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PIONEER F/G PROJECT
SPECIFICATION PC-262

PIONEER F/G: OFF-LINE DATA PROCESSING SYSTEM DESCRIPTION

REVISIONS

<u>No.</u>	<u>Date</u>	<u>No.</u>	<u>Date</u>	<u>No.</u>	<u>Date</u>
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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PIONEER F/G PROJECT

PIONEER F/G: OFF-LINE DATA PROCESSING SYSTEM
DESCRIPTION

SPECIFICATION PC-262.00

September 1, 1971

1. SCOPE

This Document specifies:

- (a) The characteristics and general requirements of the Pioneer Off-Line Data Processing System (POLDPS)
- (b) The requirements for the Experiment Data Records (EDR) produced by the Pioneer Off-Line Data Processing System for the Pioneer F data users.

2. APPLICABLE DOCUMENTS

2.1 NASA/ARC SPECIFICATIONS

PC-262.01, Pioneer F/G: Input and Output Tape Requirements
PC-262.02, Pioneer Off-Line Data Processing System Detailed Processing Requirements
PC-262.03, Pioneer F/G: Data Users Requirements
PC-262.04, Pioneer F/G: Trajectory Data Requirements
PC-262.05, Pioneer Saturn: Trajectory Data User Requirements
PC-261.00, Pioneer F/G: On-Line Ground Data System Software Specification - General

3. REQUIREMENTS

3.1 DATA PROCESSING SYSTEM REQUIREMENTS

The prime purpose of the Pioneer Off-Line Data Processing System is the generation of an Experimenter Data Record (EDR) for all Principal Investigators having an instrument on-board the Pioneer F/G spacecraft. This work will be carried out under the policy of NASA Management Instruction (NMI) 7100.0 and as detailed in NASA Policy Directive (NPD) 8030.3 dated January 7, 1967, entitled "Policy Concerning Data Obtained from Space Science Flight Experiments."

data file on the tape (fourth file) shall contain only the data sensed by his instrument plus any of the spacecraft engineering data he may need to interpret his science data. The specification describes in detail each users requirements in order to establish complete compatibility between his data processing facility and the ARC system.

- 3.1.4 Pioneer F/G Trajectory Data Requirements. Specification PC-262.04 sets forth the detailed trajectory data requirements of each user. In particular, the parameters desired, the density of the tape, the format, and the language on the tape are described in order to assure that each user's data processing facility is compatible with the system at ARC.
- 3.1.5 Pioneer Saturn Trajectory Data User Requirements. Specification PC-264.05 describes the detailed trajectory data user requirements for the Pioneer Saturn phase of the Pioneer 11 mission. Similar to PC-262.04, the parameters desired, the density of the tape, the format, and the language on the tape are specified in order to assure that each user's data processing facility is compatible with the system at ARC. (2)

3.2 DOCUMENTATION REQUIREMENTS

The documentation required, the milestones in work activity and the subsequent reporting requirements in the execution of this specification are identical to those found in specification PC-261.00, Documentation Requirements. In addition to the formal documentation required in PC-261.00, another manual entitled Experimenter Tape Formats shall be generated. This document shall contain a complete description of each experimenter's data tape format. It shall cover at least the following items: writing density, block size language and/or mode, word and/or bit assignments - in short, all information necessary to identify and process the data tape.

3.3 DOCUMENT CONTROL

This specification shall be subject to rigid document control by NASA/ARC. In the event changes are required to this specification, replacement or additional pages will be furnished by NASA/ARC. Replacement or additional pages will be appropriately labeled to indicate changes and dates of changes.

4. PRODUCT ASSURANCE PROVISIONS

Not applicable.

5. HANDLING, SHIPPING, AND STORAGE

Not applicable.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Ames Research Center
Moffett Field, California

PIONEER PROGRAM

SPECIFICATION PC-262.01

PIONEER F/G: INPUT AND OUTPUT TAPE REQUIREMENTS

September 1, 1971

1. SCOPE

This document describes the digital magnetic tapes which shall be required as an input and those tapes generated as an output for the Pioneer Off-Line Data Processing System (POLDPS).

2. APPLICABLE DOCUMENTS

2.1 NASA/ARC SPECIFICATIONS

PC-262.00, Pioneer Off-Line Data Processing System at ARC

PC-262.02, Pioneer F/G: Off-Line Data Processing System
Detailed Processing Requirements

PC-262.03, Pioneer F/G: Data User Requirements

PC-262.04, Pioneer F/G: Trajectory Data Requirements

PC-262.05, Pioneer Saturn: Trajectory Data User Requirements (2)

PC-224.00, ARC/DSN Ground Data System Interface Requirements

PC-265.00, Simulation System Requirements

PC-202 Pioneer F/G: Spacecraft Operational Characteristics

2.2 Deleted (2)

3. REQUIREMENTS

3.1 XDS SIGMA 5 INPUT DATA TAPES

- 3.1.1 Telemetry Master Data Record (MDR) Tape. The Telemetry MDR is the source data for all POLDPS processing. This tape will be generated at the SFOF by the DSN on the IBM 360-75 computer or on a Xerox Sigma 5 computer at ARC. It will be written on a 9 track tape at 800 bpi writing density and in the binary mode. The format and word assignment for this tape is shown in Figure 3.1.1 of this specification. It should be noted that the make-up of the records themselves for the telemetry data (exclusive of the header) is as follows: (2)

STREAM	BYTE LOGICAL	NO. OF LOGICAL RECORDS PER PHYSICAL RECORD	NO. OF BYTES PER PHYSICAL RECORD
Pioneer F&G (192) (384)	168	42	7056

The 192 bit stream contains 1 to 4 frames per logical record; the 384 bit stream contains 1 or 2 frames per logical record.

- 3.1.2 Command Master Data Record Tape. The Command MDR is the prime data source for command data processing. This tape will also be generated by the DSN at the SFOF on the IBM 360-75 or on a Xerox Sigma 5 computer at ARC. It also will be written on a 9 track tape at 800 bpi and in binary. The format and word assignment for this tape is shown in Figure 3.1.2 of this specification. (2)
- 3.1.3 Trajectory Master Data Record Tape. The source of trajectory data for the Pioneer F/G experimenter will be derived using JPL's Double Precision Trajectory Program (DPTRAJ). This computer program will provide position and velocity information at selected intervals for the near-earth, heliocentric transfer, encounter and post-encounter phases of the Pioneer F trajectory. (2)

- 3.1.3.1 DPTRAJ Trajectory Data for Pioneer F/G. The DPTRAJ data are (2)
computed from an initial state vector of the spacecraft which
is derived using the doppler shift of the Pioneer F spacecraft's
S-band received signal, i.e., tracking data. In the course of
the mission there will be at least four trajectory "save"
tapes generated for use by the off-line processing system.
Additional "save" tapes may be required based upon better
orbit determinations as more tracking data are gathered
during the flight.
- 3.1.3.1.1 Injection to First Midcourse. The first trajectory "save" (1)
tape will encompass the period from injection to
approximately ten days after launch and will be sent to
each Principal Investigator approximately one week after
launch. These data will be valid out to the first midcourse
maneuver which will occur between three and ten days after
launch. The number of data points will be at approximately
the following output frequency:
- (a) Injection to four hours; every one minute centers.
 - (b) Four hours to 24 hours; every 30 minute centers.
 - (c) 24 hours to five days; every one hour centers.
 - (d) Five days to ten days; every two hour centers.
- 3.1.3.1.2 First Midcourse to 35 Days After First Midcourse. The (1)
second trajectory "save" tape will be generated based upon
tracking data taken after the first midcourse maneuver and
will be sent to each Principal Investigator approximately
1½ weeks after the first midcourse maneuver. This tape will
extend from the first midcourse to approximately 35 days after
first midcourse. The number of data points will be at
approximately the following output frequency:
- (a) First midcourse to first midcourse plus two days;
every two hour centers.
 - (b) First midcourse plus two days to 14 days after
injection; every four hour centers.
 - (c) 14 days to 35 days after injection; every eight
hour centers.
- 3.1.3.1.3 Second Midcourse to 40 Days Before Periapsis. The third (1)
trajectory "save" tape will be generated based upon tracking
data taken after the second midcourse maneuver and will be
sent to each Principal Investigator approximately 1½ weeks
after the second midcourse maneuver. This tape will extend
from the second midcourse to approximately 40 days before
periapsis. The number of data points will be at
approximately the following output frequency:
- (a) Second midcourse to second midcourse plus two days;
every eight hour centers.
 - (b) Second midcourse plus two days to 40 days before
periapsis; every 24 hour centers.

Due to the protracted period of time between the start and end of the "save" tape (some 600 days), subsequent orbit refinements may dictate the requirement for additional trajectory "save" tapes to accurately cover this time interval. Nominally, when the actual data deviates from the projected data by 0.1 percent in range, a new "save" tape will be generated.

Revision

- 3.1.3.1.4 Fifty Days Before Periapsis to Ten Days After Periapsis. (1)
 The fourth trajectory "save" tape will take into account the effect of Jupiter's gravity pull based upon tracking data recorded when the spacecraft is within Jupiter's sphere of influence. This tape will overlap the previous tape some ten days by extending from 50 days before periapsis to ten days after periapsis. The number of data points will be at approximately the following output frequency:
- (a) Fifty days before periapsis to five days before periapsis; every 24 hour centers.
 - (b) Five days before periapsis to 24 hours before periapsis; every two hour centers.
 - (c) Twenty four hours before periapsis to two hours before periapsis; every ten minute centers.
 - (d) two hours before periapsis to two hours after periapsis; every one minute centers.
 - (e) Two hours after periapsis to 24 hours after periapsis; every 20 minute centers.
 - (f) Twenty four hours after periapsis to ten days after periapsis; every 6 hour centers.
- 3.1.3.1.5 Post-Encounter. A follow-on trajectory "save" tape will be generated for the post-encounter phase if there is a requirement to continue tracking coverage. The number of data points will be determined at a later date. (1)
- 3.1.3.1.6 DPTRAJ Data Tape. The "save" tape will be written on a 7 track tape at 800 bpi and in the binary mode by the JPL Univac 1108. The format and word assignment, are given in Figure 3.1.3 of this specification. PC-262.04, Pioneer F Trajectory Data and User Requirements sets forth the individual requirements of each user as well as the coordinate systems and parameters available. (1)

At the beginning of the tape, there are two physical records containing BCD information. Following these two records are the trajectory data. Each logical "save" record consists of four physical records. Appropriate flags are provided to signal the beginning and the end of the trajectory data. The format of each physical record has the following characteristics:

RECORD #1

This record consists of 252 words and contains the 6-letter BCD mnemonics of all trajectory variables available from the list given in PC-262.04, Pioneer F/G: Trajectory Data and User Requirements. See Figure 3.1.3 sheet 1. (1)
(2)

RECORD #2

This is a dummy record consisting of 140 words. See Figure 3.1.3, sheet 1. (1)

RECORD #3

Physical records #3 through #6 are grouped together as one logical "save" record. These 4 records are repeated for each time point requested by the user in his input. There are 28 words in Record #3. The initial logical "save" record is signaled by the presence of the number 377777777778 in word three. Thereafter, for each logical "save" record following the initial one, word three of physical Record #3 will contain zeroes. Following the last logical "save" record, physical record #3 is repeated with the end of data signalled by the presence again of 377777777778 in word three. The end of data is not terminated by an end-of-file.

RECORD #4

There are 252 words in this record. This record contains the actual values of the trajectory variables. With the exception of words 7 and 8, all variables are double precision quantities represented by two consecutive words comprising the UNIVAC 1108 double precision representation. Figure 3.1.3, sheet 2 describes the format of records #3 and #4. The numbering scheme shown as record #4 is consistent with the numbering of the variables on the list given in PC-262.04. (1)
(1)

Example: Words 23 and 24 both contain the number 10. (2)

This designates the location of the first half and the second half of the double precision value for variable #10, inertial azimuth angle (INAZIM). (2)

Words 7 and 8 are two integers containing the value of variable #3, the Gregorian calendar date. The format of the representation is vigesimal and is described below:

(WORD 7) bbYYYYMMDDDD

(WORD 8) bbHHNNSSPPPP

where: YYYY - year
 MM - month
 DDDD - day
 HH - hour
 NN - minute
 SS - second
 PPPP - parts of a second

Example: March 3, 1972, at 18 hours 22 minutes and 32.8 seconds

bb1972030003
bb182232.8000

RECORD #5 AND RECORD #6

Record #5 contains an additional set of parameters that are referred to as "programmable variables" and represents an option capability in the DPTRAJ Program. The format for this data are given in Figure 3.1.3 sheet 3. A description of these parameters is given in PC-262.04, Pioneer F/G: Trajectory Data and User Requirements. (1)

Record #6 is a dummy record and contains 252 words. See Figure 3.1.3 sheet 3. (1)

Two important facts should be realized.

1. BCD conversion codes for the UNIVAC 1108 are different from the BCD codes of the IBM machine.
2. Double precision numbers in FORTRAN V are represented to the base 2000_8 .

3.1.3.2 Deleted. (2)

3.1.3.3 DPTRAJ Trajectory Data for Pioneer-Saturn. For the Pioneer Saturn phase of Pioneer 11, DPTRAJ trajectory "save" tapes will be generated to cover the transfer, encounter and post-encounter periods of flight. With one exception the format, record size and word assignments for these tapes shall be identical to that specified in section 3.1.3.1.6. As shown below, seven mnemonics in record #1 (see figure 3.1.3) are different for the Pioneer Saturn "save" tape. (2)

Pioneer F/G
"Save" Tape

ES5
 SE5
 S5E
 A5SP
 S5P
 A5ASD

changes to

"
 "
 "
 "
 "

Pioneer Saturn
"Save" Tape

ES6
 SE6
 S6E
 A6SP
 S6P
 A6ASD

A complete list of the Pioneer Saturn "save" tape variables is provided in PC-262.05, Pioneer Saturn: Trajectory Data User Requirements.

3.1.4

Simulation/Test Data Tapes. Tapes will be generated by JPL to validate the performance of the off-line data processing system. These, in general, shall conform as closely as possible to the formats given in Figures 3.1.1, 3.1.2 and 3.1.3.

3.2 XDS SIGMA 5 OUTPUT DATA TAPES

- 3.2.1 Experimenter Data Record (EDR). The requirements for the EDR for each experimenter/user are covered in detail in specification PC-262.03, entitled Pioneer F Data User Requirements. This includes the requirements of the Pioneer Project staff. Figure 3.2.1 gives the organization for the fixed header data which shall precede all users data.
- 3.2.2 Simulation/Test Data Tapes. Simulation/test data tapes shall be generated by the POLDPS to aid each of the experimenters/users in validating their respective data processing system. This shall be subdivided into categories of tapes generated.
- 3.2.2.1 Category I. The intent of the Category I tape is to establish compatibility between the computer at ARC and the computer at each users data facility. The tape shall be written in the proper density, mode, appropriate file definition and length along with necessary control words, and appropriate record length definition. No attempt shall be made to provide realism in the data other than those factors given above. The data contained in the first 3 files shall contain data as indicated in Figure 3.2.1. File 4 shall contain an appropriately defined code such as alternating 1's and 0's for the science data. The format for each user is given in PC-262.03, Pioneer F Data User Requirements.
- 3.2.2.2 Category II. The intent of the Category II tape is to provide each user with the most representative data for his instrument as is possible. These data may be obtained from the Simulation System or from the live spacecraft during system testing at TRW. A test telemetry MDR, generated for ARC by the DSN shall be used to validate the POLDPS as a total system and declare it as operational. Subsequent output of POLDPS will be sent to each user to more fully validate his system and insure a workable and operational interface. As stated previously each user's format requirements are given in PC-262.03, Pioneer F Data User Requirements.

In addition to the telemetry data a representative trajectory data tape shall be generated for each user in the format and density required for his data processing facility. The details for each users format and the content of the tape are given in PC-262.04, Pioneer F Trajectory Data Requirements. The representative trajectory tape which will be sent to each user for check out of his system shall be generated from a nominal Pioneer F trajectory and provided by the Pioneer Navigation Team. The input tape format is shown in Figure 3.1.3 of this specification.

3.3 DOCUMENT CONTROL

This specification shall be subject to rigid document control by NASA/ARC. In the event changes are required to this specification, replacement, or additional pages will be furnished by NASA/ARC. Replacement or additional pages will be appropriately labeled to indicate change and dates of changes.

4. PRODUCT ASSURANCE PROVISIONS

Not applicable.

5. HANDLING, SHIPPING, AND STORAGE

Not applicable.

6. NOTES

6.1 ABBREVIATIONS

See Section 6.1 of PC-262.00 entitled, Pioneer Off-Line Data Processing System at ARC.

6.2 GLOSSARY OF TERMS

See Section 6.2 of PC-262.00 entitled, Pioneer Off-Line Data Processing System at ARC.

PHYSICAL RECORD DESCRIPTION

RECORD #1 (252 WORDS)

WORD

1	NOT USED	NOT USED	ETSP50	JULDAT	VIGDAT	TFLANC	TFINJE
8	ETMUTC	NOT USED	RANGRP	MAGVEL	INPATH	INAZIM	REARPR
15	DECPRO	RTASCP	REARSU	DECSUN	RTASCS	REARM0	DECM00
22	RTASCM	HRANGP	HMAGVP	HINPTH	CELLTP	CELLNP	CELLTE
29	CELLNE	XSCSEL	YSCSEL	ZSCSEL	SPSEXY	LNPSEL	NOT USED
36	NOT USED	XPGSFF	YPGSFF	ZPGSFF	DXPGSF	DYPGSF	DZPGSF
43	XPHSFF	YPHSFF	ZPHSFF	DXPHSF	DYPHSF	DZPHSF	XP1SFF
50	YP1SFF	ZP1SFF	DXP1SF	DYP1SF	DZP1SF	XP2SFF	YP2SFF
57	ZP2SFF	DXP2SF	DYP2SF	DZP2SF	B1MAGR	B1MAGV	B2MAGR
64	B2MAGV	EALATP	EALONP	EAVELP	EAPTHP	EAAZIP	B1LATP
71	B1LONP	B1VELP	B1PTHP	B1AZIP	B2LATP	B2LONP	B2VELP
78	B2PTHP	B2AZIP	EPB1AN	EPB2AN	EPSUAN	EPMOAN	CPEANG
85	CPSANG	MOPSAN	B1PB2A	MOEPAN	SEPANG	ESPANG	SPB1AN
92	SPB2AN	B1EPAN	B2EPAN	CONECE	CLCKCE	CONEC1	CLCKC1
99	CONEC2	CLCKC2	CONEE1	CLCKE1	CONEE2	CLCKE2	CONEEC
106	CLCKEC	CONE1E	CLCK1E	CONE12	CLCK12	CONE1C	CLCK1C
113	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
120	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
127	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
134	NOT USED	NOT USED	NOT USED	NOT USED	XP1	YP1	ZP1
141	DXP1	DYP1	DZP1	XE1	YE1	ZE1	DXE1
148	DYE1	DZE1	RE1	DECE1	RAE1	VIE1	LONE1
155	XM1	YM1	ZM1	XS1	YS1	ZS1	NOT USED
162	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	RS1
169	XE1	YE1	ZE1	XM1	YM1	ZM1	XS1
176	YS1	ZS1	DECS1	RAS1	VIS1	LONS1	ES5
183	SE5	S5E	MSP	SMP	EMP	A5SP	S5P
190	E5P	ESM	EMS	MES	EASD	SASD	MASD
197	A5ASD	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
204	-- WORDS 204 THROUGH 252 ARE NOT USED --						

RECORD #2 (140 WORDS)

WORD

1

-- WORDS 1 THROUGH 140 ARE NOT USED --

REPRODUCED FROM

TITLE

TRAJECTORY PHYSICAL RECORD
DESCRIPTION (RECORD #1
AND #2)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.01

FIG. 3.1.3

REV. NO. 1

DATE 12/20/71

SHEET 1 OF 3

RECORD #3 (28 WORDS)

WORD

```

1      NOT USED    NOT USED   3777777777778 NOT USED    NOT USED    NOT USED    NOT USED
8      -- WORDS 8 THROUGH 28 NOT USED --

```

RECORD #4 (252 WORDS)

WORD

1	NOT USED	NOT USED	1	1	2	2	3
8	3	4	4	5	5	6	6
15	NOT USED	NOT USED	7	7	8	8	9
22	9	10	10	11	11	12	12
29	13	13	14	14	15	15	16
36	16	17	17	18	18	19	19
43	20	20	21	21	22	22	23
50	23	24	24	25	25	26	26
57	27	27	28	28	29	29	30
64	30	31	31	NOT USED	NOT USED	NOT USED	NOT USED
71	32	32	33	33	34	34	35
78	35	36	36	37	37	38	38
85	39	39	40	40	41	41	42
92	42	43	43	44	44	45	45
99	46	46	47	47	48	48	49
106	49	50	50	51	51	52	52
113	53	53	54	54	55	55	56
120	56	57	57	58	58	59	59
127	60	60	61	61	62	62	63
134	63	64	64	65	65	66	66
141	67	67	68	68	69	69	70
148	70	71	71	72	72	73	73
155	74	74	75	75	76	76	77
162	77	78	78	79	79	80	80
169	81	81	82	82	83	83	84
176	84	85	85	86	86	87	87
183	88	88	89	89	90	90	91
190	91	92	92	93	93	94	94
197	95	95	96	96	97	97	98
204	98	99	99	100	100	101	101
211	102	102	103	103	104	104	105
218	105	106	106	107	107	NOT USED	NOT USED
225	-- WORDS 225 THROUGH 252 ARE NOT USED --						

REPRODUCED FROM	TITLE	PIONEER PROGRAM
	TRAJECTORY PHYSICAL RECORD	NASA
	DESCRIPTION (RECORD #3	AMES RESEARCH CENTER
	AND #4)	MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.01
		FIG. 3.1.3
	REV. NO. 2	SHEET 2 OF 3
	DATE (1/15/76)	

RECORD #5 (252 WORDS)

WORD

1	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
8	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
15	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
22	NOT USED	NOT USED	108	108	109	109	110
29	110	111	111	112	112	113	113
36	114	114	115	115	116	116	117
43	117	118	118	119	119	120	120
50	121	121	122	122	123	123	124
57	124	125	125	126	126	127	127
64	128	128	129	129	130	130	NOT USED
71	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
78	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	131
85	131	132	132	133	133	134	134
92	135	135	136	136	137	137	138
99	138	139	139	140	140	141	141
106	142	142	143	143	144	144	145
113	145	146	146	147	147	148	148
120	149	149	150	150	151	151	152
127	152	153	153	154	154	155	155
134	156	156	157	157	158	158	159
141	159	160	160	NOT USED	NOT USED	NOT USED	NOT USED
148	-- WORDS 148 THROUGH 252 ARE NOT USED --						

RECORD #6 (252 WORDS)

WORD

1 -- WORDS 1 THROUGH 252 ARE NOT USED --

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	TRAJECTORY PHYSICAL RECORD		NASA	
	DESCRIPTION (RECORD #5		AMES RESEARCH CENTER	
	AND #6)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.01	
	REV. NO.	DATE 12/20/71	FIG. 3.1.3	
			SHEET 3 OF 3	

TRAJECTORY DATA USER REQUIREMENTS
SPECIFICATION PC-262.04

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Ames Research Center
Moffett Field, California 94035

PIONEER PROGRAM

SPECIFICATION PC-262.04

Pioneer F/G Trajectory Data User Requirements

December 20, 1971

1. SCOPE

Specification PC-262.04 describes the detailed requirements for processing the Navigation Team-prepared Trajectory Data "Save" Tape at Ames Research Center on the XDS Sigma 5 computer.

2. APPLICABLE DOCUMENTS

2.1 NASA/ARC SPECIFICATIONS

PC-262.00, Pioneer F/G: Off-Line Data Processing System at ARC

PC-262.01, Pioneer F/G: Off-Line Data Processing System Detailed Processing Requirements.

PC-262.02, Pioneer F/G: Input and Output Tape Requirements

PC-262.03, Pioneer F/G: Data User Requirements

PC-262.05, Pioneer Saturn: Trajectory Data User Requirements (2)

PC-261.00, Pioneer F/G: On-Line Ground Data System Software Specification - General

2.2 NASA/JPL DOCUMENT

Constants and Related Information for Astrodynamic Calculations, (2)
1968, Jet Propulsion Laboratory, Technical Report 32-1306.

3. GENERAL PROCESSING REQUIREMENTS

The source of the user's trajectory data will be the output of the JPL DPTRAJ "save" tape as defined in PC-262.01, Pioneer F/G: Input and Output Tape Requirements. This tape in addition to being the source for each user's trajectory requirements, shall also provide a capability to calculate the "round-trip-light-time: (RTLT) required in each user's EDR. A description of the parameters is given in section 3.1 of this specification. (2)

3.1 DPTRAJ TRAJECTORY SAVE TAPE VARIABLES

Each regular record of the DPTRAJ save tape contains time annotated trajectory parameters. The following list describes and defines the available parameters.

<u>BCD NAME</u>	<u>TIME GROUP</u>
ETSP50	(1) Time past 0 ^h JANUARY 1, 1950 (sec)*
JULDAT	(2) Julian Date (days)
VIGDAT	(3) Gregorian calendar date (yr, mo, day, hr, min, sec)
TFLANC	(4) Time from launch (sec)
TFINJE	(5) Time from initial epoch of trajectory (sec)
ETMUTC	(6) ET-UTC (sec)**

*The time reference is ET (ephemeris time)

**ET and UTC (Universal Time Coordinated).

3.1.1 Geocentric. The following parameters are defined in the inertial spherical coordinate system described on Figure 3.1.1. For this group the reference body is the Earth and the plane of reference is the Earth's true equator of date.

RANGRP	(7)	Range rate (km/sec); the time rate of change of the magnitude of the radius vector	(2)
MAGVEL	(8)	Speed of the spacecraft (km/sec)	(2)
INPATH	(9)	Inertial flight path angle (deg)	(2)
INAZIM	(10)	Inertial azimuth angle (deg)	(2)
REARPR	(11)	Radius to the spacecraft (km)	(2)
DECPRO	(12)	Declination of the spacecraft (deg)	(2)
RTASCP	(13)	Right ascension of the spacecraft (deg)	(2)
REARSU	(14)	Earth-Sun distance (km)	
DECSUN	(15)	Declination of the Sun (deg)	
RTASCS	(16)	Right ascension of the Sun (deg)	
REARMO	(17)	Earth-Moon distance (km)	
DECMOO	(18)	Declination of the moon (deg)	
RTASCM	(19)	Right ascension of the moon (deg)	

3.1.2 Heliocentric. For this group of parameters there are two coordinate systems centered at the Sun.

The following parameters are defined in the inertial spherical coordinate system described on Figure 3.1.1. For this group the reference body is the Sun and the plane of reference is the true ecliptic of date.

HRANGP	(20)	Radius to the S/C (km)	
HMAGVP	(21)	Speed of the S/C (km/sec)	(2)
HINPTH	(22)	Inertial flight path angle (deg)	(2)
CELLTP	(23)	Celestial latitude of the S/C (deg)	(2)
CELLNP	(24)	Celestial longitude of the S/C (deg)	(2)

CELLTE (25) Celestial latitude of the Earth (deg)
 CELLNE (26) Celestial longitude of the Earth (deg)

The following parameters are defined in the Sun-Earth cartesian coordinate system described on Figure 3.1.2.

XSCSEL (27) X-component of the S/C in the Sun-Earth system (km)
 YXCSEL (28) Y-component of the S/C in the Sun-Earth system (km)
 ZSCSEL (29) Z-component of the S/C in the Sun-Earth system (km)
 SPSEXY (30) Sun-S/C distance in the X-Y plane of the Sun-Earth system (km); the projection of the Sun-S/C vector onto the X-Y plane
 LNPSEL (31) Longitude of the S/C in the Sun-Earth system (deg)

3.1.3 Inertial Cartesian. The following parameters represent cartesian position and velocity vectors of the S/C from the Earth, Sun, Jupiter and Mars. Figure 3.1.3 describes the inertial cartesian coordinate system. The plane of reference for these parameters is the mean ecliptic of 1950.0. (2)

XPGSFF (32) X-component of the S/C (Earth centered) (km)
 YPGSFF (33) Y-component of the S/C (Earth centered) (km)
 ZPGSFF (34) Z-component of the S/C (Earth centered) (km)
 DXPGSF (35) $\dot{X}$ -time rate of change in the X-component (km/sec)
 DYPGSF (36) $\dot{Y}$ -time rate of change in the Y-component (km/sec)
 DZPGSF (37) $\dot{Z}$ -time rate of change in the Z-component (km/sec)
 XPHSFF (38) X-component of the S/C (Sun centered) (km)
 YPHSFF (39) Y-component of the S/C (Sun centered) (km)

ZPHSFF	(40)	Z-component of the S/C (Sun centered) (km)
DXPHSF	(41)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYPHSF	(42)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZPHSF	(43)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)
XP1SFF	(44)	X-component of the S/C (Jupiter centered) (km)
YP1SFF	(45)	Y-component of the S/C (Jupiter centered) (km)
ZP1SFF	(46)	Z-component of the S/C (Jupiter centered) (km)
DXP1SF	(47)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYP1SF	(48)	$\dot{Y}$ -time rate of change in the Y component (km/sec)
DZP1SF	(49)	$\dot{Z}$ -time rate of change in the Z component (km/sec)
XP2SFF	(50)	X-component of the S/C (Mars centered) (km)
YP2SFF	(51)	Y-component of the S/C (Mars Centered) (km)
ZP2SFF	(52)	Z-component of the S/C (Mars Centered) (km)
DXP2SF	(53)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYP2SF	(54)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZP2SF	(55)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)

Additionally:

B1MAGR (56) Jupiter-S/C distance (km)
B1MAGV (57) Velocity of the S/C with respect to
Jupiter (km/sec)
B2MAGR (58) Mars-S/C distance (km)
B2MAGR (59) Velocity of the S/C with respect to
Mars (km/sec)

3.1.4 Body-Fixed. The following parameters are referenced to a rotating coordinate system fixed to either the Earth, Jupiter, or Mars. The mathematical models of the body-fixed system (equator, prime meridian, rotational dynamics) are defined in section 2.2. The body-fixed coordinate system is shown (2)
on Figure 3.1.4.

- EARTH -

EALATP (60) Latitude of the S/C (deg)
EALONP (61) Longitude of the S/C (deg)
EAVELP (62) Velocity of the S/C (km/sec)
EAPTHP (63) Body-fixed path angle (deg)
EAAZIP (64) Body-fixed azimuth angle (deg)

- JUPITER -

B1LATP (65) Latitude of the S/C (deg)
B1LONP (66) Longitude of the S/C (deg)
B1VELP (67) Velocity of the S/C (km/sec)
B1PTHP (68) Body-fixed path angle (deg)
B1AZIP (69) Body-fixed azimuth angle (deg)

- MARS -

B2LATP (70) Latitude of the S/C (deg)
B2LONP (71) Longitude of the S/C (deg)
B2VELP (72) Velocity of the S/C (km/sec)

B2PTHP (73) Body-fixed path angle (deg)

B2AZIP (74) Body-fixed azimuth angle (deg)

3.1.5 Angles (all the angles are in degrees). This group contains two types of angles.

- (a) Three body angles
- (b) Cone and Clock angles.

The following list of parameters represent the angles between two radius vectors from the same vertex. As an example the Earth-S/C-Jupiter angle is the minimum angle between the S/C-to-Earth vector and the S/C-to-Jupiter vector (see Figure 3.1.5 sheet 1).

EPB1AN (75) Earth-S/C-Jupiter

EPB2AN (76) Earth-S/C-Mars

EPSUAN (77) Earth-S/C-Sun

EPMOAN (78) Earth-S/C-Moon

CPEANG (79) Canopus-S/C-Earth

CPSANG (80) Canopus-S/C-Sun

MOPSAN (81) Moon-S/C-Sun

B1PB2A (82) Jupiter-S/C-Mars

MOEPAN (83) Moon-Earth-S/C

SEPANG (84) Sun-Earth-S/C

ESPANG (85) Earth-Sun-S/C

SPB1AN (86) Sun-S/C-Jupiter

SPB2AN (87) Sun-S/C-Mars

B1EPAN (88) Jupiter-Earth-S/C

B2EPAN (89) Mars-Earth-S/C

The following parameters represent the cone and clock angles for three different cone-clock systems. On Figure 3.1.5 sheet 2, the typical cone-clock coordinate system is defined.

- Sun-S/C-Canopus -

CONECE	(90)	Cone angle of the Earth
CLCKCE	(91)	Clock angle of the Earth
CONEC1	(92)	Cone angle of Jupiter
CLCKC1	(93)	Clock angle of Jupiter
CONEC2	(94)	Cone angle of Mars
CLCKC2	(95)	Clock angle of Mars

-Sun-S/C-Earth-

CONEE1	(96)	Cone angle of Jupiter
CLCKE1	(97)	Clock angle of Jupiter
CONEE2	(98)	Cone angle of Mars
CLCKE2	(99)	Clock angle of Mars
CONEEC	(100)	Cone angle of Canopus
CLCKEC	(101)	Clock angle of Canopus

- Sun-S/C-Jupiter -

CONE1E	(102)	Cone angle of the Earth
CLCK1E	(103)	Clock angle of the Earth
CONE12	(104)	Cone angle of Mars
CLCK12	(105)	Clock angle of Mars
CONE1C	(106)	Cone angle of Canopus
CLCK1C	(107)	Clock angle of Canopus

3.1.6 Programmable Variables. The following parameters were selected from the DPTRAJ output using the "programmable variable" option and are included on the save tape.

The following parameters (108 - 119) are cartesian position and velocity vectors of the spacecraft and the Earth with respect to an inertial coordinate system centered at Jupiter. Figure 3.1.3 describes the system. The plane of reference for these parameters is the Earth's mean equator of 1950.0. Parameters 125 - 130 are also defined in this system. (2)

XP1	(108)	X-component of the spacecraft (km)
YP1	(109)	Y-component of the spacecraft (km)
ZP1	(110)	Z-component of the spacecraft (km)
DXP1	(111)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYP1	(112)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZP1	(113)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)
XE1	(114)	X-component of the Earth (km)
YE1	(115)	Y-component of the Earth (km)
ZE1	(116)	Z-component of the Earth (km)
DXE1	(117)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYE1	(118)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZE1	(119)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)

The following parameters (120 - 123) are defined in the Jupiter-centered inertial spherical coordinate system with the Earth's mean equator of 1950.0 as the reference plane (see Figure 3.1.1). (2)

RE1 (120) Distance from Jupiter to the Earth (km)
DECE1 (121) Declination of the Earth (deg)
RAE1 (122) Right ascension of the Earth (deg)
VIE1 (123) Speed of the Earth (km/sec)

The following parameter (124) is defined in the Jupiter-fixed coordinate system shown on Figure 3.1.4.

LONE1 (124) Longitude of the Earth (deg)

Parameters 125 through 130 are defined in the Jupiter-centered inertial cartesian coordinate system as previously noted above.

XM1 (125) X-component of the Moon (km)
YM1 (126) Y-component of the Moon (km)
ZM1 (127) Z-component of the Moon (km)
XS1 (128) X-component of the Sun (km)
YS1 (129) Y-component of the Sun (km)
ZS1 (130) Z-component of the Sun (km)

Parameter 131 is the magnitude of the cartesian position vector for the Sun.

RS1 (131) Distance to the Sun (km)

The following parameters (132 - 140) are cartesian position vectors for the Earth, Moon and Sun with respect to an inertial coordinate system centered at Jupiter. Figure 3.1.3 describes the system. The plane of reference for these parameters is the mean ecliptic of 1950.0. (2)

XE1 (132) X-component of the Earth (km)
YE1 (133) Y-component of the Earth (km)
ZE1 (134) Z-component of the Earth (km)
XM1 (135) X-component of the Moon (km)

YMI (136) Y-component of the Moon (km)
 ZMI (137) Z-component of the Moon (km)
 XSI (138) X-component of the Sun (km)
 YSI (139) Y-component of the Sun (km)
 ZSI (140) Z-component of the Sun (km)

The following parameters (141 - 143) are defined in the Jupiter-centered inertial spherical coordinate system with the mean ecliptic of 1950.0 as the reference plane (see Figure 3.1.1). (2)

DECS1 (141) Celestial latitude of the Sun (deg)
 RAS1 (142) Celestial longitude of the Sun (deg)
 VIS1 (143) Speed of the Sun (km/sec)

The following parameter (144) is defined in the Jupiter-fixed coordinate system shown on Figure 3.1.4.

LONS1 (144) Longitude of the Sun (deg) (2)

The following parameters (145 - 156) represent additional three body angles (see Figure 3.1.5 and the earlier discussion of these angles).

ES5 (145) Earth-Sun-Jupiter (deg)
 SE5 (146) Sun-Earth-Jupiter (deg)
 S5E (147) Sun-Jupiter-Earth (deg)
 MSP (148) Moon-Sun-spacecraft (deg)
 SMP (149) Sun-Moon-spacecraft (deg)
 EMP (150) Earth-Moon-spacecraft (deg)
 A5SP (151) Jupiter-Sun-spacecraft (deg)
 S5P (152) Sun-Jupiter-spacecraft (deg)
 E5P (153) Earth-Jupiter-spacecraft (deg)
 ESM (154) Earth-Sun-Moon (deg)

EMS (155) Earth-Moon-Sun (deg)

MES (156) Moon-Earth-Sun (deg)

The following four parameters (157 - 160) are angular distances subtended by the semi-diameters of the Earth, Sun, Moon and Jupiter as seen from the spacecraft (see Figure 3.1.6).

EASD (157) Angular semi-diameter of the Earth (deg)

SASD (158) Angular semi-diameter of the Sun (deg)

MASD (159) Angular semi-diameter of the Moon (deg)

A5ASD (160) Angular semi-diameter of Jupiter (deg)

3.1.6.1 Deleted. (2)

3.2 OUTPUT TRAJECTORY DATA USER REQUIREMENTS

The experimenter shall either receive a copy of the DPTRAJ "save" tape or a processed tape created according to the individual format requirements summarized in sheet 1 of figure 3.2. The "processed" tape, as shown by sheet 2 of figure 3.2, shall be made up of three files of information. (2)

3.2.1 Header File. The Header File shall contain logistics type of information and shall serve to identify the "processed" trajectory tape as to content, date of generation, etc. (2)

3.2.2 Compendium File. This file shall contain a listing of all the requested parameters on the "processed" trajectory tape. It shall contain the acronym for the parameter and the calling sequence order. Of the 156 parameters selected for the "processed" tape, 127 shall be taken directly from the "save" tape and 29 shall be computed from other variables also found on the input "save" tape. A complete list of parameters in the proper order together with a description, mnemonic and computation requirement for those to be derived is shown in figure 3.2-a. (2)

3.2.3 Trajectory Data File. This file shall contain the specific value of each parameter that each user has selected for use with his EDR data. (2)

3.3 DOCUMENT CONTROL

This specification shall be subject to rigid document control by NASA/ARC. In the event changes are required to this specification, replacement, or additional pages will be furnished by NASA/ARC. Replacement or additional pages will be appropriately labeled to indicate change and dates of changes.

4. PRODUCT ASSURANCE PROVISIONS

Not applicable.

5. HANDLING, SHIPPING, AND STORAGE

Not applicable.

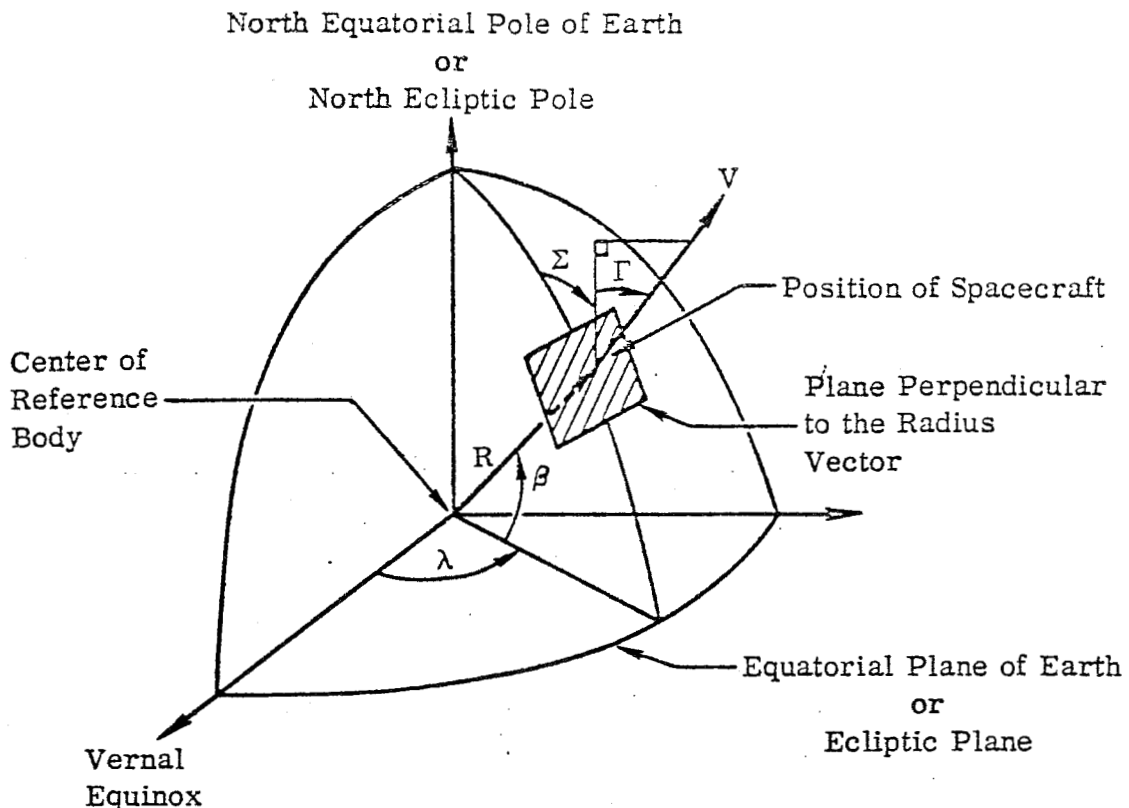
6. NOTES

6.1 ABBREVIATIONS

See Section 6.1 of specification PC-262.00.

6.2 GLOSSARY OF TERMS

See Section 6.2 of specification PC-262.00.



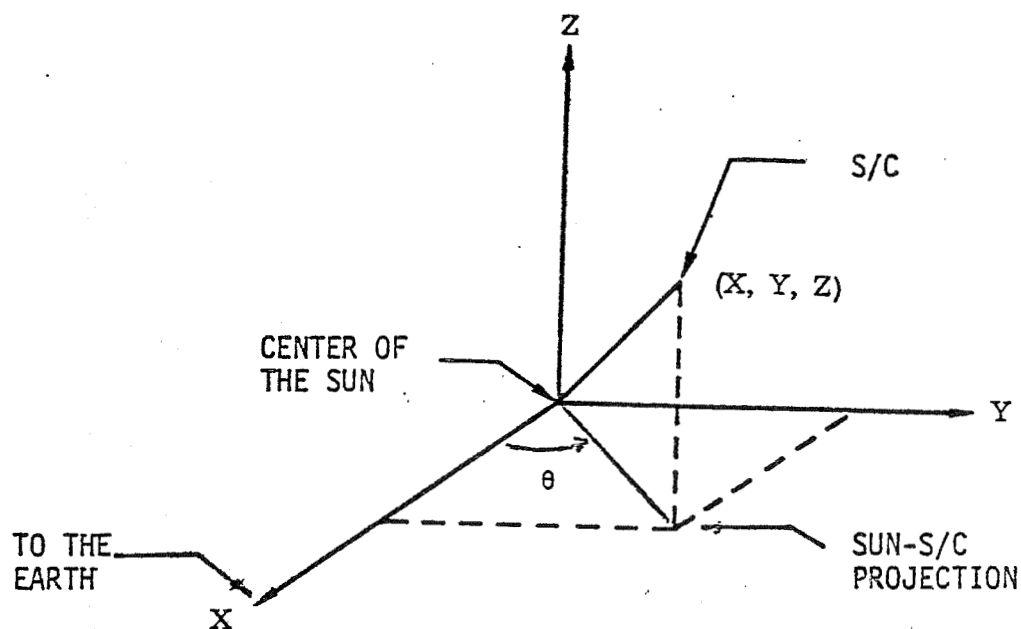
The plane of reference in the Inertial Spherical Coordinate System shall be either the ecliptic plane or the equatorial plane of Earth.

- R** radius: The distance from the center of the reference body to the spacecraft
- β** declination (equatorial reference plane): The angle between the reference body-spacecraft radius vector and the reference body equatorial plane; measured positive north of the equatorial plane
- β** celestial latitude (ecliptic reference plane): The angle between the reference body-spacecraft radius vector and the reference body ecliptic plane; measured positive north of the ecliptic plane
- λ** right ascension (equatorial reference plane): The angle between the Vernal Equinox line and the projection of the reference body-spacecraft radius vector onto the Earth equatorial plane; measured eastward from the Vernal Equinox

REPRODUCED FROM	TITLE INERTIAL SPHERICAL COORDINATE SYSTEM	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.1.1
REV. NO. 1	DATE 12/20/71	SHEET 1 OF 2

- λ celestial longitude (ecliptic reference plane): the angle between the Vernal Equinox line and the projection of the reference body-spacecraft radius vector onto the ecliptic plane; measured eastward from the Vernal Equinox line
- V speed: the magnitude of the spacecraft inertial velocity
- Γ inertial flight path angle: the angle between the spacecraft inertial velocity vector and the plane normal to the reference body-spacecraft radius vector; positive away from the center of the body
- Σ inertial azimuth angle: the angle between the local meridian and the projection of the inertial velocity vector onto the plane normal to the reference body-spacecraft radius vector; measured positive east of north

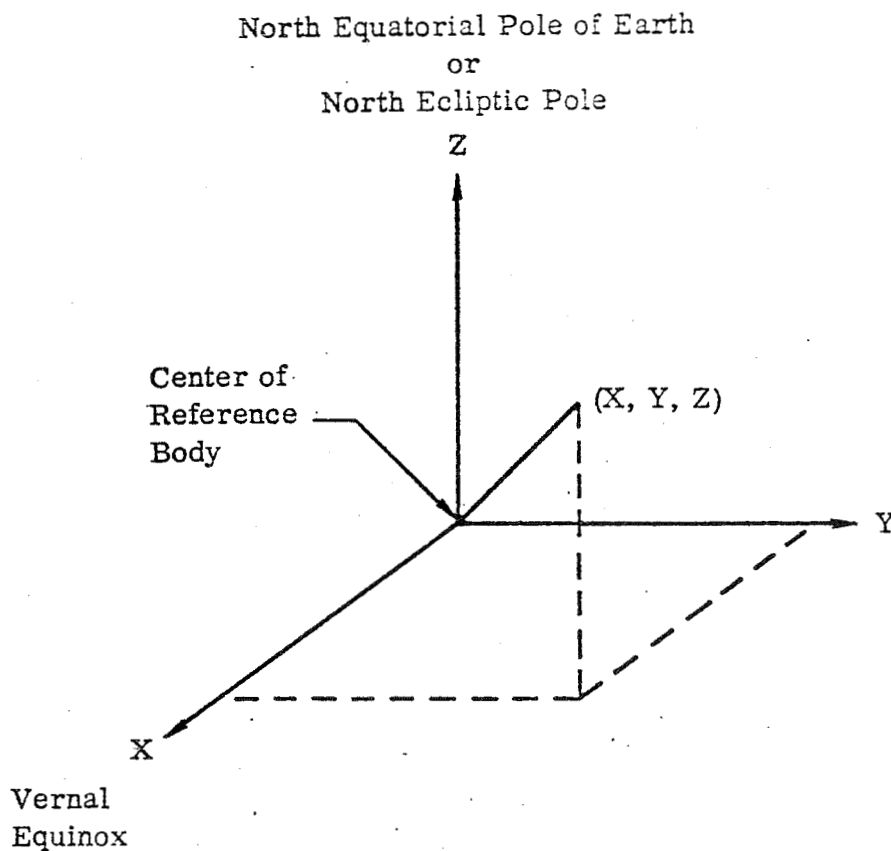
REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	INERTIAL SPHERICAL		NASA	
	COORDINATE SYSTEM		AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
	REV. NO. 1	DATE 12/20/71	FIG. 3.1.1	
			SHEET 2 OF 2	



- X Positive towards the Earth
- Y Positive from the Sun and perpendicular to the X-axis and lying in the ecliptic plane of date
- Z Positive from the Sun completing the right hand system
- θ Longitude of S/C

NOTE: This system rotates with the Earth about the Sun

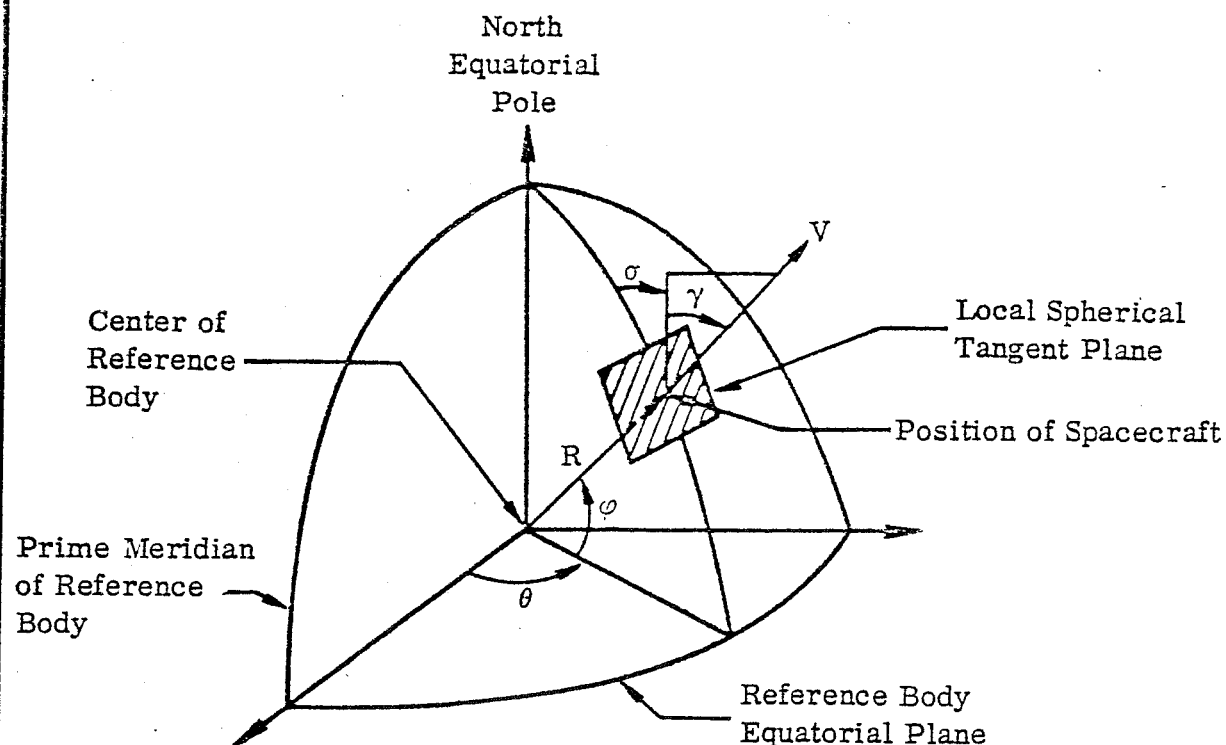
REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	SUN-EARTH-LINE CARTESIAN		NASA	
			AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.1.2	
	REV. NO. 1	DATE 12/20/71	SHEET 1 OF 1	



The plane of reference in the Inertial Cartesian System shall be either the ecliptic plane or equatorial plane of the Earth.

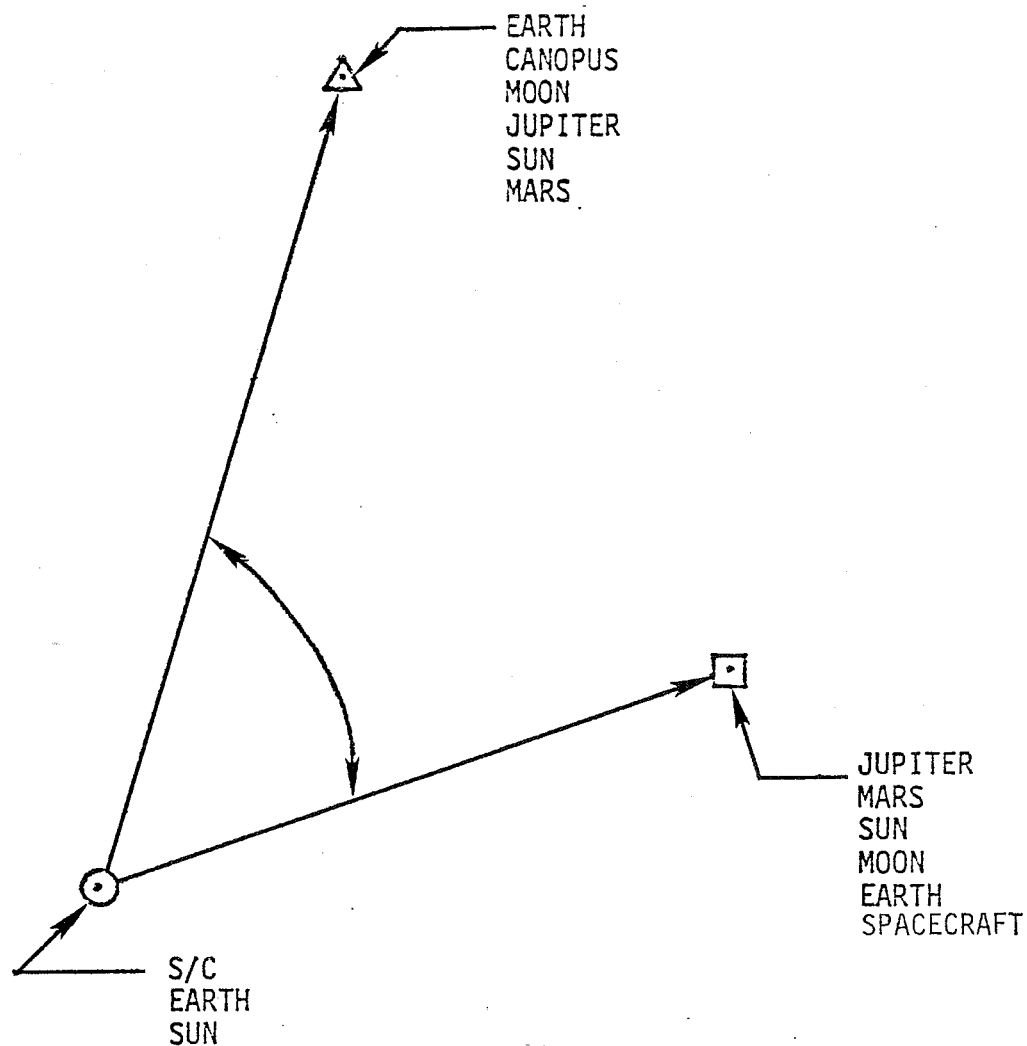
- X positive toward the Vernal Equinox and determined by the intersection of the mean Earth equator and ecliptic of 1950.0.
- Y positive outward from the center of the reference body, perpendicular to and east of the X-axis and lying in the ecliptic or equatorial plane
- Z positive toward the north ecliptic or equatorial pole of Earth and completes the orthogonal system

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	INERTIAL CARTESIAN COORDINATE SYSTEM		NASA	
			AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.1.3	
	REV. NO. 2	DATE 1/15/76	SHEET 1 OF 1	

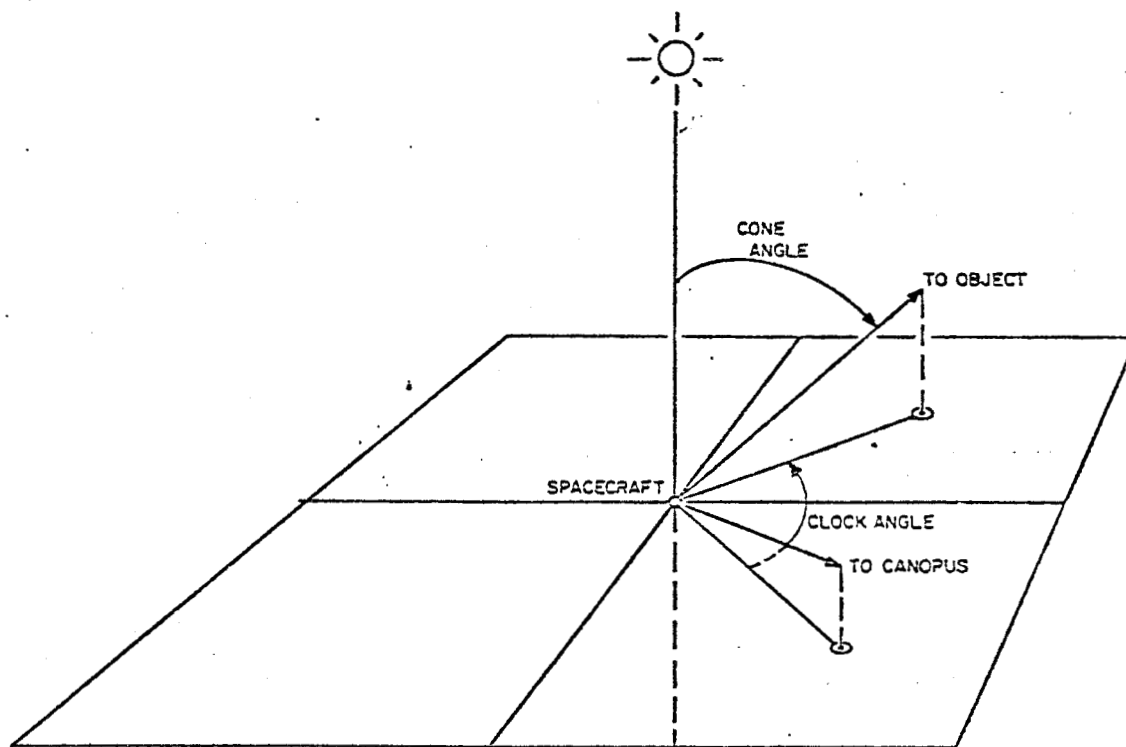


- R radius: the distance from the center of the reference body to the spacecraft
- φ latitude: the body-centered latitude of the spacecraft measured positive north of the reference body's equator
- θ longitude: the longitude of the spacecraft measured eastward from the prime meridian of the reference body to the projection of the radius vector onto the equatorial plane
- V speed: the magnitude of velocity of the spacecraft
- γ flight path angle: the angle, measured positive away from the reference body between the relative velocity vector of the spacecraft and the local spherical tangent plane
- σ azimuth angle: the angle, measured eastward in the local spherical tangent plane, from true north to the projection of the relative velocity vector of the spacecraft onto the local spherical tangent plane

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	BODY-FIXED SPHERICAL		NASA	
	COORDINATE SYSTEM		AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.1.4	
	REV. NO. 1	DATE 12/20/71	SHEET 1	OF 1



REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	THREE BODY ANGLES		NASA	
			AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.1.5	
	REV. NO. 2	DATE 1/15/76	SHEET 1 OF 2	

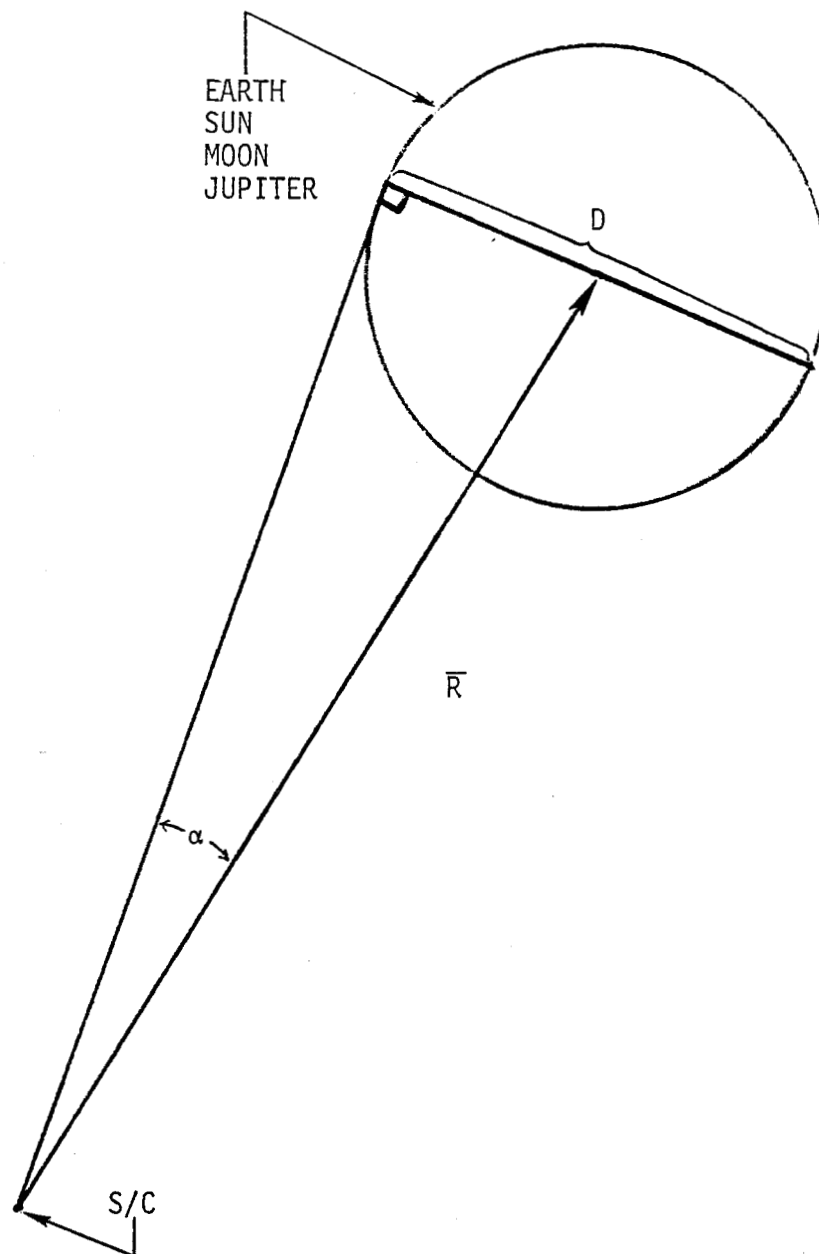


Cone Angle of Object: The angle from the spacecraft-Sun vector to the spacecraft-object-vector

Clock Angle of Object: The angle measured clockwise (when looking towards the Sun) from the Sun-spacecraft-Canopus plane to the Sun-spacecraft-object plane

NOTE: Canopus can be replaced by the Earth or Jupiter to form two additional systems.

REPRODUCED FROM 	TITLE CONE, CLOCK ANGLES REV. NO. 1 DATE 12/20/71	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.1.5 SHEET 2 OF 2
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α Angular semi-diameter of the Earth, Sun, Moon and Jupiter:

$$\sin^{-1} \left(\frac{D/2}{R} \right)$$

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	ANGULAR SEMI-DIAMETER		NASA	
			AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG 3.1.6	
	REV. NO. 1	DATE 12/20/71	SHEET	OF

USER	JPL/HVM	ARC/PA	UC/CPI	UI/GTT	GSFC/CRT	UCSD/TRD	USC/UV	UA/IPP	CIT/IR	GE/AMD	LaRC/MD	DUD/IPP
Computer	UNIVAC 1108	IBM 360/67	XDS 930	UNIVAC 418	IBM 360/75	BURROUGHS 6500	IBM 370/155	CDC 6400	IBM 370/155	GE 635	CDC 6600	UNIVAC 1108
Word Size	36-bit	32-bit	24-bit	18-bit	32-bit	48-bit	32-bit	36-bit	32-bit	36-bit	36-bit	36-bit
Operating System	Exec-8	OS;TSS	OSMVT; PL-1	R/T Exec	OS	BUR TSS	OS	OS	OS	GECOS III	SCOPE 3.1	EXEC 8
Density (bpi)	800	556	556	556	800	556	800	556	800	556	556	556
Tracks	7	7	7	7	9	7	9	7	9	7	7	7
Tape Type	Copy	BCD	BCD	Copy	EBCDIC	BCD	EBCDIC	BCD	EBCDIC	BCD	BCD	Copy
Specification Reference	PC-262.01 Section 3.1.3.1.6 PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.01 Section 3.1.3.1.6 PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.01 Section 3.1.3.1.6 PC-262.04 Section 3.1
Format Description	Figure 3.1.3	Figure 3.2.2	Figure 3.2.1	Figure 3.1.3	Figure 3.2.2	Figure 3.2.4	Figure 3.2.2	Figure 3.2.3	Figure 3.2.2	Figure 3.2.3	Figure 3.2.3	Figure 3.1.3

REPRODUCED FROM

TITLE

SUMMARY OF EXPERIMENTER
TRAJECTORY TAPE
REQUIREMENTS

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2

REV. NO. 2

DATE 1/15/76

SHEET 1 OF 2

Trajectory Tape Organization

FILE 1 MASTER HEADER	BCD OR EBCDIC (LOGISTICS INFO)
FILE 2 PARAMETER LISTING	BCD, EBCDIC (IDENTIFICATION)
FILE 3 PARAMETER VALUE	BCD, EBCDIC

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PROCESSED TRAJECTORY TAPE		NASA	
	GENERAL ORGANIZATION		AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
	REV. NO. 2	DATE 1/15/76	DOC. NO. PC-262.04	
			FIG. 3.2	
			SHEET 2 OF 2	

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>				
1	ETSP50	1	DPTRAJ "save" tape variable	(1)			
2	JULDAT	2	" " " "	(2)			
3	VIGDAT	3	1st half of " " "	(3)	(yr,mo,day)		
		4	2nd half of " " "	(3)	(Hr,min,sec)		
4	TFLANC	5	DPTRAJ "save" tape variable	(4)			
5	TFINJE	6		(5)			
6	ETMUTC	7		(6)			
7	RANGRP	8		(7)			
8	MAGVEL	9		(8)			
9	INPATH	10		(9)			
10	INAZIM	11		(10)			
11	REARPR	12		(11)			
12	DECPRO	13		(12)			
13	RTASCP	14		(13)			
14	REARSU	15		(14)			
15	DECSUN	16		(15)			
16	RTASCS	17		(16)			
17	REARMO	18		(17)			
18	DECMOD	19		(18)			
19	RTASCM	20		(19)			
20	HRANGP	21		(20)			
21	MHAGVP	22		(21)			
22	HINPTH	23		(22)			
23	CELLTP	24		(23)			
24	CELLNP	25		(24)			
25	CELLTE	26		(25)			
26	CELLNE	27		(26)			
27	XSCSEL	28		(27)			
28	YSCSEL	29		(28)			
29	ZSCSEL	30		(29)			
30	SPSEXY	31		(30)			
31	LNPSEL	32		(31)			
32	XPGSFF	33		(32)			
33	YPGSFF	34		(33)			
34	ZPGSFF	35		(34)			
35	DXPGSF	36		(35)			
36	DYPGSF	37		(36)			
37	DZPGSF	38		(37)			

REPRODUCED FROM	TITLE "PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS		PIONEER PROGRAM NASA	
			AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO.	PC-262.04
			FIG.	3.2-a
REV. NO. 2		DATE 1/15/76	SHEET 1	OF 7

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
38	XPHSFF	39	DPTRAJ "save" tape variable (38)
39	YPHSFF	40	(39)
40	ZPHSFF	41	(40)
41	DXPHSF	42	(41)
42	DYPHSF	43	(42)
43	DZPHSF	44	(43)
44	XP1SFF	45	(44)
45	YP1SFF	46	(45)
46	ZP1SFF	47	(46)
47	DXP1SF	48	(47)
48	DYP1SF	49	(48)
49	DZP1SF	50	(49)
50	XP2SFF	51	(50)
51	YP2SFF	52	(51)
52	ZP2SFF	53	(52)
53	DXP2SF	54	(53)
54	DYP2SF	55	(54)
55	DZP2SF	56	(55)
56	B1MAGR	57	(56)
57	B1MAGV	58	(57)
58	B2MAGR	59	(58)
59	B2MAGV	60	(59)
60	EALATP	61	(60)
61	EALONP	62	(61)
62	EAVELP	63	(62)
63	EAPTHP	64	(63)
64	EAAZIP	65	(64)
65	B1LATP	66	(65)
66	B1LONP	67	(66)
67	B1VELP	68	(67)
68	B1PTHP	69	(68)
69	B1HZIP	70	(69)
70	B2LATP	71	(70)
71	B2LONP	72	(71)
72	B2VELP	73	(72)
73	B2PTHP	74	(73)
74	B2HZIP	75	(74)
75	EPB1AN	76	(75)

REPRODUCED FROM	TITLE "PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS		PIONEER PROGRAM NASA	
			AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.2-a	
	REV. NO. 2	DATE 1/15/76	SHEET 2	OF 7

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
76	EPBZAN	77	DPTRAJ "save" tape variable (76)
77	EPSUAN	78	(77)
78	EPMOAN	79	(78)
79	CPEANG	80	(79)
80	DPSANG	81	(80)
81	MOPSAN	82	(81)
82	B1PB2A	83	(82)
83	MOEPAN	84	(83)
84	SEPANG	85	(84)
85	ESPANG	86	(85)
86	SPB1AN	87	(86)
87	SPB2AN	88	(87)
88	B1EPAN	89	(88)
89	B2EPAN	90	(89)
90	CONECE	91	(90)
91	CLCKCE	92	(91)
92	CONEC1	93	(92)
93	CLCKC1	94	(93)
94	CONEC2	95	(94)
95	CLCKC2	96	(95)
96	CONEE1	97	(96)
97	CLCKE1	98	(97)
98	CONEE2	99	(98)
99	CLCKE2	100	(99)
100	CONEEC	101	(100)
101	CLCKEC	102	(101)
102	CONE1E	103	(102)
103	CLCK1E	104	(103)
104	CONE12	105	(104)
105	CLCK12	106	(105)
106	CONE1C	107	(106)
107	CLCK1C	108	(107)

The following parameter, 108, relates the Prime Meridian of the Earth fixed coordinate system to the Vernal Equinox of the inertial coordinate system as shown in figure 3.2-b. The plane of reference is the Earth's true equator of date.

108	HOURAN	109	Hour angle of the Vernal Equinox (deg) DPTRAJ variable (9) minus DPTRAJ variable (61)
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REPRODUCED FROM	TITLE "PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS.		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.2-a	
	REV. NO. 2	DATE 1/15/76	SHEET 3	OF 7

<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
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The following parameters, 109 thru 123, are cartesian position vectors for the spacecraft (also velocity), Moon, Sun and Jupiter defined in an inertial cartesian coordinate system centered at the Earth. Figure 3.1.3 describes the system. The plane of reference for these parameters is the Earth's mean equator of 1950.0.

109	XP	110	X-component of the spacecraft (km) DPTRAJ variable (108) minus DPTRAJ variable (114)
110	YP	111	Y-component of the spacecraft (hr) DPTRAJ variable (109) minus DPTRAJ variable (115)
111	ZP	112	Z-component of the spacecraft (km) DPTRAJ variable (110) minus DPTRAJ variable (116)
112	DXP	113	$\dot{X}$ -time rate of change in X (km/sec) DPTRAJ variable (111) minus DPTRAJ variable (117)
113	DYP	114	$\dot{Y}$ -time rate of change in Y (km/sec) DPTRAJ variable (112) minus DPTRAJ variable (118)
114	DZP	115	$\dot{Z}$ -time rate of change in Z (km/sec) DPTRAJ variable (113) minus DPTRAJ variable (119)
115	XM	116	X-component of the Moon (km) DPTRAJ variable (125) minus DPTRAJ variable (114)
116	YM	117	Y-component of the Moon (km) DPTRAJ variable (126) minus DPTRAJ variable (115)
117	ZM	118	Z-component of the Moon (km) DPTRAJ variable (127) minus DPTRAJ variable (116)
118	XS	119	X-component of the Sun (km) DPTRAJ variable (128) minus DPTRAJ variable (114)
119	YS	120	Y-component of the Sun (km) DPTRAJ variable (129) minus DPTRAJ variable (115)

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			DOC. NO. PC-262.04	
	REV. NO. 2		FIG. 3.2-a	
	DATE 1/15/76		SHEET 4 OF 7	

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
120	Z5	121	Z-component of the Sun (km) DPTRAJ variable (130) minus variable (116)
121	X5	122	X-component of Jupiter (km) minus DPTRAJ variable (114)
122	X5	123	Y-component of Jupiter (km) minus DPTRAJ variable (115)
123	Z5	124	Z-component of Jupiter minus DPTRAJ variable (116)

The following parameters, 124 thru 127, are defined in an Earth-centered inertial spherical coordinate system with the Earth's mean equator of 1950.0 as the reference plane (see Figure 3.1.1).

124	RA5	125	Right ascension of Jupiter (deg) Modulo 360° (DPTRAJ variable (122) plus 180°)
125	DEC5	126	Declination of Jupiter (deg) minus DPTRAJ variable (121)
126	R5	127	Distance from the Earth to Jupiter (km) DPTRAJ variable (120)
127	VI5	128	Speed of Jupiter (km/sec) DPTRAJ variable (123)

The following parameters, 128 thru 136, are cartesian position vectors for the Earth, Moon and Jupiter defined in an inertial coordinate system centered at the Sun. Figure 3.1.3 describes the system. The plane of reference for these parameters is the mean ecliptic of 1950.0.

128	XE	129	X-component of the Earth (km) DPTRAJ variable (132) minus DPTRAJ variable (138)
129	YE	130	Y-component of the Earth (km) DPTRAJ variable (133) minus DPTRAJ variable (139)

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			NASA	
	"PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS		AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.2-a	
	REV. NO. 2	DATE 1/15/76	SHEET 5 OF 7	

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
130	ZE	131	Z-component of the Earth (km) DPTRAJ variable (134) minus DPTRAJ variable (140)
131	HXM	132	X-component of the Moon (km) DPTRAJ variable (135) minus DPTRAJ variable (138)
132	HYM	133	Y-component of the Moon (km) DPTRAJ variable (136) minus DPTRAJ variable (139)
133	HZM	134	Z-component of the Moon (km) DPTRAJ variable (139) minus DPTRAJ variable (140)
134	HX5	135	X-component of Jupiter (km) minus DPTRAJ variable (138)
135	HY5	136	Y-component of Jupiter (km) minus DPTRAJ variable (139)
136	HZ5	137	Z-component of Jupiter (km) minus DPTRAJ variable (140)

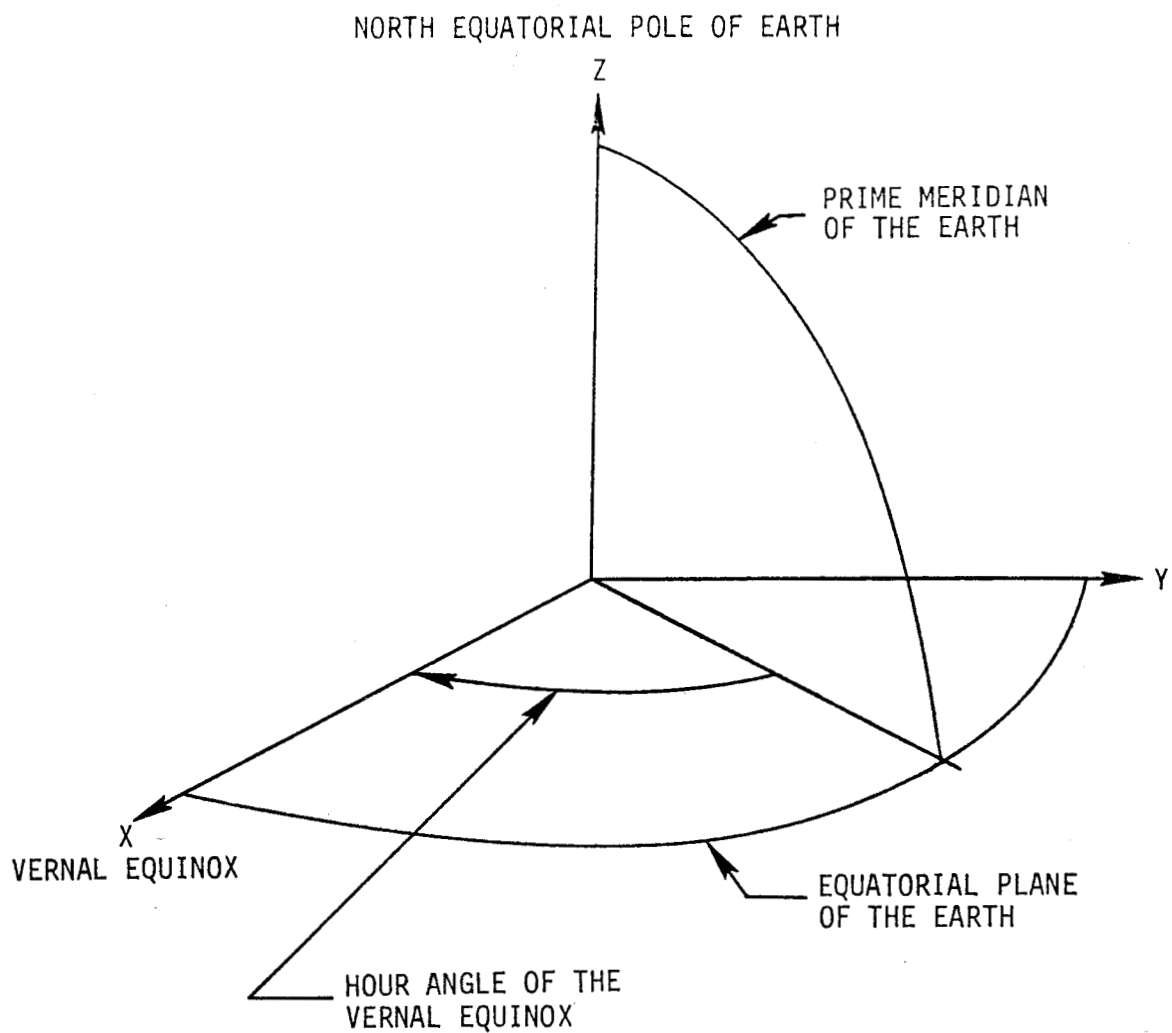
The following parameters, 137 thru 140, are defined in a Sun-centered inertial spherical coordinate system with the mean ecliptic of 1950.0 as the reference plane (see figure 3.1.1).

137	HRA5	138	Celestial longitude of Jupiter (deg) Modulo 360° (DPTRAJ variable (142) + 180°)
138	HDEC5	139	Celestial latitude of Jupiter (deg) minus DPTRAJ variable (141)
139	HR5	140	Distance from the Sun to Jupiter (km) DPTRAJ variable (131)
140	HVI5	141	Speed of Jupiter (km/sec) DPTRAJ variable (143)

REPRODUCED FROM	TITLE "PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS		PIONEER PROGRAM	
			NASA	
			AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
		FIG. 3.2-a		
REV. NO. 2	DATE 1/15/76	SHEET 6 OF 7		

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENTS</u>	
141	ES5	142	DPTRAJ "save" tape variable	(145)
142	SE5	143		(146)
143	S5E	144		(147)
144	MSP	145		(148)
145	SMP	146		(149)
146	EMP	147		(150)
147	A5SP	148		(151)
148	S5P	149		(152)
149	E5P	150		(153)
150	ESM	151		(154)
151	EMS	152		(155)
152	MES	153		(156)
153	EASD	154		(157)
154	SASD	155		(158)
155	MASD	156		(159)
156	A5ASD	157		(160)

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
			NASA	
	"PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS		AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.2-a	
	REV. NO. 2	DATE 1/15/76	SHEET 7 OF 7	



REPRODUCED FROM

TITLE

HOUR ANGLE OF THE
VERNAL EQUINOX

PIONEER PROGRAM
NASA

AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2-b

REV. NO.

2

DATE

1/15/76

SHEET

1

OF 1

NOTE FOR ALL FIGURES RELATING TO THE 24-BIT MACHINE

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic 1 ... Entry 1
mnemonic 2 ... Entry 2
mnemonic 3 ... Entry 3 and Entry 4
mnemonic 4 ... Entry 5
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.
.
mnemonic 156 .. Entry 157

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR 24-BIT MACHINES	NASA	
		AMES RESEARCH CENTER	
		MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.04	
		FIG.	3.2.1
	REV. NO. 1	DATE	12-20-71
		SHEET	1 OF 17

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1		P						I						O						N				
2		E						E						R										
3		F												T						R				
4		A						J						E						C				
5		T						O						R						Y				
6								D						A						T				
7		A												O						P				
8		E						R						A						T				
9		I						O						N						A				
10		L												T						A				
11		P						E												N				
12		O																		n				
13		n						n												U				
14		C						/						C						P				
15		I												J						P				
16		L												G						E				
17		N						E						R						A				
18		T						E						D										
19		M						M						/						D				
20		D						/						Y						Y				
21								A						R						C				
22								G						E						N				
23		E						R						A						T				
24		E						D												M				
25		M						/						D						D				
26		/						Y						Y										
27																								
28								BLANK																
29																								
30																								
31		S						T						A						R				

TYPE-BCD
LOGICAL RECORD LENGTH - 30 WORDS
PHYSICAL RECORD LENGTH - 60 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	HEADER		
	FILE 1		
	(24-BIT MACHINE)		
REV. NO. 1	DATE 12-20-71	SHEET 2 OF 17	

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262 04
FIG. 3.2.1

REPRODUCED FROM	TITLE	PIONEER PROGRAM
	HEADER	NASA
	FILE 1	AMES RESEARCH CENTER
	(24-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.1
	REV. NO. 1	DATE 12-20-71
		SHEET 3 OF 17

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1		E						T						S					P					
2		5						O																
3		J						U						L					D					
4		A						T																
5		V						I						G					D					
6		A						T																
7		T						F						L					A					
8		N						C																
9		T						F						I					N					
10		J						E																
11		E						T						M					U					
12		T						C																
13		R						A						N					G					
14		R						P																
15		M						A						G					V					
16		E						L																
17		I						N						P					A					
18		T						H																
19		I						N						A					Z					
20		I						M																
21		R						E						A					R					
22		P						R																
23		D						E						C					P					
24		R						O																
25		R						T						A					S					
26		C						P																
27		R						E						A					R					
28		S						U																
29		D						E						C					S					
30		U						N																
31		R						T						A					S					

TYPE-BCD
 LOGICAL RECORD LENGTH - 30 WORDS
 PHYSICAL RECORD LENGTH - 390 WORDS
 FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.1
	PARAMETER MNEMONICS	
	FILE 2	
	(24-BIT MACHINE)	
REV. NO. 1	DATE 12-20-71	SHEET 4 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
C								S															
R								E					A						R				
M								O															
D								E					C						M				
O								O															
R								T					A						S				
C								M															
H								R					A						N				
G								P															
H								M					A						G				
V								P															
H								I					N						P				
T								H															
C								E					L						L				
T								D															
C								E					L						L				
N								P															
C								E					L						L				
T								E															
C								E					L						L				
N								E															
X								S					C						S				
E								L															
Y								S					C						S				
E								L															
Z								S					C						S				
E								L															
S								P					S						E				
X								Y															
L								N					P						S				
E								L															

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.1
	PARAMETER MNEMONICS	
	FILE 2	
	(24-BIT MACHINE)	
REV. NO. 1	DATE 12-20-71	SHEET 5 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	X							P						G						S				
	F							F																
	Y							P						G						S				
	F							F																
	Z							P						G						S				
	F							F																
	D							X						P						G				
	S							F																
	D							Y						P						G				
	S							F																
	D							Z						P						G				
	S							F																
	X							P						H						S				
	F							F																
	Y							P						H						S				
	F							F																
	Z							P						H						S				
	F							F																
	D							X						P						H				
	S							F																
	D							Y						P						H				
	S							F																
	D							Z						P						H				
	S							F																
	X							P						1						S				
	F							F																
	Y							P						1						S				
	F							F																
	Z							P						1						S				
	F							F																
	D							X						P						1				

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.1

REV. NO. 1

DATE 12-20-71

SHEET 6 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	S							F																
	D							Y					P						1					
	S							F																
	D							Z					P						1					
	S							F																
	X							P					2						S					
	F							F																
	Y							P					2						S					
	F							F																
	Z							P					2						S					
	F							F																
	D							X					P						2					
	S							F																
	D							Y					P						2					
	S							F																
	D							Z					P						2					
	S							F																
	B							1					M						A					
	G							R																
	B							1					M						A					
	G							V																
	B							2					M						A					
	G							R																
	B							2					M						A					
	G							V																
	E							A					L						A					
	T							P																
	E							A					L						0					
	N							P																
	E							A					V						E					
	L							P																

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.1
	PARAMETER MNEMONICS FILE 2 (24-BIT MACHINE)		
	REV. NO 1	DATE 12-20-71	
	SHEET 7 OF 17		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
E						A						P						T					
H						P																	
E						A						A						Z					
I						P																	
B						1						L						A					
T						P																	
B						1						L						0					
N						P																	
B						1						V						E					
L						P																	
B						1						P						T					
H						P																	
B						1						A						Z					
I						P																	
B						2						L						A					
T						P																	
B						2						L						0					
N						P																	
B						2						V						E					
L						P																	
B						2						P						T					
H						P																	
B						2						A						Z					
I						P																	
E						P						B						1					
A						N																	
E						P						B						2					
A						N																	
E						P						S						U					
A						N																	
E						P						M						0					

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262.04

FIG. 3.2.1

REV. NO. 1

DATE 12-20-71

SHEET 8 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A								N															
C								P					E						A				
N								G															
C								P					S						A				
N								G															
M								O					P						S				
A								N															
B								1					P						B				
2								A															
M								O					E						P				
A								N															
S								E					P						A				
N								G															
E								S					P						A				
N								G															
S								P					B						1				
A								N															
S								P					B						2				
A								N															
B								1					E						P				
A								N															
B								2					E						P				
A								N															
C								O					N						E				
C								E															
C								L					C						K				
C								E															
C								O					N						E				
C								1															
C								L					C						K				
C								1															

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.1

REV. NO. 1

DATE 12-20-71

SHEET 9 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
C								0						N					E				
C								2															
C								L						C					K				
C								2															
C								0						N					E				
E								1															
C								L						C					K				
E								1															
C								0						N					E				
E								2															
C								L						C					K				
E								2															
C								0						N					E				
E								C															
C								L						C					K				
E								C															
C								0						N					E				
I								E															
C								L						C					K				
I								E															
C								0						N					E				
I								2															
C								L						C					K				
I								2															
C								0						N					E				
I								C															
C								L						C					K				
I								C															
H								0						U					R				
A								N						BLANK					BLANK				
BLANK								BLANK						BLANK					BLANK				

REPRODUCED FROM	TITLE	PIONEER PROGRAM
	PARAMETER MNEMONICS	NASA
	FILE 2	AMES RESEARCH CENTER
	(24-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
	REV. NO. 1	DATE 12-20-71
		FIG. 3.2.1
		SHEET 10 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	D						Z						P										
	X						M																
	Y						M																
	Z						M																
	X						S																
	Y						S																
	Z						S																
	X						5																
	Y						5																
	Z						5																
	R						A						5										
	D						E						C						5				
	R						5																
	V						I						5										
	X						E																

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262.04

FIG. 3.2.1

REV. NO. 1

DATE 12-20-71

SHEET 13 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Y						E																
	Z						E																
	H						X						M										
	H						Y						M										
	H						Z						M										
	H						X						5										
	H						Y						5										
	H						Z						5										
	H						R						A						5				
	H						D						E							C			
	5																						
	H						R						5										
	H						V						I							5			
	E						S						5										
	S						E						5										
	S						5						E										
	M						S						P										

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA

AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.1

REV. NO. 1

DATE 12-20-71

SHEET 14 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
S							M							P									
E							M							P									
A							5							S					P				
S							5							P									
E							5							P									
E							S							M									
E							M							S									
M							E							S									
E							A							S					D				
S							A							S					D				
M							A							S					D				
A							5							A					S				
D																							
							BLANK																

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.1
	PARAMETER MNEMONICS FILE 2 (24-BIT MACHINE)		
	REV. NO 1	DATE 12-20-71	
	SHEET 15 OF 17		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	(SIGN) <u>+</u>																							
2																								
3							ENTRY						1											
4																								
5																								
6							BLANK						BLANK						BLANK					
937	(SIGN) <u>+</u>																							
938																								
939							ENTRY						157											
940																								
941																								
942							BLANK						BLANK						BLANK					
							FOR																	

TYPE-BCD
 LOGICAL RECORD LENGTH - 6 WORDS
 PHYSICAL RECORD LENGTH - 942 OWRDS
 FILE SIZE

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER VALUES		
	FILE 3		
	(24-BIT MACHINE)		
REV. NO. 1	DATE 12-20-71	FIG. 3.2.1	
SHEET 17 OF 17			

NOTE FOR ALL FIGURES RELATING TO THE 32-BIT MACHINE.

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD or EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic	1	...	Entry 1
mnemonic	2	...	Entry 2
mnemonic	3	...	Entry 3 and Entry 4
mnemonic	4	...	Entry 5
.			
.			
.			
mnemonic	156	...	Entry 157

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR		NASA	
	32-BIT MACHINES		AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
	REV. NO.	DATE 12-20-71	FIG. 3.2.2	
			SHEET 1 OF 17	

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1		P								I							O											N				
2		E								E							R															
3		F															T											R				
4		A								J							E											C				
5		T								O							R											Y				
6										D							A											T				
7		A															O											P				
8		E								R							A											T				
9		I								O							N											A				
10		L															T											A				
11		P								E																		N				
12		O								.																		n				
13		n								n																		W				
14		A								M							E											/				
15		E								X							P															
16		J								P							L															
17		G								E							N											E				
18		R								A							T											E				
19		D															M											M				
20		/								D							D											/				
21		Y								Y																		A				
22		R								C																		G				
23		E								N							E											R				
24		A								T							E											D				
25										M							M											/				
26		D								D							/											Y				
27		Y																														
28																																
29																	BLANK															
30																																
31		S								T							A											R				

TYPE-EBCDIC
 LOGICAL RECORD LENGTH - 30 WORDS
 PHYSICAL RECORD LENGTH - 60 WORDS
 FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. 262.04 FIG. 3.2.2		
	HEADER FILE 1 (32-BIT MACHINE)			
	REV. NO. 1		DATE 12-20-71	SHEET 2 OF 17

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
32	T																D								A							
33	T								E																M							
34	M								/								D								D							
35	/								Y								Y															
36	S								T								A								R							
37	T																T								I							
38	M								E																H							
39	H								/								M								M							
40	/								S								S															
41	S								T								O								P							
42									D								A								T							
43	E																M								M							
44	/								D								D								/							
45	Y								Y																S							
46	T								O								P															
47	T								I								M								E							
48									H								H								/							
49	M								M								/								S							
50	S																R								E							
51	E								L																N							
52	O																															
53																																
54																																
55																																
56																																
57																																
58																																
59																																
60																																
									EOF																							

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	HEADER FILE 1 (32-BIT MACHINE)		
	REV. NO. 1	DATE 12-20-71	
	FIG. 3.2.2		
		SHEET 3 OF 17	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
E								T								S								P							
5								O																							
J								U								L								D							
A								T																							
V								I								G								D							
A								T																							
T								F								L								A							
N								C																							
T								F								I								N							
J								E																							
E								T								M								U							
T								C																							
R								A								N								G							
R								P																							
M								A								G								V							
E								L																							
I								N								P								A							
T								H																							
I								N								A								Z							
I								M																							
R								E								A								R							
P								R																							
D								E								C								P							
R								O																							
R								T								A								S							
C								P																							
R								E								A								R							
S								U																							
D								E								C								S							
U								N																							
R								T								A								S							

TYPE - EBCDIC
 LOGICAL RECORD LENGTH - 30 WORDS
 PHYSICAL RECORD LENGTH - 390 WORDS
 FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.2
	PARAMETER MNEMONICS		
	FILE 2		
	(32-BIT MACHINE)		
REV. NO. 1	DATE 12-20-71	SHEET 4 OF 17	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C								S																							
R								E									A										R				
M								O																							
D								E									C										M				
O								O																							
R								T									A										S				
C								M																							
H								R									A										N				
G								P																							
H								M									A										G				
V								P																							
H								I									N										P				
T								H																							
C								E									L										L				
T								P																							
C								E									L										L				
N								P																							
C								E									L										L				
T								E																							
C								E									L										L				
N								E																							
X								S									C										S				
E								L																							
Y								S									C										S				
E								L																							
Z								S									C										S				
E								L																							
S								P									S										E				
X								Y																							
L								N									P										S				
E								L																							

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)		
	REV. NO. 1	DATE 12-20-71	
	SHEET 5 OF 17		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
X										P								G									S				
F										F																					
Y										P								G									S				
F										F																					
Z										P								G									S				
F										F																					
D										X								P									G				
S										F																					
D										Y								P									G				
S										F																					
D										Z								P									G				
S										F																					
X										P								H									S				
F										F																					
Y										P								H									S				
F										F																					
Z										P								H									S				
F										F																					
D										X								P									H				
S										F																					
D										Y								P									H				
S										F																					
D										Z								P									H				
S										F																					
X										P								I									S				
F										F																					
Y										P								I									S				
F										F																					
Z										P								I									S				
F										F																					
D										X								P									I				

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER MNEMONICS		
	FILE 2		
	(32-BIT MACHINE)		
REV. NO. 1	DATE 12-20-71	FIG. 3.2.2	
SHEET 6		OF 17	

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262.04

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
S								F																							
D								Y								P											1				
S								F																							
D								Z								P											1				
S								F																							
X								P								2											S				
F								F																							
Y								P								2											S				
F								F																							
Z								P								2											S				
F								F																							
D								X								P											2				
S								F																							
D								Y								P											2				
S								F																							
D								Z								P											2				
S								F																							
B								1								M											A				
G								R																							
B								1								M											A				
G								V																							
B								2								M											A				
G								R																							
B								2								M											A				
G								V																							
E								A								L											A				
T								P																							
E								A								L											0				
N								P																							
E								A								V											E				
L								P																							

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(32-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
	REV. NO. 1		DATE 12-20-71	
		DOC. NO. PC-262.04		
		FIG. 3.2.2		
		SHEET 7 OF 17		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
E										A									P								T				
H										P																					
E										A									A								Z				
I										P																					
B										1									L								A				
T										P																					
B										1									L								O				
N										P																					
B										1									V								E				
L										P																					
B										1									P								T				
H										P																					
B										1									A								Z				
I										P																					
B										2									L								A				
T										P																					
B										2									L								O				
N										P																					
B										2									V								E				
L										P																					
B										2									P								T				
H										P																					
B										2									A								Z				
I										P																					
E										P									B								1				
A										N																					
E										P									B								2				
A										N																					
E										P									S								U				
A										N																					
E										P									M								O				

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(32-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.2.2	
	REV. NO. 1	DATE 12-20-71	SHEET 8 OF 17	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
A								N																							
C								P										E									A				
N								G																							
C								P										S									A				
N								G																							
M								O										P									S				
A								N																							
B								I										P									B				
2								A																							
M								O										E									P				
A								N																							
S								E										P									A				
N								G																							
E								S										P									A				
N								G																							
S								P										B									I				
A								N																							
S								P										B									2				
A								N																							
B								I										E									P				
A								N																							
B								2										E									P				
A								N																							
C								O										N									E				
C								E																							
C								L										C									K				
C								E																							
C								O										N									F				
C								I																							
C								L										C									K				
C								I																							

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)	
	DOC. NO. PC-262.04	
	FIG. 3.2.2	
	REV. NO. 1 DATE 12-20-71	
	SHEET 9 OF 17	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C										0									N								E				
C										2																					
C										L									C								K				
C										2																					
C										0									N								E				
E										1																					
C										L									C								K				
E										1																					
C										0									N								E				
E										2																					
C										L									C								K				
E										2																					
C										0									N								E				
E										C																					
C										L									C								K				
E										C																					
C										0									N								E				
1										E																					
C										L									C								K				
1										E																					
C										0									N								E				
1										2																					
C										L									C								K				
1										2																					
C										0									N								E				
1										C																					
C										L									C								K				
1										C																					
H										0									U								R				
A										N																					

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.2		
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)			
	REV. NO. 1		DATE 12-20-71	SHEET 10 OF 17

[illegible]

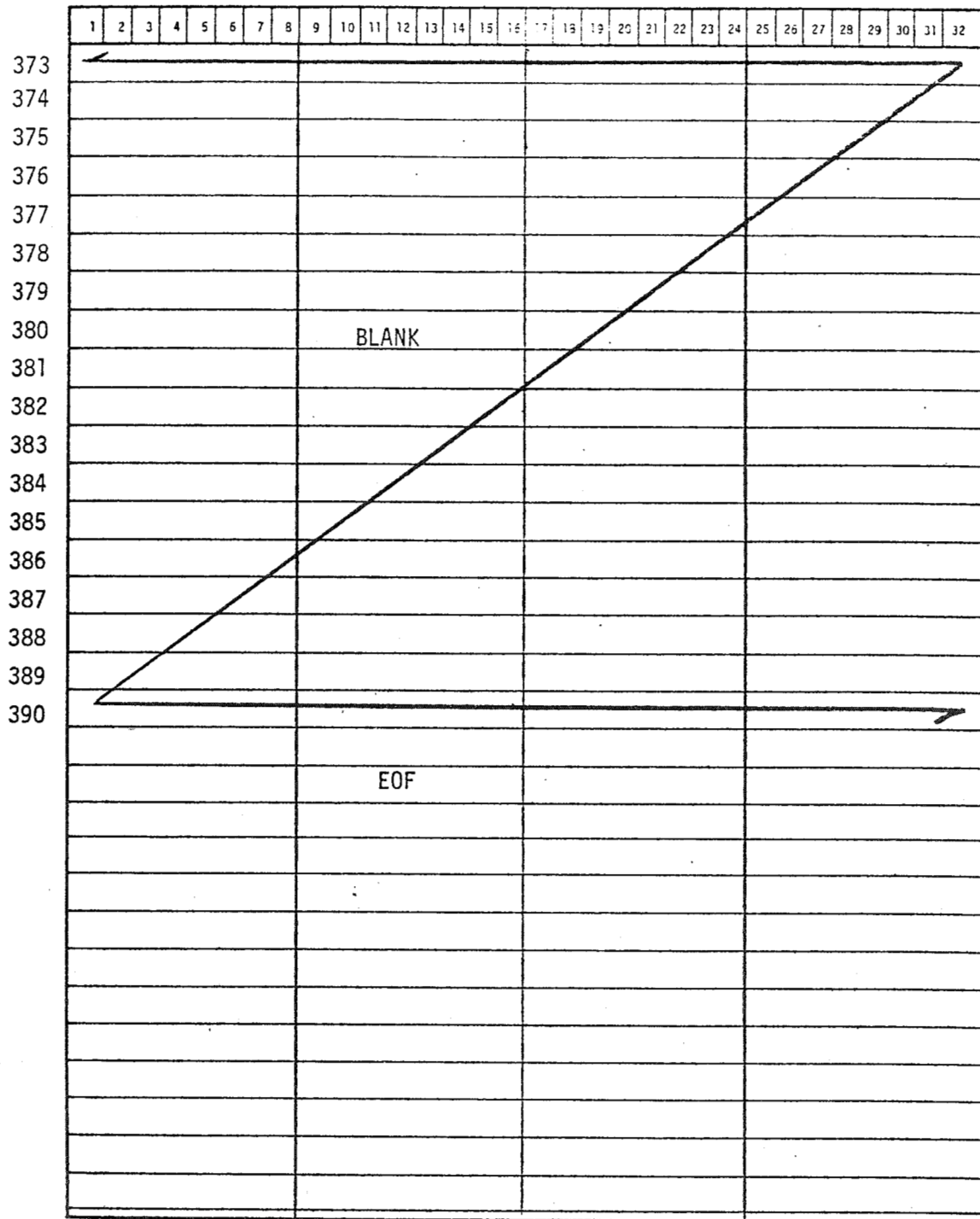
REPRODUCED FROM	TITLE	PIONEER PROGRAM
	PARAMETER MNEMONICS	NASA
	FILE 2	AMES RESEARCH CENTER
	(32-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.2
REV. NO. 1	DATE 12-20-71	SHEET 11 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
		D								Z									P												
		X								M																					
		Y								M																					
		Z								M																					
		X								S																					
		Y								S																					
		Z								S																					
		X								5																					
		Y								5																					
		Z								5																					
		R								A									5												
		D								E									C								5				
		R								5																					
		V								I									5												
		X								E																					

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG 3.2.2		
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)			
	REV NO. 1		DATE 12-20-71	SHEET 13 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Y								E																							
Z								E																							
H								X								M															
H								Y								M															
H								Z								M															
H								X								5															
H								Y								5															
H								Z								5															
H								R								A								5							
H								D								E								C							
5																															
H								R								5															
H								V								I								5							
E								S								5															
S								E								5															
S								5								E															
M								S								P															

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)	
	DOC. NO. PC-262.04	
	FIG. 3.2.2	
REV. NO. 1	DATE 12-20-71	SHEET 14 OF 17



REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(32-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
	REV. NO. 1	DATE 12-20-71	DOC. NO. PC-262.04	
			FIG. 3.2.2	
			SHEET 16 OF 17	

NOTE FOR ALL FIGURES RELATING TO THE 36-BIT MACHINE

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD or EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic 1 Entry 1
mnemonic 2 Entry 2
mnemonic 3 Entry 3 and Entry 4
mnemonic 4 Entry 5
.
.
.
mnemonic 156... Entry 157

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR 36-BIT MACHINES	NASA	
		AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.04	
		FIG. 3.2.3	
	REV. NO. 1	DATE 12-20-71	SHEET 1 OF 13

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1	P						I						O				N				E					E										
2	R												F								T					R										
3	A						J						E				C				T					O										
4	R						Y														D				A		T									
5	A												O				P				E					R										
6	A						T						I				O				N					A										
7	L												T				A				P					E										
8							N						O				.									n										
9	n						n										N				A					M										
10	/						E						X				P									J										
11	P						L										G				F					N										
12	E						R						A				T				F					D										
13							M						M				/				D					D										
14	/						Y						Y								A					R										
15	C												G				E				N					E										
16	R						A						T				E				D															
17	M						M						/				D				D					/										
18	Y						Y																													
19																																				
20																																				
21	S						T						A				R				T															
22	D						A						T				E									M										
23	M						/						D				D				/					Y										
24	Y												S				T				A					R										
25	T												T				I				M					E										
26							H						H				/				M					M										
27	/						S						S								S					T										
28	O						P										D				A					T										
29	E												M				M				/					D										
30	D						/						Y				Y									S										
31	T						O						P								T					I										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

TYPE-BCD
 LOGICAL RECORD LENGTH - 20 WORDS
 PHYSICAL RECORD LENGTH - 40 WORDS
 FILE SIZE 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	HEADER	NASA	
	FILE 1	AMES RESEARCH CENTER	
	(36-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA	
	REV. NO. 1	DATE 12-20-71	DOC. NO. PC-262.04
			FIG. 3.2.3
			SHEET 2 OF 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
E							T						S				P							5							O				
													J				U							L							D				
A							T																	V							I				
G							D						A				T																		
T							F						L				A							N							C				
													T				F							I							N				
J							E																	E							T				
M							U						T				C																		
R							A						N				G							R							P				
													M				A							G							V				
E							L																	I							N				
P							A						T				H																		
I							N						A				Z							I							M				
													R				E							A							R				
P							R																	D							E				
C							P						R				O																		
R							T						A				S							C							P				
													R				E							A							R				
S							U																	D							E				
C							S						U				N																		
R							T						A				S							C							S				
													R				E							A							R				
M							O																	D							E				
C							M						O				O																		
R							T						A				S							C							M				
													H				R							A							N				
G							P																	H							M				
A							G						V				P																		
H							I						N				P							T							H				
													C				E							L							L				
T							P																	C							E				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

TYPE-BCD
TYPICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 264 WORDS
FILE SIZE 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.3
	PARAMETER MNEMONICS	
	FILE 2	
	(36-BIT MACHINE)	
REV. NO. 1	DATE 12-20-71	SHEET 4 OF 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
L						L								N					P																
C						E								L					L					T									E		
														C					E					L									L		
N						E																		X									S		
C						S								E					L																
Y						S								C					S					E									L		
														Z					S					C									S		
E						L																		S									P		
S						E								X					Y																
L						N								P					S					E									L		
														X					P					G									S		
F						F																		Y									P		
G						S								F					F																
Z						P								G					S					F									F		
														D					X					P									G		
S						F																		D									Y		
P						G								S					F																
D						Z								P					G					S									F		
														X					P					H									S		
F						F																		Y									P		
H						S								F					F																
Z						P								H					S					F									F		
														D					X					P									H		
S						F																		D									Y		
P						H								S					F																
D						Z								P					H					S									F		
														X					P					I									S		
F						F																		Y									P		
I						S								F					F																
Z						P								I					S					F									F		
														D					X					P									I		

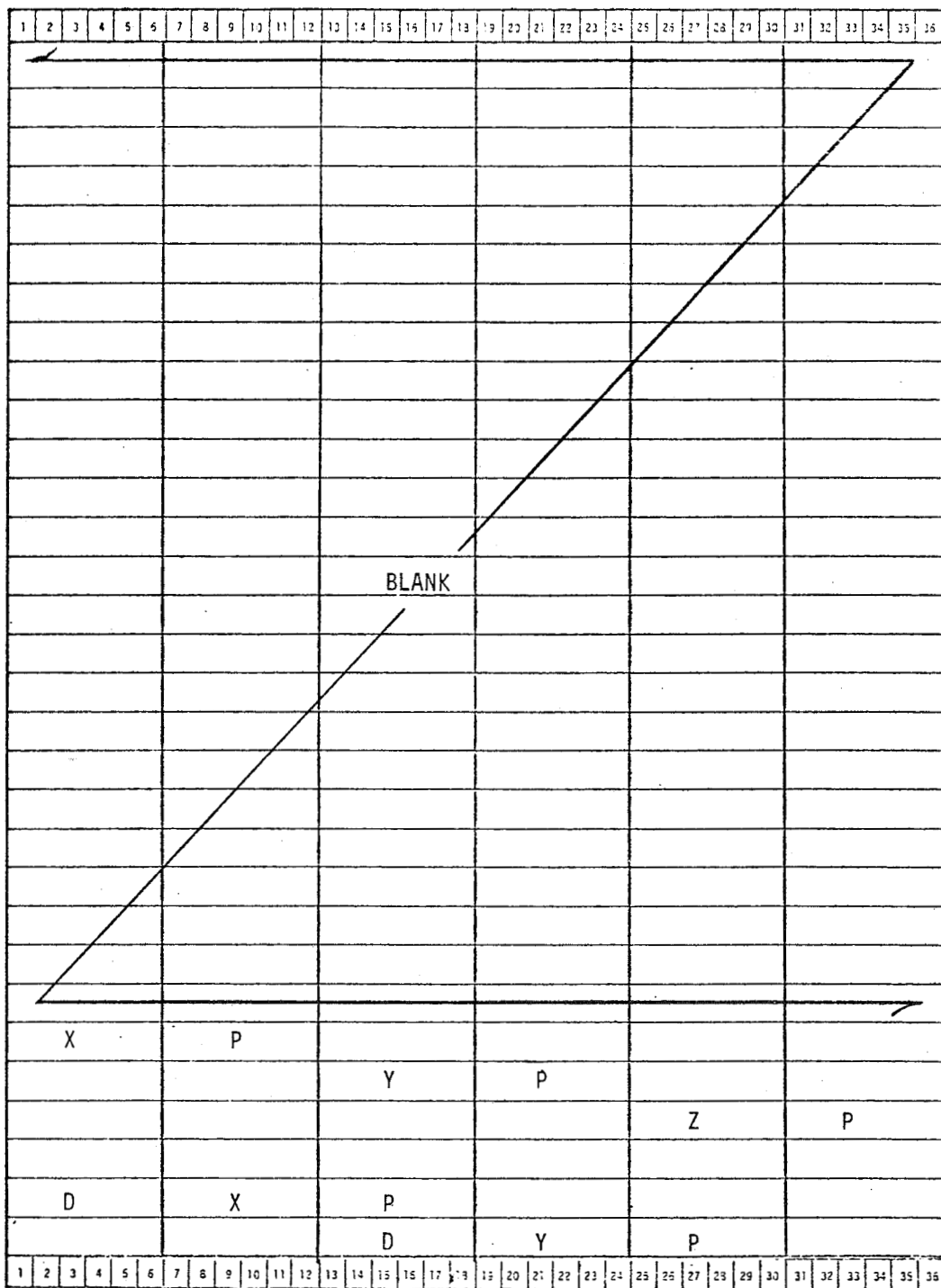
REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
	REV. NO. 1	DATE 12-20-71	FIG. 3.2.3	
			SHEET 5 OF 13	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
S							F																		D					Y					
P							1					S					F																		
D							Z					P					1							S					F						
												X					P							2					S						
F							F																	Y					P						
2							S					F					F																		
Z							P					2					S							F				F							
												D					X							P				2							
S							F																	D				Y							
P							2					S					F																		
D							Z					P					2							S				F							
												B					1							M				A							
G							R																	B				1							
M							A					G					V																		
B							2					M					A							G			R								
												B					2							M			A								
G							V																	E			A								
L							A					T					P																		
E							A					L					0							N			P								
												E					A							V			E								
L							P																	E			A								
P							T					H					P																		
E							A					A					Z							I			P								
												B					1							L			A								
T							D																	B			1								
L							0					N					P																		
B							1					V					E							L			P								
												B					1							P			T								
H							P																	B			1								
A							Z					I					P																		
B							2					L					A							T			P								

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (36-BIT MACHINE)	
	DOC. NO. PC-262.04	
	FIG. 3.2.3	
REV. NO. 1	DATE 12-20-71	SHEET 6 OF 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
														B			2				L													
	N							P														B												2
	V							E						L			P																	
	B							2						P			T					H												P
														B			2					A												Z
	I							P														E												P
	B							1						A			N																	
	E							P						B			2					A												N
														E			P					S												U
	A							N														E												P
	M							O						A			N																	
	C							P						E			A					N												G
														C			P					S												A
	N							G														M												O
	P							S						A			N																	
	B							1						P			B					2												A
														M			O					E												P
	A							N														S												E
	P							A						N			G																	
	E							S						P			A					N												G
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	A							N														S												P
	B							2						A			N																	
	B							1						E			P					A												N
														B			2					E												P
	A							N														C												O
	N							E						C			E																	
	C							L						C			K					C												E
														C			O					N												E
	C							1														C												L
	C							K						C			1																	

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
	REV. NO. 1		DOC. NO. PC-262.04	
DATE 12-20-71		FIG. 3.2.3		
SHEET 7 OF 13				



REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
			FIG. 3.2.3	
REV. NO. 1	DATE 12-20-71		SHEET 9 OF 13	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
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		P																																
		X						M																										
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		V						I					5																					
													X				E																	
																											Y					E		
		Z						E																										
													H				X										M							
																											H					Y		
		M																																
		H						Z					M																					
													H				X										5							
																											H					Y		
		5																																
		H						Z					5																					

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(36-BIT MACHINE)

PIONEER PROGRAM

NASA

AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

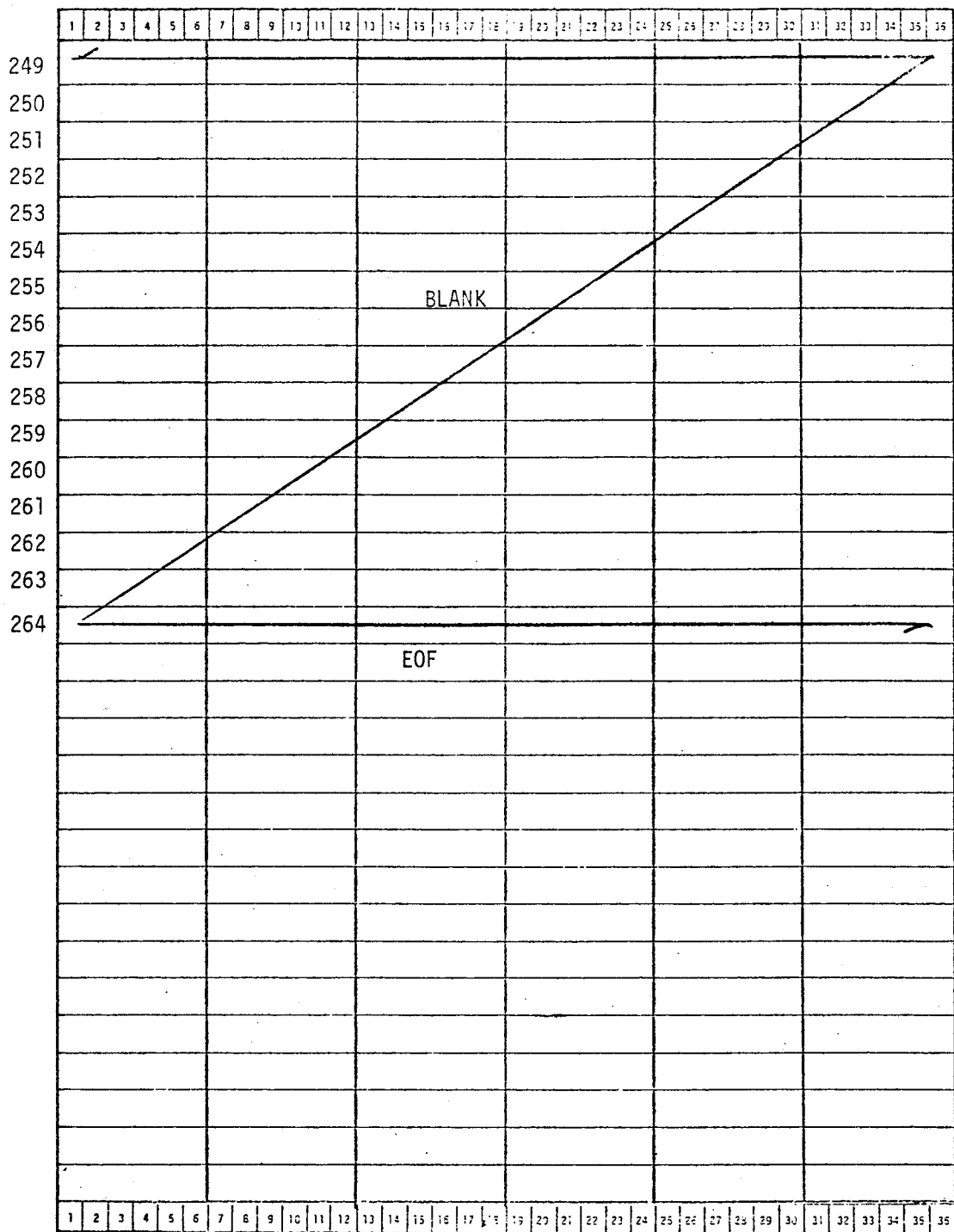
FIG. 3.2.3

REV. NO. 1

DATE 12-20-71

SHEET 10 OF 13

REPRODUCED FROM	TITLE	PIONEER PROGRAM
	PARAMETER MNEMONICS	NASA
	FILE 2	AMES RESEARCH CENTER
	(36-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.3
	REV. NO. 1	SHEET 11 OF 13
	DATE 12-20-71	



REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	PARAMETER MNEMONICS	NASA	
	FILE 2	AMES RESEARCH CENTER	
	(36-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA	
		DOC. NO PC-262.04	
	REV. NO. 1	DATE 12-20-71	FIG. 3.2.3
			SHEET 12 OF 13

TYPE-BCD
LOGICAL RECORD LENGTH - 4 WORDS
PHYSICAL RECORD LENGTH - 628 WORDS
FILE SIZE

SHEET 13 OF 13

NOTE FOR ALL FIGURES RELATING TO THE 48-BIT MACHINE

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD or EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

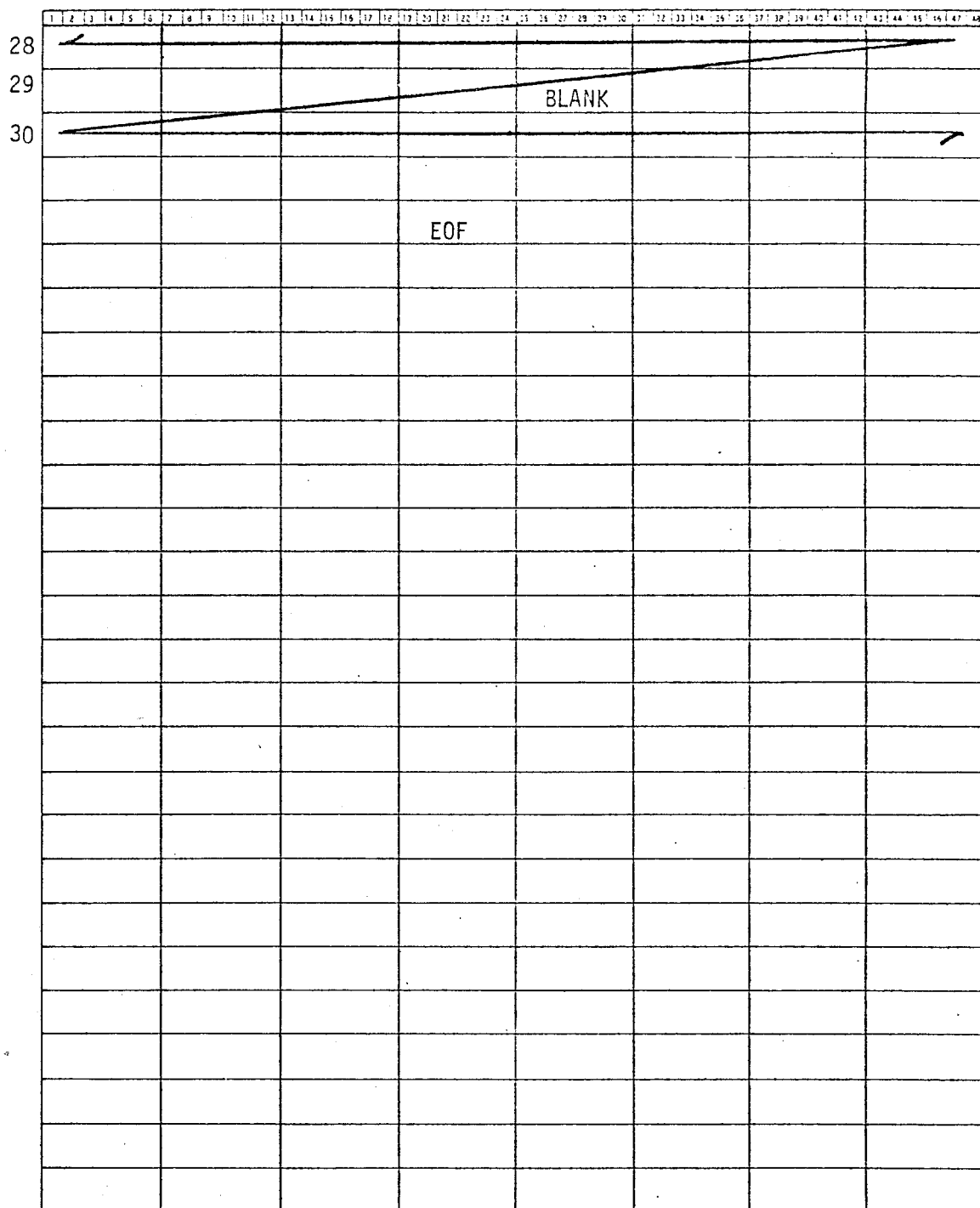
mnemonic 1 ... Entry 1
mnemonic 2 ... Entry 2
mnemonic 3 ... Entry 3 and Entry 4
mnemonic 4 ... Entry 5
.
.
.
mnemonic 156 - Entry 157

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR		NASA	
	48-BIT MACHINES		AMES RESEARCH CENTER	
			MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.04	
	REV. NO. 1	DATE 12-20-71	FIG. 3.2.4	
			SHEET 1	OF 12

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48			
1	P		I		O				N		E		E		R																																				
2	F				T				R		A		J		E																																			C	
3	T		O		R				Y				D		A																																			T	
4	A				O				P		E		R		A																																			T	
5	I		O		N				A		L				T																																			A	
6	P		E						N		O																																							n	
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8	T		R		D						J		P		L																																				
9	G		E		N				E		R		A		T																																		E		
10	D				M				M		/		D		D																																			/	
11	Y		Y						A		R		C																																					G	
12	E		N		E				R		A		T		E																																		D		
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14	Y																																																		
15																																																			
16	S		T		A				R		T				D																																			A	
17	T		E						M		M		/		D																																			D	
18	/		Y		Y						S		T		A																																			R	
19	T				T				I		M		E																																					H	
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21	S		T		O				P				D		A																																			T	
22	E				M				M		/		D		D																																			/	
23	Y		Y						S		T		O		P																																				
24	T		I		M				E				H		H																																			/	
25	M		M		/				S		S				R																																			E	
26	E		L						N		O																																								
27									BLANK																																										

TYPE-BCD
LOGICAL RECORD LENGTH - 15 WORDS
PHYSICAL RECORD LENGTH - 30 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	HEADER FILE 1 (48-BIT MACHINE)	
	DOC. NO. PC-262.04	
	FIG. 3.2.4	
REV. NO. 1	DATE 12-20-71	SHEET 2 OF 12



REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	HEADER	NASA	
	FILE 1	AMES RESEARCH CENTER	
	(48-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA	
	REV. NO. 1	DATE 2-20-71	DOC. NO. PC-262.04
			FIG. 3.2.4
			SHEET 3 OF 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48					
E						T						S						P					5																													
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R						A						N						G					R																													
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D						E						C						M					O																													
R						T						A						S					C																													
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TYPE-BCD
LOGICAL RECORD LENGTH - 15 WORDS
PHYSICAL RECORD LENGTH - 192 WORDS
FILE SIZE 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS	
	FILE 2	
	(48-BIT MACHINE)	
REV. NO. 1	DATE 12-20-71	FIG. 3.2.4
		SHEET 4 OF 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
Y				S				C					S				E			L																												
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X				P				G					S				F			F																												
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D				Y				P					H				S			F																												
D				Z				P					H				S			F																												
X				P				1					S				F			F																												
Y				P				1					S				F			F																												
Z				P				1					S				F			F																												
D				X				P					1				S			F																												
D				Y				P					1				S			F																												
D				Z				P					1				S			F																												
X				P				2					S				F			F																												
Y				P				2					S				F			F																												
Z				P				2					S				F			F																												
D				X				P					2				S			F																												
D				Y				P					2				S			F																												

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.04 FIG. 3.2.4
	PARAMETER MNEMONICS FILE 2 (48-BIT MACHINE)		
	REV. NO. 1	DATE 12-20-71	
	SHEET 5 OF 12		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
D		Z		P		2		S		F																																					
B		1		M		A		G		R																																					
B		1		M		A		G		V																																					
B		2		M		A		G		R																																					
B		2		M		A		G		V																																					
E		A		L		A		T		P																																					
E		A		L		O		N		P																																					
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E		A		P		T		H		P																																					
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B		2		L		A		T		P																																					
B		2		L		O		N		P																																					
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B		2		A		Z		I		P																																					
E		P		B		1		A		N																																					
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C		P		E		A		N		G																																					
C		P		S		A		N		G																																					
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REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER MNEMONICS		
	FILE 2		
	(48-BIT MACHINE)		
	REV. NO. 1		DATE 12-20-71
	FIG. 3.2.4		
	SHEET 6 OF 12		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	B						1							P						B					2					A																	
	M						O							E						P					A					N																	
	S						E							P						A					N					G																	
	E						S							P						A					N					G																	
	S						P							B						1					A					N																	
	S						P							B						2					A					N																	
	B						1							E						P					A					N																	
	B						2							E						P					A					N																	
	C						O							N						E					C					E																	
	C						L							C						K					C					E																	
	C						O							N						E					C					1																	
	C						L							C						K					C					1																	
	C						O							N						E					C					2																	
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	C						O							N						E					E					1																	
	C						L							C						K					E					1																	
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	C						O							N						E					1					E																	
	C						L							C						K					1					E																	
	C						O							N						E					1					2																	
	C						L							C						K					1					2																	
	C						O							N						E					1					C																	
	C						L							C						K					1					C																	
	H						O							U						R					A					N																	

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

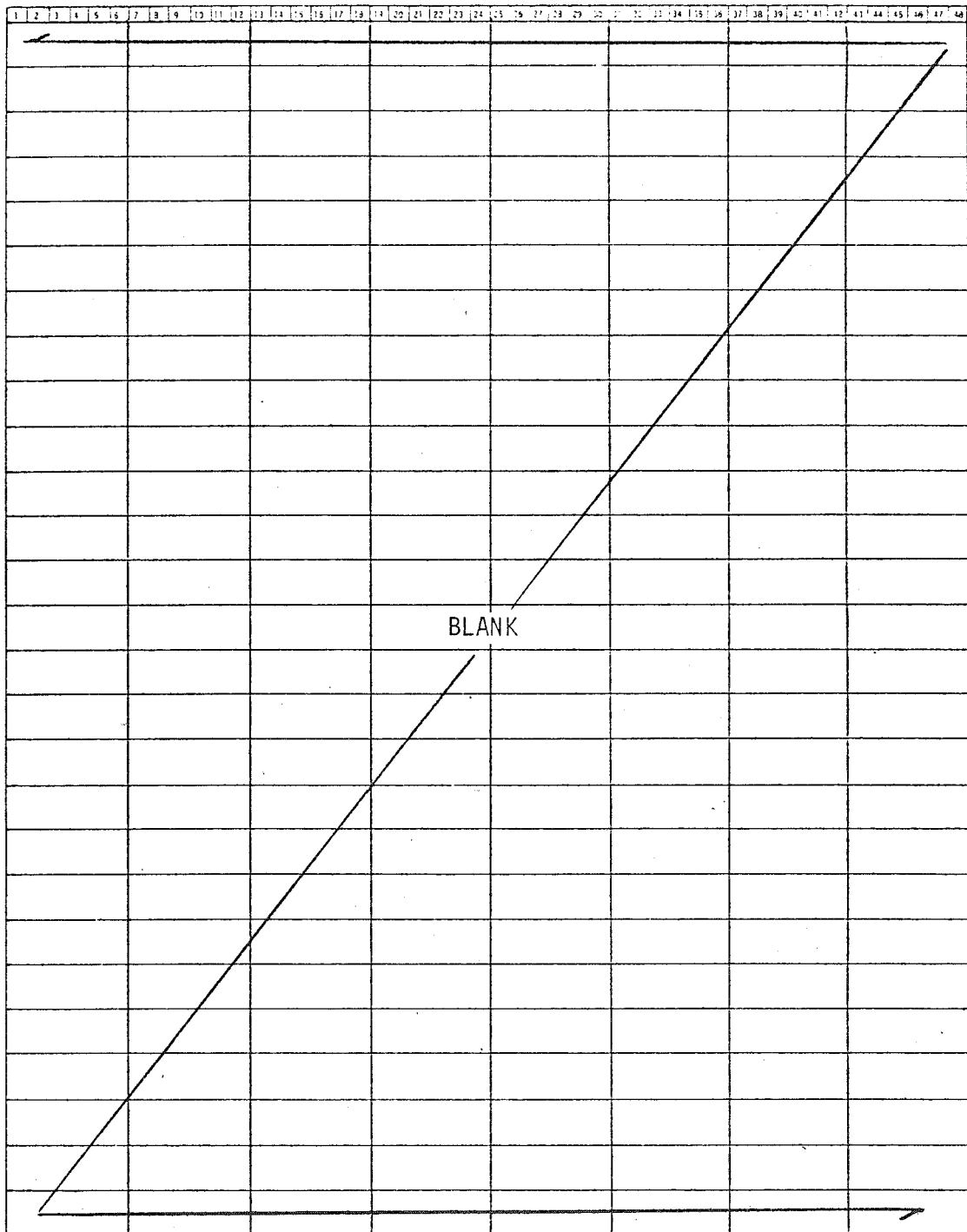
DOC. NO. PC-262.04

FIG. 3.2.4

REV. NO. 1

DATE 12-20-71

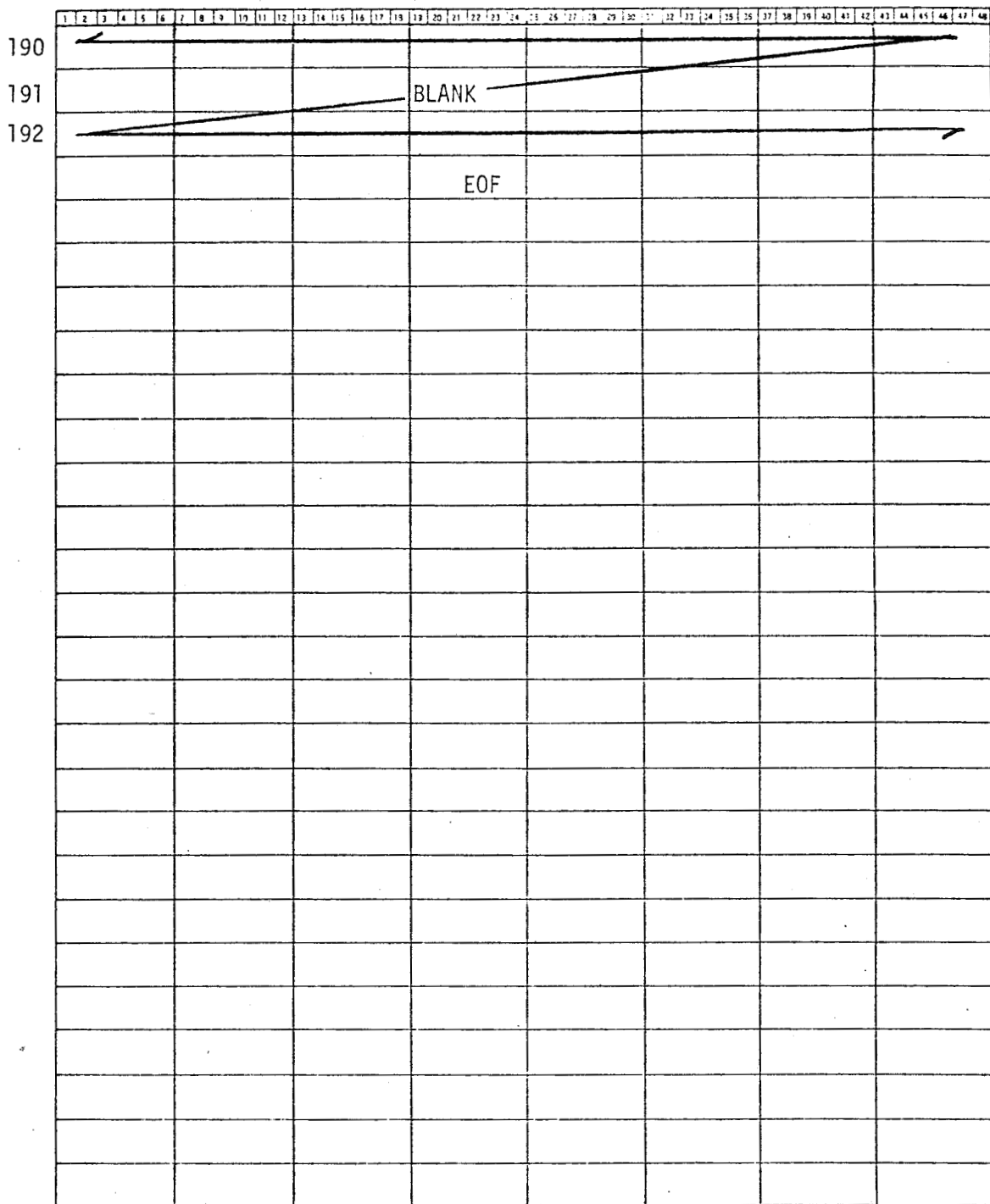
SHEET 7 OF 12



REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	PARAMETER MNEMONICS	NASA	
	FILE 2	AMES RESEARCH CENTER	
	(48-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA	
	REV. NO. 1	DATE 12-20-71	DOC. NO. PC-262.04
			FIG. 3.2.4
			SHEET 8 OF 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
X		P																																														
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REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (48-BIT MACHINE)		
	REV. NO. 1		
	DATE 12-20-71		
		FIG. 3.2.4	SHEET 9 OF 12



REPRODUCED FROM	TITLE	PIONEER PROGRAM
	PARAMETER MNEMONICS	NASA
	FILE 2	AMES RESEARCH CENTER
	(48-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
	REV. NO. 1	DOC. NO. PC-262.04
	DATE 12-20-71	FIG. 3.2.4
		SHEET 11 OF 12

TYPE-BCD
LOGICAL RECORD LENGTH - 5 WORDS
PHYSICAL RECORD LENGTH - 471 WORDS
FILE SIZE

REPRODUCED FROM	TITLE	PIONEER PROGRAM
	PARAMETER VALUES	NASA
	FILE 3	AMES RESEARCH CENTER
	(48-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.4
	REV. NO. 1	SHEET 12 OF 12
	DATE 12-20-71	

PIONEER SATURN
TRAJECTORY DATA USER REQUIREMENTS
SPECIFICATION PC-262.05

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Ames Research Center
Moffett Field, California 94035

PIONEER PROGRAM

SPECIFICATION PC-262.05

Pioneer Saturn: Trajectory Data User Requirements

January 15, 1976

1. SCOPE

Specification PC-262.05 describes the detailed requirements for processing the Navigation Team-prepared Trajectory Data "Save" Tape at Ames Research Center on the XDS Sigma 5 computer.

2. APPLICABLE DOCUMENTS

2.1 NASA/ARC SPECIFICATIONS

PC-262.00, Pioneer F/G: Off-Line Data Processing System at ARC

PC-262.01, Pioneer F/G: Off-Line Data Processing System Detailed Processing Requirements.

PC-262.02, Pioneer F/G: Input and Output Tape Requirements

PC-262.03, Pioneer F/G: Data User Requirements

PC-262.04, Pioneer F/G: Trajectory Data User Requirements

PC-261.00, Pioneer F/G: On-Line Ground Data System Software Specification - General

2.2 NASA/JPL DOCUMENT

Constants and Related Information for Astrodynamical Calculation, 1968, Jet Propulsion Laboratory, Technical Report 32-1306.

3. GENERAL PROCESSING REQUIREMENTS

The source of the user's trajectory data will be the output of the JPL DPTRAJ "save" tape as defined in PC-262.01, Pioneer F/G: Input and Output Tape Requirements. This tape in addition to being the source for each user's trajectory requirements, shall also provide a capability to calculate the "round-trip-light-time: (RTLTL) required in each user's EDR. A description of the parameters is given in section 3.1 of this specification.

3.1 DPTRAJ TRAJECTORY SAVE TAPE VARIABLES

Each regular record of the DPTRAJ save tape contains time annotated trajectory parameters. The following list describes and defines the available parameters.

<u>BCD NAME</u>	<u>TIME GROUP</u>
ETSP50	(1) Time past 0 ^h JANUARY 1, 1950 (sec)*
JULDAT	(2) Julian Date (days)
VIGDAT	(3) Gregorian calendar date (yr, mo, day, hr, min, sec)
TFLANC	(4) Time from launch (sec)
TFINJE	(5) Time from initial epoch of trajectory (sec)
ETMUTC	(6) ET-UTC (sec)**

*The time reference is ET (ephemeris time)

**ET and UTC (Universal Time Coordinated).

3.1.1 Geocentric. The following parameters are defined in the inertial spherical coordinate system described on Figure 3.1.1. For this group the reference body is the Earth and the plane of reference is the Earth's true equator of date.

RANGRP (7) Range rate (km/sec); the time rate of change of the magnitude of the radius vector

MAGVEL (8) Speed of the spacecraft (km/sec)

INPATH (9) Inertial flight path angle (deg)

INAZIM (10) Inertial azimuth angle (deg)

REARPR (11) Radius to the spacecraft (km)

DECPRO (12) Declination of the spacecraft (deg)

RTASCP (13) Right ascension of the spacecraft (deg)

REARSU (14) Earth-Sun distance (km)

DECSUN (15) Declination of the Sun (deg)

RTASCS (16) Right ascension of the Sun (deg)

REARMO (17) Earth-Moon distance (km)

DECMOO (18) Declination of the moon (deg)

RTASCM (19) Right ascension of the moon (deg)

3.1.2 Heliocentric. For this group of parameters there are two coordinate systems centered at the Sun.

The following parameters are defined in the inertial spherical coordinate system described on Figure 3.1.1. For this group the reference body is the Sun and the plane of reference is the true ecliptic of date.

HRANGP (20) Radius to the S/C (km)

HMAGVP (21) Speed of the S/C (km/sec)

HINPTH (22) Inertial flight path angle (deg)

CELLTP (23) Celestial latitude of the S/C (deg)

CELLNP (24) Celestial longitude of the S/C (deg)

CELLTE (25) Celestial latitude of the Earth (deg)

CELLNE (26) Celestial longitude of the Earth (deg)

The following parameters are defined in the Sun-Earth cartesian coordinate system described on Figure 3.1.2.

XSCSEL (27) X-component of the S/C in the Sun-Earth system (km)

YXCSEL (28) Y-component of the S/C in the Sun-Earth system (km)

ZSCSEL (29) Z-component of the S/C in the Sun-Earth system (km)

SPSEXV (30) Sun-S/C distance in the X-Y plane of the Sun-Earth system (km); the projection of the Sun-S/C vector onto the X-Y plane

LNPSEL (31) Longitude of the S/C in the Sun-Earth system (deg)

3.1.3 Inertial Cartesian. The following parameters represent cartesian position and velocity vectors of the S/C from the Earth, Sun, Saturn and Jupiter. Figure 3.1.3 describes the inertial cartesian coordinate system. The plane of reference for these parameters is the mean ecliptic of 1950.0.

XPGSFF (32) X-component of the S/C (Earth centered) (km)

YPGSFF (33) Y-component of the S/C (Earth centered) (km)

ZPGSFF (34) Z-component of the S/C (Earth centered) (km)

DXPGSF (35) $\dot{X}$ -time rate of change in the X-component (km/sec)

DYPGSF (36) $\dot{Y}$ -time rate of change in the Y-component (km/sec)

DZPGSF (37) $\dot{Z}$ -time rate of change in the Z-component (km/sec)

XPHSFF (38) X-component of the S/C (Sun centered) (km)

YPHSFF (39) Y-component of the S/C (Sun centered) (km)

ZPHSFF	(40)	Z-component of the S/C (Sun centered) (km)
DXPHSF	(41)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYPHSF	(42)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZPHSF	(43)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)
XP1SFF	(44)	X-component of the S/C (Saturn centered) (km)
YP1SFF	(45)	Y-component of the S/C (Saturn centered) (km)
ZP1SFF	(46)	Z-component of the S/C (Saturn centered) (km)
DXP1SF	(47)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYP1SF	(48)	$\dot{Y}$ -time rate of change in the Y component (km/sec)
DZP1SF	(49)	$\dot{Z}$ -time rate of change in the Z component (km/sec)
XP2SFF	(50)	X-component of the S/C (Jupiter centered) (km)
YP2SFF	(51)	Y-component of the S/C (Jupiter centered) (km)
ZP2SFF	(52)	Z-component of the S/C (Jupiter centered) (km)
DXP2SF	(53)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYP2SF	(54)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZP2SF	(55)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)

Additionally:

B1MAGR (56) Saturn-S/C distance (km)
B1MAGV (57) Velocity of the S/C with respect to
Saturn (km/sec)
B2MAGR (58) Jupiter-S/C distance (km)
B2MAGR (59) Velocity of the S/C with respect to
Jupiter (km/sec)

3.1.4 Body-Fixed. The following parameters are referenced to a rotating coordinate system fixed to either the Earth, Saturn, or Jupiter. The mathematical models of the body-fixed system (equator, prime meridian, rotational dynamics) are defined in section 2.2. The body-fixed coordinate system is shown on Figure 3.1.4.

- EARTH -

EALATP (60) Latitude of the S/C (deg)
EALONP (61) Longitude of the S/C (deg)
EAVELP (62) Velocity of the S/C (km/sec)
EAPTHP (63) Body-fixed path angle (deg)
EAAZIP (64) Body-fixed azimuth angle (deg)

- SATURN -

B1LATP (65) Latitude of the S/C (deg)
B1LONP (66) Longitude of the S/C (deg)
B1VELP (67) Velocity of the S/C (km/sec)
B1PTHP (68) Body-fixed path angle (deg)
B1AZIP (69) Body-fixed azimuth angle (deg)

- JUPITER -

B2LATP (70) Latitude of the S/C (deg)
B2LONP (71) Longitude of the S/C (deg)
B2VELP (72) Velocity of the S/C (km/sec)

B2PTHP (73) Body-fixed path angle (deg)
 B2AZIP (74) Body-fixed azimuth angle (deg)

3.1.5 Angles (all the angles are in degrees). This group contains two types of angles.

- (a) Three body angles
- (b) Cone and Clock angles.

The following list of parameters represent the angles between two radius vectors from the same vertex. As an example the Earth-S/C-Saturn angle is the minimum angle between the S/C-to-Earth vector and the S/C-to-Saturn vector (see Figure 3.1.5 sheet 1).

EPB1AN (75) Earth-S/C-Saturn
 EPB2AN (76) Earth-S/C-Jupiter
 EPSUAN (77) Earth-S/C-Sun
 EPMOAN (78) Earth-S/C-Moon
 CPEANG (79) Canopus-S/C-Earth
 CPSANG (80) Canopus-S/C-Sun
 MOPSAN (81) Moon-S/C-Sun
 B1PB2A (82) Saturn-S/C-Jupiter
 MOEPAN (83) Moon-Earth-S/C
 SEPANG (84) Sun-Earth-S/C
 ESPANG (85) Earth-Sun-S/C
 SPB1AN (86) Sun-S/C-Saturn
 SPB2AN (87) Sun-S/C-Jupiter
 B1EPAN (88) Saturn-Earth-S/C
 B2EPAN (89) Jupiter-Earth-S/C

The following parameters represent the cone and clock angles for three different cone-clock systems. On Figure 3.1.5 sheet 2, the typical cone-clock coordinate system is defined.

- Sun-S/C-Canopus -

CONECE	(90)	Cone angle of the Earth
CLCKCE	(91)	Clock angle of the Earth
CONEC1	(92)	Cone angle of Saturn
CLCKC1	(93)	Clock angle of Saturn
CONEC2	(94)	Cone angle of Jupiter
CLCKC2	(95)	Clock angle of Jupiter

-Sun-S/C-Earth-

CONEE1	(96)	Cone angle of Saturn
CLCKE1	(97)	Clock angle of Saturn
CONEE2	(98)	Cone angle of Jupiter
CLCKE2	(99)	Clock angle of Jupiter
CONEEC	(100)	Cone angle of Canopus
CLCKEC	(101)	Clock angle of Canopus

- Sun-S/C-Saturn-

CONE1E	(102)	Cone angle of the Earth
CLCK1E	(103)	Clock angle of the Earth
CONE12	(104)	Cone angle of Jupiter
CLCK12	(105)	Clock angle of Jupiter
CONE1C	(106)	Cone angle of Canopus
CLCK1C	(107)	Clock angle of Canopus

3.1.6 Programmable Variables. The following parameters were selected from the DPTRAJ output using the "programmable variable" option and are included on the save tape.

The following parameters (108 - 119) are cartesian position and velocity vectors of the spacecraft and the Earth with respect to an inertial coordinate system centered at Saturn. Figure 3.1.3 describes the system. The plane of reference for these parameters is the Earth's mean equator of 1950.0. Parameters 125 - 130 are also defined in this system.

XP1	(108)	X-component of the spacecraft (km)
YP1	(109)	Y-component of the spacecraft (km)
ZP1	(110)	Z-component of the spacecraft (km)
DXP1	(111)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYP1	(112)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZP1	(113)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)
XE1	(114)	X-component of the Earth (km)
YE1	(115)	Y-component of the Earth (km)
ZE1	(116)	Z-component of the Earth (km)
DXE1	(117)	$\dot{X}$ -time rate of change in the X-component (km/sec)
DYE1	(118)	$\dot{Y}$ -time rate of change in the Y-component (km/sec)
DZE1	(119)	$\dot{Z}$ -time rate of change in the Z-component (km/sec)

The following parameters (120 - 123) are defined in the Saturn-centered inertial spherical coordinate system with the Earth's mean equator of 1950.0 as the reference plane (see Figure 3.1.1).

RE1 (120) Distance from Saturn to the Earth (km)
 DECE1 (121) Declination of the Earth (deg)
 RAE1 (122) Right ascension of the Earth (deg)
 VIE1 (123) Speed of the Earth (km/sec)

The following parameter (124) is defined in the Saturn-fixed coordinate system shown on Figure 3.1.4.

LONE1 (124) Longitude of the Earth (deg)

Parameters 125 through 130 are defined in the Saturn-centered inertial cartesian coordinate system as previously noted above.

XM1 (125) X-component of the Moon (km)
 YM1 (126) Y-component of the Moon (km)
 ZM1 (127) Z-component of the Moon (km)
 XS1 (128) X-component of the Sun (km)
 YS1 (129) Y-component of the Sun (km)
 ZS1 (130) Z-component of the Sun (km)

Parameter 131 is the magnitude of the cartesian position vector for the Sun.

RS1 (131) Distance to the Sun (km)

The following parameters (132 - 140) are cartesian position vectors for the Earth, Moon and Sun with respect to an inertial coordinate system centered at Saturn. Figure 3.1.3 describes the system. The plane of reference for these parameters is the mean ecliptic of 1950.0.

XE1 (132) X-component of the Earth (km)
 YE1 (133) Y-component of the Earth (km)
 ZE1 (134) Z-component of the Earth (km)
 XM1 (135) X-component of the Moon (km)

YM1 (136) Y-component of the Moon (km)
 ZM1 (137) Z-component of the Moon (km)
 XS1 (138) X-component of the Sun (km)
 YS1 (139) Y-component of the Sun (km)
 ZS1 (140) Z-component of the Sun (km)

The following parameters (141 - 143) are defined in the Saturn-centered inertial spherical coordinate system with the mean ecliptic of 1950.0 as the reference plane (see Figure 3.1.1).

DECS1 (141) Celestial latitude of the Sun (deg)
 RAS1 (142) Celestial longitude of the Sun (deg)
 VIS1 (143) Speed of the Sun (km/sec)

The following parameter (144) is defined in the Saturn fixed coordinate system shown on Figure 3.1.4.

LONS1 (144) Longitude of the Sun (deg)

The following parameters (145 - 156) represent additional three body angles (see Figure 3.1.5 and the earlier discussion of these angles).

ES6 (145) Earth-Sun-Saturn (deg)
 SE6 (146) Sun-Earth-Saturn (deg)
 S6E (147) Sun-Saturn-Earth (deg)
 MSP (148) Moon-Sun-spacecraft (deg)
 SMP (149) Sun-Moon-spacecraft (deg)
 EMP (150) Earth-Moon-spacecraft (deg)
 A6SP (151) Saturn-Sun-spacecraft (deg)
 S6P (152) Sun-Saturn-spacecraft (deg)
 E6P (153) Earth-Saturn-spacecraft (deg)
 ESM (154) Earth-Sun-Moon (deg)

EMS (155) Earth-Moon-Sun (deg)

MES (156) Moon-Earth-Sun (deg)

The following four parameters (157 - 160) are angular distances subtended by the semi-diameters of the Earth, Sun, Moon and Saturn as seen from the spacecraft (see Figure 3.1.6).

EASD (157) Angular semi-diameter of the Earth (deg)

SASD (158) Angular semi-diameter of the Sun (deg)

MASD (159) Angular semi-diameter of the Moon (deg)

A6ASD (160) Angular semi-diameter of Saturn (deg)

3.2 OUTPUT TRAJECTORY DATA USER REQUIREMENTS

The experimenter shall either receive a copy of the DPTRAJ "save" tape or a processed tape created according to the individual format requirements summarized in sheet 1 of figure 3.2. The "processed" tape, as shown by sheet 2 of figure 3.2, shall be made up of three files of information.

- 3.2.1 Header File. The Header File shall contain logistics type of information and shall serve to identify the "processed" trajectory tape as to content, date of generation, etc.
- 3.2.2 Compendium File. This file shall contain a listing of all the requested parameters on the "processed" trajectory tape. It shall contain the acronym for the parameter and the calling sequence order. Of the 156 parameters selected for the "processed" tape, 127 shall be taken directly from the "save" tape and 29 shall be computed from other variables also found on the input "save" tape. A complete list of parameters in the proper order together with a description, mnemonic and computation requirement for those to be derived is shown in figure 3.2-a.
- 3.2.3 Trajectory Data File. This file shall contain the specific value of each parameter that each user has selected for use with his EDR data.

3.3 DOCUMENT CONTROL

This specification shall be subject to rigid document control by NASA/ARC. In the event changes are required to this specification, replacement, or additional pages will be furnished by NASA/ARC. Replacement or additional pages will be appropriately labeled to indicate change and dates of changes.

4. PRODUCT ASSURANCE PROVISIONS

Not applicable.

5. HANDLING, SHIPPING, AND STORAGE

Not applicable.

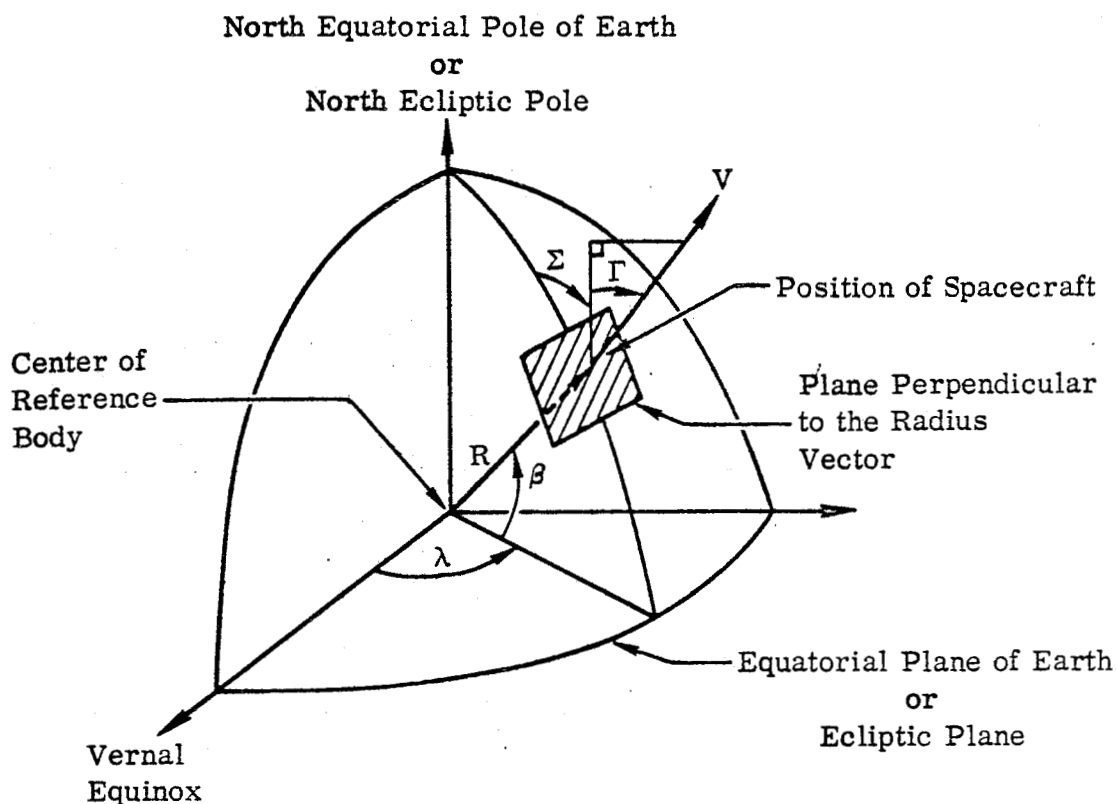
6. NOTES

6.1 ABBREVIATIONS

See Section 6.1 of specification PC-262.00.

6.2 GLOSSARY OF TERMS

See Section 6.2 of specification PC-262.00.



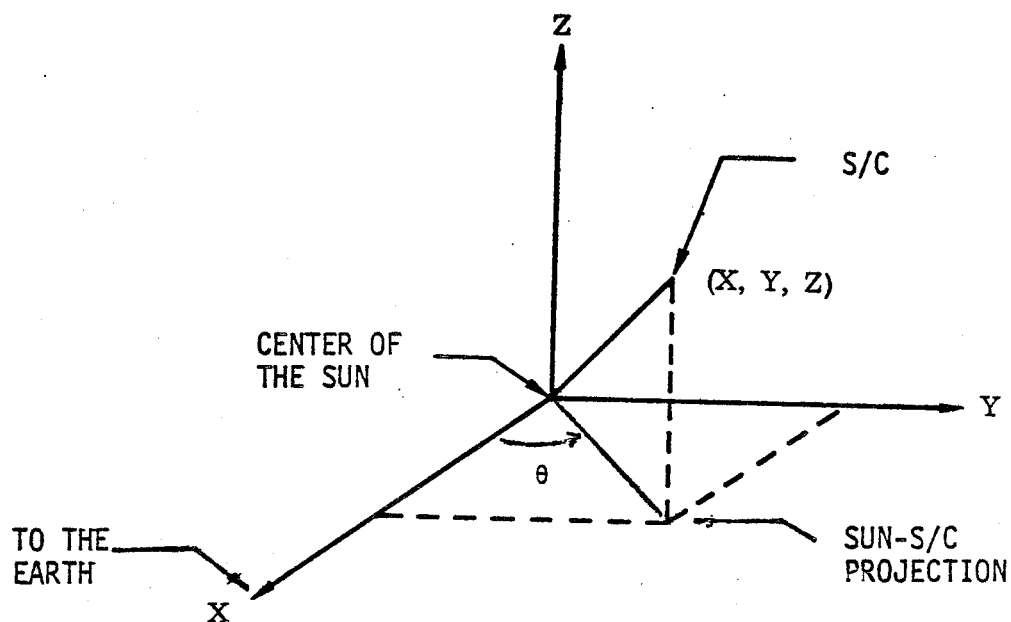
The plane of reference in the Inertial Spherical Coordinate System shall be either the ecliptic plane or the equatorial plane of Earth.

- R radius: The distance from the center of the reference body to the spacecraft
- β declination (equatorial reference plane): The angle between the reference body-spacecraft radius vector and the reference body equatorial plane; measured positive north of the equatorial plane
- β celestial latitude (ecliptic reference plane): The angle between the reference body-spacecraft radius vector and the reference body ecliptic plane; measured positive north of the ecliptic plane
- λ right ascension (equatorial reference plane): The angle between the Vernal Equinox line and the projection of the reference body-spacecraft radius vector onto the Earth equatorial plane; measured eastward from the Vernal Equinox

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REV. NO.	DATE 1/15/76	FIG. 3.1.1	
		SHEET 1 OF 2	

- λ celestial longitude (ecliptic reference plane): the angle between the Vernal Equinox line and the projection of the reference body-spacecraft radius vector onto the ecliptic plane; measured eastward from the Vernal Equinox line
- V speed: the magnitude of the spacecraft inertial velocity
- Γ inertial flight path angle: the angle between the spacecraft inertial velocity vector and the plane normal to the reference body-spacecraft radius vector; positive away from the center of the body
- Σ inertial azimuth angle: the angle between the local meridian and the projection of the inertial velocity vector onto the plane normal to the reference body-spacecraft radius vector; measured positive east of north

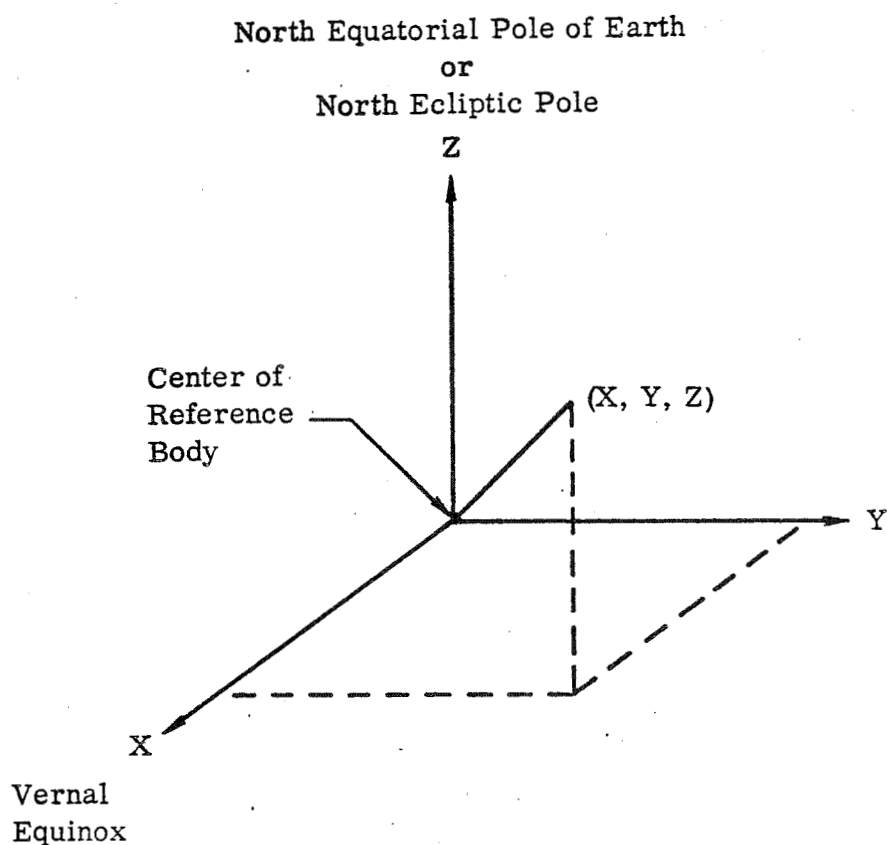
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	INERTIAL SPHERICAL COORDINATE SYSTEM		NASA	
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			FIG. 3.1.1	
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- X Positive towards the Earth
- Y Positive from the Sun and perpendicular to the X-axis and lying in the ecliptic plane of date
- Z Positive from the Sun completing the right hand system
- θ Longitude of S/C

NOTE: This system rotates with the Earth about the Sun

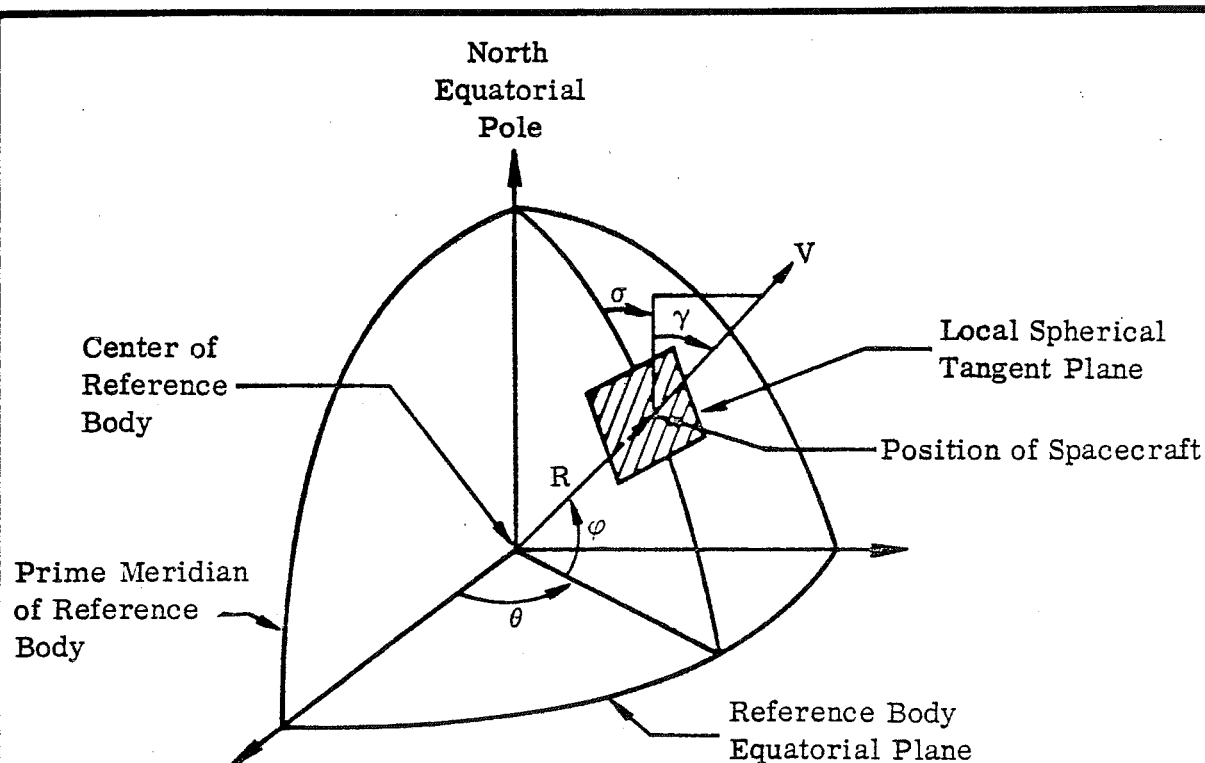
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	SUN-EARTH-LINE CARTESIAN		NASA	
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			FIG. 3.1.2	
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The plane of reference in the Inertial Cartesian System shall be either the ecliptic plane or equatorial plane of the Earth.

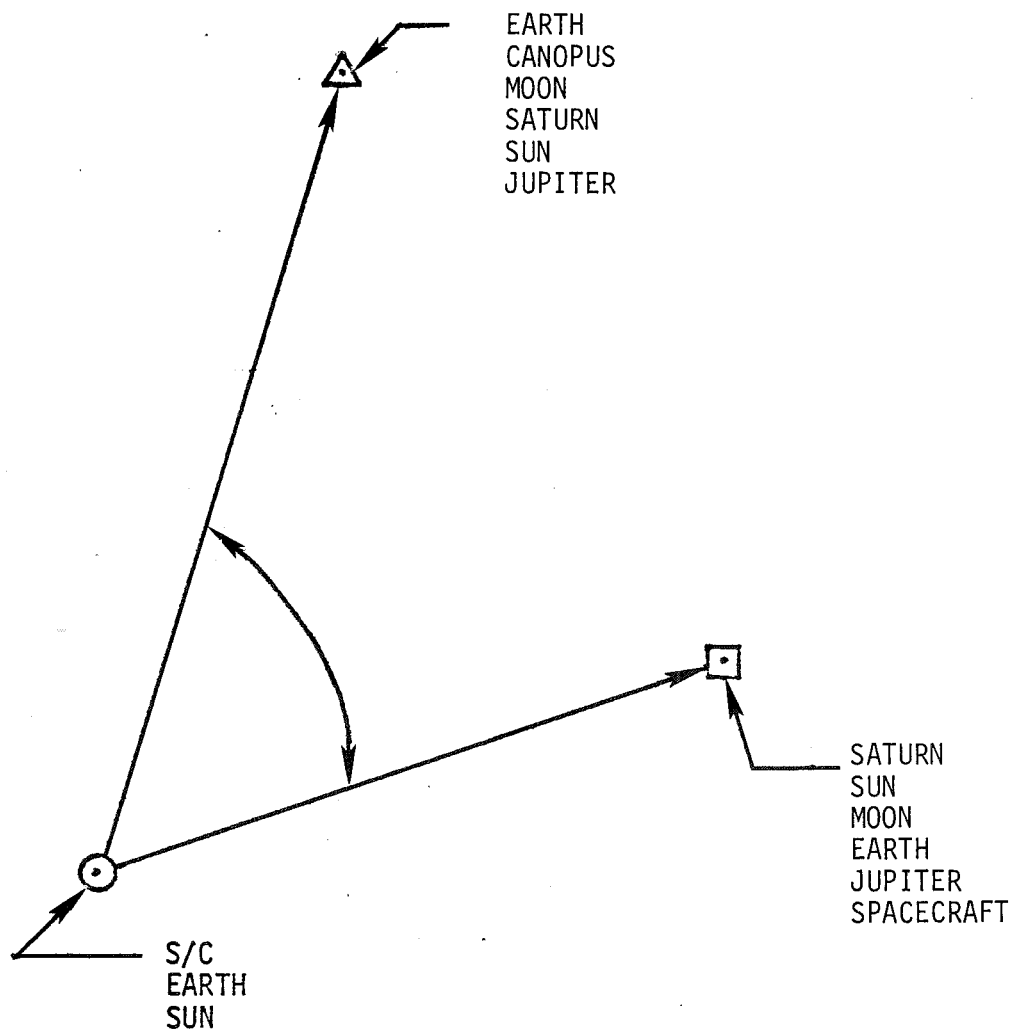
- X positive toward the Vernal Equinox and determined by the intersection of the mean Earth equator and ecliptic of 1950.0.
- Y positive outward from the center of the reference body, perpendicular to and east of the X-axis and lying in the ecliptic or equatorial plane
- Z positive toward the north ecliptic or equatorial pole of Earth and completes the orthogonal system

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			FIG. 3.1.3	
	REV. NO.	DATE 1/15/76	SHEET 1	OF 1

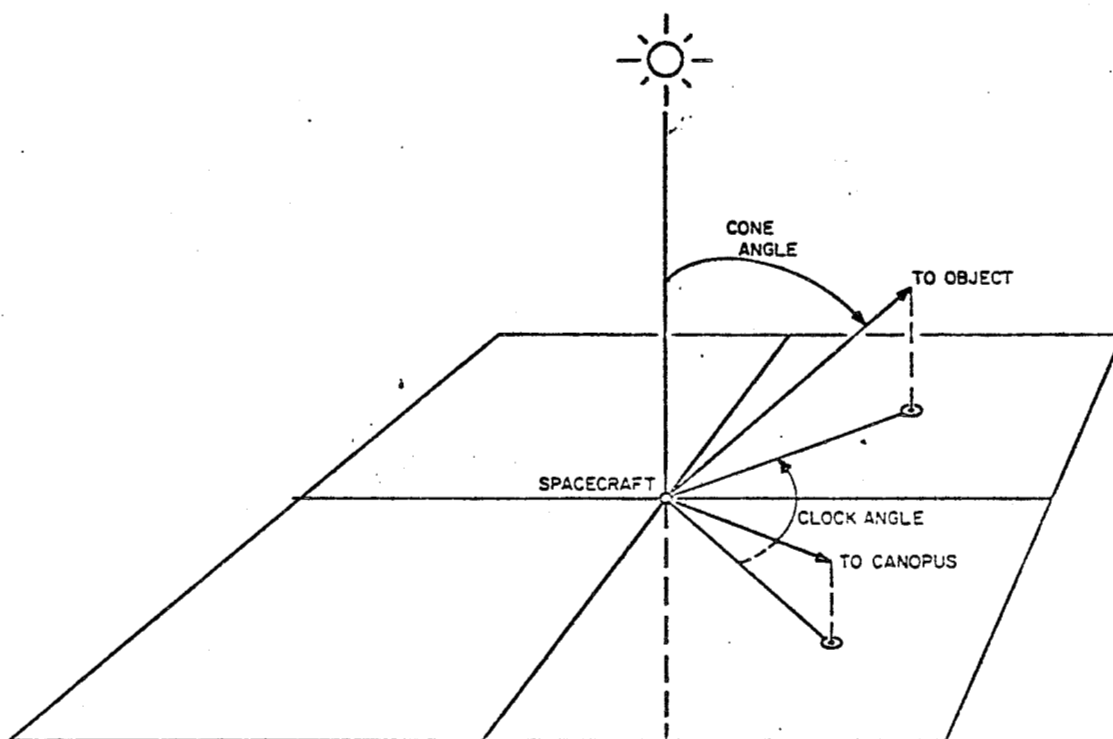


- R radius: the distance from the center of the reference body to the spacecraft
- ϕ latitude: the body-centered latitude of the spacecraft measured positive north of the reference body's equator
- θ longitude: the longitude of the spacecraft measured eastward from the prime meridian of the reference body to the projection of the radius vector onto the equatorial plane
- V speed: the magnitude of velocity of the spacecraft
- γ flight path angle: the angle, measured positive away from the reference body between the relative velocity vector of the spacecraft and the local spherical tangent plane
- σ azimuth angle: the angle, measured eastward in the local spherical tangent plane, from true north to the projection of the relative velocity vector of the spacecraft onto the local spherical tangent plane

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			FIG. 3.1.4	
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	THREE BODY ANGLES		NASA	
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			DOC. NO. PC-262.05	
			FIG. 3.1.5	
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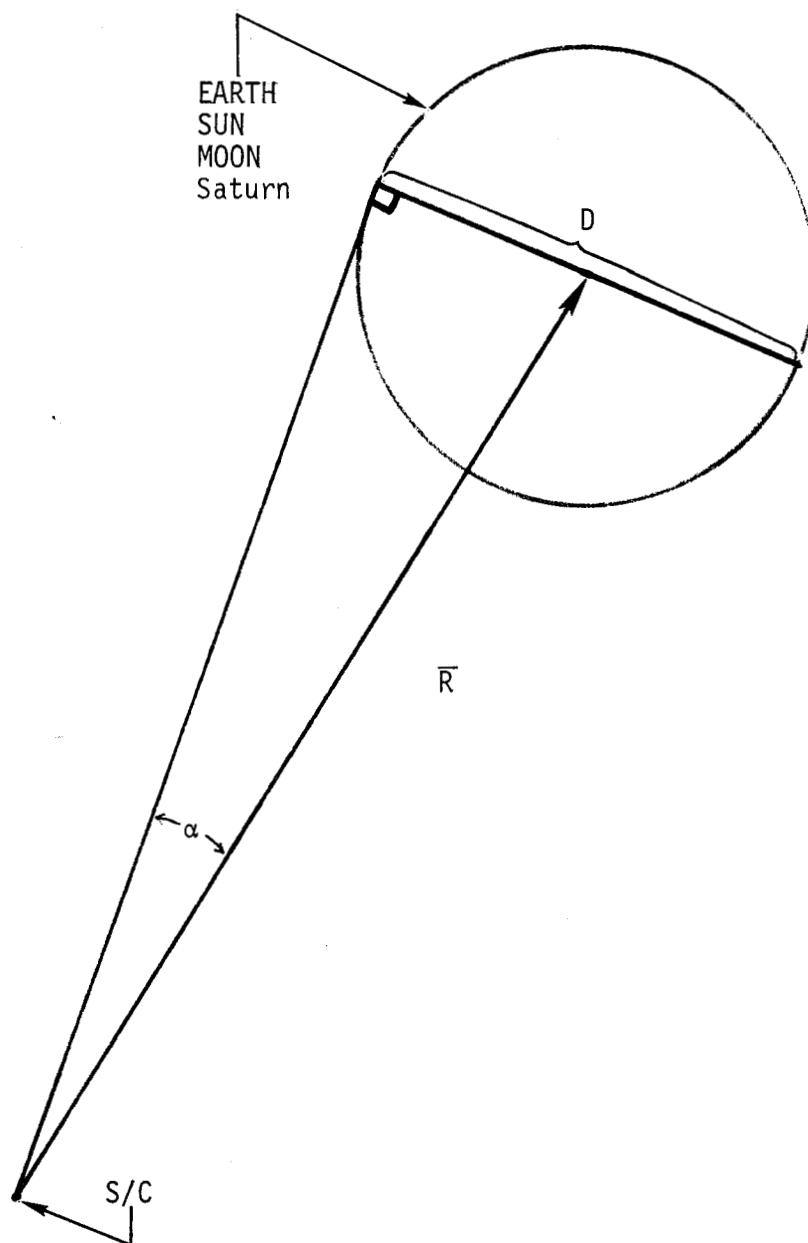


Cone Angle of Object: The angle from the spacecraft-Sun vector to the spacecraft-object vector

Clock Angle of Object: The angle measured clockwise (when looking towards the Sun) from the Sun-spacecraft-Canopus plane to the Sun-spacecraft-object plane

NOTE: Canopus can be replaced by the Earth or Saturn to form two additional systems.

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		FIG. 3.1.5
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		SHEET 2 OF 2



α Angular semi-diameter of the Earth, Sun, Moon and Saturn :

$$\sin^{-1} \left(\frac{D/2}{R} \right)$$

REPRODUCED FROM	TITLE ANGULAR SEMI-DIAMETER	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.1.6	
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USER	JPL/HVM	ARC/PA	UC/CPI	UI/GTT	GSFC/CRT	UCSD/TRD	USC/UV	UA/IPP	CIT/IR	GE/AMD	LaRC/MD	DUD/IPP
Computer	UNIVAC 1108	IBM 360/67	XDS 930	UNIVAC 418	IBM 360/75	BURROUGHS 6500	IBM 370/155	CDC 6400	IBM 370/155	GE 635	CDC 6600	UNIVAC 1108
Word Size	36-bit	32-bit	24-bit	18-bit	32-bit	48-bit	32-bit	36-bit	32-bit	36-bit	36-bit	36-bit
Operating System	Exec-8	OS;TSS	OSMVT; PL-1	R/T Exec	OS	BUR TSS	OS	OS	OS	GECOS III	SCOPE 3.1	EXEC 8
Density (bpi)	800	556	556	556	800	556	800	556	800	556	556	556
Tracks	7	7	7	7	9	7	9	7	9	7	7	7
Tape Type	Copy	BCD	BCD	Copy	EBCDIC	BCD	EBCDIC	BCD	EBCDIC	BCD	BCD	Copy
Specification Reference	PC-262.01 Section 3.1.3.1.6 PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.01 Section 3.1.3.1.6 PC-262.04 Section 3.1	PC-262.01 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.04 Section 3.1	PC-262.01 Section 3.1.3.1.6 PC-262.04 Section 3.1
Format Description	Figure 3.1.3	Figure 3.2.2	Figure 3.2.1	Figure 3.1.3	Figure 3.2.2	Figure 3.2.4	Figure 3.2.2	Figure 3.2.3	Figure 3.2.2	Figure 3.2.3	Figure 3.2.3	Figure 3.1.3

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SUMMARY OF EXPERIMENTER
TRAJECTORY TAPE
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PIONEER PROGRAM

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FIG. 3.2

REV. NO.

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SHEET 1 OF 2

Trajectory Tape Organization

FILE 1 MASTER HEADER	BCD OR EBCDIC (LOGISTICS INFO)
FILE 2 PARAMETER LISTING	BCD, EBCDIC (IDENTIFICATION)
FILE 3 PARAMETER VALUE	BCD, EBCDIC

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	PROCESSED TRAJECTORY TAPE	NASA	
	GENERAL ORGANIZATION	AMES RESEARCH CENTER	
		MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
		FIG. 3.2	
	REV. NO.	DATE 1/15/76	SHEET 2 OF 2

	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>				
1	ETSP50	1	DPTRAJ	"save"	tape variable	(1)	
2	JULDAT	2	"	"	"	(2)	
3	VIGDAT	3	1st half of	"	"	(3)	(yr,mo,day)
		4	2nd half of	"	"	(3)	(Hr,min,sec)
4	TFLANC	5	DPTRAJ	"save"	tape variable	(4)	
5	TFINJE	6				(5)	
6	ETMUTC	7				(6)	
7	RANGRP	8				(7)	
8	MAGVEL	9				(8)	
9	INPATH	10				(9)	
10	INAZIM	11				(10)	
11	REARPR	12				(11)	
12	DECPRO	13				(12)	
13	RTASCP	14				(13)	
14	REARSU	15				(14)	
15	DECSUN	16				(15)	
16	RTASCS	17				(16)	
17	REARMO	18				(17)	
18	DECMOD	19				(18)	
19	RTASCM	20				(19)	
20	HRANGP	21				(20)	
21	MHAGVP	22				(21)	
22	HINPTH	23				(22)	
23	CELLTP	24				(23)	
24	CELLNP	25				(24)	
25	CELLTE	26				(25)	
26	CELLNE	27				(26)	
27	XSCSEL	28				(27)	
28	YSCSEL	29				(28)	
29	ZSCSEL	30				(29)	
30	SPSEXY	31				(30)	
31	LNPSEL	32				(31)	
32	XPGSFF	33				(32)	
33	YPGSFF	34				(33)	
34	ZPGSFF	35				(34)	
35	DXPGSF	36				(35)	
36	DYPGSF	37				(36)	
37	DZPGSF	38				(37)	

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			NASA	
	"PROCESSED" TAPE PARAMETER LISTING AND COMPUTATION REQUIREMENTS		AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.05	
			FIG. 3.2-a	
REV. NO.		DATE 1/15/76	SHEET 1 OF 7	

<u>MNEMONIC</u>		<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>			
38	XPHSFF	39	DPTRAJ "save" tape variable (38)			
39	YPHSFF	40	(39)			
40	ZPHSFF	41	(40)			
41	DXPHSF	42	(41)			
42	DYPHSF	43	(42)			
43	DZPHSF	44	(43)			
44	XP1SFF	45	(44)			
45	YP1SFF	46	(45)			
46	ZP1SFF	47	(46)			
47	DXP1SF	48	(47)			
48	DYP1SF	49	(48)			
49	DZP1SF	50	(49)			
50	XP2SFF	51	(50)			
51	YP2SFF	52	(51)			
52	ZP2SFF	53	(52)			
53	DXP2SF	54	(53)			
54	DYP2SF	55	(54)			
55	DZP2SF	56	(55)			
56	B1MAGR	57	(56)			
57	B1MAGV	58	(57)			
58	B2MAGR	59	(58)			
59	B2MAGV	60	(59)			
60	EALATP	61	(60)			
61	EALONP	62	(61)			
62	EAVELP	63	(62)			
63	EAPTHP	64	(63)			
64	EAAZIP	65	(64)			
65	B1LATP	66	(65)			
66	B1LONP	67	(66)			
67	B1VELP	68	(67)			
68	B1PTHP	69	(68)			
69	B1HZIP	70	(69)			
70	B2LATP	71	(70)			
71	B2LONP	72	(71)			
72	B2VELP	73	(72)			
73	B2PTHP	74	(73)			
74	B2HZIP	75	(74)			
75	EPB1AN	76	(75)			

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			DOC. NO.	PC-262.05
			FIG.	3.2-a
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	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>	
76	EPBZAN	77	DPTRAJ "save" tape variable	(76)
77	EPSUAN	78		(77)
78	EPMOAN	79		(78)
79	CPEANG	80		(79)
80	DPSANG	81		(80)
81	MOPSAN	82		(81)
82	B1PB2A	83		(82)
83	MOEPAN	84		(83)
84	SEPANG	85		(84)
85	ESPANG	86		(85)
86	SPB1AN	87		(86)
87	SPB2AN	88		(87)
88	B1EPAN	89		(88)
89	B2EPAN	90		(89)
90	CONECE	91		(90)
91	CLCKCE	92		(91)
92	CONEC1	93		(92)
93	CLCKC1	94		(93)
94	CONEC2	95		(94)
95	CLCKC2	96		(95)
96	CONEE1	97		(96)
97	CLCKE1	98		(97)
98	CONEE2	99		(98)
99	CLCKE2	100		(99)
100	CONEEC	101		(100)
101	CLCKEC	102		(101)
102	CONE1E	103		(102)
103	CLCK1E	104		(103)
104	CONE12	105		(104)
105	CLCK12	106		(105)
106	CONE1C	107		(106)
107	CLCK1C	108		(107)

The following parameter, 108, relates the Prime Meridian of the Earth fixed coordinate system to the Vernal Equinox of the inertial coordinate system as shown in figure 3.2-b. The plane of reference is the Earth's true equator of date.

108	HOURAN	109	Hour angle of the Vernal Equinox (deg) DPTRAJ variable (9) minus DPTRAJ variable (61)
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			DOC. NO. PC-262.05	
REV. NO.		DATE 1/15/76	FIG. 3.2-a	
			SHEET 3 OF 7	

<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
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The following parameters, 109 thru 123, are cartesian position vectors for the spacecraft (also velocity), Moon, Sun and Saturn defined in an inertial cartesian coordinate system centered at the Earth. Figure 3.1.3 describes the system. The plane of reference for these parameters is the Earth's mean equator of 1950.0.

109	XP	110	X-component of the spacecraft (km) DPTRAJ variable (108) minus DPTRAJ variable (114)
110	YP	111	Y-component of the spacecraft (hr) DPTRAJ variable (109) minus DPTRAJ variable (115)
111	ZP	112	Z-component of the spacecraft (km) DPTRAJ variable (110) minus DPTRAJ variable (116)
112	DXP	113	$\dot{X}$ -time rate of change in X (km/sec) DPTRAJ variable (111) minus DPTRAJ variable (117)
113	DYP	114	$\dot{Y}$ -time rate of change in Y (km/sec) DPTRAJ variable (112) minus DPTRAJ variable (118)
114	DZP	115	$\dot{Z}$ -time rate of change in Z (km/sec) DPTRAJ variable (113) minus DPTRAJ variable (119)
115	XM	116	X-component of the Moon (km) DPTRAJ variable (125) minus DPTRAJ variable (114)
116	YM	117	Y-component of the Moon (km) DPTRAJ variable (126) minus DPTRAJ variable (115)
117	ZM	118	Z-component of the Moon (km) DPTRAJ variable (127) minus DPTRAJ variable (116)
118	XS	119	X-component of the Sun (km) DPTRAJ variable (128) minus DPTRAJ variable (114)
119	YS	120	Y-component of the Sun (km) DPTRAJ variable (129) minus DPTRAJ variable (115)

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			FIG. 3.2-a	
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	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
120	Z6	121	Z-component of the Sun (km) DPTRAJ variable (130) minus variable (116)
121	X6	122	X-component of Saturn (km) minus DPTRAJ variable (114)
122	X6	123	Y-component of Saturn (km) minus DPTRAJ variable (115)
123	Z6	124	Z-component of Saturn minus DPTRAJ variable (116)

The following parameters, 124 thru 127, are defined in an Earth-centered inertial spherical coordinate system with the Earth's mean equator of 1950.0 as the reference plane (see Figure 3.1.1).

124	RA6	125	Right ascension of Saturn (deg) Modulo 360° (DPTRAJ variable (122) plus 180°)
125	DEC6	126	Declination of Saturn (deg) minus DPTRAJ variable (121)
126	R6	127	Distance from the Earth to Saturn (km) DPTRAJ variable (120)
127	VI6	128	Speed of Saturn (km/sec) DPTRAJ variable (123)

The following parameters, 128 thru 136, are cartesian position vectors for the Earth, Moon and Saturn defined in an inertial coordinate system centered at the Sun. Figure 3.1.3 describes the system. The plane of reference for these parameters is the mean ecliptic of 1950.0.

128	XE	129	X-component of the Earth (km) DPTRAJ variable (132) minus DPTRAJ variable (138)
129	YE	130	Y-component of the Earth (km) DPTRAJ variable (133) minus DPTRAJ variable (139)

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			FIG. 3.2-a	
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	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENT</u>
130	ZE	131	Z-component of the Earth (km) DPTRAJ variable (134) minus DPTRAJ variable (140)
131	HXM	132	X-component of the Moon (km) DPTRAJ variable (135) minus DPTRAJ variable (138)
132	HYM	133	Y-component of the Moon (km) DPTRAJ variable (136) minus DPTRAJ variable (139)
133	HZM	134	Z-component of the Moon (km) DPTRAJ variable (139) minus DPTRAJ variable (140)
134	HX6	135	X-component of Saturn (km) minus DPTRAJ variable (138)
135	HY6	136	Y-component of Saturn (km) minus DPTRAJ variable (139)
136	HZ6	137	Z-component of Saturn (km) minus DPTRAJ variable (140)

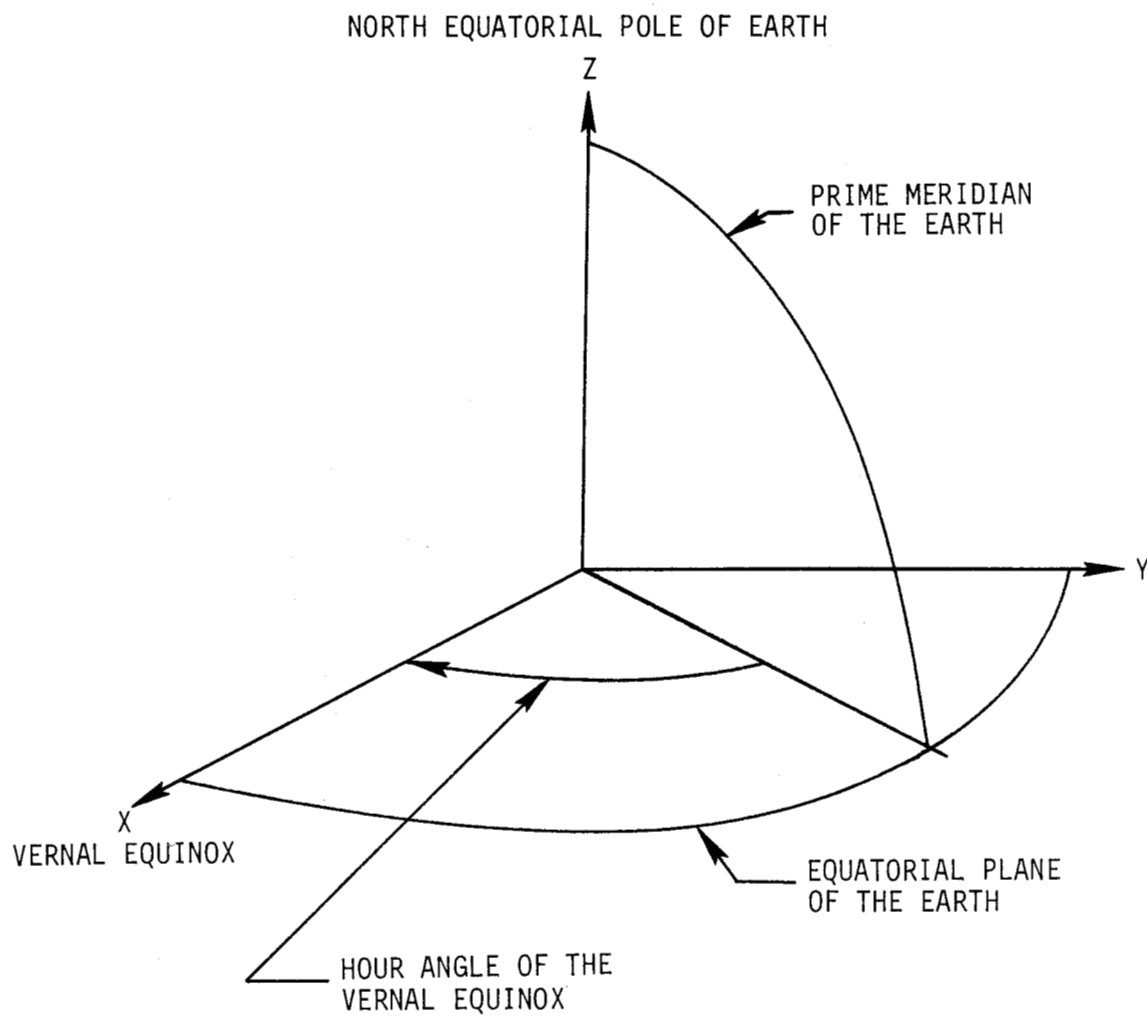
The following parameters, 137 thru 140, are defined in Sun-centered inertial spherical coordinate system with the mean ecliptic of 1950.0 as the reference plane (see figure 3.1.1).

137	HRA6	138	Celestial longitude of Saturn (deg) Modulo 360° (DPTRAJ variable (142) + 180°)
138	HDEC6	139	Celestial latitude of Saturn (deg) minus DPTRAJ variable (141)
139	HR6	140	Distance from the Sun to Saturn (km) DPTRAJ variable (131)
140	HVI6	141	Speed of Saturn (km/sec) DPTRAJ variable (143)

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			DOC. NO. PC-262.05	
			FIG. 3.2-a	
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	<u>MNEMONIC</u>	<u>ENTRY</u>	<u>DESCRIPTION/COMPUTATION REQUIREMENTS</u>	
141	ES6	142	DPTRAJ "save" tape variable	(145)
142	SE6	143		(146)
143	S6E	144		(147)
144	MSP	145		(148)
145	SMP	146		(149)
146	EMP	147		(150)
147	A6SP	148		(151)
148	S6P	149		(152)
149	E6P	150		(153)
150	ESM	151		(154)
151	EMS	152		(155)
152	MES	153		(156)
153	EASD	154		(157)
154	SASD	155		(158)
155	MASD	156		(159)
156	A6ASD	157		(160)

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			DOC. NO. PC-262.05	
REV. NO.		DATE 1/15/76	FIG. 3.2-a	
			SHEET 7 OF 7	



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			DOC. NO. PC-262.05	
			FIG. 3.2-b	
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NOTE FOR ALL FIGURES RELATING TO THE 24-BIT MACHINE

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic 1 ... Entry 1
mnemonic 2 ... Entry 2
mnemonic 3 ... Entry 3 and Entry 4
mnemonic 4 ... Entry 5

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mnemonic 156 .. Entry 157

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	FORMAT DESCRIPTION FOR	NASA	
	24-BIT MACHINES	AMES RESEARCH CENTER	
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		DOC. NO. PC-262.05	
		FIG. 3.2.1	
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1		P						I						O						N				
2		E						E						R										
3		F												T						R				
4		A						J						E						C				
5		T						O						R						Y				
6								D						A						T				
7		A												O						P				
8		E						R						A						T				
9		I						O						N						A				
10		L												T						A				
11		P						E												N				
12		O																		n				
13		n						n												U				
14		C						/						C						P				
15		I												J						P				
16		L												G						E				
17		N						E						R						A				
18		T						E						D										
19		M						M						/						D				
20		D						/						Y						Y				
21								A						R						C				
22								G						E						N				
23		E						R						A						T				
24		E						D												M				
25		M						/						D						D				
26		/						Y						Y										
27																								
28								BLANK																
29																								
30																								
31		S						T						A						R				

TYPE-BCD
 LOGICAL RECORD LENGTH - 30 WORDS
 PHYSICAL RECORD LENGTH - 60 WORDS
 FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM

TITLE

HEADER
 FILE 1
 (24-BIT MACHINE)

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DOC. NO. PC-262.05

FIG. 3.2.1

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	HEADER	NASA
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	(24-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.05
		FIG. 3.2.1
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	E							T					S							P				
2	5							0																
3	J							U					L							D				
4	A							T																
5	V							I					G							D				
6	A							T																
7	T							F					L							A				
8	N							C																
9	T							F					I							N				
10	J							E																
11	E							T					M							U				
12	T							C																
13	R							A					N							G				
14	R							P																
15	M							A					G							V				
16	E							L																
17	I							N					P							A				
18	T							H																
19	I							N					A							Z				
20	I							M																
21	R							E					A							R				
22	P							R																
23	D							E					C							P				
24	R							O																
25	R							T					A							S				
26	C							P																
27	R							E					A							R				
28	S							U																
29	D							E					C							S				
30	U							N																
31	R							T					A							S				

TYPE-BCD
LOGICAL RECORD LENGTH - 30 WORDS
PHYSICAL RECORD LENGTH - 390 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS		
	FILE 2		
	(24-BIT MACHINE)		
REV. NO.	DATE 1/15/76	FIG. 3.2.1	
		SHEET 4 OF 17	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	C							S																
	R							E					A						R					
	M							O																
	D							E					C						M					
	O							O																
	R							T					A						S					
	C							M																
	H							R					A						N					
	G							P																
	H							M					A						G					
	V							P																
	H							I					N						P					
	T							H																
	C							E					L						L					
	T							D																
	C							E					L						L					
	N							P																
	C							E					L						L					
	T							E																
	C							E					L						L					
	N							E																
	X							S					C						S					
	E							L																
	Y							S					C						S					
	E							L																
	Z							S					C						S					
	E							L																
	S							P					S						E					
	X							Y																
	L							N					P						S					
	E							L																

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FIG. 3.2.1

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
X							P					G					S						
F							F																
Y							P					G					S						
F							F																
Z							P					G					S						
F							F																
D							X					P					G						
S							F																
D							Y					P					G						
S							F																
D							Z					P					G						
S							F																
X							P					H					S						
F							F																
Y							P					H					S						
F							F																
Z							P					H					S						
F							F																
D							X					P					H						
S							F																
D							Y					P					H						
S							F																
D							Z					P					H						
S							F																
X							P					1					S						
F							F																
Y							P					1					S						
F							F																
Z							P					1					S						
F							F																
D							X					P					1						

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.1	
	PARAMETER MNEMONICS FILE 2 (24-BIT MACHINE)		
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
S								F															
D								Y					P						1				
S								F															
D								Z					P						1				
S								F															
X								P					2						S				
F								F															
Y								P					2						S				
F								F															
Z								P					2						S				
F								F															
D								X					P						2				
S								F															
D								Y					P						2				
S								F															
D								Z					P						2				
S								F															
B								1					M						A				
G								R															
B								1					M						A				
G								V															
B								2					M						A				
G								R															
B								2					M						A				
G								V															
E								A					L						A				
T								P															
E								A					L						0				
N								P															
E								A					V						E				
L								P															

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FIG. 3.2.1

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
E								A						P					T				
H								P															
E								A						A					Z				
I								P															
B								1						L					A				
T								P															
B								1						L					O				
N								P															
B								1						V					E				
L								P															
B								1						P					T				
H								P															
B								1						A					Z				
I								P															
B								2						L					A				
T								P															
B								2						L					O				
N								P															
B								2						V					E				
L								P															
B								2						P					T				
H								P															
B								2						A					Z				
I								P															
E								P						B					1				
A								N															
E								P						B					2				
A								N															
E								P						S					U				
A								N															
E								P						M					O				

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	PARAMETER MNEMONICS FILE 2 (24-BIT MACHINE)		
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
	A							N																
	C							P					E						A					
	N							G																
	C							P					S						A					
	N							G																
	M							O					P						S					
	A							N																
	B							1					P						B					
	2							A																
	M							O					E						P					
	A							N																
	S							E					P						A					
	N							G																
	E							S					P						A					
	N							G																
	S							P					B						1					
	A							N																
	S							P					B						2					
	A							N																
	B							1					E						P					
	A							N																
	B							2					E						P					
	A							N																
	C							O					N						E					
	C							E																
	C							L					C						K					
	C							E																
	C							O					N						E					
	C							1																
	C							L					C						K					
	C							1																

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FIG. 3.2.1

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	C							0						N					E				
	C							2															
	C							L						C					K				
	C							2															
	C							0						N					E				
	E							1															
	C							L						C					K				
	E							1															
	C							0						N					E				
	E							2															
	C							L						C					K				
	E							2															
	C							0						N					E				
	E							C															
	C							L						C					K				
	E							C															
	C							0						N					E				
	1							E															
	C							L						C					K				
	1							E															
	C							0						N					E				
	1							2															
	C							L						C					K				
	1							2															
	C							0						N					E				
	1							C															
	C							L						C					K				
	1							C															
	H							0						U					R				
	A							N						BLANK					BLANK				
	BLANK							BLANK						BLANK					BLANK				

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FILE 2
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FIG. 3.2.1

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SHEET 10 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		D						Z						P									
		X						M															
		Y						M															
		Z						M															
		X						S															
		Y						S															
		Z						S															
		X						6															
		Y						6															
		Z						6															
		R						A						6									
		D						E						C						6			
		R						6															
		V						I						6									
		X						E															

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.1

REV. NO.

DATE 1/15/76

SHEET 13 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Y						E																
	Z						E																
	H						X						M										
	H						Y						M										
	H						Z						M										
	H						X						6										
	H						Y						6										
	H						Z						6										
	H						R						A						6				
	H						D						E						C				
	6																						
	H						R						6										
	H						V						I						6				
	E						S						6										
	S						E						6										
	S						6						E										
	M						S						P										

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262.05

FIG. 3.2.1

REV. NO.

DATE 1/15/76

SHEET 14 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
S							M					P											
E							M					P											
A							6					S						P					
S							6					P											
E							6					P											
E							S					M											
E							M					S											
M							E					S											
E							A					S						D					
S							A					S						D					
M							A					S						D					
A							6					A						S					
D																							
							BLANK																

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.1

REV. NO.

DATE 1/15/76

SHEET 15 OF 17

[illegible]

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.1

REV. NO.

DATE 1/15/76

SHEET 16 OF 17

```
TYPE-BCD
LOGICAL RECORD LENGTH - 6 WORDS
PHYSICAL RECORD LENGTH - 942 OWRDS
FILE SIZE
```

SHEET 17 OF 17

NOTE FOR ALL FIGURES RELATING TO THE 32-BIT MACHINE.

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD or EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic	1	...	Entry 1
mnemonic	2	...	Entry 2
mnemonic	3	...	Entry 3 and Entry 4
mnemonic	4	...	Entry 5
.			
.			
.			
mnemonic	156	...	Entry 157

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR	NASA	
	32-BIT MACHINES	AMES RESEARCH CENTER	
		MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
	REV. NO.	DATE 1/15/76	FIG. 3.2.2
			SHEET 1 OF 17

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	P								I								O											N				
2	E								E								R															
3	F																T										R					
4	A								J								E										C					
5	T								O								R										Y					
6									D								A										T					
7	A																O										P					
8	E								R								A										T					
9	I								O								N										A					
10	L																T										A					
11	P								E																		N					
12	O																										n					
13	n								n																		W					
14	A								M								E										/					
15	E								X								P															
16	J								P								L															
17	G								E								N										E					
18	R								A								T										E					
19	D																M										M					
20	/								D								D										/					
21	Y								Y																		A					
22	R								C																		G					
23	E								N								E										R					
24	A								T								E										D					
25									M								M										/					
26	D								D								/										Y					
27	Y																															
28																																
29																																
30																																
31	S								T								A										R					

TYPE-EBCDIC
 LOGICAL RECORD LENGTH - 30 WORDS
 PHYSICAL RECORD LENGTH - 60 WORDS
 FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM

TITLE

HEADER
 FILE 1
 (32-BIT MACHINE)

PIONEER PROGRAM

NASA
 AMES RESEARCH CENTER
 MOFFETT FIELD, CALIFORNIA

DOC. NO 262.05

FIG. 3.2.2

REV. NO.

DATE 1/15/76

SHEET 2 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
E								T								S								P							
5								O																							
J								U								L								D							
A								T																							
V								I								G								D							
A								T																							
T								F								L								A							
N								C																							
T								F								I								N							
J								E																							
E								T								M								U							
T								C																							
R								A								N								G							
R								P																							
M								A								G								V							
E								L																							
I								N								P								A							
T								H																							
I								N								A								Z							
I								M																							
R								E								A								R							
P								R																							
D								E								C								P							
R								O																							
R								T								A								S							
C								P																							
R								E								A								R							
S								U																							
D								E								C								S							
U								N																							
R								T								A								S							

TYPE - EBCDIC
LOGICAL RECORD LENGTH - 30 WORDS
PHYSICAL RECORD LENGTH - 390 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.2

REV. NO.

DATE 1/15/76

SHEET 4 OF 17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C								S																							
R								E								A										R					
M								O																							
D								E								C										M					
O								O																							
R								T								A										S					
C								M																							
H								R								A										N					
G								P																							
H								M								A										G					
V								P																							
H								I								N										P					
T								H																							
C								E								L										L					
T								P																							
C								E								L										L					
N								P																							
C								E								L										L					
T								E																							
C								E								L										L					
N								E																							
X								S								C										S					
E								L																							
Y								S								C										S					
E								L																							
Z								S								C										S					
E								L																							
S								P								S										E					
X								Y																							
L								N								P										S					
E								L																							

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(32-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
	REV. NO.		DOC. NO. PC-262.05	
DATE 1/15/76		FIG. 3.2.2		
SHEET 5 OF 17				

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
X										P									G							S					
F										F																					
Y										P									G							S					
F										F																					
Z										P									G							S					
F										F																					
D										X									P							G					
S										F																					
D										Y									P							G					
S										F																					
D										Z									P							G					
S										F																					
X										P									H							S					
F										F																					
Y										P									H							S					
F										F																					
Z										P									H							S					
F										F																					
D										X									P							H					
S										F																					
D										Y									P							H					
S										F																					
D										Z									P							H					
S										F																					
X										P									1							S					
F										F																					
Y										P									1							S					
F										F																					
Z										P									1							S					
F										F																					
D										X									P							1					

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.2
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)		
	REV. NO.	DATE 1/15/76	
	SHEET 6 OF 17		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
S										F																					
D										Y								P									1				
S										F																					
D										Z								P									1				
S										F																					
X										P								2									S				
F										F																					
Y										P								2									S				
F										F																					
Z										P								2									S				
F										F																					
D										X								P									2				
S										F																					
D										Y								P									2				
S										F																					
D										Z								P									2				
S										F																					
B										1								M									A				
G										R																					
B										1								M									A				
G										V																					
B										2								M									A				
G										R																					
B										2								M									A				
G										V																					
E										A								L									A				
T										P																					
E										A								L									0				
N										P																					
E										A								V									E				
L										P																					

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER MNEMONICS		
	FILE 2		
	(32-BIT MACHINE)		
REV. NO.	DATE 1/15/76	SHEET 7 OF 17	
		NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
		FIG. 3.2.2	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
E										A									P								T				
H										P																					
E										A									A								Z				
I										P																					
B										1									L								A				
T										P																					
B										1									L								O				
N										P																					
B										1									V								E				
L										P																					
B										1									P								T				
H										P																					
B										1									A								Z				
I										P																					
B										2									L								A				
T										P																					
B										2									L								O				
N										P																					
B										2									V								E				
L										P																					
B										2									P								T				
H										P																					
B										2									A								Z				
I										P																					
E										P									B								1				
A										N																					
E										P									B								2				
A										N																					
E										P									S								U				
A										N																					
E										P									M								O				

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)	
	DOC. NO. PC-262.05	
	FIG. 3.2.2	
	REV. NO.	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
A										N																					
C										P							E									A					
N										G																					
C										P							S									A					
N										G																					
M										O							P									S					
A										N																					
B										1							P									B					
2										A																					
M										O							E									P					
A										N																					
S										E							P									A					
N										G																					
E										S							P									A					
N										G																					
S										P							B									1					
A										N																					
S										P							B									2					
A										N																					
B										1							E									P					
A										N																					
B										2							E									P					
A										N																					
C										O							N									E					
C										E																					
C										L							C									K					
C										E																					
C										O							N									E					
C										1																					
C										L							C									K					
C										1																					

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.2
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)		
	REV. NO.	DATE 1/15/76	
	SHEET 9 OF 17		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C										0									N							E					
C										2																					
C										L									C							K					
C										2																					
C										0									N							E					
E										1																					
C										L									C							K					
E										1																					
C										0									N							E					
E										2																					
C										L									C							K					
E										2																					
C										0									N							E					
E										C																					
C										L									C							K					
E										C																					
C										0									N							E					
1										E																					
C										L									C							K					
1										E																					
C										0									N							E					
1										2																					
C										L									C							K					
1										2																					
C										0									N							E					
1										C																					
C										L									C							K					
1										C																					
H										0									U							R					
A										N																					

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.2	
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)		
	REV. NO.		DATE 1/15/76
	SHEET 10 OF 17		

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	PARAMETER MNEMONICS	NASA	
	FILE 2	AMES RESEARCH CENTER	
	(32-BIT MACHINE)	MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
		FIG. 3.2.2	
	REV. NO.	DATE 1/15/76	SHEET 12 OF 17

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(32-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.05	
			FIG. 3.2.2	
	REV. NO.	DATE 1/15/76	SHEET 13 OF 17	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Y								E																							
Z								E																							
H								X								M															
H								Y								M															
H								Z								M															
H								X								6															
H								Y								6															
H								Z								6															
H								R								A								6							
H								D								E								C							
6																															
H								R								6															
H								V								I								6							
E								S								6															
S								E								6															
S								6								E															
M								S								P															

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.2	
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)		
	REV. NO.		DATE 1/15/76
	SHEET 14 OF 17		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	(SIGN) <u>+</u>																															
2																																
3									ENTRY								1															
4																																
5																																
6									BLANK								BLANK								BLANK							
937	(SIGN) <u>+</u>																															
938																																
939									ENTRY								157															
940																																
941																																
942									BLANK								BLANK								BLANK							
									EOR																							

TYPE-EBCDIC
 LOGICAL RECORD LENGTH - 6 WORDS
 PHYSICAL RECORD LENGTH - 942 WORDS
 FILE SIZE

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER VALUE		
	FILE 3		
	(32-BIT MACHINE)		
REV. NO.	DATE 1/15/76	NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
		FIG. 3.2.2	
		SHEET 17 OF 17	

NOTE FOR ALL FIGURES RELATING TO THE 36-BIT MACHINE

File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD or EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic 1 Entry 1
mnemonic 2 Entry 2
mnemonic 3 Entry 3 and Entry 4
mnemonic 4 Entry 5
.
.
.
mnemonic 156... Entry 157

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR 36-BIT MACHINES	NASA	
		AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
		FIG. 3.2.3	
	REV. NO.	DATE 1/15/76	SHEET 1 OF 13

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1	P						I						O				N				E			E												
2	R												F								T			R												
3	A						J						E				C				T			O												
4	R						Y										D				A			T												
5	A												O				P				E			R												
6	A						T						I				O				N			A												
7	L												T				A				P			E												
8							N						O				.							n												
9	n						n										N				A			M												
10	/						E						X				P							J												
11	P						L										G				E			N												
12	E						R						A				T				E			D												
13							M						M				/				D			D												
14	/						Y						Y								A			R												
15	C												G				E				N			E												
16	R						A						T				E				D															
17	M						M						/				D				D			/												
18	Y						Y																													
19																																				
20																																				
21	S						T						A				R				T															
22	D						A						T				E							M												
23	M						/						D				D				/			Y												
24	Y												S				T				A			R												
25	T												T				I				M			E												
26							H						H				/				M			M												
27	/						S						S								S			T												
28	O						P										D				A			T												
29	E												M				M				/			D												
30	D						/						Y				Y							S												
31	T						O						P								T			I												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

TYPE-BCD
 LOGICAL RECORD LENGTH - 20 WORDS
 PHYSICAL RECORD LENGTH - 40 WORDS
 FILE SIZE 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05
	HEADER FILE 1 (36-BIT MACHINE)	
	FIG. 3.2.3	
	REV. NO.	

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	HEADER		NASA	
	FILE 1		AMES RESEARCH CENTER	
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO. PC-262.05	
			FIG. 3.2.3	
	REV. NO.	DATE	SHEET 3 OF 13	
		1/15/76		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
E						T						S					P							5						O					
												J					U							L						D					
A						T																		V						I					
G						D						A					T																		
T						F						L					A							N						C					
												T					F							I						N					
J						E																		E						T					
M						U						T					C																		
R						A						N					G							R						P					
												M					A							G						V					
E						L																		I						N					
P						A						T					H																		
I						N						A					Z							I						M					
												R					E							A						R					
P						R																		D						E					
C						P						R					O																		
R						T						A					S							C						P					
												R					E							A						R					
S						U																		D						E					
C						S						U					N																		
R						T						A					S							C						S					
												R					E							A						R					
M						O																		D						E					
C						M						O					O																		
R						T						A					S							C						M					
												H					R							A						N					
G						P																		H						M					
A						G						V					P																		
H						I						N					P							T						H					
												C					E							L						L					
T						P																		C						E					

TYPE-BCD
TYPICAL RECORD LENGTH - 20 WORDS.
PHYSICAL RECORD LENGTH - 264 WORDS
FILE SIZE 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05
	PARAMETER MNEMONICS FILE 2 (36-BIT MACHINE)	
	FIG. 3.2.3	
	REV. NO.	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
L						L						N					P																		
C						E						L					L			T						T					E				
												C					E									L					L				
N						E																				X					S				
C						S						E					L																		
Y						S						C					S			E						E					L				
												Z					S									C					S				
E						L																				S					P				
S						E						X					Y																		
L						N						P					S			E						E					L				
												X					P			G						G					S				
F						F																				Y					P				
G						S						F					F																		
Z						P						G					S			F						F					F				
												D					X									P					G				
S						F																				D					Y				
P						G						S					F																		
D						Z						P					G			S						S					F				
												X					P			H						H					S				
F						F																				Y					P				
H						S						F					F																		
Z						P						H					S			F						F					F				
												D					X									P					H				
S						F																				D					Y				
P						H						S					F																		
D						Z						P					H			S						S					F				
												X					P			I						I					S				
F						F																				Y					P				
I						S						F					F																		
Z						P						I					S			F						F					F				
												D					X									P					I				

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(36-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.3

REV. NO.

DATE 1/15/76

SHEET 5 OF 13

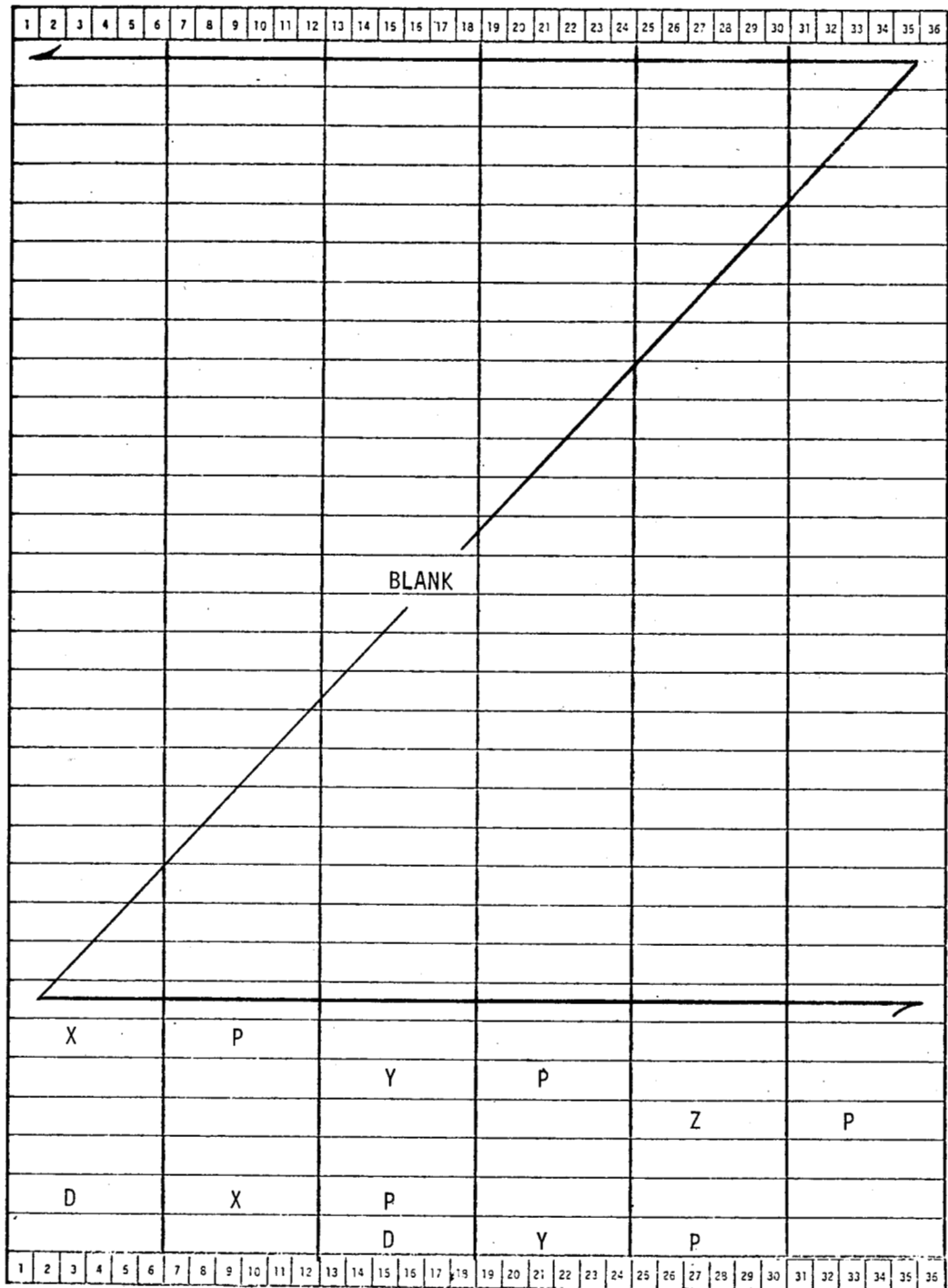
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S						F																			D						Y				
P						1						S								F															
D						Z						P								1					S						F				
												X								P					2						S				
F						F																			Y						P				
2						S						F								F															
Z						P						2								S					F						F				
												D								X					P						2				
S						F																			D						Y				
P						2						S								F															
D						Z						P								2					S						F				
												B								1					M						A				
G						R																			B						1				
M						A						G								V															
B						2						M								A					G						R				
												B								2					M						A				
G						V																			E						A				
L						A						T								P															
E						A						L								O					N						P				
												E								A					V						E				
L						P																			E						A				
P						T						H								P															
E						A						A								Z					I						P				
												B								1					L						A				
T						D																			B						1				
L						O						N								P															
B						1						V								E					L						P				
												B								1					P						T				
H						P																			B						1				
A						Z						I								P															
B						2						L								A					T						P				

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER MNEMONICS		
	FILE 2		
	(36-BIT MACHINE)		
REV. NO.	DATE 1/15/76	DOC. NO. PC-262.05	
		FIG. 3.2.3	
		SHEET 6 OF 13	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
														B			2									L							0		
	N						P																			B							2		
	V						E							L			P																		
	B						2							P			T									H							P		
														B			2									A							Z		
	I						P																			E							P		
	B						1							A			N																		
	E						P							B			2									A							N		
														E			P									S							U		
	A						N																			E							P		
	M						O							A			N																		
	C						P							E			A									N							G		
														C			P									S							A		
	N						G																			M							O		
	P						S							A			N																		
	B						1							P			B									2							A		
														M			O									E							P		
	A						N																			S							E		
	P						A							N			G																		
	E						S							P			A									N							G		
														S			P									B							1		
	A						N																			S							P		
	B						2							A			N																		
	B						1							E			P									A							N		
														B			2									E							P		
	A						N																			C							O		
	N						E							C			E																		
	C						L							C			K									C							E		
														C			O									N							E		
	C						1																			C							L		
	C						K							C			1																		

REPRODUCED FROM 	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.3 SHEET 7 OF 13
	PARAMETER MNEMONICS		
	FILE 2		
	(36-BIT MACHINE)		
	REV. NO.	DATE 1/15/76	

REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
			DOC. NO.	PC-262.05
			FIG.	3.2.3
	REV. NO.	DATE	SHEET	OF
		1/15/76	8	13



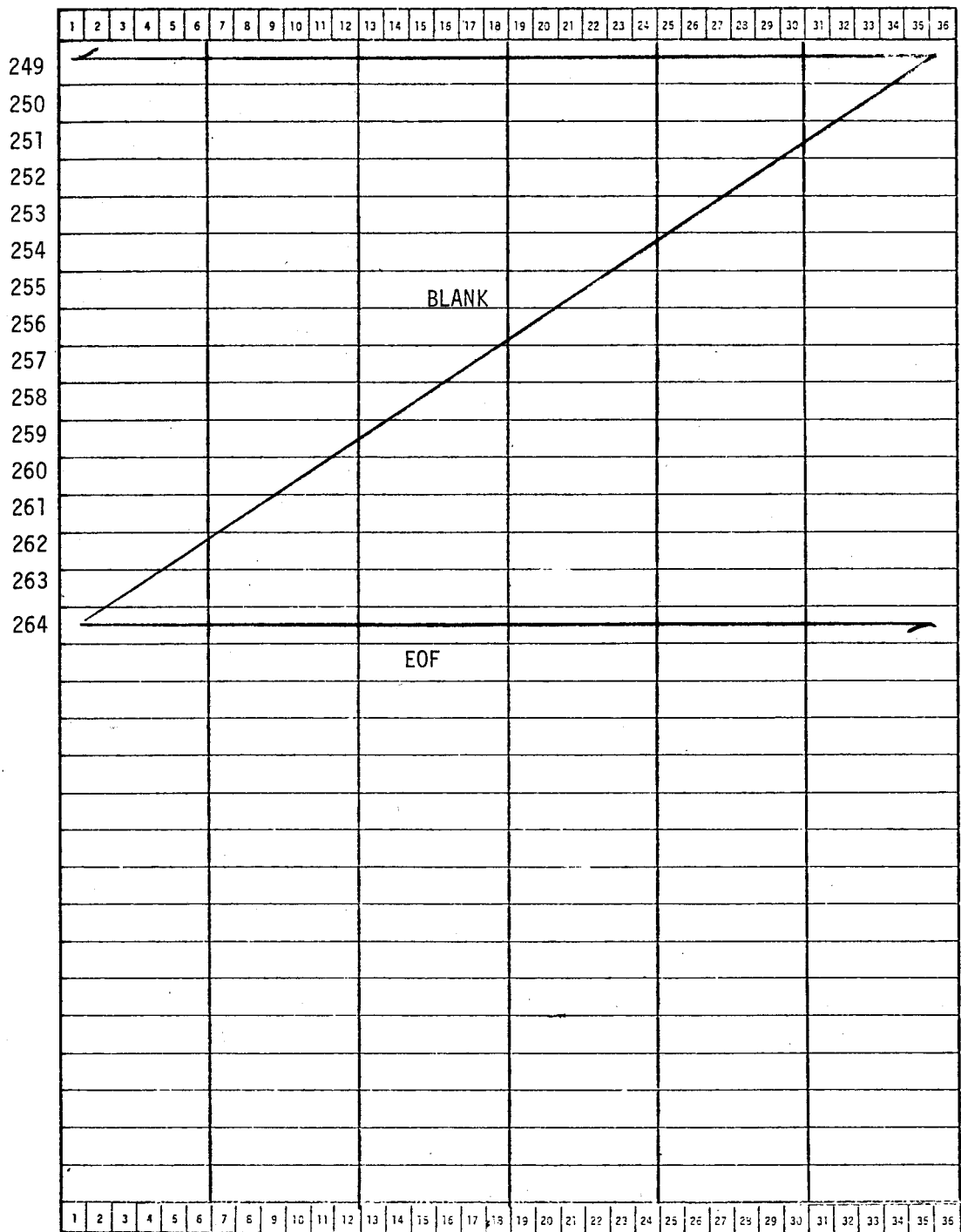
REPRODUCED FROM	TITLE		PIONEER PROGRAM	
	PARAMETER MNEMONICS		NASA	
	FILE 2		AMES RESEARCH CENTER	
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA	
	REV. NO.		DATE 1/15/76	DOC. NO. PC-262.05
				FIG. 3.2.3
				SHEET 9 OF 13

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
																										D					Z				
	P																																		
	X						M																												
													Y					M																	
																										Z					M				
	X						S																												
													Y					S																	
																										Z					S				
	X						6																												
													Y					6																	
																										Z					6				
	R						A						6																						
													D					E								C				6					
																										R				6					
	V						I						6																						
													X					E																	
																											Y				E				
	Z						E																												
													H					X								M									
																										H					Y				
	M																																		
	H						Z						M																						
													H					X								6									
																										H					Y				
	6																																		
	H												Z																						
														6																					

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER MNEMONICS		
	FILE 2		
	(36-BIT MACHINE)		
REV. NO.	DATE 1/15/76	FIG. 3.2.3	SHEET 10 OF 13

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262.05

REPRODUCED FROM	TITLE		PIONEER PROGRAM
	PARAMETER MNEMONICS		NASA
	FILE 2		AMES RESEARCH CENTER
	(36-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA
			DOC. NO. PC-262.05
			FIG. 3.2.3
	REV. NO.	DATE 1/15/76	SHEET 11 OF 13



REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO PC-262.05
	PARAMETER MNEMONICS FILE 2 (36-BIT MACHINE)	
	FIG. 3.2.3	
	REV. NO.	

NOTE FOR ALL FIGURES RELATING TO THE 48-BIT MACHINE

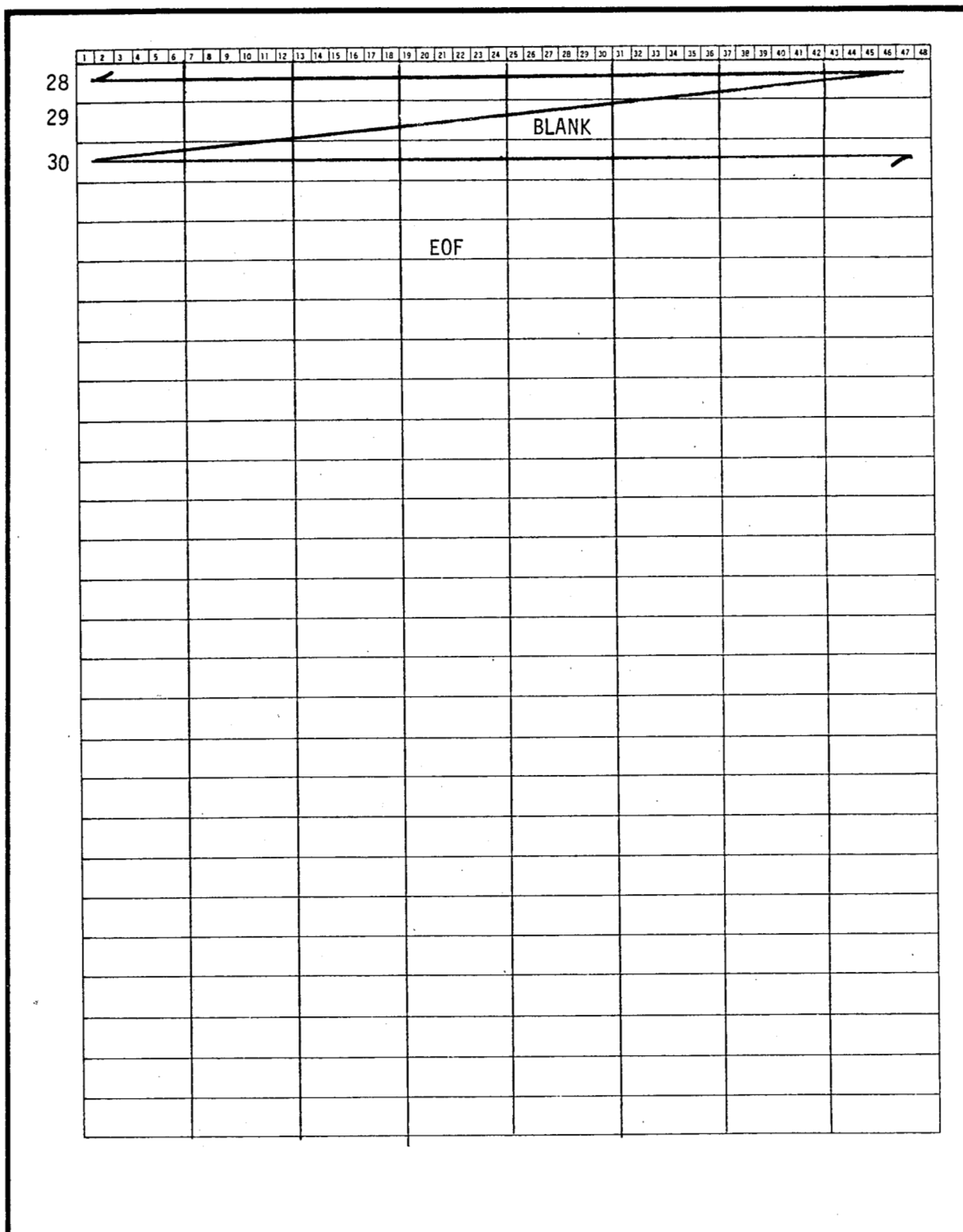
File 3 contains one entry for each of the one hundred fifty seven (157) parameters. Each entry consists of twenty-four (24) BCD or EBCDIC characters with the decimal point inserted in the appropriate place.

The mnemonics in File 2 order and identify the parameters in File 3.

The relationship of the mnemonics to the parameters is as follows:

mnemonic 1 ... Entry 1
mnemonic 2 ... Entry 2
mnemonic 3 ... Entry 3 and Entry 4
mnemonic 4 ... Entry 5
.
.
.
mnemonic 156 - Entry 157

REPRODUCED FROM	TITLE	PIONEER PROGRAM	
	FORMAT DESCRIPTION FOR 48-BIT MACHINES	NASA	
		AMES RESEARCH CENTER	
		MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.05	
		FIG.	3.2.4
	REV. NO.	DATE 1/15/76	SHEET 1 OF 12



REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05 FIG. 3.2.4	
	HEADER FILE 1 (48-BIT MACHINE)		
	REV. NO.		DATE 1/15/76
	SHEET 3 OF 12		

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
E						T								S							P				5																							
J						U								L							D				A																							
V						I								G							D				A																							
T						F								L							A				N																							
T						F								I							N				J																							
E						T								M							U				T																							
R						A								N							G				R																							
M						A								G							V				E																							
I						N								P							A				T																							
I						N								A							Z				I																							
R						E								A							R				P																							
D						E								C							P				R																							
R						T								A							S				C																							
R						E								A							R				S																							
D						E								C							S				U																							
R						T								A							S				C																							
R						E								A							R				M																							
D						E								C							M				O																							
R						T								A							S				C																							
H						R								A							N				G																							
H						M								A							G				V																							
H						I								N							P				T																							
C						E								L							L				T																							
C						E								L							L				N																							
C						E								L							L				T																							
C						E								L							L				N																							
X						S								C							S				E																							

TYPE-BCD
LOGICAL RECORD LENGTH - 15 WORDS
PHYSICAL RECORD LENGTH - 192 WORDS
FILE SIZE 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA DOC. NO. PC-262.05
	PARAMETER MNEMONICS	
	FILE 2	
	(48-BIT MACHINE)	
REV. NO.	DATE 1/15/76	FIG. 3.2.4
SHEET 4		OF 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
Y						S						C								S				E					L																			
Z						S						C								S				E					L																			
S						P						S								E				X					Y																			
L						N						P								S				E					L																			
X						P						G								S				F					F																			
Y						P						G								S				F					F																			
Z						P						G								S				F					F																			
D						X						P								G				S					F																			
D						Y						P								G				S					F																			
D						Z						P								G				S					F																			
X						P						H								S				F					F																			
Y						P						H								S				F					F																			
Z						P						H								S				F					F																			
D						X						P								H				S					F																			
D						Y						P								H				S					F																			
D						Z						P								H				S					F																			
X						P						1								S				F					F																			
Y						P						1								S				F					F																			
Z						P						1								S				F					F																			
D						X						P								1				S					F																			
D						Y						P								1				S					F																			
D						Z						P								1				S					F																			
X						P						2								S				F					F																			
Y						P						2								S				F					F																			
Z						P						2								S				F					F																			
D						X						P								2				S					F																			
D						Y						P								2				S					F																			

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA
DOC. NO. PC-262.05

FIG. 3.2.4

REV. NO.

DATE 1/15/76

SHEET 5 OF 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
D						Z						P						2					S					F																			
B						1						M						A					G					R																			
B						1						M						A					G					V																			
B						2						M						A					G					R																			
B						2						M						A					G					V																			
E						A						L						A					T					P																			
E						A						L						O					N					P																			
E						A						V						E					L					P																			
E						A						P						T					H					P																			
E						A						A						Z					I					P																			
B						1						L						A					T					P																			
B						1						L						O					N					P																			
B						1						V						E					L					P																			
B						1						P						T					H					P																			
B						1						A						Z					I					P																			
B						2						L						A					T					P																			
B						2						L						O					N					P																			
B						2						V						E					L					P																			
B						2						P						T					H					P																			
B						2						A						Z					I					P																			
E						P						B						1					A					N																			
E						P						B						2					A					N																			
E						P						S						U					A					N																			
E						P						M						O					A					N																			
C						P						E						A					N					G																			
C						P						S						A					N					G																			
M						O						P						S					A					N																			

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

PIONEER PROGRAM

NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.4

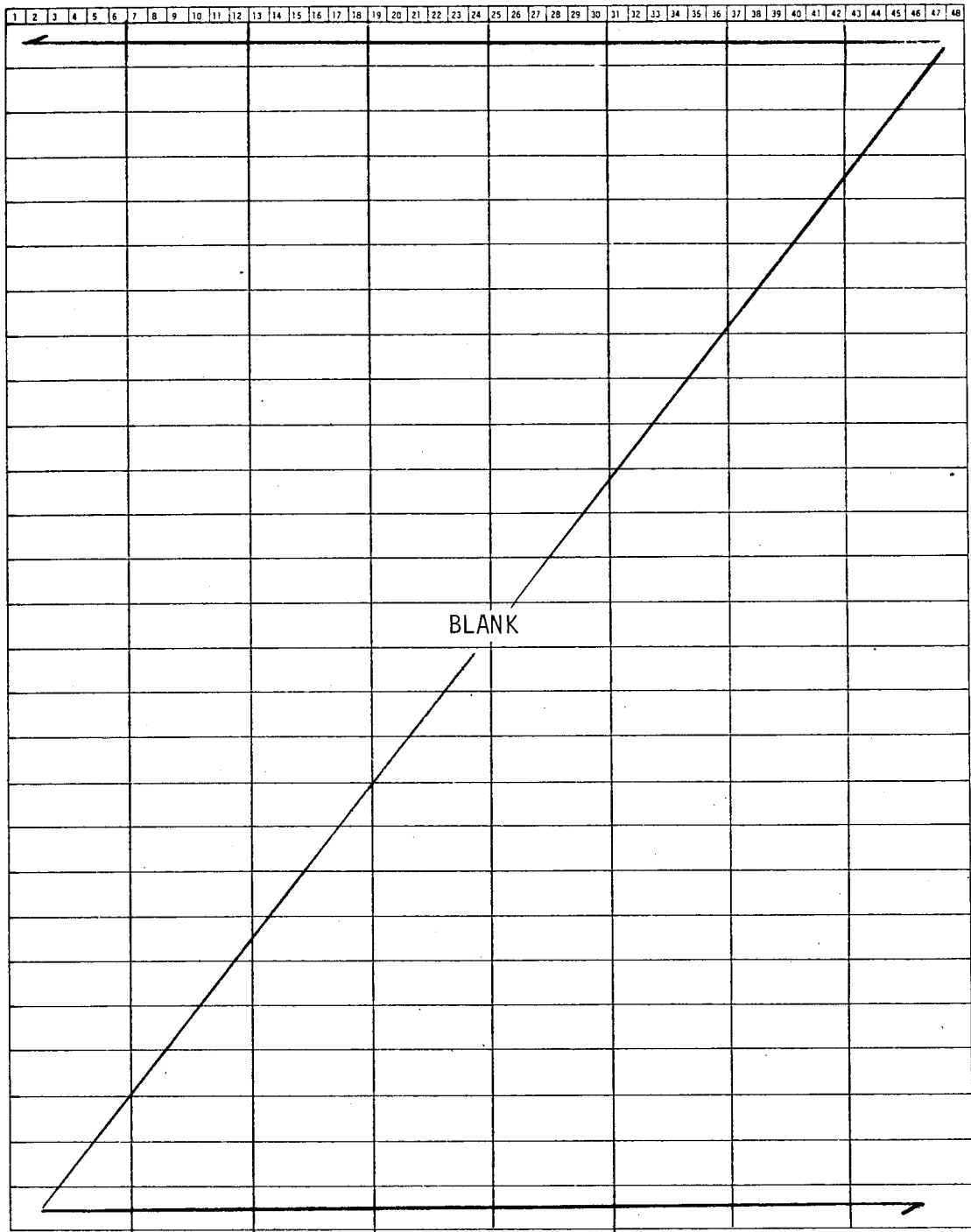
REV. NO.

DATE 1/15/76

SHEET 6 OF 12

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	B						1						P						B					2					A																		
	M						O						E						P					A					N																		
	S						E						P						A					N					G																		
	E						S						P						A					N					G																		
	S						P						B						1					A					N																		
	S						P						B						2					A					N																		
	B						1						E						P					A					N																		
	B						2						E						P					A					N																		
	C						O						N						E					C					E																		
	C						L						C						K					C					E																		
	C						O						N						E					C					1																		
	C						L						C						K					C					1																		
	C						O						N						E					C					2																		
	C						L						C						K					C					2																		
	C						O						N						E					E					1																		
	C						L						C						K					E					1																		
	C						O						N						E					E					2																		
	C						L						C						K					E					1																		
	C						O						N						E					E					C																		
	C						L						C						K					E					C																		
	C						O						N						E					1					E																		
	C						L						C						K					1					E																		
	C						O						N						E					1					2																		
	C						L						C						K					1					2																		
	C						O						N						E					1					C																		
	C						L						C						K					1					C																		
	H						O						U						R					A					N																		

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS	
	FILE 2	
	(48-BIT MACHINE)	
	DOC. NO. PC-262.05	
REV. NO.	DATE 1/15/76	FIG. 3.2.4
		SHEET 7 OF 12



REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

PIONEER PROGRAM

NASA
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MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.05

FIG. 3.2.4

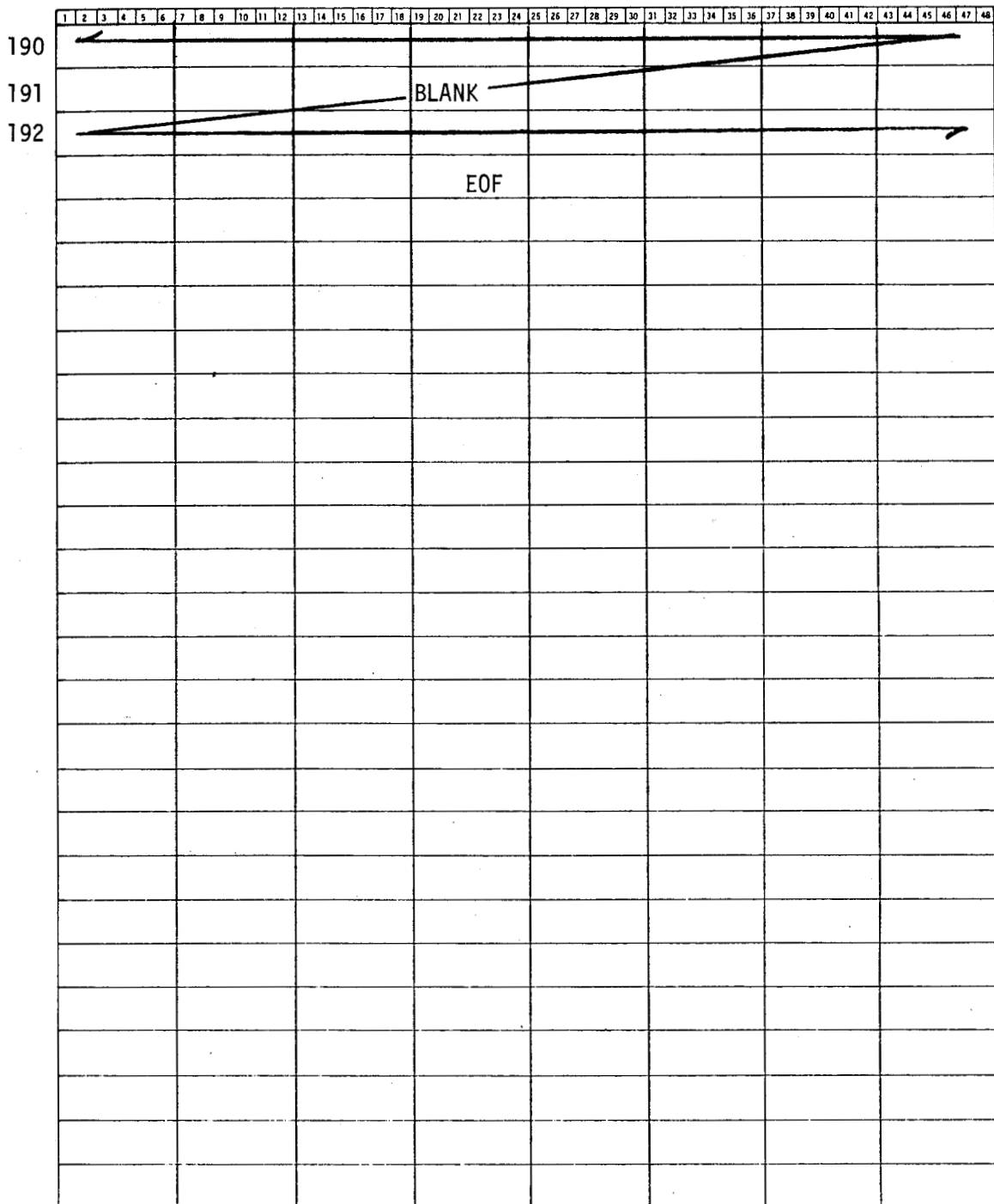
REV. NO.

DATE 1/15/76

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
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REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (48-BIT MACHINE)		
	REV. NO.	DATE 1/15/76	
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	PARAMETER MNEMONICS		NASA
	FILE 2		AMES RESEARCH CENTER
	(48-BIT MACHINE)		MOFFETT FIELD, CALIFORNIA
REV. NO.	DATE 1/15/76	DOC. NO. PC-262.05	
		FIG. 3.2.4	
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