Data Set Catalog #121
Search Coil Magnetometer 'A'
64-054A-01A 29 taper

Table of Contents

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1. INTRODUCTION:

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP's).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

When printing, special settings may be required to make the text box appear on the printed output.

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC INFORMATION SYSTEM:

http://nssdc.gsfc.nasa.gov/nmc/

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

a. Associated Documents To find associated documents you will need to know the document ID number and then click here. http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/

b. Core Catalog Materials

OGO 1

37-S SEARCH COIL MAG. DATA, TAPES

64-054A-01A

THIS DATA SET HAS BEEN RESTORED. THERE WERE ORIGINALLY 29 7-TRACK, 556 BPI TAPES. THERE ARE THREE RESTORED TAPES. THERE WAS ONE BAD TAPE; D005640 AND D005649 LOST FILES 4-9. THE DR TAPES ARE 3480 CARTRIDGES AND THE DS TAPES ARE 9-TRACK, 6250 BPI. THE ORIGINAL TAPES WERE CREATED ON AN IBM 7094 COMPUTER. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND TIME SPANS ARE AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR003150	DS003150	D005639	1-2	09/23/64 - 09/29/64
		D005641	3-11	10/26/64 - 11/16/64
		D005642	12-20	11/21/64 - 12/14/64
		D005643	21-23	12/18/64 - 12/26/64
		D005644	24-32	03/08/65 - 03/31/65
		D005645	33-41	04/03/65 - 04/30/65
		D005646	42-50	05/01/65 - 05/26/65
		D005647	51-57	05/27/65 - 06/20/65
DR003151	DS003151	D005648	1-9	09/13/65 - 10/07/65
		D005649	10-12	10/07/65 - 10/31/65
		D005650	13-21	11/03/65 - 11/27/65
		D005651	22-25	11/29/65 - 12/09/65
		D005652	26-28	03/11/66 - 03/18/66
		D005653	29-31	03/16/66 - 03/24/66
		D005654	32-40	04/12/66 - 05/06/66
		D005655	41-47	05/08/66 - 05/27/66
		D005656	48-53	09/03/66 - 09/19/66
		D005657	54-62	09/19/66 - 10/13/66
		D005658	63-71	10/15/66 - 11/08/66
DR003152	DS003152	D005659	1-9	11/11/66 - 12/04/66
		D005660	10-11	12/08/66 - 12/11/66
		D005661	12-19	03/03/67 - 03/24/67
		D005662	20-28	03/24/67 - 04/20/67
		D005663	29-37	04/20/67 - 05/17/67
		D005664	38-46	05/17/67 - 06/05/67
		D005665	47-51	09/03/67 - 09/27/67
		D005666	52-54	09/27/67 - 10/21/67
		D005667	55-63	10/24/67 - 11/17/67

54-054A-01A

This data set consists of 29, 556 BPI, BCD, 7-track tapes made on the IBM/7094. Each revolution of the satellite is recorded on a separate file, but there is not data for every orbit.

D#	C#	Orbits	Files	Start	Stop
D-05639	C-04752	8,9	2	09/23/64	09/29/64
D-05640	C-04753				
D-05641	C-04754	20-28	9	10/25/64	11/16/64
D-05642	C-04755	30-38	9	11/21/64	12/14/64
D-05643	C-04756	40-42	3	12/18/64	12/26/64
D-05644	C-04757	70-78	9	03/08/65	03/21/65
D-05645	C-04758	80-89	10	04/03/65	04/30/65
D-05646	C-04759	90-99	10	05/01/65	05/26/65
D-05647	C-04760	100-106	7	05/27/65	06/2[illegible]/65
D-05648	C-04761	141-149	9	09/13/65	10/07/65
D-05649	C-04762	150-158	9	10/07/65	10/31/65
D-05650	C-04763	160-168	9	11/03/65	11/27/65
D-05651	C-04764	170-173	4	11/29/65	12/09/65
D-05652	C-04765	208-210	3	03/11/66	03/15/66
D-05653	C-04766	210-212	3	03/16/66	03/24/66
D-05654	C-04767	220-228	9	04/12/66	05/06/66
D-05655	C-04768	230-236	7	05/08/66	05/27/66
D-05656	C-04769	274-279	6	09/03/66	09/19/66
D-05657	C-04770	280-288	9	09/19/66	10/13/66
D-05658	C-04771	290-298	9	10/15/66	11/08/66

D#	C#	Orbits	Files	Start	Stop
D-05659	C-04772	300-308	9	11/11/66	12/04/66
D-05660	C-04773	310-311	2	12/08/66	12/11/66
D-05661	C-04774	342-347	8	03/13/67	03/24/67
D-05662	C-04775	350-359	10	03/24/67	04/20/67
D-05663	C-04776	360-369	10	04/20/67	05/17/67
D-05664	C-04777	370-377	8	05/17/67	06/05/67
D-05665	C-04778	411-419	8	09/03/67	09/27/67
D-05666	C-04779	420-428	9	09/27/67	10/21/67
D-05667	C-04780	430-438	9	10/24/67	11/17/67

Note: Tape number D-05640 arrived at the Data Center as a blank tape

The experiment number listed on the header file does not

coincide with the experiment number assigned to this data set by NSSDC.

OGO-3
D5-60E-5708

THE B_s - θ PLOTS FOR THE OGO-1 SEARCH COIL MAGNETOMETER

The spin stabilization of the OGO-1 spacecraft makes it possible for the search coil magnetometer to measure the amplitude and direction of the dc magnetic field in the spin plane of the spacecraft. The methods used to make these measurements are described in the Appendix.

The measurements obtained are plotted in the following three forms:

FORM ONE

A. Vertical scales

1. Amplitude

1" = 10, 100, 1000 γ depending upon instrument gain.

2. Phase

1" = 100°

B. Horizontal scale

1.2" = 1 hour, yielding a plot 1'x6'.

FORM TWO

A. Vertical scales (same as Form One).

B. Horizontal scale

0.3" = 1 hour, yielding a plot 1'x2.5'.

FORM THREE

A. Vertical and horizontal scales are ¼ of Form One. For the second and third plots the data are averaged in groups of four then plotted at ¼ the time scale. We have not supplied copies of this

plot for all the orbits since the second plot, with its larger vertical scales, is more useful for data analysis.

APPENDIX

THE MEASUREMENT OF $B_\perp - \theta$ ON THE OGO-1 SPACECRAFT

Let B_x and B_y be two perpendicular components of the field in a plane perpendicular to the spin axis. Then, in the "rotated frame" (Z-axis parallel to the spin axis, X and Y axes in spin plane rotating with a frequency ω) the following signals will be observed:

$$X_R = B_x' \cos\omega t + B_y' \sin\omega t$$
$$Y_R = B_y' \cos\omega t - B_x' \sin\omega t$$
$$Z_R = 0$$

where $B_x' = kB_x$ and $B_y' = kB_y$. k is the product of the angular velocity of the satellite and an instrument calibration constant. If we now rotate to the coil system using the inverse of the matrix for the rotation from the coil system to the rotated frame:

$$\begin{pmatrix} X_c \\ Y_c \\ Z_c \end{pmatrix} \begin{pmatrix} a_{11} & a_{21} & a_{31} \\ a_{12} & a_{22} & a_{32} \\ a_{13} & a_{23} & a_{33} \end{pmatrix} \begin{pmatrix} X_R \\ Y_R \\ 0 \end{pmatrix}$$

We obtain the following signals on the coils due to the spacecraft spin in a dc field:

$$X_c = a_{11}X_R + a_{21}Y_R$$
$$Y_c = a_{12}X_R + a_{22}Y_R$$
$$Z_c = a_{13}X_R + a_{23}Y_R$$

The Fourier Series Analysis of these signals gives:

(1) $2\alpha_x = a_{11}B_x' + a_{21}B_y'$ $\quad 2\beta_x = a_{11}B_y' - a_{21}B_x'$

$2\alpha_y = a_{12}B_x' + a_{22}B_y'$ $\quad 2\beta_y = a_{12}B_y' - a_{22}B_x'$

$2\alpha_z = a_{13}B_x' + a_{23}B_y'$ $\quad 2\beta_z = a_{13}B_y' - a_{23}B_x'$

These can be rewritten in terms of the peak-to-peak amplitudes and phases in the coil system as follows:

(2) $2\alpha_x = X\cos\theta_x$ $\quad 2\beta_x = X\sin\theta_x$

$2\alpha_y = Y\cos\theta_y$ $\quad 2\beta_y = Y\sin\theta_y$

$2\alpha_z = Z\cos\theta_z$ $\quad 2\beta_z = Z\sin\theta_z$

X - Y - Z are p-p amplitudes measured in the coil system

θ_x - θ_y - θ_z are the respective phases

Solving for B_y in equations (1) gives:

$$a_{21}2\alpha_x + a_{11}2\beta_x = (a_{21}^2 + a_{11}^2)B_y'$$

$$a_{22}2\alpha_y + a_{12}2\beta_y = (a_{22}^2 + a_{12}^2)B_y'$$

$$a_{23}2\alpha_z + a_{13}2\beta_z = (a_{23}^2 + a_{13}^2)B_y'$$

which, when summed and equations (2) are substituted gives:

$$B_y = K(a_{11}X\sin\theta_x + a_{12}Y\sin\theta_y + a_{13}Z\sin\theta_z + a_{21}X\cos\theta_x + a_{22}Y\cos\theta_y + a_{23}Z\cos\theta_z)$$

where $K = 1/2k$.

B_x is found in the same way.

The procedure used to determine these components of the magnetic field involves two processing steps. First

the Fourier coefficients (α_i, β_i) of the signal resulting from the rotation of the spacecraft are determined for each axis. This is accomplished by multiplying the original signals from the search coils by

$\cos(\omega t + \theta_r)$ to get the α_i

and

$\sin(\omega t + \theta_r)$ to get the β_i

where

ω = spin frequency in rad/sec

t = time of day in seconds

θ_r = reference angle giving the number of radians from the beginning of the year to the beginning of the current day

The resulting signals are averaged for 71.424 seconds, are converted to a peak-to-peak amplitude and phase and are stored on magnetic tape.

The second processing step involves reading the above tapes and computing the values of B_x and B_y from the measurements provided on these tapes. The equations and constants used in this computation are as follows:

$$B_x = K(a_{11}X\cos\theta_x + a_{12}Y\cos\theta_y + a_{13}Z\cos\theta_z - a_{21}X\sin\theta_x - a_{22}Y\sin\theta_y - a_{23}Z\sin\theta_z)$$

$$B_y = K(a_{11}X\sin\theta_x + a_{12}Y\sin\theta_y + a_{13}Z\sin\theta_z + a_{21}X\cos\theta_x + a_{22}Y\cos\theta_y + a_{23}Z\cos\theta_z)$$

where, as before,

X - Y - Z are the peak-to-peak amplitudes

θ_x - θ_y - θ_z are the corresponding phases

The constants used in this computation are given in Table 1. These constants were derived using the rotation matrix from the coil system to the "rotated system" described earlier, and the instrument calibrations. The constant K is designed to give a full scale value of 50 γ when the instrument is in high gain, 500 γ when in medium gain and 5000 γ when in low gain.