

#375

GEOS

NASA LASER DATA

*Xfer to
CSDIS*

65-032A-03C	-	ESGP-00025
65-089A-02G	-	
68-002A-02C	-	
75-010A-01A	-	ESGP-00114
75-027A-04A	-	ESGP-00073
76-039A-01B	-	ESGP-00039
78-064A-06A	-	ESGP-00100

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 This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system.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

BE-C, GEOS-A, B, C

STARLETTE, LAGEOS, SEASAT-A

NASA LASER DATA

65-032A-03C, 65-089A-02G, 68-002A-02C, **ESGP-00025**

75-010A-01A, 75-027A-04A, 76-039A-01B, 78-064A-06A

ESGP-00114

ESGP-00073

ESGP-00073

ESGP-00100

THESE DATA SETS HAVE BEEN RESTORED. ORIGINALLY THERE WAS A TOTAL OF 98 9-TRACK, 1600 BPI TAPES WRITTEN IN BINARY. TWELVE OF THESE TAPES ARE ORIGINAL VERSIONS, 4 ARE REVISED VERSIONS, 80 ARE REVISED B VERSIONS AND 2 ARE REVISED C VERSIONS. THERE ARE 11 RESTORED TAPES, EACH VERSION IS NOTED ABOVE THE DR/DS NUMBER. THE SATELLITES AS THEY APPEAR ON THE TAPES ARE: BE-C, GEOS-A, GEOS-B, STARLETTE, GEOS-C, LAGEOS-1, AND SEASAT-1. THE DR TAPES ARE 3480 CARTRIDGES AND THE DS TAPES ARE 9-TRACK, 6250 BPI. THE ORIGINAL TAPES WERE CREATED ON AN IBM 360 COMPUTER AND WERE RESTORED ON THE MRS SYSTEM. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND TIME SPANS ARE AS FOLLOWS:

ORIGINAL VERSION 65-032A-03C, 65-089A-02G, 68-002A-02C,
75-010A-01A, 75-027A-04A

DR#	DS#	D#	FILES	TIME SPAN
DR004666	DS004666	D022041	1-5	04/24/75 - 04/29/75
		D022103	6-10	05/05/75 - 05/31/75
		D022354	11-15	06/01/75 - 06/30/75
		D022356	16-20	07/01/75 - 07/31/75
		D022573	21-25	08/01/75 - 08/31/75
		D022621	26-30	09/02/75 - 09/30/75
		D022912	31-35	10/01/75 - 10/31/75
		D023143	36-40	11/01/75 - 11/29/75
		D023661	41-45	12/02/75 - 12/31/75
		D023712	46-49	01/07/76 - 01/30/76
		D023745	50-54	02/02/76 - 02/29/76
		D023794	55-59	03/02/76 - 03/30/76

REVISED VERSION 65-032A-03C, 65-089A-02G, 68-002A-02C,
75-010A-01A, 75-027A-04A

DR005155	DS005155	D025148	1-5	09/02/75 - 09/15/75
		D024521	6-10	11/04/75 - 11/29/75
		D024522	11-15	12/02/75 - 12/31/75
		D023992	16-20	03/02/76 - 03/30/76

REVISED B VERSION 65-032A-03C, 65-089A-02G, 68-002A-02C,
75-010A-01A, 75-027A-04A, 76-039A-01B

DR#	DS#	D#	FILES	TIME SPAN
DR004667	DS004667	D027594	1-5	11/04/75 - 11/29/75
		D027595	6-10	12/02/75 - 12/31/75
		D027596	11-14	01/13/76 - 01/30/76
		D028148	15-18	02/02/76 - 02/29/76
		D028153	19-23	03/01/76 - 03/30/76
		D028811	24-28	04/02/76 - 04/30/76
		D028816	29-34	05/01/76 - 05/28/76
		D028813	35-40	06/05/76 - 06/30/76
		D028833	41-46	07/01/76 - 07/30/76
		D029363	47-52	08/05/76 - 08/31/76
		D029650	53-58	09/01/76 - 09/30/76
		D029364	59-64	10/01/76 - 10/31/76
		D029658	65-70	11/01/76 - 11/30/76
		D029676	71-76	12/03/76 - 12/29/76
		D029953	77-80	01/05/77 - 01/31/77
		D029960	81-86	02/01/77 - 02/28/77
		D030428	87-92	03/01/77 - 03/31/77
		D030503	93-98	04/01/77 - 04/30/77
		D030504	99-102	05/01/77 - 05/31/77
		D030686	103-108	06/01/77 - 06/30/77
		D030717	109-112	07/01/77 - 07/29/77
		D030730	113-117	08/01/77 - 08/31/77
		D030921	118-122	09/01/77 - 09/30/77
		D031000	123-127	10/03/77 - 10/31/77
		D031016	128-132	11/05/77 - 11/29/77
		D031017	133-135	12/01/77 - 12/28/77
DR005156	DS005156	D029649	1-6	07/01/76 - 07/30/76 *
		D029952	7-12	10/01/76 - 10/31/76 *
		D031039	13-17	01/04/78 - 01/30/78
		D031263	18-22	02/04/78 - 02/28/78
		D031277	23-27	03/03/78 - 03/31/78
		D031832	28-32	04/01/78 - 04/26/78
		D031955	33-36	05/13/78 - 05/31/78
		D031992	37-41	06/01/78 - 06/30/78
		D032360	42-47	07/01/78 - 07/31/78
		D032693	48-53	08/01/78 - 08/31/78
		D032925	54-59	09/01/78 - 09/30/78
		D033303	60-65	10/01/78 - 10/31/78
		D033352	66-71	11/01/78 - 11/30/78
		D033413	72-77	12/04/78 - 12/20/78
		D033660	78-83	01/04/79 - 01/31/79
		D033821	84-89	02/01/79 - 02/28/79
		D034010	90-94	03/01/79 - 03/30/79
		D034528	95-99	04/02/79 - 04/30/79
		D035039	100-104	05/01/79 - 05/25/79
		D035041	105-109	06/02/79 - 06/29/79
		D035173	110-114	07/02/79 - 07/31/79
		D035175	115-119	08/01/79 - 08/31/79

FILES 1-12 OF DR/DS005156 ARE REVISED C VERSION, THE ID'S ARE AS
FOLLOWS: 65-032A-03C, 65-089A-02G, 76-039A-01B, 75-027A-04A,
78-064A-06A, 68-002A-02C, 75-010A-01A

DR#	DS#	D#	FILES	TIME SPAN
DR004668	DS004668	D035301	1-5	09/04/79 - 09/30/79
		D037637	6-10	10/01/79 - 10/31/79
		D037638	11-15	11/01/79 - 11/30/79
		D038009	16-20	12/01/79 - 12/31/79
		D039824	21-25	01/01/80 - 01/31/80
DR004669	DS004669	D040375	1-5	02/01/80 - 02/29/80
		D040875	6-10	03/01/80 - 03/31/80
		D040910	11-15	04/01/80 - 04/30/80
		D041587	16-20	05/01/80 - 05/31/80
		D041928	21-25	06/02/80 - 06/30/80
DR004670	DS004670	D042105	1-5	07/01/80 - 07/31/80
		D042239	6-10	08/01/80 - 08/31/80
		D042727	11-15	09/01/80 - 09/30/80
		D042728	16-20	10/01/80 - 10/31/80
		D043231	21-25	11/02/80 - 11/29/80

* NO LONGER TRACKING GEOS-A OR GEOS-C DATA

DR004671	DS004671	D043791	1-3	12/01/80 - 12/31/80
		D043790	4-6	01/02/81 - 01/31/81
		D044646	7-9	02/02/81 - 02/28/81
		D045263	10-12	03/01/81 - 03/31/81
		D045299	13-15	04/01/81 - 04/30/81
		D045700	16-18	05/01/81 - 05/30/81
DR004672	DS005672	D046014	1-3	06/01/81 - 06/30/81
		D046595	4-6	07/01/81 - 07/31/81
		D046749	7-9	08/01/81 - 08/31/81
		D046890	10-12	09/01/81 - 09/30/81
		D047131	13-15	10/01/81 - 10/31/81
DR004673	DS004673	D047291	1-3	11/01/81 - 11/30/81
		D047398	4-6	12/01/81 - 12/31/81
		D048031	7-9	01/01/82 - 01/29/82
		D048145	10-12	02/01/82 - 02/26/82
		D048304	13-15	03/01/82 - 03/31/82
DR004674	DS004674	D048548	1-3	04/01/82 - 04/30/82
		D048884	4-6	05/01/82 - 05/29/82
		D048962	7-9	06/02/82 - 06/30/82

REQ. AGENT
CMP

RAND NO.
RC4826

ACQ. AGENT
JRJ
RWP

GEOS

NASA LASER DATA

65-032A-03C, 65-089A-02G
68-002A-02C, 75-010A-01A
75-027A-04A, 76-039A-01B
78-064A-06A

This data set contains 70 tapes, 12 original versions, 4 revised versions, and 53 revised B versions and 1 revised C version. The satellites are 1 per file on each tape. The satellites as they appear on the tape are: BE-C, GEOS-A, GEOS-B, Starlette, GEOS-C, LAGEOS-1 and SEASAT-A. The tapes are 9 track, 1600 BPI, Binary and multifiled. A program has been created to convert one of these tapes from the original format to a 7 track, 800 BPI, BCD tape. This program is on file in the program library. The following pages are the formates, D & C numbers and number of files on each tape.

GEOS NASA LASER

Original Version

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>
D-22041 ✓	1 C-16932	5	4/17/75 - 4/29/75
D-22103 ✓	2 C-17055	5	5/05/75 - 5/31/75
D-22354 ✓	3 C-17248	5	6/01/75 - 6/30/75
D-22356 ✓	4 C-17289	5	7/01/75 - 7/31/75
D-22573 ✓	5 C-17349	5	8/01/75 - 8/31/75
D-22621 ✓	6 C-17402 X	5	9/02/75 - 9/30/75
D-22912 ✓	8 C-17458	5	10/01/75 - 10/31/75
D-23143 ✓	9 C-17498 X	5	11/01/75 - 11/29/75
D-23661 ✓	C-17687 X	5	12/02/75 - 12/31/75
D-23712 ✓	C-17817 X	4	1/07/76 - 1/30/76
D-23745 ✓	C-17843 X	5	2/02/76 - 2/29/76
D-23794 ✓	C-17908 X	5	3/01/76 - 3/30/76

Revised Version

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>
D-24521 ✓	C-18051	5	11/01/75 - 11/29/75
D-24522 ✓	C-18052	5	12/02/75 - 12/31/75
D-25148 ✓	7 C-18268	5	9/02/75 - 9/30/75
D-23992 ✓	C-18016	5	3/02/76 - 3/30/76

Revised B Version

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>
D-27594 ✓	10 C-18428	5	11/01/75 - 11/29/75
D-27595 ✓	C-18429	5	12/02/75 - 12/31/75
D-27596 ✓	C-18430	4	1/07/76 - 1/30/76
D-28148 ✓	C-18551	5	2/02/76 - 2/29/76
D-28153 ✓	C-18567	5	3/01/76 - 3/30/76

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>
D-28811	C-18672	5	4/02/76 - 4/30/76
D-28816	C-18714	6	5/01/76 - 5/28/76
D-28813	C-18673	6	6/05/76 - 6/30/76
D-28833	C-18716	6	7/01/76 - 7/30/76
D-29363	C-19039	6	8/05/76 - 8/31/76
D-29650	C-19136	6	9/01/76 - 9/30/76
(29952) IDA - K Jan 1977	C-19040	6	10/01/76 - 10/31/76
D-29364	C-19175	6	11/01/76 - 11/30/76
D-29658	C-19264	6	12/03/76 - 12/29/76
D-29676	C-19349	4	1/05/77 - 1/31/77
D-29953	C-19392	6	2/01/77 - 2/28/77
D-29960	C-19393	6	3/01/77 - 3/31/77
D-30428	C-19395	6	4/01/77 - 4/30/77
D-30503	C-19422	4	5/01/77 - 5/31/77
D-30504	C-19640	6	6/01/77 - 6/30/77
D-30686	C-19638	4	7/01/77 - 7/29/77
D-30717	C-19641	5	8/01/77 - 8/31/77
D-30730	C-19722	5	9/01/77 - 9/30/77
D-30921	C-19798	5	10/03/77 - 10/31/77
D-31000	C-19816	5	11/05/77 - 11/29/77
D-31016	C-19817	3	12/01/77 - 12/28/77
D-31017			
REVISED C VERSION			
D-29649	C-19135	6	7/1/76 - 7/30/76

2 29952 1.1.5 - 1/1/77 - 1/31/77

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>
D-31039	C-19832	5	1/04/78 - 1/30/78
D-31263	C-19897	5	2/04/78 - 2/28/78
D-31277	C-19926	5	3/03/78 - 3/31/78
D-31832	C-19948	5	4/01/78 - 4/26/78
D-31955	C-20088	4	5/13/78 - 5/31/78
D-31992	C-20125	5	6/01/78 - 6/30/78
D-32360	C-20208	6	7/01/78 - 7/31/78
D-32693	C-20257	6	8/01/78 - 8/31/78
D-32925	C-20291	6	9/01/78 - 9/30/78
D-33303	C-20313	6	10/01/78 - 10/31/78
D-33352	C-20407	6	11/01/78 - 11/30/78
D-33413	C-20517	6	12/04/78 - 12/20/78
D-33660	C-20604	6	1/04/79 - 1/31/79
D-33821	C-20605	6	2/01/79 - 2/28/79
D-34010	C-20691	5	3/01/79 - 3/30/79
D-34528	C-20692	5	4/02/79 - 4/30/79
D-35039	C-20730	5	5/01/79 - 5/25/79
D-35041	C-20693	5	6/02/79 - 6/29/79
D-35173	C-21003	5	7/02/79 - 7/31/79
D-35175	C-21002	5	8/01/79 - 8/31/79
D-35301	C-21005	5	9/04/79 - 9/30/79
D-37637	C-21004	5	10/01/79 - 10/31/79
D-37638	C-21001	5	11/01/79 - 11/30/79
D-38009	C-21006	5	12/01/79 - 12/31/79
D-39824	C-21013	5	1/01/80 - 1/31/80
D-40375	C-21014	5	2/01/80 - 2/29/80
D-40857	C-21015	5	3/01/80 - 3/31/80
D-40910	C-21036	5	4/01/80 - 4/30/80
D-41587	C-21066	5	5/01/80 - 5/31/80
D-41928	C-21076	5	6/02/80 - 6/30/80
D-42105	C-21185	5	7/01/80 - 7/31/80
D-42239	C-21210	5	8/01/80 - 8/31/80
D-42727	C-21272	5	9/01/80 - 9/30/80
D-42728	C-21273	5	10/01/80 - 10/31/80
D-43231	C-21322	5	11/02/80 - 11/29/80

NO LONGER TRACKING GEOS A OR GEOS C

D-43791	C-21381	3	12/01/80 - 12/31/80
D-43790	C-21380	3	1/02/81 - 1/31/81
D-44646	C-21416	3	2/02/81 - 2/28/81
D-45263	C-21486	3	3/01/81 - 3/31/81
D-45299	C-21539	3	4/01/81 - 4/30/81
D-45700	C-21569	3	5/01/81 - 5/31/81
D-46014	C-21626	3	6/01/81 - 6/30/81
D-46595	C-21733	3	7/01/81 - 7/31/81
D-46749	C-21849	3	8/01/81 - 8/31/81
D-46890	C-21946	3	9/01/81 - 9/30/81
D-47131	C-22017	3	10/01/81 - 10/31/81
D-47291	C-22093	3	11/01/81 - 11/30/81
D-47398	C-22150	3	12/01/81 - 12/31/81
D-48031	C-22231	3	1/01/82 - 1/29/82
D-48145	C-22339	3	2/01/82 - 2/26/82

NASA LASER

<u>D#</u>	<u>C#</u>	<u>FILES</u>	<u>TIME SPAN</u>
D-48304	C-22399	3	03/01/82-03/31/82
D-48548	C-22422	3	04/01/82-04/30/82
D-48884	C-22442	3	05/01/82-05/29/82
D-48962	C-22474	3	06/02/82-06/30/82

GEOS-C BINARY FORMAT

65-032A-03C
65-089A-02G
68-002A-02C
75-010A-01A
75-027A-04A
76-039A-01B
78-064A-06A

(* Information pertains to Laser Data)

The GEOS-C satellite will be tracked by many different systems and networks of tracking stations. It is intended that this format will accommodate data taken from all tracking systems and networks as well as altimeter data taken by the satellite. As a consequence of its design characteristics, this format not only meets the specifications of the GEOS-C project, but also the precise orbit determination requirements of all currently existing satellites.

The FORTRAN variable types used in this format description are:

- I*2 - Half-Word Integer
- I - Single Word Integer
- R - Single Word Floating Point
- DP - Double Word Floating Point

Figure 4.7.14

Description of Bytes 1-28 for all measurement types.

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
* 1-4	I	Satellite ID - This is the international satellite designation nnpppq where: nn - last two digits of the year of launch (e.g., 1974-74, 1969-69). ppp - order of launch. Example: The 25th vehicle launch in a given year is designated with ppp = 025. qq - component identifier (e.g., component a-01, component l-12, etc.)
* 5-6	I*2	Measurement Type 10-14 Right Ascension and Declination 10 = Optical 11 = Laser Optical 15-19 Hour Angle and Declination 15 = DSN S-Band Radar 20-29 Range or Range Difference * 20 = Laser 21 = C-Band Radar 22 = C-Band VLBI Range Difference Radars 23 = DSN S-Band Radar 24 = USB Radar 25 = GRARR S-Band Radar 26 = GRARR ATS-F C-Band Radar 27 = GRARR VHF Radar

Figure 4.7.14

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
(5-6 cont'd)		
30-39		Range Rate or Range Rate Difference
30		= Combined DSN/USB Radars
31		= C-Band Radar
32		= C-Band VLBI Range Rate Difference Radars
33		= DSN S-Band Radar
34		= USB Radar
35		= GRARR S-Band Radar
36		= GRARR ATS-F C-Band Radar
37		= GRARR VHF Radar
38		= TRANET Doppler
39		= Geociever Doppler
40-44		Altimeter Height
40		= Long Pulse
41		= Short Pulse
45-49		Available for additional measure- ment types such as Altimeter Height Rate.
50-54		ℓ and m Direction Cosines
51		= Minitrack Equatorial Mode
52		= Minitrack Polar Mode
55-59		Available for additional angles or cosines
60-63		X-Y Angles (East-West)
60		= USB Radar

Figure 4.7.14

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
(5-6 cont'd)		64-69 X-Y Angles (North-South)
		64 = USB Radar
		65 = GRARR S-Band Radar
		66 = GRARR ATS-F C-Band Radar
		67 = GRARR VHF Radar
		70-79 Azimuth and Elevation Angles
		* 70 = Laser
		71 = C-Band Radar
		73 = DSN S-Band Radar
		80-89 Available for additional Range type measurements
		90-99 Available for additional Range Rate type measurements
7-8	I*2	Time System Indicator (nm)
		<u>n value</u> <u>description</u>
		0 Ground Received Time
		*1 Satellite Transponder/Transmitter Time
		2 Ground Transmitted Time (Effec- tive Time for Averaged Altimeter Data, Types 40-44)
		3 Satellite Receiver Time

Figure 4.7.14

Bytes FORTTRAN
 Variable
 Type

Description

(7-8 cont'd)

m value description

0 UT-0

1 UT-1

2 UT-2

*3 UTC

4 A.1

5 A.3 (A.T. B.I.H.)

6 A-S (Smithsonian)

* 9-12

I

Station Number

0 Altimeter

1- 99 USB

500- 599 DSN

1000- 1999 NASA STADAN

1100- 1199 S-Band Radar (GRARR)

1500- 1599 Minitrack

1600- 1699 VHF Radar (GRARR)

2000- 2999 U. S. Navy TRANET Doppler

3000- 3999 U. S. Air Force Optical

4000- 4999 Interagency C-Band

5000- 5999 U. S. Army Secor

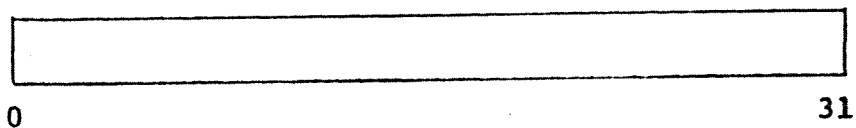
6000- 6999 Worldwide BC-4 Network

7000- 7999 NASA SPEOPT

8000- 8999 International Observers

Figure 4.7.14

<u>Bytes</u>	<u>FORTAN Variable Type</u>	<u>Description</u>
(9-12 cont'd)		9000- 9999 SAO
		10000-99999 U. S. Navy GEOCEIVER Doppler
*13-16	I	Preprocessing Indicators/Report
The preprocessing indicators are bit switches packed into a single 32 bit word. The rightmost bit (bit 31) is of lowest order and the leftmost bit (bit 0) is of highest order.		



The preprocessing bits are configured as follows:

<u>Bits</u>	<u>Value</u>	<u>Description</u>
*0		This bit should always be zero filled.
1 - 2		Format Indicator (Types 40-44)
	1	Format 1
	2	Format 2
	3	Format 3
3		Beacon Activity Indicator (Types 10-14)
	0	Beacon Inactive or No Beacon
	1	Beacon Active

Figure 4.7.14

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
(13-16 cont'd)		
	<u>Bits</u>	<u>Value</u>
	4	Equator Designation (Types 10-14)
		0 Mean Equator and Equinox
		1 True Equator and Equinox
	5 - 6	Date of Equator and Equinox (Types 10-14)
		0 Standard Equator and Equinox (Jan 0.0 1950)
		1 Jan 0.0 of year of observation
		2 Equator and Equinox of Date (instant of observation)
		3 DODS Reference Date (0 hr. Sept. 19, 1957)
	7	Annual Aberration (Types 10-14)
		0 Data has been corrected
		1 Data has not been corrected
	8	Diurnal Aberration (Types 10-14)
		0 Data has been corrected
		1 Data has not been corrected
	9	Parallactic Refraction (Types 10-14)

Figure 4.7.14

FORTRAN Variable Type		Description		
Bytes		Bits	Value	Description
(13-16 cont'd)				
			0	Data has been corrected
			1	Data has not been corrected
	*10-12			Tropospheric Refraction (all but Types 10-14)
			0	Data has been corrected
			1	Data has not been corrected
			2	Data has been corrected using the correction formulas for international laser data. Correction value is for zero zenith.
			3	Data has not been corrected. Correction value is for zero zenith.
		>3		Data has not been corrected. Bytes 53-56 contains meteorological data.
	*13			Ionospheric Refraction (all but Types 10-14)
			0	Data has been corrected
			1	Data has not been corrected
	14			Transponder Delay (Types 20-29)
			0	Data has been corrected
			1	Data has not been corrected (correction is required)

Figure 4.7.14

FORTRAN Variable		<u>Description</u>	
<u>Bytes</u>	<u>Type</u>	<u>Bits</u>	<u>Value</u>
(13-16 cont'd)			<u>Description</u>
		*15	Antenna Axis Displacement (Types 20-29)
			0 Data has been corrected (or no correction required)
			1 Data has not been cor- rected (correction is required)
		*16-17	Receiver Mount Type (all but Types 10-14, and Types 38-59)
			0 X-Y (East-West)
			*1 X-Y (North-South)
			*2 Azimuth-Elevation
			3 Hour Angle-Declination
		18-19	Transmitter Mount Type (all but Types 10-14, and Types 38-59)
			0 X-Y (East-West)
			*1 X-Y (North-South)
			*2 Azimuth-Elevation
			3 Hour Angle-Declination
		20-21	Transponder Channel/Type (Radar Data Only) or Altimeter Mode (Data Types 40-44)

Figure 4.7.14

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
(13-16 cont'd)		<u>Transponder Channel for GRARR</u>
	0	Channel A
	1	Channel B
	2	Channel C
		<u>Altimeter Mode</u>
	0	Global Track Mode
	1	Intensive Track Mode
	>1	Not in track mode
		<u>Transponder Type for Other Systems</u>
	0	Skin Track
	1	Coherent
	2	Non-coherent
22-25		Range Ambiguity Levels
		<u>For DSN S-Band</u>
	0	MARK 1A (824,809,582.0m)
	1	TAU (151,285,510.38518m)
		<u>For USB</u>
	1	824809582.0m
		<u>For GRARR S-Band</u>
	1	18737031.3m
	2	4684257.8m
	3	936851.6m

Figure 4.7.14

FORTRAN Variable Type		Description		
Bytes		Bits	Value	Description
(13-16 cont'd)		26-31		Preprocessing Report
			0	Report not specified
			---	Other values to be assigned later
*17-20	I	Modified Julian Date (MJD) of observation. JD = MJD + 2400000.5		
*21-28	DP	Fraction of Day Past Midnight (GMT)		
29-68		These words have different uses for each of the measurement types, except for Bytes 53-56 which contains meteorological data for the troposphere if Bit 10 of the preprocessing indicator word (Bytes 13-16) has been set on. If Bit 10 of the preprocessing indicator word is on, the format of Bytes 53-56 is as follows:		
53-56	I	Meteorological Data Report		
		The pressure temperature and relative humidity are packed into a single 32-bit word. The rightmost bit (bit 31) is of lowest order and the leftmost bit (bit 0) is of highest order.		



0 31

The meteorological bits are configured as follows:

Bits	Values	Description
0		This bit should always be zero filled.
1- 7	0-100	Relative humidity at the tracking site.

Figure 4.7.14

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>		
(53-56 cont'd)		<u>Bits</u>	<u>Values</u>	<u>Description</u>
		8-19	>0	Temperature in Degrees Kelvin
		20-31	>0	Atmospheric pressure in millibars.

Bytes 29-68 for Angle Measurements (Types 10-19, 60-79)

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
*29-36	DP	Observation Value in Radians for Right Ascension, or Hour Angle, or Azimuth, or X-Angle
*37-44	DP	Observation Value in Radians for Declination, or Elevation, or Y-Angle
45-48	R	Standard Deviation in Radians for Observation in Bytes 29-36. For R.A. and H.A. sigma value is multiplied by cosine of the declination. For Azimuth sigma value is multiplied by cosine of elevation.
49-52	R	Standard Deviation in Radians for Observation in Bytes 37-44.
53-56	R	Tropospheric Refraction Correction in Radians for X-Angle
57-60	R	Tropospheric Refraction Correction in Radians for Y-Angle or Elevation
60-68		Not Used

Figure 4.7.14

Bytes 29-68 for Range and Range Rate Measurements (Types 20-39)

<u>Bytes</u>	<u>FORTTRAN Variable Type</u>	<u>Description</u>
*29-36	DP	Observation Value in Meters for Range (Types 20-29) and Meters/Second for Range Rates (Types 30-39)
37-40	I	Transmitting or Reference Station Number for Average Range Rate or VLBI Range Difference and Range Rate Difference
41-44	I	Relay Satellite ID for Satellite-to-Satellite Tracking Data
45-48	R	Standard Deviation of Observation in Same Units as Observation
49-52	I	Counting Interval in Microseconds for Average Range Rate Data (Types 30, 33, 34, and 38)
53-56	R	Tropospheric Refraction Correction in Same Units as Observation. For international observers, the value in this field is for a zenith angle of zero degrees.
57-60	R	Ionospheric Refraction Correction in Same Units as Observation
61-64	R	Receiver Antenna Axis Displacement in Meters
65-68	R	Transmitter Antenna Axis Displacement in Meters

Figure 4.7.14

GEOS-C DECIMAL FORMAT

(* Information Pertains to Laser Data)

Range and Range Difference

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
* 1- 7		Satellite - ID
* 8- 9		Measurement Type
	20-29	Range or Range Difference
	20=	Laser
	21=	C-Band Radar
	22=	C-Band VLBI Range Difference Radars
	23=	DSN S-Band Radar
	24=	USB Radar
	25=	GRARR S-Band Radar
	26=	GRARR ATS-F S-Band Radar
	27=	GRARR VHF Radar
*10-11		Time System Indicator
	*10	0 = Ground Received Time *1 = Satellite Transponder/Transmitter Time 2 = Ground Transmitted Time 3 = Satellite Receiver Time
	*11	0 = UT-0 1 = UT-1 2 = UT-2 *3 = UT-C 4 = A.1 5 = A.3 (A.T. B.I.H.) 6 = A-S (Smithsonian)
* 2-16		Station ID
* 7-32		GMT of Observation
	*17-18	Year
		YY

Figure 4.7.15

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
	*19-21	Day of Year DDD
	*22-26	Time of Day (Seconds from midnight GMT)
	*27-32	Fractional Part of Seconds (in microseconds)
3-35		<u>Preprocessing Indicators</u>
	*33	0 = Data has been corrected for ionospheric refraction effects. 1 = Data not corrected for ionospheric refraction.
	*34	0 = Data has been corrected for tropospheric refraction effects. 1 = Data not corrected for tropospheric refraction. 2 = Data has been corrected for tropospheric refraction using the correction formulas for international laser data (see Cols. 76-80). 3 = Data not corrected for tropospheric refraction. Cols. 76-80 contain coefficient for use with international laser formulas.
	35	0 = Data has been corrected for transponder delay effects. 1 = Data not corrected for transponder delay.
36-54		<u>Observation Data</u>
	*36-45	Range or Range Difference (Km)
	*46-54	Range or Range Difference XXX.XXXXXX Meters (NOTE: In this format, XX.XX - Decimal Point is implied.)

Figure 4.7.15

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
55-56		<u>Preprocessing Indicators</u>
	55	Preprocessing Report 0 = Report not indicated 1-9, A-Z values to be assigned.
	56	Transponder type for pulse radars. 1 - coherent 2 - non-coherent or Transponder Channel for GRARR 1 = Channel A or 1st sidetone 2 = Channel B or 2nd sidetone 3 = Channel C or 3rd sidetone
57-61		Reference station number for range differencing or transmitting station number for station-to-satellite-to-satellite-to-station data.
62-68		Relay satellite-ID for satellite-to-satellite data.
69-73		Measurement standard deviation XX.XXX Meters
74		Range ambiguity indicator For DSC S-Band 1 - MARK 1A (824809582.0 m) 2 - TAU (151285510.38518 m) For USB 1 - 824809582.0 m

Figure 4.7.15

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
		For GRARR S-Band
		1 - 18737031.3 m
		2 - 4684257.8 m
		3 - 936851.6 m
75		Not used
76-80		Tropospheric refraction correction
		XX.XXX Meters or
		Coefficient of Tropospheric Refraction
		for international lasers (see Col. 34)
		XX.XXX Meters

GEOS-C Decimal Azimuth/Elevation and X-Y Angles Format

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
* 1- 7		Satellite-ID
* 8- 9		Measurement Type
		60-63 X-Y Angles (East-West)
		60 = USB Radar
		64-69 X-Y (North-South)
		64 = USB Radar
		65 = GRARR S-Band Radar
		66 = GRARR ATS-F C-Band Radar
		67 = GRARR VHF Radar
		70-79 Azimuth and Elevation Angles
		*70 = Laser
		71 = C-Band Radar
		73 = DSN S-Band Radar
*10-11		Time System Indicator
	*10	0 = Ground Received Time
		*1 = Satellite Transponder/Transmitter Time
		2 = Ground Transmitted Time
		3 = Satellite Receiver Time

Figure 4.7.15

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
	*11	0 = UT-0 1 = UT-1 2 = UT-2 *3 = UT-C 4 = A.1 5 = A.3 (A.T. B.I.H.) 6 = A-S (Smithsonian)
*12-16		Station ID
*17-32		GMT of Observation
*17-18		Year
		YY
*19-21		Day of Year
		DDD
*22-26		Time of Day (seconds from midnight GMT)
*27-32		Fractional Part of Seconds (in microseconds)
*33-34		<u>Refraction Indicators</u>
	33	0 = Data has been corrected for ionospheric effects. 1 = Data not corrected for ionospheric effects.
	34	0 = Data has been corrected for tropospheric effects. 1 = Data not corrected for tropospheric effects.
35		Not used.
36-54		<u>Observation Data</u>
	*36-38	Azimuth or X angle (degrees). Sign of X angle appears in Col. 36.

Figure 4.7.15

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
	*39-40	Azimuth or X angle (arc minutes)
	*41-45	Azimuth or X angle XX.XXXX Arc Seconds
	46	Sign of Y angle
	47-48	Elevation or Y angle (degrees)
	49-50	Elevation or Y angle (minutes)
	51-54	Elevation or Y angle XX.XX Arc Seconds
55-57		Not Used.
58-61		Standard deviation in X angle or azimuth XX.XX Arc Minutes
62-65		Standard deviation in elevation or Y angle XX.XX Arc Minutes
66		Preprocessing Report 0 = Report not indicated 1-9, A-Z Values to be assigned
67-71		Tropospheric refraction correction to X angle XXX.XX Arc Minutes
72-76		Tropospheric refraction correction to Y angle or elevation XXX.XX Arc Minutes
77-80		Not used.

Figure 4.7.15

GEOS-C DATA FORMAT FOR LASER DATA

INTRODUCTION

The GEOS-C satellite will be tracked by many different systems and networks of tracking stations. It is intended that this format will accommodate data taken from all tracking systems and networks as well as altimeter data taken by the satellite. As a consequence of its design characteristics this format not only meets the specifications of the GEOS-C project but also the precise orbit determination requirements of all currently existing satellites. Enclosed is a portion of this format which pertains to laser data.

Since the format is a card image representation, it is ideally suited for transferring data between the different types of computer facilities supporting the GEOS-C project research. The only character images used by the format are:

integer numbers 0 - 9

letters of the alphabet A - Z

blanks, and

minus signs

All decimal points are implied, therefore eliminating the need for that character representation.

Descriptions of columns 1 - 32 for all measurement types

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
1-7	I	Satellite - ID
8-9	I	Measurement Type
		10-14 Right Ascension and Declination
		11 = Laser Optical
		20-29 Range or Range Difference
		20 = Laser
		64-69 X-Y Angles (North-South)
		68 = Laser
		70-79 Azimuth and Elevation Angles
		70 = Laser
10-11		Time System Indicator
	10	0 = Ground Received Time
		1 = Satellite Transponder/Transmitter Time
		2 = Ground Transmitted Time
	11	0 = UT-0
		1 = UT-1
		2 = UT-2
		3 = UT-C
		4 = A.1
		5 = A.3 (A.T. B.I.H.)
		6 = A-S (Smithsonian)
12-16		Station ID
17-32		GMT of Observation
	17-18	year YY
	19-21	Day of Year DDD
	22-26	Time of Day (Seconds from midnight GMT)
	27-32	Fractional Part of Seconds (in microseconds)

Columns 33-80 for laser range measurements (Data Type 20)

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
33-35		<u>Preprocessing Indicators</u>
	33	0 = Data has been corrected for ionospheric refraction effects. 1 = Data not corrected for ionospheric refraction.
	34	0 = Data has been corrected for tropospheric refraction effects. 1 = Data not corrected for tropospheric refraction. 2 = Data has been corrected for tropospheric refraction using the correction formulas for international laser data (see cols. 76-80). 3 = Data not corrected for tropospheric refraction. Columns 76-80 contain coefficient for use with international laser formulas. 4 = Data has been corrected for tropospheric refraction effects and meteorological data is present. 5 = Data not corrected for tropospheric refraction and meteorological data is present.
	35	0 = Data has been corrected for transponder delay effects. 1 = Data not corrected for transponder delay.
36-54		<u>Observation Data</u>
	36-45	Range or Range Difference (Km)
	46-54	Range or Range Difference XXX.XXXXXX Meters
55-56		<u>Preprocessing Indicators</u>
	55	Preprocessing Report 0 = Report not indicated 1 - 9, A - Z values to be assigned
	56	Not used

ColumnsSubsetDescription

57-60

Surface Pressure

XXXX Millibars

61-63

Surface Temperature

XXX^o KELVIN

64-66

Relative Humidity at Surface

XXX percent

67-68

Not used

69-73

Measurement standard deviation

XX.XXX Meters

74-75

Not used

76-80

Tropospheric refraction correction

XX.XXX Meters

Columns 33-80 for Laser X-Y angles and Laser Azimuth and Elevation angles (Types 68,70)

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
33-34		<u>Refraction Indicators</u>
	33	0 = Data has been corrected for ionospheric effects.
		1 = Data not corrected for ionosphere
	34	0 = Data has been corrected for tropospheric effects.
		1 = Data not corrected for troposphere
35		Not Used.
36-54		<u>Observation Data</u>
	36-38	Azimuth or X-angle (degrees). Sign of X-angle appears in column 36.
	39-40	Azimuth or X-angle (arc minutes)
	41-45	Azimuth or X-angle XX.XXX Arc Seconds
	46	Sign of Y-angle
	47-48	Elevation or Y-angle (degrees)
	49-50	Elevation or Y-angle (minutes)
	51-54	Elevation or Y-angle XX.XX Arc Seconds
55-57		Not Used.
58-61		Standard deviation in X-angle or azimuth XX.XX Arc Minutes
62-65		Standard deviation in elevation or Y-angle XX.XX Arc Minutes
66		Preprocessing Report 0 = Report not indicated 1 - 9, A - Z Values to be assigned.
67-71		Tropospheric refraction correction to X-angle XXX.XX Arc Minutes

TABLE 1

VALUES OF GEOS III RANGE CORRECTION FROM FORMULA*

γ°	$\Delta R-M$	$d\Delta R/d\theta$	γ°	$\Delta R-M$	$d\Delta R/d\theta$
0.	-1.3038		31.	-1.3629	.0035
1.	-1.3047	-.0008	32.	-1.3591	.0039
2.	-1.3084	-.0037	33.	-1.3548	.0043
3.	-1.3133	-.0049	34.	-1.3501	.0047
4.	-1.3188	-.0055	35.	-1.3450	.0051
5.	-1.3244	-.0056	36.	-1.3395	.0055
6.	-1.3301	-.0056	37.	-1.3337	.0059
7.	-1.3355	-.0055	38.	-1.3274	.0063
8.	-1.3409	-.0053	39.	-1.3207	.0067
9.	-1.3459	-.0050	40.	-1.3136	.0071
10.	-1.3507	-.0047	41.	-1.3061	.0075
11.	-1.3551	-.0044	42.	-1.2982	.0079
12.	-1.3592	-.0041	43.	-1.2899	.0083
13.	-1.3629	-.0037	44.	-1.2812	.0087
14.	-1.3663	-.0034	45.	-1.2722	.0091
15.	-1.3693	-.0030	46.	-1.2627	.0094
16.	-1.3719	-.0026	47.	-1.2529	.0098
17.	-1.3741	-.0022	48.	-1.2427	.0102
18.	-1.3759	-.0018	49.	-1.2321	.0106
19.	-1.3774	-.0014	50.	-1.2211	.0110
20.	-1.3784	-.0010	51.	-1.2098	.0113
21.	-1.3790	-.0006	52.	-1.1981	.0117
22.	-1.3793	-.0002	53.	-1.1861	.0121
23.	-1.3791	.0002	54.	-1.1737	.0124
24.	-1.3785	.0006	55.	-1.1609	.0128
25.	-1.3775	.0010	56.	-1.1478	.0131
26.	-1.3761	.0014	57.	-1.1343	.0135
27.	-1.3743	.0018	58.	-1.1205	.0138
28.	-1.3721	.0022	59.	-1.1063	.0142
29.	-1.3694	.0026	60.	-1.0918	.0145
30.	-1.3664	.0030	61.	-1.0770	.0148
			62.	-1.0619	.0151
			63.	-1.0464	.0155

* $\Delta R = [1.411 - 0.0036 (\frac{v}{v+3})] \cos (v - 22.473)$ meters

TABLE 2

Range Corrections for GEOS-III

Incidence Angle (Degrees)	Range Correction - Meters		
	Experimental	"Ratio" Program	Formula
0	-1.316	-1.303	-1.304
10	-1.355	-1.350	-1.350
20	-1.367	-1.379	-1.379
30	-1.356	-1.366	-1.366
40	-1.291	-1.314	-1.314
45	-1.273	-1.273	-1.272
50	-1.221	-1.219	-1.219
60	-1.084	-1.085	-1.085

TABLE 3

CROSS SECTION VS INCIDENCE ANGLE - GEOS III

Cross Section - Meters² x 10⁶

Incidence Angle	Min.	Max.	Retro Program	Formula
0	1.86	1.86	4.40	2.0
10	1.86	5.56	7.20	3.1
20	9.27	18.6	14.3	9.4
30	18.6	29.7	23.2	20.2
40	24.1	46.4	30.1	28.7
45	27.8	46.4	30.9	30.0
50	27.8	37.1	27.5	28.7
60	9.27	18.6	17.4	20.2

8.3.5.1.2 Range and Range Difference*

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
1-7		Satellite - ID
8-9		Measurement Type
	20-29	Range or Range Difference
	20	- Lasor
	21	- C-Band Radar
	22	- C-Band VLBI Range Difference Radars
	23	- DSN S-Band Radar
	24	- USB Radar
	25	- GRARR S-Band Radar
	26	- GRARR ATS-F S-Band Radar
	27	- GRARR VHF Radar
10-11		Time System Indicator
	10	0 - Ground Received Time
		1 - Satellite Transponder/Transmitter Time
		2 - Ground Transmitted Time
		3 - Satellite Receiver Time
	11	0 - UT-0
		1 - UT-1
		2 - UT-2
		3 - UT-C
		4 - A.1
		5 - A.3 (A.T. B.I.H.)
		6 - A-S (Smithsonian)

*Range Difference - Time Delay VLBI

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
12-16		Station ID
17-32		GMT of Observation
	17-18	Year YY
	19-21	Day of Year DDD
	22-26	Time of Day (Seconds from midnight GMT)
	27-32	Fractional Part of Seconds (In microseconds)
33-35		<u>Preprocessing Indicators</u>
	33	0 = Data has been corrected for ionospheric refraction effects. 1 = Data not corrected for ionospheric refraction.
	34	0 = Data has been corrected for tropospheric refraction effects. 1 = Data not corrected for tropospheric refraction. 2 = Data has been corrected for tropospheric refraction using the correction formulas for international laser data (see cols. 76-80). 3 = Data not corrected for tropospheric refraction. Columns 76-80 contain coefficient for use with international laser formulas.
	35	0 = Data has been corrected for transponder delay effects. 1 = Data not corrected for transponder delay.
36-54		<u>Observation Data</u>
	36-45	Range or Range Difference (Km)
	46-54	Range or Range Difference XXX.XXXXXX Meters

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
55-56		<u>Preprocessing Indicators</u>
	55	Preprocessing Report
		0 = Report not indicated
		1 - 9, A - Z values to be assigned.
	56	Transponder type for pulse radars
		1 - coherent
		2 - non-coherent
		or
		Transponder Channel for GRARR
		1 = Channel A or 1st sidetone
		2 = Channel B or 2nd sidetone
		3 = Channel C or 3rd sidetone
57-61		Reference station number for range differencing or transmitting station number for station-to- satellite-to satellite-to-station data.
62-68		Relay satellite-ID for satellite-to-satellite data.
69-73		Measurement standard deviation XX.XXX Meters
74		Range ambiguity indicator
		For DSC S-Band ?
		1 - MARK 1A (824809582.0 m)
		2 - TAU (151285510.38518 m)
		For USB
		1 - 824809582.0 m
		For GRARR S-Band
		1 - 18737031.3 m
		2 - 4684257.8 m
		3 - 936851.6 m
75		Not used
76-80		Tropospheric refraction correction XX.XXX Meters
		or,
		Coefficient of Tropospheric Refraction for Inter- national lasers (see Col. 34)
		XX.XXX Meters

S.3.5.1.3 Range Rate, and Range Rate Differences*

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
1-7		Satellite - ID
S-9		Measurement Type _
	30-37	Range Rate or Range Rate Difference
	30	= Combined DSN/USB Radars
	31	= C-Band Radar
	32	= C-Band VLBI Range Rate Difference Radars
	33	= DSN S-Band Radar
	34	= USB Radar
	35	= GRARR S-Band Radar
	36	= GRARR ATS-F C-Band Radar
	37	= GRARR VHF Radar
10-11		Time System Indicator
	10	0 = Ground Received Time
		1 = Satellite Transponder/Transmitter Time
		2 = Ground Transmitted Time
		3 = Satellite Receiver Time
	11	0 = UT-0
		1 = UT-1
		2 = UT-2
		3 = UT-C
		4 = A.1
		5 = A.3 (A.T. B.I.H.)
		6 = A-S (Smithsonian)

*Range Rate Differences - Fringe Rate VLBI

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
12-16		Station ID
17-32		GMT of Observation
	17-18	Year YY
	19-21	Day of Year DDD
	22-26	Time of Day (Seconds from midnight GMT)
	27-32	Fractional Part of Seconds (In microseconds)
33-35		<u>Preprocessing Indicators</u>
	33	0 = Data has been corrected for ionospheric refraction effects. 1 = Data not corrected for ionospheric refraction.
	34	0 = Data has been corrected for tropospheric refraction effects. 1 = Data not corrected for tropospheric refraction.
	35	<u>Receiver Mount Type</u> 1 = X-Y (East-West) 2 = X-Y (North-South) 3 = Azimuth-Elevation 4 = Hour angle-declination
36-42		Counting interval for average range rate data (Types 30, 33, 34). XXXXX.XX Seconds or, Tropospheric refraction correction for other range rate data types. XXXXX.XX cm/Second
43-55		<u>Observation Data</u>
	43-49	Range rate or range rate difference XXXX.XXX Km/Second
	50-55	Range rate or range rate difference XXX.XXX Millimeters/Second

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
56		<u>Preprocessing Report</u>
		0 = Report not indicated.
		1 - 9, A - Z Values to be assigned.
57-61		Reference station number for range differencing, or transmitting station number for station-to-satellite-to-satellite-to-station data or average range rate data.
62-68		Relay satellite - ID for satellite-to-satellite data.
69-73		Measurement Standard deviation XXX.XX millimeters/second
74		Transmitter or reference station Mount type
		1 = X-Y (East-West)
		2 = X-Y (North-South)
		3 = Azimuth-Elevation
		4 = Hour angle-declination
75-77		Receiver antenna axis displacement XX.X Meters
78-80		Transmitter or reference station Antenna axis displacement XX.X Meters

S. 3.3.1.7 Azimuth/Elevation and X-Y Angles

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
1-7		Satellite - ID
8-9		Measurement Type
		60-63 X-Y Angles (East-West)
		60 = USB Radar
		64-69 X-Y Angles (North-South)
		64 = USB Radar
		65 = GRARR S-Band Radar
		66 = GRARR ATS-F C-Band Radar
		67 = GRARR VHF Radar
		70-79 Azimuth and Elevation Angles
		70 = Laser
		71 = C-Band Radar
		73 = DSN S-Band Radar
10-11		Time System Indicator
	10	0 = Ground Received Time
		1 = Satellite Transponder/Transmitter Time
		2 = Ground Transmitted Time
		3 = Satellite Receiver Time
	11	0 = UT-0
		1 = UT-1
		2 = UT-2
		3 = UT-C
		4 = A.1
		5 = A.3 (A. T. B. I. H.)
		6 = A-S (Smithsonian)

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
12-16		Station ID
17-32		GMT of Observation
	17-18	Year
		YY
	19-21	Day of Year
		DDD
	22-26	Time of Day (seconds from midnight GMT)
	27-32	Fractional Part of Seconds (in microseconds)
		<u>Refraction Indicators</u>
33-34	33	0 - Data has been corrected for ionospheric effects.
		1 - Data not corrected for ionosphere
	34	0 - Data has been corrected for tropospheric effects.
		1 - Data not corrected for troposphere
		Not Used.
		<u>Observation Data</u>
36-54	36-38	Azimuth or X angle (degrees). Sign of X angle appears in column 36.
	39-40	Azimuth or X angle (arc minutes)
	41-45	Azimuth or X angle XX.XXXX Arc Seconds
	46	Sign of Y angle
	47-48	Elevation or Y angle (degrees)
	49-50	Elevation or Y angle (minutes)
	51-54	Elevation or Y angle XX.XX Arc Seconds

<u>Columns</u>	<u>Subset</u>	<u>Description</u>
57		Not Used.
58-61		Standard deviation in X angle or azimuth XX.XX Arc Minutes
62-65		Standard deviation in elevation or Y angle XX.XX Arc Minutes
66		Preprocessing Report 0 - Report not indicated 1 - 9, A - Z Values to be assigned.
67-71		Tropospheric refraction correction to X angle XXX.XX Arc Minutes
72-76		Tropospheric refraction correction to Y angle or elevation XXX.XX Arc Minutes
77-80		Not Used.

INPUT TAPE RPIN CN MT1
DATA INPUT H9 NF FL 1 2 2
DATA INPUT H9 NF 1 FL 2 2

DUMP OF TAPE RPIN

PHYSICAL CONTROL WORD
LOGICAL CONTROL WORD
SAT-ID

DATE 44238 (YEAR 1988)
ACEF - EQUALS DAY OF YEAR
SAMPLE DUMP OF
FILE 1 OF NASA
LASER DATA (Δ39824)

FILE	1	RECORD	1	LENGTH	7132BYTES
(0)	1EDC0000	00480000	00E33B21	0014000D	00001BAE
(40)	6330FAD5	00000000	00000000	00000000	4154FB0E
(80)	00633B21	0046000D	00001BAE	0020A000	0000ACCF
(120)	EB4E6362	00000000	00000000	33115326	00000000
(160)	00001BAE	0020A000	0000ACCF	406CF748	BF78E790
(200)	413C8B9D	33115326	00000000	00000000	C052F837
(240)	0000ACCF	406CF748	BF78E790	413C6E79	35134555
(280)	00000000	00000000	00000000	00480000	00633B21
(320)	3B2B86A0	4617E406	0EE4B98D	00000000	00000000
(360)	C053E425	00480000	00E33B21	0046000D	00001BAE
(400)	1EC71824	40905A5A	6FC03672	00000000	00000000
(440)	00633B21	0014000D	00001BAE	0020A000	0000ACCF
(480)	00000000	00000000	41379D7F	33115326	00000000
(520)	00001BAE	0020A000	0000ACCF	406D05B2	219D0D90
(560)	00000000	33115326	00000000	00000000	00000000
(600)	0000ACCF	406D0674	4D4DDE50	461770EA	81F6C6A0
(640)	00000000	00000000	C053E425	00480000	00633B21
(680)	4D4DDE50	413B80FB	0182AEE5	4094CA6A	B36F9CB8
(720)	00000000	00480000	00E33B21	0014000D	00001BAE
(760)	46FF568E	00000000	00000000	00000000	41371E60
(800)	00633B21	0046000D	00001BAE	0020A000	0000ACCF
(840)	2AF0E474	00000000	00000000	33115326	00000000
(880)	00001BAE	0020A000	0000ACCF	406D07F8	AA171AA0
(920)	4136E2DD	33115326	00000000	00000000	C053E425
(960)	0000ACCF	406D07F8	AA171AA0	413BD143	CBAE09A9
(1000)	00000000	00000000	00000000	00480000	00633B21
(1040)	8C403E30	4616ECDB	E9C4CE16	00000000	00000000
(1080)	C05460AA	00480000	00633B21	0046000D	00001BAE
(1120)	930B0047	409A2015	EE9E646E	00000000	00000000
(1160)	00633B21	0014000D	00001BAE	0020A000	0000ACCF
(1200)	00000000	00000000	41357426	33115326	00000000
(1240)	00001BAE	0020A000	0000ACCF	406D0C85	BAE9A470
(1280)	00000000	33115326	00000000	00000000	00000000
(1320)	0000ACCF	406D1112	CC7E6F80	46166B5F	8308E73D
(1360)	00000000	00000000	C054DD2F	00480000	00633B21
(1400)	CC7B6F80	413B6B38	2EAAAB26	409F9CC4	25F72D21
(1440)	00000000	00480000	00E33B21	0014000D	00001BAE
(1480)	5D11C558	00000000	00000000	00000000	41325470
(1520)	00633B21	0046000D	00001BAE	0020A000	0000ACCF
(1560)	61F26587	00000000	00000000	33115326	00000000
(1600)	00001BAE	0020A000	0000ACCF	406D1B81	4A479830
(1640)	41311241	33115326	00000000	00000000	C0556041
(1680)	0000ACCF	406D1B81	4A479830	413AE251	C5348221
(1720)	00000000	00000000	00000000	00480000	00633B21
(1760)	E451AFE0	4614D66B	EE61F7A6	00000000	00000000
(1800)	C055E353	00480000	00E33B21	0046000D	00001BAE
(1840)	F78B2B49	40B2F79F	FAB7B62F	00000000	00000000
(1880)	00633B21	0014000D	00001BAE	0020A000	0000ACCF
(1920)	00000000	00000000	412EB65E	33115326	00000000
(1960)	00001BAE	0020A000	0000ACCF	406D24CB	6D698B50
(2000)	00000000	33115326	00000000	00000000	00000000
(2040)	0000ACCF	406D264F	C7F30F80	4614830E	0D396F42
(2080)	00000000	00000000	C0566666	00480000	00633B21
(2120)	C7F30F80	413A400E	16FC2ADE	40B76E16	EBE72B9A
(2160)	00000000	00480000	00E33B21	0014000D	00001BAE

(REMAINING DUMPS
WERE TOSSED)
RWP

(2280)	45A21BE5	00000000	00000000	33115326	00000000	00000000	00000000	00480000	00633B21	00140000
(2320)	00001BAE	0020A000	0000ACCF	406D33F6	FA934410	4E1266F1	DD543192	00000000	00000000	00000000
(2360)	412E31FC	33115326	00000000	00000000	C057B4A2	0C48C000	00633B21	0046000D	00001BAE	0C20A000
(2400)	0000ACCF	406D33F6	FA934410	41394286	88F0BA0E	4CC8378D	A4359D9D	00000000	00000000	33115326
(2440)	00000000	00000000	00000000	00480000	00633B21	0C14000D	00001BAE	0020A000	0000ACCF	406D34E9
(2480)	279F38B0	461357F4	322C5C17	00000000	00000000	00000000	412B0955	33115326	00000000	00000000
(2520)	C057B4A2	00480000	00633B21	0046000D	00001BAE	0C20A000	0000ACCF	406D34B9	279F38B0	41393281
(2560)	9E02AC49	40C9295C	74041036	00000000	00000000	33115326	00000000	00000000	00000000	0C48C000
(2600)	00633B21	0014000D	00001BAE	0020A000	0000ACCF	406D363D	80861200	46133A3D	3F643D48	00000000
(2640)	00000000	00000000	412AB675	33115326	00000000	00000000	C057B4A2	00480000	00633B21	0C46000D
(2680)	00001BAE	0020A000	0000ACCF	406D363D	80861200	41391122	1E34476C	40CB1EB1	34F4CC92	00000000
(2720)	00000000	33115326	00000000	00000000	00000000	0C48C000	00633B21	0014000D	00001BAE	0C20A000
(2760)	0000ACCF	406D3946	37A2019D	4612FFE6	633D703D	00000000	00000000	00000000	412A1758	33115326
(2800)	00000000	00000000	C05816F0	00480000	00633B21	0C46000D	00001BAE	0020A000	0000ACCF	406D3946
(2840)	37A2019D	4138CDB8	10717529	40CF024B	9D328AD1	00000000	00000000	33115326	00000000	00000000
(2880)	00000000	00480000	00633B21	0014000D	00001BAE	0C20A000	0000ACCF	406D3A08	622E6F40	4612F18C
(2920)	5325AF3E	00000000	00000000	00000000	4129F052	33115326	00000000	00000000	C05816F0	0C48C000
(2960)	00633B21	0046000D	00001BAE	0020A000	0000ACCF	406D3A08	622E6F40	4138BBD9	8F6F8A1B	40CFFD74
(3000)	842DD474	00000000	00000000	33115326	00000000	00000000	00480000	00633B21	0C14000D	
(3040)	00001BAE	0020A000	0000ACCF	406D3ACA	90670D40	4E12E34A	5A533457	00000000	00000000	00000000
(3080)	4129C8DF	33115326	00000000	00000000	C05816F0	0C48C000	00633B21	0046000D	00001BAE	0C20A000
(3120)	0000ACCF	406D3ACA	90670D40	4138AA7D	19BD63EE	40D0FE3F	0ACC14FF	00000000	00000000	33115326
(3160)	00000000	00000000	00000000	00480000	00633B21	0C14000D	00001BAE	0020A000	0000ACCF	406D3B8C
(3200)	BEBA2700	4612D520	80686803	00000000	00000000	00000000	4129A284	33115326	00000000	00000000
(3240)	C05816F0	00480000	00633B21	0046000D	00001BAE	0C20A000	0000ACCF	406D3B8C	BEBA2700	4138981C
(3280)	724FA854	40D1FAC4	733C1DD4	00000000	00000000	33115326	00000000	00000000	00000000	0C48C000
(3320)	00633B21	0014000D	00001BAE	0020A000	0000ACCF	406D3C4E	E2898C10	4612C710	73D00165	00000000
(3360)	00000000	00000000	41297CA4	33115326	00000000	00000000	C05816F0	00480000	00633B21	0C46000D
(3400)	00001BAE	0020A000	0000ACCF	406D3C4E	E2898C10	4138858E	D6B1A9A2	40D2F6FA	87D84799	00000000
(3440)	00000000	33115326	00000000	00000000	00000000	0C48C000	00633B21	0014000D	00001BAE	0C20A000
(3480)	0000ACCF	406D3DD3	499B3E00	4612AB38	CF7D2811	00000000	00000000	00000000	412931B4	33115326
(3520)	00000000	00000000	C05872B0	00480000	00633B21	0C46000D	00001BAE	0020A000	0000ACCF	406D3DD3
(3560)	499B3E00	41385FE2	CA3CD211	40D4F276	B8081B5E	00000000	00000000	33115326	00000000	00000000
(3600)	00000000	00480000	00633B21	0014000D	00001BAE	0C20A000	0000ACCF	406D3F57	A3403710	46128FC7
(3640)	75BE224C	00000000	00000000	00000000	4128E7B9	33115326	00000000	00000000	C05872B0	0C48C000
(3680)	00633B21	0046000D	00001BAE	0020A000	0000ACCF	406D3F57	A3403710	4138396E	D317CD91	40D6F2F5
(3720)	123404E2	00000000	00000000	33115326	00000000	00000000	00480000	00633B21	0C14000D	
(3760)	00001BAE	0020A000	0000ACCF	406D419E	29695E40	4E12E75F	49A623A2	00000000	00000000	00000000
(3800)	41287B2B	33115326	00000000	00000000	C05872B0	00480000	00633B21	0046000D	00001BAE	0020A000
(3840)	0000ACCF	406D419E	29695E40	4137FD4C	36558DAE	40D9F893	43E24251	00000000	00000000	33115326
(3880)	00000000	00000000	00000000	00480000	00633B21	0C14000D	00001BAE	0020A000	0000ACCF	406D4322
(3920)	88CE55E0	46124CF2	82D6F473	00000000	00000000	00000000	4128359B	33115326	00000000	00000000
(3960)	C058C154	00480000	00633B21	0046000D	00001BAE	0020A000	0000ACCF	406D4322	88CE55E0	4137D3C3
(4000)	857A6A6A	40DBF68B	AFE7682F	00000000	00000000	33115326	00000000	00000000	00000000	0C48C000
(4040)	00633B21	0014000D	00001BAE	0020A000	0000ACCF	406D43E4	B59B58E0	46123FE4	D6E2363F	00000000
(4080)	00000000	00000000	41281283	33115326	00000000	00000000	C058C154	0C48C000	00633B21	0C46000D
(4120)	00001BAE	0020A000	0000ACCF	406D43E4	B59B58E0	4137EE7C	46F109BA	40DCFC39	672C4CFD	00000000
(4160)	00000000	33115326	00000000	00000000	00000000	0C48C000	00633B21	0C14000D	00001BAE	0C20A000
(4200)	0000ACCF	406D4569	10629EC0	4612261A	C0CD849E	00000000	00000000	00000000	4127CD5E	33115326
(4240)	00000000	00000000	C058C154	00480000	00633B21	0C46000D	00001BAE	0020A000	0000ACCF	406D4569
(4280)	10629EC0	413792D4	507CE61B	40DF08E7	AF653F65	00000000	00000000	33115326	00000000	00000000
(4320)	00000000	00480000	00633B21	0014000D	00001BAE	0C20A000	0000ACCF	406D4933	F4431B40	4611E789
(4360)	01076F58	00000000	00000000	00000000	4127288F	33115326	00000000	00000000	C058C154	0C48C000
(4400)	00633B21	0046000D	00001BAE	0020A000	0000ACCF	406D4933	F4431B40	4137203B	68374BF1	40E41D8D
(4440)	50DB5758	00000000	00000000	33115326	00000000	00000000	00000000	00480000	00633B21	0C14000D
(4480)	00001BAE	0020A000	0000ACCF	406D49F6	213AB6E0	4E11DBEB	238E25EB	00000000	00000000	00000000
(4520)	412708D5	33115326	00000000	00000000	C059096B	00480000	00633B21	0046000D	00001BAE	0020A000
(4560)	0000ACCF	406D49F6	213AB6E0	4137084D	46C9891F	40EE2092	60E64E7A	00000000	00000000	33115326
(4600)	00000000	00000000	00000000	00480000	00633B21	0C14000D	00001BAE	0020A000	0000ACCF	406D4AB8
(4640)	502E0550	46110CF49	D1B28C95	00000000	00000000	00000000	4126E862	33115326	00000000	00000000
(4680)	C059096B	00480000	00633B21	0046000D	00001BAE	0C20A000	0000ACCF	406D4AB8	502E0550	413EEFC9
(4720)	E93F398B	40E629FF	94EAD195	00000000	00000000	33115326	00000000	00000000	00000000	0C48C000
(4760)	00633B21	0014000D	00001BAE	0020A000	0000ACCF	406D4B7A	7C5C7C30	4611C356	26F2B157	00000000
(4800)	00000000	00000000	4126CA67	33115326	00000000	00000000	C059096B	00480000	00633B21	0046000D

(4920)	0000ACCF	406D4DC1	07939250	4611A02C	5EC2C270	00000000	00000000	00000000	41266EC9	33115326
(4960)	00000000	00000000	0059096B	00480000	00633B21	004E0000	00001BAE	0020A000	0000ACCF	406D4DC1
(5000)	07939250	41368A73	0E1F833B	40EA3591	983B0AB4	00000000	00000000	33115326	00000000	00000000
(5040)	00000000	00480000	00633B21	00140000	00001BAE	0020A000	0000ACCF	406D4F45	626B7B00	46118951
(5080)	EF631F74	00000000	00000000	00000000	41263327	33115326	00000000	00000000	0059096B	00480000
(5120)	00633B21	00460000	00001BAE	0020A000	0000ACCF	406C4F45	626B7B00	41365536	45FE2462	40EC4181
(5160)	C3E7DC32	00000000	00000000	33115326	00000000	00000000	00000000	00480000	00633B21	00140000
(5200)	00001BAE	0020A000	0000ACCF	406D5007	8EE65220	46117E12	A441D1DA	00000000	00000000	00000000
(5240)	412615E6	33115326	00000000	00000000	0059096B	00480000	00633B21	00460000	00001BAE	0020A000
(5280)	0000ACCF	406D5007	8EE65220	41363A5A	A600A7AD	40EC46ED	115DEF76	00000000	00000000	33115326
(5320)	00000000	00000000	00000000	00480000	00633B21	00140000	00001BAE	0020A000	0000ACCF	406D518B
(5360)	E9DA6EF0	461167F0	F595D11E	00000000	00000000	00000000	4125DCE9	33115326	00000000	00000000
(5400)	0059096B	00480000	00633B21	00460000	00001BAE	0020A000	0000ACCF	406D518B	E9DA6EF0	413602E2
(5440)	23AC40D4	40EF4CD1	2ED8D398	00000000	00000000	33115326	00000000	00000000	00000000	00480000
(5480)	00633B21	00140000	00001BAE	0020A000	0000ACCF	406C524E	17B360E0	4611ED0F	006A7870	00000000
(5520)	00000000	00000000	4125C11C	33115326	00000000	00000000	0059096B	00480000	00633B21	00460000
(5560)	00001BAE	0020A000	0000ACCF	406D524E	17B360E0	4135E61D	6804199D	40F04DB5	5081416F	00000000
(5600)	00000000	33115326	00000000	00000000	00000000	00480000	00633B21	00140000	00001BAE	0020A000
(5640)	0000ACCF	406D5494	A1D761B0	46113D27	CB904958	00000000	00000000	00000000	41256F98	33115326
(5680)	00000000	00000000	0059096B	00480000	00633B21	00460000	00001BAE	0020A000	0000ACCF	406D5494
(5720)	A1D761B0	41358DD1	E2DB2639	40F34FC6	B2835AFE	00000000	00000000	33115326	00000000	00000000
(5760)	00000000	00480000	00633B21	00140000	00001BAE	0020A000	0000ACCF	406D5618	FD9FB1B0	46112884
(5800)	454902E1	00000000	00000000	00000000	41253AA2	33115326	00000000	00000000	0059096B	00480000
(5840)	00633B21	00460000	00001BAE	0020A000	0000ACCF	406C5618	FD9FB1B0	41355155	92909E72	40F55218
(5880)	718BF13D	00000000	00000000	33115326	00000000	00000000	00480000	00633B21	00140000	00000000
(5920)	00001BAE	0020A000	0000ACCF	406D60B7	7EA61E30	4610A6C8	F83AA28B	00000000	00000000	00000000
(5960)	4123F339	33115326	00000000	00000000	005872E0	00480000	00633B21	00460000	00001BAE	0020A000
(6000)	0000ACCF	406D60B7	7EA61E30	41336995	BB4355A3	411C2D72	CEB62DD2	00000000	00000000	33115326
(6040)	00000000	00000000	00000000	00480000	00633B21	00140000	00001BAE	0020A000	0000ACCF	406D89AD
(6080)	3B416E40	45FC4592	ED7507E7	00000000	00000000	00000000	4121D51D	33115326	00000000	00000000
(6120)	C051C432	00480000	00633B21	00460000	00001BAE	0020A000	0000ACCF	406D89AD	3B416E40	4127E975
(6160)	AFBC9B7D	4111F06D	C3A51B67	00000000	00000000	33115326	00000000	00000000	00000000	00480000
(6200)	00633B21	00140000	00001BAE	0020A000	0000ACCF	406DBEC5	FAB94740	46115236	EA2F4D04	00000000
(6240)	00000000	00000000	4126046B	33115326	00000000	00000000	004C6A7E	00480000	00633B21	00460000
(6280)	00001BAE	0020A000	0000ACCF	406DBEC5	FAB94740	411AE480	7B888229	40EDE46C	A4372FA3	00000000
(6320)	00000000	33115326	00000000	00000000	00000000	00480000	00633B21	00140000	00001BAE	0020A000
(6360)	0000ACCF	406DBF88	2430F460	46115CFC	3458DE76	00000000	00000000	00000000	4126222D	33115326
(6400)	00000000	00000000	004C6A7E	00480000	00633B21	00460000	00001BAE	0020A000	0000ACCF	406DFF88
(6440)	2430F460	411AC85E	EC319527	40ECD8DB	13A667B7	00000000	00000000	33115326	00000000	00000000
(6480)	00000000	00480000	00633B21	00140000	00001BAE	0020A000	0000ACCF	406DC1CE	E40FE180	46117E0A
(6520)	0634C95C	00000000	00000000	00000000	41267B2E	33115326	00000000	00000000	004C28F5	00480000
(6560)	00633B21	00460000	00001BAE	0020A000	0000ACCF	406DC1CE	B40FE180	411A76AD	D1952547	40E9CA21
(6600)	06C5799E	00000000	00000000	33115326	00000000	00000000	00480000	00633B21	00140000	00000000
(6640)	00001BAE	0020A000	0000ACCF	406DCAE8	EA97BA90	46120CEF	0647F72D	00000000	00000000	00000000
(6680)	4126051E	33115326	00000000	00000000	0048573E	00480000	00633B21	00460000	00001BAE	0020A000
(6720)	0000ACCF	406DCAE8	EA97BA90	411955BE	75C47DD8	4000E0E5	B7D29512	00000000	00000000	33115326
(6760)	00000000	00000000	00000000	00480000	00633B21	00140000	00001BAE	0020A000	0000ACCF	406DCF76
(6800)	0232A140	46125A6E	8EC4FC07	00000000	00000000	00000000	4128DFF8	33115326	00000000	00000000
(6840)	004B089A	00480000	00633B21	00460000	00001BAE	0020A000	0000ACCF	406DCF76	0232A140	4118D72F
(6880)	1DC0B6B1	40D72956	CACE55F7	00000000	00000000	33115326	00000000	00000000	00000000	00480000
(6920)	00633B21	00140000	00001BAE	0020A000	0000ACCF	406DD0FA	624BA590	4612751D	07203D8A	00000000
(6960)	00000000	00000000	412929CC	33115326	00000000	00000000	004AB9F5	00480000	00633B21	00460000
(7000)	00001BAE	0020A000	0000ACCF	406DD0FA	624BA590	4118AF7F	C57D3633	40D528AC	26BC7EED	00000000
(7040)	00000000	33115326	00000000	00000000	00000000	00480000	00633B21	00140000	00001BAE	0020A000
(7080)	0000ACCF	406DD27E	EDA88A10	46129034	AF9DB053	00000000	00000000	00000000	4129771D	33115326
(7120)	00000000	00000000	004AB9F5							

FILE	1	RECORD	2	LENGTH	7132BYTES
(0)	1B0C0000	00480000	00633B21	00460000	00001BAE 0020A000 0000ACCF 406DD27E BDA88A10 411889E0
(40)	A468508B	40D31C07	6AE1A75B	00000000	00000000 33115326 00000000 00000000 00000000 00480000
(80)	00633B21	00140000	00001BAE	0020A000	0000ACCF 40EC04C5 4AC57820 4612B99A 9C8A85F7 00000000
(120)	00000000	00000000	4129EB74	33115326	00000000 00000000 00480000 00633B21 00460000
(160)	00001BAE	0020A000	0000ACCF	406DD4C5	4AC57820 4118527B A85C5991 40D01CFA 52E8398B 00000000
(200)	00000000	33115326	00000000	00000000	00480000 00633B21 00140000 00001BAE 0020A000