 -32171L2  2.15E-
  1.94E 00  1.05E 00  7.25E-09  3.85E 02  2.26E-10  3.23E-01 -1.39E 02      183
.28E 01  9.1  83 -32 83H3  2.18E-10  4.44E 02  0.0          0.0          0.0
1E-10  7.08E-02 -1.39E 02      198 149 16  6  4.57E 01  1.34E 01  9.7  79 -32 8
  0.0          0.0          0.0          0.0          0.0          2.48E-10  1.27E-01 -1.39E
.39E 01  1.42E 01 10.6  74 -30 83H3  3.32E-10  1.21E 02  0.0          0.0
  2.43E-10  5.37E-02 -1.39E 02      238 149 17  1  2.91E 01  1.47E 01 11.1
  1.37E 02  0.0          0.0          0.0          0.0          0.0          2.03E-10  1.40E
9 17 23  2.43E 01  1.52E 01 11.8  65 -28 73H3  2.20E-10  3.11E 02  0.0
7E-09  0.0          1.56E-10  9.75E-02 -1.39E 02      270 149 17 44  2.13E 01  1.5
  1.87E-10  3.38E 02  0.0          0.0          0.0          4.84E-09  0.0          1.65E
  28E 149 18  6  1.88E 01  1.59E 01 12.7  58 -26 83H3  2.77E-10  1.09E 02
  5.82E-09  0.0          2.03E-10  4.20E-02 -1.39E 02      302 149 18 28  1.6
3 -25 83H3  2.73E-10  1.68E 02  0.0          0.0          0.0          0.0          0.0
-1.39E 02      326 149 19  1  1.38E 01  1.68E 01 14.0  47 -24 83H3  2.86E-10
  0.0          4.87E-09  0.0          1.91E-10  2.54E-01 -1.39E 02      342 149
01 14.5  42 -23172H1  1.90E-10  1.87E 18  7.31E-09  2.46E 00  0.0          0.0
  1.13E-01 -1.39E 02      358 149 19 45  1.11E 01  1.75E 01 14.9  38 -22 83H3
  0.0          0.0          3.72E-09  0.0          1.27E-10  3.58E-01 -1.39E 02
01  1.79E 01 15.3  34 -22143L2  1.02E-10  0.0          2.21E-09  2.29E 00  1.17
1.31E-10  1.83E-01 -1.39E 02      375 149 20  8  9.90E 00  1.79E 01 15.4  33
  5.36E-09  2.19E 00  1.02E 00  5.48E-09  2.74E 02  1.31E-10  1.70E-01
8  9.90E 00  1.79E 01 15.4  33 -22153H1  1.99E-10  4.52E 02  1.82E-09  2.11
  3.22E 02  1.81E-10  9.35E-02 -1.39E 02      390 149 20 28  9.10E 00  1.83E 0

162H1  1.85E-10  8.92E 14  5.86E-09  2.51E 00  2.37E 00  7.10E-09  3.32E 02
9E 02      390 149 20 28  9.10E 00  1.83E 01 15.9  29 -21171H1  1.84E-10  7.05
  2.83E 00  7.10E-09  3.20E 02  1.81E-10  1.24E-01 -1.39E 02      390 149 20 3
.9  29 -21153L2  1.48E-10  0.0          2.19E-09  2.08E 00  1.20E 00  6.03E-09
7E-01 -1.39E 02      407 149 20 52  8.40E 00  1.86E 01 16.2  25 -20171L2  1.49
```

23E-08 0.0 4.22E-11 1.85E-01 -1.3 REC 1. LENGTH 2790
2 6.47E-11 0.0 5.36E-09 1.00E 00
2 71 149 13 13 6.68E 02 5.80E 00 4
70E-01 1.07E-08 6.86E 02 6.41E-11 2.9
92 -34133H1 1.92E-10 4.48E 01 2.73E-09
1 -1.39E 02 102 149 13 55 2.52E 02 8
79E 00 1.38E 00 6.57E-09 2.91E 02 8.8
E 00 5.6 94 -36151H1 1.57E-10 6.96E 01
11 2.00E-01 -1.39E 02 102 149 13 55 2
80E-09 1.80E 00 6.32E-01 6.57E-09 3.6
E 02 8.41E 00 5.6 94 -36151L2 1.62E-10
02 1.73E-10 7.79E-02 -1.39E 02 103 14
54E 01 2.44E-09 2.29E 00 7.90E-01 6.6
4 17 1.75E 02 9.47E 00 6.3 94 -35142H1
09 2.31E 02 7.98E-11 1.50E-01 -1.39E 02
32E-10 0.0 2.84E-09 1.72E 00 5.2
119 149 14 18 1.61E 02 9.71E 00 6.5 9
01 6.49E-09 3.57E 02 1.41E-10 6.73E-02
35153H1 7.42E-11 2.13E 18 1.82E-09 2.6
39E 02 134 149 14 39 1.19E 02 1.06E
00 1.68E 00 0.0 2.71E 02 7.19E-11
7.1 91 -35 83H3 7.26E-11 3.97E 02 0.0
52E-01 -1.39E 02 150 149 15 1 9.13E
09 2.04E 00 9.73E-01 6.38E-09 3.31E 02
1.16E 01 7.9 88 -34171L2 9.17E-11 0.0
11E-10 8.68E-02 -1.39E 02 151 149 15
01 1.79E-09 2.14E 00 1.46E 00 7.10E-09
6.81E 01 1.22E 01 8.5 86 -33

0.0 3.59E 02 1.05E-10 1.60E-01 -1.3 REC 2. LENGTH 2790
3H3 2.52E-10 2.38E 04 0.0 0.0
02 182 149 15 44 5.53E 01 1.28E 01 9
1.31E 00 7.25E-09 3.73E 02 2.26E-10 3.3
83 -32171L2 2.15E-10 0.0 6.95E-09
-01 -1.39E 02 183 149 15 46 5.53E 01 1
0.0 0.0 4.64E-09 0.0 2.0
4E 01 9.7 79 -32 83H3 3.10E-10 1.66E 02
-10 1.27E-01 -1.39E 02 222 149 16 39 3
0.0 0.0 0.0 0.0 0.0
1E 01 1.47E 01 11.1 70 -29 83H3 2.68E-10
2.03E-10 1.40E-01 -1.39E 02 254 14
3.11E 02 0.0 0.0 0.0 5.5
17 44 2.13E 01 1.55E 01 12.3 62 -27 83H3
-09 0.0 1.65E-10 3.85E-02 -1.39E 02
2.77E-10 1.09E 02 0.0 0.0 0.0
302 149 18 28 1.62E 01 1.63E 01 13.3 5
0.0 0.0 2.21E-10 8.66E-02
-24 83H3 2.86E-10 1.09E 02 0.0 0.0
-1.39E 02 342 149 19 23 1.22E 01 1.72E
E 00 0.0 0.0 2.91E 02 1.92E-10
14.9 38 -22 83H3 1.41E-10 3.43E 02 0.0
3.58E-01 -1.39E 02 374 149 20 6 1.01E
E-09 2.29E 00 1.17E 00 5.48E-09 2.68E 02
1.79E 01 15.4 33 -22161L2 1.08E-10 0.0
1.31E-10 1.70E-01 -1.39E 02 375 149 20
E 02 1.82E-09 2.11E 00 1.12E 00 6.31E-09
8 9.10E 00 1.83E 01 15.9 29 -21

7.10E-09 3.32E 02 1.81E-10 1.09E-01 -1.3 REC 3. LENGTH 2790
71H1 1.84E-10 7.05E 10 8.15E-09 2.69E 00
E 02 390 149 20 28 9.10E 00 1.83E 01 15
1.20E 00 6.03E-09 3.09E 02 1.95E-10 2.1
2 25 -20171L2 1.49E-10 0.0 5.90E-09

65-042A-01A
Expl 28, RETARDING POTENTIAL ANALYSER

5/29/65 - 5/5/67
Partial dump of D-01940

```
  1.68E 00  1.01E 00  6.03E-09  3.17E 02  1.55E-10  2.05E-01 -1.39E 02     407 1
.86E 01 16.2  25 -20133H1  1.72E-10  6.44E 12  2.09E-09  2.28E 00  2.85E-01  4.
5E-10  1.89E-01 -1.39E 02     414 149 21  1  8.10E 00  1.88E 01 16.4  23 -20142H
  5.45E-09  2.86E 00  1.58E 00  4.87E-09  2.13E 02  1.95E-10  2.30E-01 -1.39E 0
.10E 00  1.88E 01 16.4  23 -20151H1  1.67E-10  1.55E 14  6.46E-09  3.22E 00  2.
1E 02  1.85E-10  2.53E-01 -1.39E 02     414 149 21  1  8.10E 00  1.88E 01 16.4
  0.0       3.64E-09  1.56E 00  2.56E-01  7.63E-09  4.52E 02  2.60E-10  2.42E-0
9 21 24  7.40E 00  1.92E 01 16.9  18 -20161L2  2.43E-10  0.0       8.41E-09  1.
3E-09  4.08E 02  2.60E-10  2.36E-01 -1.39E 02     431 149 21 24  7.40E 00  1.92E
  2.43E-10  0.0       8.41E-09  1.91E 00  7.84E-01  7.63E-09  4.08E 02  2.60E-1
    431 149 21 24  7.40E 00  1.92E 01 16.9  18 -20133H1  2.13E-10  7.66E 01  2.
8E-01  4.76E-09  2.89E 02  1.34E-10  1.32E-01 -1.39E 02     438 149 21 34  7.10E
6 -19142H1  1.75E-10  1.77E 02  6.60E-09  2.44E 00  1.10E 00  4.76E-09  2.26E 0
 -1.39E 02     438 149 21 34  7.10E 00  1.93E 01 17.1  16 -19151H1  1.46E-10  2.
6E 00  1.99E 00  4.76E-09  2.05E 02  1.34E-10  3.04E-01 -1.39E 02     438 149 21
01 17.1  16 -19123L2  1.24E-10  0.0       2.49E-09  1.88E 00  5.33E-01  5.34E-0
  1.75E-01 -1.39E 02     447 149 21 46  6.90E 00  1.95E 01 17.3  14 -19151L2  1.
6E-09  2.03E 00  8.89E-01  5.34E-09  2.78E 02  1.26E-10  1.65E-01 -1.39E 02
00  1.95E 01 17.3  14 -19151L2  1.18E-10  0.0       5.56E-09  2.03E 00  8.89E-0
  1.26E-10  1.65E-01 -1.39E 02     447 149 21 46  6.90E 00  1.95E 01 17.3  14 -1
7E 01  1.96E-09  1.66E 00 -2.09E-01  4.25E-09  2.44E 02  9.10E-11  3.42E-01 -1.
56  6.60E 00  1.97E 01 17.5  12 -19132H1  1.58E-10  9.64E 01  4.23E-09  2.77E
  2.05E 02  9.10E-11  3.69E-01 -1.39E 02     454 149 21 56  6.60E 00  1.97E 01

151H1  1.50E-10  1.16E 02  5.00E-09  3.19E 00  2.94E 00  4.61E-09  1.91E 02  9
9E 02     454 149 21 56  6.60E 00  1.97E 01 17.5  12 -19123H1  1.67E-10  4.91E
  8.20E-01  4.11E-09  2.02E 02  6.78E-11  3.61E-01 -1.38E 02     478 149 22 28
.1   5 -19142H1  1.68E-10  5.42E 01  4.45E-09  2.69E 00  1.20E 00  3.43E-09  1
4E-01 -1.38E 02     478 149 22 28  5.90E 00  2.03E 01 18.1   5 -19143L2  1.93E-
  1.87E 00  9.67E-01  5.69E-09  3.08E 02  2.07E-10  4.38E-01 -1.38E 02     479
.03E 01 18.1   5 -19151L2  1.94E-10  0.0       5.84E-09  1.85E 00  9.24E-01  5
7E-10  4.20E-01 -1.38E 02     479 149 22 30  5.90E 00  2.03E 01 18.1   5 -19143
  2.93E-09  1.67E 00  3.39E-01  6.15E-09  3.52E 02  2.06E-10  3.80E-01 -1.38E
.60E 00  2.07E 01 18.5   0 -19161L2  1.80E-10  0.0       6.83E-09  1.88E 00  7
2E 02  2.06E-10  3.57E-01 -1.38E 02     495 149 22 52  5.60E 00  2.07E 01 18.5
  2.65E 01  0.0       0.0       0.0       3.93E-09  0.0       8.38E-11  5.86E-
9 23 12  5.20E 00  2.11E 01 18.9  -5 -19123L2  2.71E-10  0.0       2.95E-09  1
1E-09  3.31E 02  3.01E-10  3.05E-01 -1.38E 02     527 149 23 35  4.90E 00  2.15
  2.56E-10  0.0       6.20E-09  1.98E 00  8.44E-01  5.81E-09  3.06E 02  3.01E-
  527 149 23 35  4.90E 00  2.15E 01 19.2  -9 -19143H1  2.11E-10  3.64E 01  2
3E-01  5.87E-09  3.12E 02  7.24E-11  4.69E-01 -1.38E 02     542 149 23 56  4.70
4 -19152H1  2.15E-10  3.85E 01  7.70E-09  2.28E 00  8.06E-01  4.76E-09  2.33E
 -1.38E 02     542 149 23 56  4.70E 00  2.19E 01 19.6 -14 -19161H1  2.07E-10  4
7E 00  1.86E 00  4.76E-09  2.12E 02  7.24E-11  4.84E-01 -1.38E 02     542 149 2
01 19.6 -14 -19133L2  1.93E-10  0.0       2.83E-09  1.93E 00  8.49E-01  6.99E-
  2.94E-01 -1.38E 02     543 149 23 57  4.60E 00  2.20E 01 19.7 -15 -19151L2  1
2E-09  1.97E 00  9.33E-01  6.99E-09  3.68E 02  1.90E-10  2.69E-01 -1.38E 02
00  2.20E 01 19.7 -15 -19133L2  3.02E-10  0.0       2.82E-09  2.10E 00  1.41E
  2.87E-10  2.40E-01 -1.38E 02     559 150  0 19  4.40E 00  2.24E 01 20.0 -19 -
19  4.40E 00  2.24E 01 20.0 -19 -19133H1  4.21E-10  2.69E 01  2.16E-09  2.95E
  2.93E 02  1.21E-10  3.08E-01 -1.38E 02     574 150  0 40  4.20E 00  2.28E 01

152H1  4.81E-10  2.68E 01  6.95E-09  2.92E 00  7.95E-01  4.76E-09  2.06E 02
8E 02     574 150  0 40  4.20E 00  2.28E 01 20.3 -23 -19133L2  1.94E-10  0.0
  5.89E-01  7.04E-09  4.03E 02  1.84E-10  3.33E-01 -1.38E 02     575 150  0 41
.3 -23 -19151L2  1.86E-10  0.0       7.33E-09  1.82E 00  8.97E-01  7.04E-09
4E-01 -1.38E 02     575 150  0 41  4.20E 00  2.28E 01 20.3 -23 -19133L2  3.18E
  1.30E 00 -2.95E-01  5.87E-09  3.81E 02  3.48E-10  4.01E-01 -1.38E 02     591
.34E 01 20.7 -29 -20151L2  3.02E-10  0.0       6.91E-09  1.76E 00  5.83E-01
8E-10  4.15E-01 -1.38E 02     591 150  1  3  4.00E 00  2.34E 01 20.7 -29 -2013
  2.88E-09  1.49E 00 -1.47E 00  2.94E-09  1.78E 02  6.27E-11  4.22E-01 -1.38E
.90E 00  2.38E 01 21.0 -33 -20133H1  1.04E-09  1.52E 01  3.22E-09  2.21E 00
```

```
05E-01 -1.39E 02    407 149 20 52  8.40E 00  1
9  2.28E 00  2.89E-01  4.58E-09  2.25E 02  1.8
1.88E 01 16.4  23 -20142H1  1.69E-10  2.16E 12
85E-10  2.30E-01 -1.39E 02    414 149 21  1  8
4  6.46E-09  3.22E 00  2.29E 00  4.87E-09  2.0
8.10E 00  1.88E 01 16.4  23 -20143L2  2.67E-10
52E 02  2.60E-10  2.42E-01 -1.39E 02    431 14
0  0.0        8.41E-09  1.91E 00  7.84E-01  7.6
149 21 24  7.40E 00  1.92E 01 16.9  18 -20161L2
63E-09  4.08E 02  2.60E-10  2.36E-01 -1.39E 02
H1  2.13E-10  7.66E 01  2.30E-09  1.49E 00 -4.1
02    438 149 21 34  7.10E 00  1.93E 01 17.1  1
10E 00  4.76E-09  2.26E 02  1.34E-10  2.52E-01
16 -19151H1  1.46E-10  2.54E 17  7.16E-09  2.9
01 -1.39E 02    438 149 21 34  7.10E 00  1.93E
88E 00  5.33E-01  5.34E-09  2.89E 02  1.26E-10
E 01 17.3  14 -19151L2  1.18E-10  0.0        5.5
10  1.65E-01 -1.39E 02    447 149 21 46  6.90E
56E-09  2.03E 00  8.89E-01  5.34E-09  2.79E 02
E 00  1.95E 01 17.3  14 -19123H1  1.71E-10  7.1
02  9.10E-11  3.42E-01 -1.39E 02    454 149 21
64E 01  4.23E-09  2.77E 00  2.14E 00  4.61E-09
1 56  6.60E 00  1.97E 01 17.5  12 -19

00  4.61E-09  1.91E 02  9.10E-11  3.51E-01 -1.3  REC      4, LENGTH  2790
19123H1  1.67E-10  4.91E 01  1.49E-09  2.28E 00
38E 02    478 149 22 28  5.90E 00  2.03E 01 18
00  1.20E 00  3.43E-09  1.55E 02  6.78E-11  3.3
18.1  5 -19143L2  1.93E-10  0.0        2.10E-09
38E-01 -1.38E 02    479 149 22 30  5.90E 00  2
09  1.85E 00  9.24E-01  5.69E-09  3.09E 02  2.0
2.03E 01 18.1  5 -19143L2  1.87E-10  0.0
06E-10  3.80E-01 -1.38E 02    495 149 22 52  5
    6.83E-09  1.88E 00  7.72E-01  6.15E-09  3.3
5.60E 00  2.07E 01 18.5  0 -19 83H3  2.90E-10
0        8.38E-11  5.86E-01 -1.38E 02    510 14
10  0.0        2.95E-09  1.69E 00  2.48E-01  5.8
149 23 35  4.90E 00  2.15E 01 19.2  -9 -19151L2
81E-09  3.06E 02  3.01E-10  2.91E-01 -1.38E 02
H1  2.11E-10  3.64E 01  2.14E-09  1.94E 00  4.6
02    542 149 23 56  4.70E 00  2.19E 01 19.6 -1
06E-01  4.76E-09  2.33E 02  7.24E-11  4.54E-01
-14 -19161H1  2.07E-10  4.23E 01  7.72E-09  2.7
-01 -1.38E 02    542 149 23 56  4.70E 00  2.19E
93E 00  8.49E-01  6.99E-09  3.72E 02  1.90E-10
E 01 19.7 -15 -19151L2  1.91E-10  0.0        7.1
-10  2.69E-01 -1.38E 02    543 149 23 57  4.60E
82E-09  2.10E 00  1.41E 00  8.48E-09  4.33E 02
E 00  2.24E 01 20.0 -19 -19151L2  3.15E-10  0.0
02  2.87E-10  2.26E-01 -1.38E 02    559 150  0
69E 01  2.16E-09  2.95E 00  1.89E 00  6.81E-09
0 40  4.20E 00  2.28E 01 20.3 -23 -19

-01  4.76E-09  2.06E 02  1.21E-10  3.10E-01 -1.3  REC      5, LENGTH  2790
-19133L2  1.94E-10  0.0        2.89E-09  1.67E 00
1.38E 02    575 150  0 41  4.20E 00  2.28E 01 20
00  8.97E-01  7.04E-09  3.86E 02  1.84E-10  3.1
20.3 -23 -19133L2  3.18E-10  0.0        3.70E-09
4.01E-01 -1.38E 02    591 150  1  3  4.00E 00  2
-09  1.76E 00  5.83E-01  5.87E-09  3.27E 02  3.4
2.34E 01 20.7 -29 -20133H1  2.87E-10  2.57E 01
6.27E-11  4.22E-01 -1.38E 02    606 150  1 23  3
01  3.22E-09  2.21E 00  1.36E 00  1.17E-08  5.8
```

```
5E 01  0.0        0.0        0.0        1.33E-09  0.0        1.25E-10  4.06E-02 -1.63
36  1.26E 01  5.38E 01 16.3  -8  57163L2  8.47E-11  0.0        5.25E-10  2.37E 00
  0.0        9.09E-11  1.15E-01 -1.63E 02      402125  6 37  1.28E 01  5.39E 01 16.

 83H3  8.81E-11  7.67E 01  0.0        0.0        0.0        9.01E-10  0.0        5.21
3E 02      552125  6 56  1.35E 01  5.41E 01 16.0 -14  57 83H3  9.82E-11  4.37E 01
  0.0        1.11E-09  0.0        4.04E-11  9.60E-02 -1.63E 02      712125  7 20  1.
.7 -19  57 83H3  1.12E-10  5.95E 01  0.0        0.0        0.0        0.0        0.0
4E-02 -1.63E 02      872125  7 42  1.52E 01  5.38E 01 15.4 -23  58143H1  2.98E-10
  1.72E 00  1.63E 00  2.82E-09  1.59E 02  1.16E-10  9.56E-02 -1.63E 02     1512125
.09E 01 14.0 -42  58162H1  3.12E-10  3.71E 01  2.52E-09  2.00E 00  1.63E 00  0.0
6E-10  9.29E-02 -1.63E 02     1512125  9  9  2.04E 01  5.09E 01 14.0 -42  58143H1
  4.48E-10  1.84E 00  1.71E 00  2.56E-09  1.40E 02  1.11E-10  7.76E-02 -1.63E 02
.18E 01  4.97E 01 13.7 -46  58162H1  2.78E-10  3.95E 01  2.27E-09  2.10E 00  1.71
0E 02  1.11E-10  9.21E-02 -1.63E 02     1672125  9 31  2.18E 01  4.97E 01 13.7 -46
  3.57E 01  4.64E-10  1.82E 00  1.91E 00  3.01E-09  1.65E 02  1.09E-10  9.94E-02 -
5  9 53  2.39E 01  4.85E 01 13.3 -51  59182H1  3.14E-10  3.63E 01  2.71E-09  1.92
       1.65E 02  1.09E-10  9.22E-02 -1.63E 02     1832125  9 53  2.39E 01  4.85E 01
  2.59E-10  3.79E 01  4.74E-10  1.79E 00  2.03E 00  3.41E-09  1.89E 02  1.04E-10
     1992125 10 15  2.57E 01  4.73E 01 12.9 -54  59172H1  2.83E-10  3.80E 01  3.13
3E 00  0.0        1.85E 02  1.04E-10  8.30E-02 -1.63E 02     1992125 10 15  2.57E 01
4  59 83H3  1.72E-10  5.33E 01  0.0        0.0        0.0        0.0        0.0
 -1.63E 02     2392125 11  9  3.20E 01  4.37E 01 12.0 -62  58 83H3  1.20E-10  4.96
       0.0        9.03E-10  0.0        5.47E-11  5.94E-02 -1.63E 02     2552125 11 3
01 11.7 -64  58 83H3  1.13E-10  5.89E 01  0.0        0.0        0.0        8.35E-10
  5.08E-02 -1.63E 02     2712125 11 53  3.88E 01  4.05E 01 11.3 -67  58 83H3  2.25
       0.0        0.0        1.32E-09  0.0        1.52E-10  3.91E-02 -1.63E 02     287
01  3.91E 01 10.9 -68  58163L2  9.55E-11  0.0        5.03E-10  2.42E 00  0.0
  1.04E-10  1.06E-01 -1.63E 02     2882125 12 16  4.25E 01  3.91E 01 10.9 -68  581
6E 01  2.97E-10  1.77E 00  2.04E 00  2.20E-09  1.22E 02  9.57E-11  8.97E-02 -1.63
36  4.66E 01  3.72E 01 10.6 -70  58152H1  2.78E-10  3.37E 01  1.48E-09  2.15E 00
  1.45E 02  9.57E-11  1.72E-01 -1.63E 02     3032125 12 36  4.66E 01  3.72E 01 10.

161H1  2.85E-10  3.41E 01  2.64E-09  2.19E 00  3.38E 00  2.87E-09  1.44E 02  9.57
3E 02      3032125 12 36  4.66E 01  3.72E 01 10.6 -70  58 83H3  1.14E-10  4.92E 01
  0.0        1.03E-09  0.0        5.20E-11  5.99E-02 -1.63E 02     3352125 13 20  5.
.8 -71  57163L2  9.91E-11  0.0        4.71E-10  2.47E 00  3.73E 00  3.06E-09  1.44
9E-02 -1.63E 02     3522125 13 43  6.58E 01  3.03E 01  9.4 -71  56171L2  1.09E-10
  1.54E 00  1.39E 00  3.06E-09  1.82E 02  1.07E-10  1.77E-01 -1.63E 02     3522125
.03E 01  9.4 -71  56 83H3  6.94E-11  1.18E 02  0.0        0.0        0.0        1.15
2E-11  2.80E-01 -1.62E 02     3912125 14 37  8.52E 01  2.42E 01  8.6 -70  54153H1
  1.11E-09  2.42E 00  2.21E 00  5.12E-09  2.43E 02  2.38E-10  9.98E-02 -1.62E 02
.02E 02  1.99E 01  8.0 -69  51 83H3  1.47E-10  1.07E 02  0.0        0.0        0.0
       1.04E-10  1.12E-01 -1.62E 02     4312125 15 31  1.13E 02  1.74E 01  7.7 -67
  0.0        6.82E-10  2.28E 00  2.67E 00  3.28E-09  1.61E 02  9.18E-11  9.75E-02 -
5 15 33  1.15E 02  1.69E 01  7.6 -67  48141L2  1.10E-10  0.0        3.17E-09  1.43
8E-09  2.01E 02  9.18E-11  1.64E-01 -1.62E 02     4322125 15 33  1.15E 02  1.69E 01
  2.98E-10  9.79E 01  1.16E-09  1.59E 00  8.38E-01  5.06E-09  2.97E 02  2.07E-10
     4472125 15 53  1.26E 02  1.46E 01  7.3 -66  45162H1  2.68E-10  1.68E 02  4.75
0E 00  4.74E-09  2.36E 02  2.07E-10  2.15E-01 -1.62E 02     4472125 15 53  1.26E 02
6  45 43H3  3.21E-10  5.29E 01  0.0        0.0        0.0        0.0        0.0
 -1.62E 02     4632125 16 15  1.37E 02  1.26E 01  7.0 -65  42123H1  4.93E-10  7.60
6E 00  2.79E 00  5.56E-09  2.65E 02  3.28E-10  9.28E-02 -1.62E 02     4792125 16 3
01  6.8 -63  38142H1  5.61E-10  6.27E 01  5.39E-09  2.35E 00  2.01E 00  5.63E-09
  1.22E-01 -1.62E 02     4792125 16 37  1.47E 02  1.09E 01  6.8 -63  38151H1  4.85
0E-09  2.89E 00  2.57E 00  5.63E-09  2.45E 02  3.28E-10  1.67E-01 -1.62E 02     47
02  1.09E 01  6.8 -63  38163L2  2.94E-10  0.0        1.56E-09  1.98E 00  0.0
  3.00E-10  9.52E-02 -1.62E 02     4802125 16 38  1.49E 02  1.05E 01  6.7 -63  37
5E 02  0.0        0.0        0.0        3.12E-09  0.0        9.86E-11  6.86E-02 -1.62
59  1.57E 02  9.13E 00  6.5 -62  33133H1  2.42E-10  6.77E 01  1.38E-09  1.98E 00
  3.34E 02  1.46E-10  6.60E-02 -1.62E 02     5112125 17 20  1.62E 02  8.02E 00  6.

152H1  2.44E-10  7.43E 01  6.56E-09  2.14E 00  1.34E 00  5.06E-09  2.56E 02  1.46
```

```
  1.25E-10  4.06E-02 -1.63E 02      392125  6
       5.25E-10  2.37E 00  0.0         0.0
37  1.28E 01  5.39E 01 16.2  -9  57

  9.01E-10  0.0        5.21E-11  4.61E-02 -1.6  REC     12, LENGTH  2790
 83H3  9.82E-11  4.37E 01  0.0         0.0
3E 02      712125  7 20  1.43E 01  5.39E 01 15
  0.0         0.0         0.0        5.96E-11  9.9
.4 -23  58143H1  2.98E-10  3.51E 01  4.57E-10
6E-02 -1.63E 02     1512125  9  9  2.04E 01  5
  2.00E 00  1.63E 00  0.0         1.59E 02  1.1
.09E 01 14.0 -42  58143H1  2.67E-10  3.72E 01
1E-10  7.76E-02 -1.63E 02     1672125  9 31  2
  2.27E-09  2.10E 00  1.71E 00  0.0         1.4
.18E 01  4.97E 01 13.7 -46  58163H1  2.90E-10
5E 02  1.09E-10  9.94E-02 -1.63E 02      183212
  3.63E 01  2.71E-09  1.92E 00  1.91E 00  0.0
5  9 53  2.39E 01  4.85E 01 13.3 -51  59163H1
1E-09  1.89E 02  1.04E-10  8.64E-02 -1.63E 02
  2.83E-10  3.80E 01  3.13E-09  1.80E 00  2.0
    1992125 10 15  2.57E 01  4.73E 01 12.9 -5
       0.0         0.0        8.57E-11  6.10E-02
2  58 83H3  1.20E-10  4.96E 01  0.0         0.0
 -1.63E 02     2552125 11 31  3.48E 01  4.25E
       0.0         8.35E-10  0.0         5.76E-11
01 11.3 -67  58 83H3  2.25E-10  7.63E 01  0.0
  3.91E-02 -1.63E 02     2872125 12 15  4.25E
3E-10  2.42E 00  0.0         0.0         0.0
01  3.91E 01 10.9 -68  58133H1  2.66E-10  3.1
  9.57E-11  8.97E-02 -1.63E 02     3032125 12
7E 01  1.48E-09  2.15E 00  3.32E 00  2.87E-09
36  4.66E 01  3.72E 01 10.6 -70  58

  2.87E-09  1.44E 02  9.57E-11  1.65E-01 -1.6  REC     13, LENGTH  2790
 83H3  1.14E-10  4.92E 01  0.0         0.0
3E 02      3352125 13 20  5.80E 01  3.30E 01  9
  3.73E 00  3.06E-09  1.44E 02  1.07E-10  8.3
.4 -71  56171L2  1.09E-10  0.0         2.34E-09
7E-01 -1.63E 02     3522125 13 43  6.58E 01  3
  0.0         0.0         1.15E-09  0.0         4.7
.42E 01  8.6 -70  54153H1  3.04E-10  1.42E 02
8E-10  9.98E-02 -1.62E 02     4152125 15  9  1
  0.0         0.0         0.0        1.82E-09  0.0
.13E 02  1.74E 01  7.7 -67  49113L2  8.91E-11
1E 02  9.18E-11  9.75E-02 -1.62E 02      432212
  0.0         3.17E-09  1.45E 00  1.02E 00  3.2
5 15 33  1.15E 02  1.69E 01  7.6 -67  48143H1
6E-09  2.97E 02  2.07E-10  9.33E-02 -1.62E 02
  2.68E-10  1.68E 02  4.75E-09  2.21E 00  1.9
    4472125 15 53  1.26E 02  1.46E 01  7.3 -6
       0.0         0.0        1.62E-10  4.93E-02
5  42123H1  4.93E-10  7.60E 01  1.26E-09  2.7
 -1.62E 02     4792125 16 37  1.47E 02  1.09E
5E 00  2.01E 00  5.63E-09  2.72E 02  3.28E-10
01  6.8 -63  38151H1  4.85E-10  9.29E 01  7.0
  1.67E-01 -1.62E 02     4792125 16 37  1.47E
6E-09  1.98E 00  0.0         0.0         0.0
02  1.05E 01  6.7 -63  37 83H3  1.13E-10  2.7
  9.86E-11  6.86E-02 -1.62E 02     4952125 16
7E 01  1.38E-09  1.98E 00  1.51E 00  6.34E-09
20  1.62E 02  8.02E 00  6.3 -61  28

  5.06E-09  2.56E 02  1.46E-10  1.36E-01 -1.6  REC     14, LENGTH  2790
```

```
2E 02    8112125 17 20  1.62E 02  8.02E 00  6.3 -61  28 83H3  1.52E-10  7.95E
  0.0        4.43E-09  0.0          9.37E-11  6.66E-02 -1.62E 02    5272125 17 42
.1 -60  21123L2  7.78E-11  0.0          9.65E-10  1.86E 00  2.00E 00  4.60E-09  2
4E-01 -1.62E 02    5282125 17 44  1.64E 02  6.96E 00  6.1 -60  21151L2  8.73E-
  1.46E 00  1.10E 00  4.60E-09  2.81E 02  9.01E-11  2.21E-01 -1.62E 02    5282
.96E 00  6.1 -60  21153H1  1.84E-10  9.15E 01  1.48E-09  1.68E 00  4.03E-01  4
8E-10  1.05E-01 -1.62E 02    5432125 18  4  1.62E 02  6.40E 00  6.0 -59  16162
  4.67E-09  2.33E 00  2.04E 00  4.95E-09  2.40E 02  1.28E-10  1.43E-01 -1.62E
.62E 02  6.40E 00  6.0 -59  16171H1  1.57E-10  1.90E 02  6.03E-09  2.63E 00  2
6E 02  1.28E-10  1.67E-01 -1.62E 02    5432125 18  4  1.62E 02  6.40E 00  6.0
  0.0        2.24E-09  1.55E 00  9.98E-01  7.63E-09  4.54E 02  2.20E-10  1.20E-
5 18 27  1.58E 02  5.98E 00  5.9 -58  8171L2  2.21E-10  0.0          7.60E-09  1
3E-09  4.56E 02  2.20E-10  1.27E-01 -1.62E 02    5602125 18 27  1.58E 02  5.98
  3.21E-10  8.14E 01  8.20E-09  2.52E 00  2.99E 00  7.55E-09  3.52E 02  1.90E-
    5752125 18 48  1.56E 02  5.86E 00  5.9 -57  2143H1  3.17E-10  6.54E 01  2
6E-01  7.62E-09  4.51E 02  1.88E-10  1.20E-01 -1.62E 02    5912125 19 10  1.54
6  -4152H1  2.74E-10  1.07E 02  7.78E-09  2.30E 00  2.21E 00  8.92E-09  4.35E
 -1.62E 02    5912125 19 10  1.54E 02  1.88E-10  1.82E-01 -1.62E 02    5912125
6E 00  2.75E 00  8.52E-09  4.12E 02  1.88E-10  5.87E 01  0.0          0.0          0.0          4.86E-
00  5.9 -56  -4 83H3  2.05E-10  6072125 19 32  1.54E 02  6.17E 00  6.0 -55 -10143L2
  9.69E-02 -1.62E 02    6072125 19 32  1.54E 02  6.17E 00  6.0 -55 -10143L2
0E-09  1.80E 00  1.29E 00  5.08E-09  2.81E 02  1.05E-10  1.69E-01 -1.62E 02
02  6.26E 00  6.0 -55 -12161L2  1.07E-10  0.0          4.95E-09  1.67E 00  1.02E
  1.05E-10  1.65E-01 -1.62E 02    6082125 19 33  1.54E 02  6.26E 00  6.0 -55
1E 02  0.0          0.0          0.0          6.37E-09  0.0          1.34E-10  5.90E-02 -
53  1.53E 02  6.72E 00  6.1 -54 -17123L2  9.68E-11  0.0          1.47E-09  2.16E
  2.91E 02  1.08E-10  1.07E-01 -1.62E 02    6242125 19 55  1.53E 02  6.72E 00
                    2.85-2800 = 125, 1967 07 5/5/67

151L2  1.12E-10  0.0          5.44E-09  1.76E 00  1.08E 00  5.79E-09  3.23E 02
2E 02    6242125 19 55  1.53E 02  6.72E 00  6.1 -54 -17153H1  2.11E-10  1.00E
  8.60E-01  5.63E-09  2.91E 02  1.50E-10  6.65E-02 -1.62E 02    6392125 20 15
.3 -52 -22162H1  2.01E-10  1.31E 02  5.91E-09  2.47E 00  1.78E 00  5.63E-09
0E-02 -1.62E 02    6392125 20 15  1.50E 02  7.35E 00  6.3 -52 -22171H1  1.86E
  2.84E 00  2.53E 00  5.63E-09  2.47E 02  1.50E-10  1.37E-01 -1.62E 02    639
.35E 00  6.3 -52 -220000
```

```
 1.52E-10  7.95E 01  0.0        0.0
   5272125 17 42  1.64E 02  6.96E 00  6
E 00  4.60E-09  2.50E 02  9.01E-11  1.2
  21151L2  8.73E-11  0.0        4.20E-09
-1.62E 02    5282125 17 44  1.64E 02  6
E 00  4.03E-01  4.60E-09  2.63E 02  1.2
0  6.0 -59  16162H1  1.67E-10  1.39E 02
 1.43E-01 -1.62E 02    5432125 18  4  1
E-09  2.63E 00  2.68E 00  4.95E-09  2.2
2  6.40E 00  6.0 -59  16153L2  2.20E-10
 2.20E-10  1.20E-01 -1.62E 02    560212
       7.60E-09  1.54E 00  9.77E-01  7.6
7  1.58E 02  5.98E 00  5.9 -58   8151H1
 3.52E 02  1.90E-10  1.54E-01 -1.62E 02
7E-10  6.54E 01  2.18E-09  1.65E 00  6.0
912125 19 10  1.54E 02  5.93E 00  5.9 -5
 8.92E-09  4.35E 02  1.88E-10  1.67E-01
161H1  2.53E-10  1.46E 02  1.06E-08  2.5
2E 02    5912125 19 10  1.54E 02  5.93E
 0.0        4.86E-09  0.0        1.09E-10
.0 -55 -10143L2  1.04E-10  0.0        1.5
9E-01 -1.62E 02    6082125 19 33  1.54E
 1.67E 00  1.02E 00  5.08E-09  2.91E 02
.26E 00  6.0 -55 -12 83H3  1.82E-10  1.2
4E-10  5.90E-02 -1.62E 02    6232125 19
 1.47E-09  2.16E 00  2.07E 00  5.79E-09
.53E 02  6.72E 00  6.1 -54 -17

9E-09  3.23E 02  1.08E-10  1.48E-01 -1.6  REC    15, LENGTH   624
 2.11E-10  1.00E 02  1.79E-09  2.06E 00
   6392125 20 15  1.50E 02  7.35E 00  6
8E 00  5.63E-09  2.55E 02  1.50E-10  8.7
2 -22171H1  1.86E-10  1.87E 02  7.13E-09
 -1.62E 02    6392125 20 15  1.50E 02  7
```