PIONEER PROGRAM

CFH

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California

DOCUMENT NO. PC-262

PIONEER F/G: OFF-LINE DATA

PROCESSING SYSTEM DESCRIPTION

PIONEER PROGRAM

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California

DOCUMENT NO. PC-262

PIONEER F/G: OFF-LINE DATA

PROCESSING SYSTEM DESCRIPTION

APPROVAL:

NASA/ARC
Pioneer Project Manager, Charles F. Hall, Charles F Hall (Signature) 10/28/71 (Date)

This document is a part of the Pioneer Program Documentation which is controlled by the Pioneer Project Office, Ames Research Center, Moffett Field, California. As such it is requested that no copies be made by any individual of any pages within.

To be placed on the distribution list for additional official versions of this document, address your request to:

Pioneer Project Manager
NASA/Ames Research Center
Moffett Field, California 94035

PIONEER F/G PROJECT

SPECIFICATION PC-262

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

REVISIONS

No.	Date	No.	Date	No.	Date
1	12/20/71				
2	1/15/76				

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

PC-262.01, (Cont'd)

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

PC-262.03, (Cont'd)

ILLUSTRATIONS

TABLE OF CONTENTS/REVISIONS

PC-262.03, (Cont'd).

ILLUSTRATIONS

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

PC-262.04, (Cont'd)

ILLUSTRATIONS

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

TABLE OF CONTENTS/REVISIONS

OFF-LINE DATA PROCESSING SYSTEM DESCRIPTION

SPECIFICATION PC-262.00

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

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."

The source of the data for producing the EDR's will be generated by the Jet Propulsion Laboratory (JPL) in Pasadena, California on data tapes referred to as Master Data Records (MDR). These data shall be validated from a prior data source referred to as an Original Data Record (ODR) which has as its origin the Deep Space Station which tracked the spacecraft. The MDR sent to ARC will contain all data related to a Pioneer F tracking period and will be generated by the JPL IBM 360/75 computer. The MDR will be generated and mailed to ARC within 24 hours following a spacecraft tracking period.

3.1.1 Pioneer F/G Input and Output Tape Requirements. Specification PC-262.01, sets forth the format and content of the MDR which JPL will send to ARC. In addition, this specification also describes the output EDR tape organization because the organization is common for all the data users. This is true for the fixed words for the first three files of the EDR. See paragraph 3.1.3 below for definition of the information in the fourth file which contains the science data for each user. In addition to the above, the specification sets forth the requirements for:

(a) The validation of the total Pioneer Off-Line Data Processing System (POLDPS) as a system through the test of simulation tapes and test tapes by the spacecraft manufacturer and/or the JPL computer facilities.
(b) The validation of the data processing system of each of the scientific data users through the use of either simulation tapes or test data tapes generated by POLDPS.

3.1.2 Pioneer F/G Off-Line System Detailed Processing Requirements. Specification PC-262.02 describes the detailed processing that will be performed on the JPL MDR at ARC. Validation and decommutation of this tape to generate EDR's for the various users will be accomplished on an XDS Sigma 5 computer system. The modules which comprise this program for the most part shall be written in the machine language operating under the XDS supplied operating system known as Batch Process Monitor (BPM) Model F01.

3.1.3 Pioneer F/G Data User Requirements. Specification PC-262.03 sets forth the detailed data formats for each experimenter's EDR. It was stated in a previous paragraph (3.1.1) that the first 3 files on the tape are the fixed words of the tape. This specification describes the format, density, number of tracks on the tape, and the language in which the total data is to be written. In particular, each experimenter's

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 describesthe 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.

6. NOTES

6.1 ABBREVIATIONS

A/D	Analog to Digital
AGC	Automatic Gain Control
ARC	Ames Research Center, Moffett Field, California
AU	Astronomical Units
Avail.	Available
BCD	Binary Coded Decimal
bit	a binary unit
BPI	Bits per inch
bps	bits per second
cps	cycles per second
CO	Contracting Officer
dB	decibels
decoding-tail	a fixed pattern at the end of a coded frame
DCI	Data Condition Indicator
DQI	Data Quality Indicator
DSN	Deep Space Network
DSU	data storage unit
DSS	Deep Space Station
EGSE	Electrical Ground Support Equipment
EOF	End of File
EOM	end of memory
EOR	end of record

EOT	End of Tape
ETR	Eastern Test Range
GCF	ground communication facility
GFE	Government Furnished Equipment
GMT	Greenwich Mean Time (UT)
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center, Greenbelt, Maryland
HSDL	high speed data line
Hz	Hertz (cyles per second)
IBM	International Business Machines Corporation
ID	identification
I/O	input/output
ips	inches per second
JPL	Jet Propulsion Laboratory
LSB	least significant bit
MDR	master data record
MDS	mission dependent software
MIS	mission independent software
MSB	most significant bit
MSFN	Manned Space Flight Network
ODR	original data record
PDP	Project Development Plan
PGDS	Pioneer Ground Data System
PIN	parallel input

RF	radio frequency
RFI	radio frequency interference
RTG	radioisotope thermoelectric generator
S/C	spacecraft
SCID	subcommutator identification
SDR	system/special data record
SFOF	Space Flight Operation Facility
SSA	symbol synchronizer assembly
$\frac{ST_{sy}}{N_o}$	ratio of signal energy per symbol to noise spectral density. The relationship to ST_B/N_o is $2(ST_{sy}/N_o)$ for rate 1/2 convolutional coded data.
symbol	a transmitted bit
sync	synchronization
T.B.S.	To Be Supplied (information not currently available)
TCP	telemetry and command processor
TLM	telemetry
TRW	TRW Systems, One Space Park, Redondo Beach, California
TTY	teletype
TV	television
TWT	traveling wave tube
UT	Universal Time (GMT)
VCO	voltage controlled oscillator
XDS	Xerox Data Systems, a division of the Xerox Corporation
ϕ	EDR and MDR indicator for zero
σ	standard deviation

6.2 GLOSSARY OF TERMS

Documentation. Forms, reports, specifications, plans, procedures, manuals, logs, correspondences, engineering data books, etc. generated in support of or to provide evidence of performance of tasks in connection with the contract.

Executive Control Program. A group of instructions which exercises programming system control and provides the linkage between modules.

Experimenter or Principal Investigator. The individual with prime responsibility for a particular scientific instrument in the Pioneer Program.

Logical Record. A sequence of data or information on digital magnetic tape that conforms to a logical group or data set and in a format such that each item on the tape is positionally unique. A logical record may also be a physical record.

Module. A collection of similar type routines related in purpose.

Module Control Program. A group of instructions which provides a basic linkage between the routines of the module and the executive control program; also renders decisions on the outputs of routines.

Physical Record. A sequence of data or information on digital magnetic tape that conforms to a predetermined format that has been constructed for the convenience of the machine or the data user. Each record is separated from the next by a 3/4 inch gap.

Pioneer Off-Line Data Processing System (POLDPS). The collective term in reference to software and hardware necessary to process the JPL Master Data Record (MDR) and produce an Experimenter Data Record (EDR) for data users.

Programming System. The collection of computer programs which are used in the Off-Line Computer System.

Routine. A group of instructions which performs logical decisions and/or arithmetic computations (i.e., subroutines) which accomplishes a single function or purpose.

Spacecraft. The system comprised of the assembly of all the spacecraft subsystems and the scientific instruments.

Subroutine. A group of instructions which performs a specialized function and is normally available in a computer programming library (i.e., square root function).

Time. Time is defined (in this specification) as the ground recorded time in GMT of the receipt of the spacecraft telemetry data or the time GMT of occurrence for a parameter's state in the ground equipment.

INPUT AND OUTPUT TAPE REQUIREMENTS
SPECIFICATION PC-262.01

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)

Revision

3.1.3.1 DPTRAJ Trajectory Data for Pioneer F/G. The DPTRAJ data are 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. (2)

3.1.3.1.1 Injection to First Midcourse. The first trajectory "save" 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: (1)

(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 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: (1)

(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 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 scond midcourse to approximately 40 days before periapsis. The number of data points will be at approximately the following output frequency: (1)

(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.

Revision

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.

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 (1)
from the list given in PC-262.04, Pioneer F/G: Trajectory
Data and User Requirements. See Figure 3.1.3 sheet 1. (2)

RECORD #2

This is a dummy record consisting of 140 words. See Figure (1)
3.1.3, sheet 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 377777777777_8 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 377777777777_8 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 (1)
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)

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		Pioneer Saturn "Save" Tape
ES5	changes to	ES6
SE5	"	SE6
S5E	"	S6E
A5SP	"	A6SP
S5P	"	S6P
A5ASD	"	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.

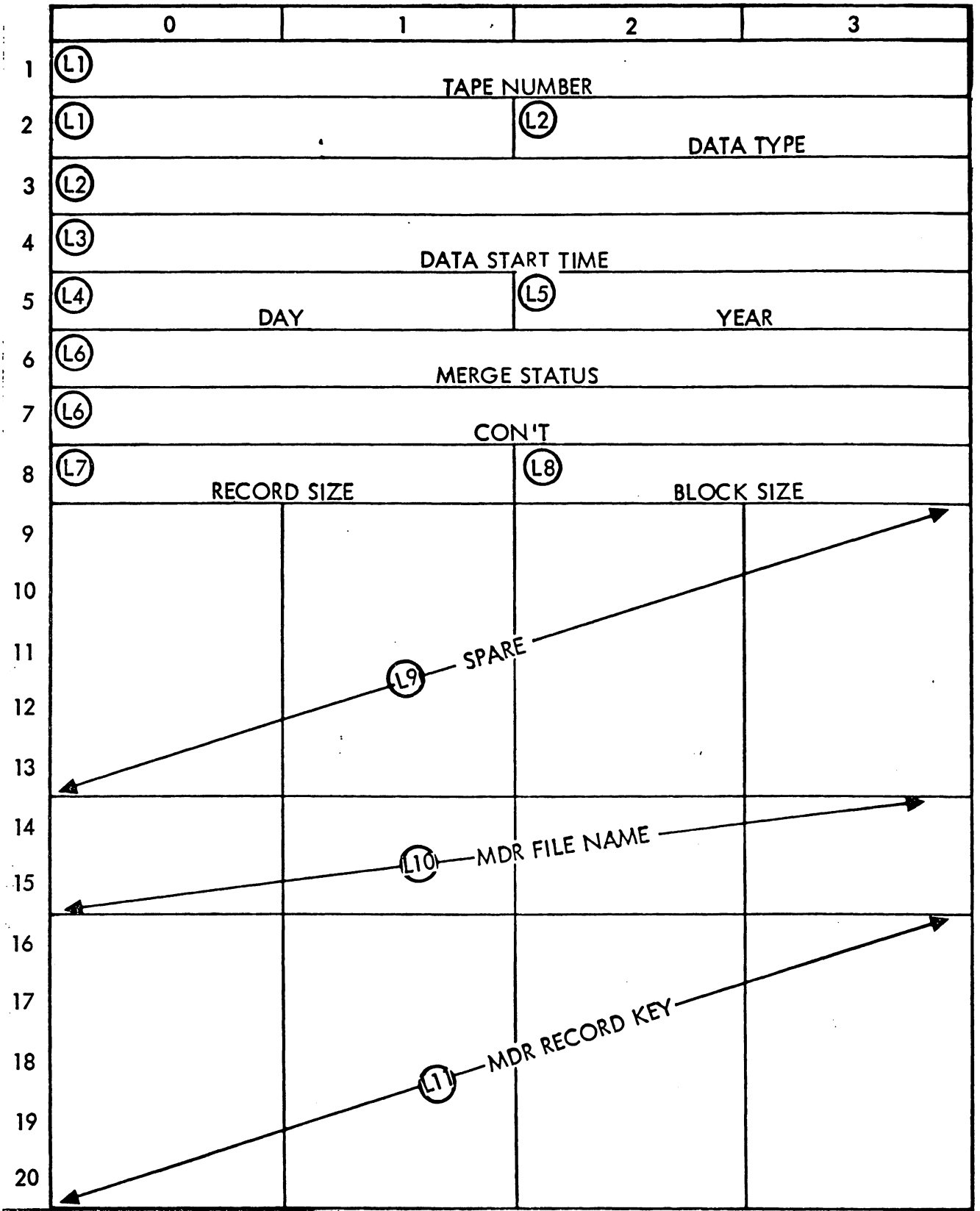
6. NOTES

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.



REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	TELEMETRY MASTER DATA RECORD (MDR) (HEADER FILE)	DOC. NO. PC-262.01
		FIG. 3.1.1
	REV. NO. / DATE 9/1/71	SHEET 1 OF 14

Item No.	Length and Orientation	Description
L1	6 bytes	Tape No. in EBCDIC (1)
L2	6 bytes	Data Type EBCDIC (2)
L3	4 bytes	Data Start Time in Binary Milliseconds of Day
L4	2 bytes	Day of Year Packed 4 bit BCD of Data First Record
L5	2 bytes	Last 2 Digits of Year Packed 4 bit BCD
L6	8 bytes	Merge Status (To be defined)
L7	2 bytes	Logical Record Size in Bytes (Binary)
L8	2 bytes	Physical Block Size in Bytes (Binary)
L9	20 bytes	Spare
L10	8 bytes	MDR File Name EBCDIC
L11	20 bytes	MDR Record Key of First Record

(1) Operator Supplied

(2) Stream Identification

P = Pioneer

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	DESCRIPTION OF ITEMS IN MDR HEADER FILE	DOC. NO. PC-262.01
		FIG. 3.1.1
	REV. NO. / DATE 9/1/71	SHEET 2 OF 14

	0	1	2	3
0	(1) TIME TAG			
1	(8) SPC	(9) TIME CORRECTION FLAG	(10) DAY OF YEAR	
2	(11) USER DATA TYPE	(12) DATA DEPENDENT TYPE	(13) SYNC CONDITION CODE	(14) DATA QUALITY INDICATOR
3	(15) # OF BIT ERRORS IN PN	(16) YEAR DIGIT	(17) SNR	
4	(18) DSS	(19) LOCK STATUS BITS	(20) CONFIGURATION INDICATORS	
5	(21) SPECIAL DATA TYPE	(22) GDD	(23) # OF DATA BITS IN RECORD	
6	(24) #AGC SAMPLES IN AVERAGE	(25) HSD ERROR CONDITION BITS	(26) RATE OF DATA TRANSMISSION	
7	(27) AVERAGE AGC OVER DATA IN RECORD			
8	(6) FORMAT	(35) NO. OF FRAMES	(28)	
9	(30) ROUND TRIP LIGHT TIME			

TITLE: FIXED WORDS OF TELEMETRY MDR DATA RECORD

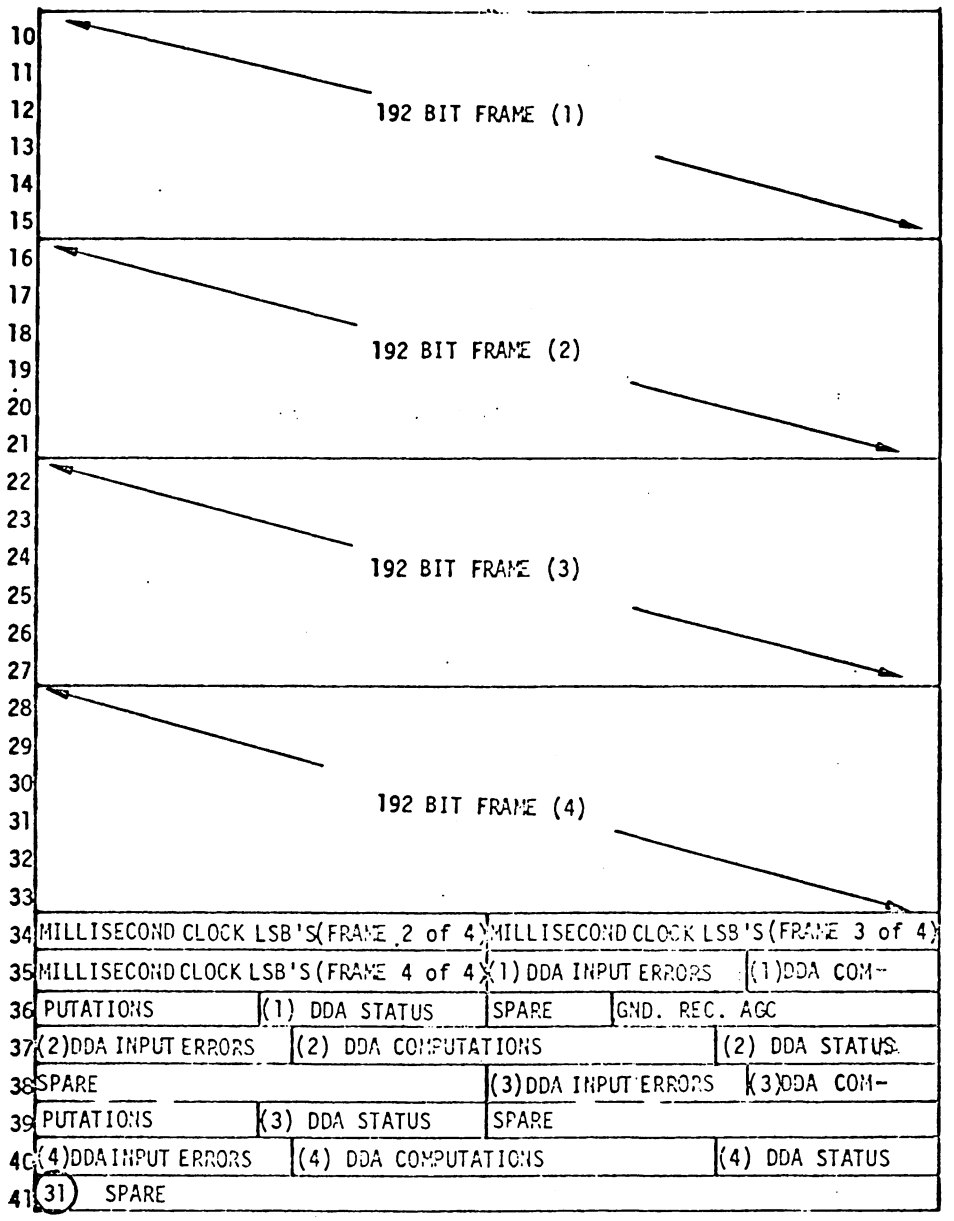
REV. NO.

DATE 9/1/71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

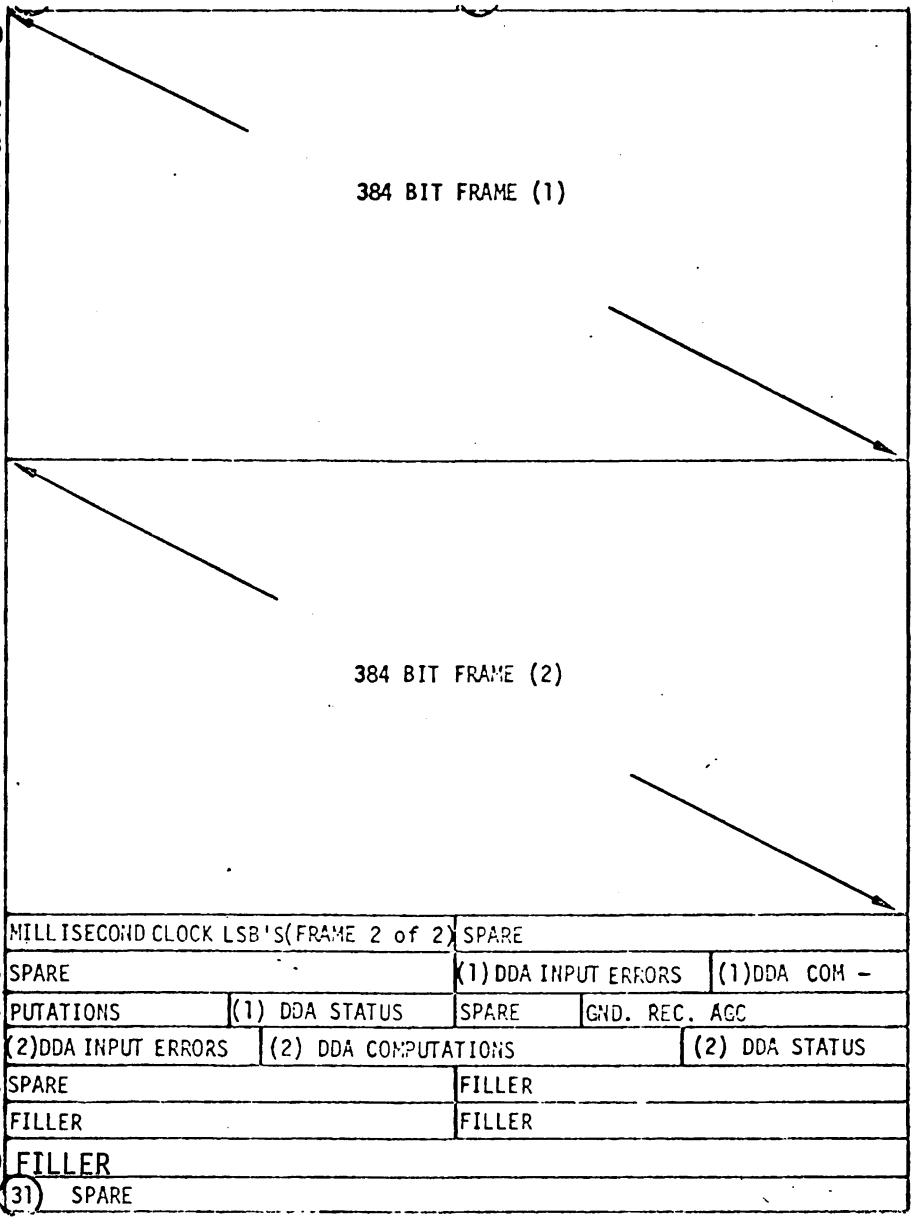
DOC. NO. PC-262.01

FIG. 3.1.1



DDA STATUS ITEM 32
DDA INPUT ERRORS ITEM 33
DDA COMPUTATIONS ITEM 34

REPRODUCED FROM	TITLE: TELEMETRY DATA FORMAT IN TELEMETRY MDR DATA RECORD (192 BIT FRAMES)	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.01
		FIG. 3.1.1
	REV. NO. / DATE 9/1/71	SHEET 4 OF 14



DDA STATUS ITEM 32
DDA INPUT ERRORS ITEM 33
DDA COMPUTATIONS ITEM 34

REPRODUCED FROM

TITLE

TELEMETRY DATA FORMAT IN TELEMETRY MDR DATA RECORD (384 BIT FRAMES)

REV. NO.

DATE 9/1/71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.01

FIG. 3.1.1

SHEET 5 OF 14

Item No.	Length & Orientation	Description
1	1 full word (32 bits)	Binary time in elapsed milliseconds from start of day (GMT) of Ground Receipt at specified Deep Space Station (DSS) of first bit of data in record
2	Not applicable.	
3	Not applicable.	
4	Not applicable.	
5	Not applicable.	
6	1 byte	Pioneer format in binary extracted from data (Table TLM 3-2-13)
7	Not applicable.	
8	1 byte	Spacecraft # assigned spacecraft number in binary (Table TLM-3-2-1)
9	1 byte	Time correction flag (0 - no correction, FF_{16} - suspect or corrected)
10	1 half word	Day of year associated with Item 1 in 4 bit packed BCD
11	1 byte	User data type code (see Table TLM-3-2-2)
12	1 byte	Data dependent type code (see Table TLM-3-2-3)
13	1 byte	Sync condition code (see Table TLM-3-2-4
14	1 byte	Quality Indicator (see Table TLM-3-2-5)
15	1 byte	# of bit errors detected in leading PN in binary
16	1 byte	Last 2 digits of year in 4 bit packed BCD
17	1 half word	SNR (Signal-to-noise ratio extracted from HSD Block) (see Ref 1)

Item No.	Length & Orientation	Description
18	1 byte	DSS of Data Receipt-Station in binary as in column 3 of Table 3-2-6 (Columns 1 and 2 of this table are not used)
19	1 byte	Lock status bits extracted from HSD block (see Table TLM-3-2-7)
20	1 half word	DSS configuration bits extracted from HSD block (see Table TLM-3-2-8)
21	1 byte	Special data type code (see Table TLM-3-2-9) (See reference 2 below)
22	1 byte	Gross data descriptor (see Table TLM-3-2-10)
23	1 half word	Total # of data bits in record in binary
24	1 byte	# of AGC samples included in average AGC (Item No. 27)
25	1 byte	Error condition bits from HSD block (bits reflect condition of receipt of block 0 - bad, 7 - good)
26	1 half word	Rate of transmission of data from space-craft (see Table TLM-3-2-11)
27	1 full word	Average AGC over the data record
28	1 half word	Spare
29	variable full words	Data sub-frame or raw data (see Table TLM-3-2-12)
30	3 bytes	Round Trip Light Time in ms.
31	1 full word	Spare, always - 0
32	1 byte	DDA status as extracted from HSD Block
33	1 half word	DDA input errors
34	1 half word	DDA computations
35	1 half word	Nunber of Pioneer frames (see Table TLM 3-3-14)

Reference 1 (SNR, Item 17): This is a 12 bit fixed binary quanitity with the binary point just to the right of the 2^5 bit (± XXXXXX.XXXXX as binary positions)

Reference 2 (Item 21): The high order bit of this byte will be set to 1 for a Pioneer DSU readout.

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	DESCRIPTION OF ITEMS IN MDR DATA RECORDS	DOC. NO. PC-262.01
		FIG. 3.1.1
	REV. NO. DATE 9/1/71	SHEET 7 OF 14

TABLE TLM-3-2-1 SPACECRAFT CODES

(Octal)	Code (Decimal)	Definition
027	23	Pioneer F
030	24	Pioneer G
41	33	Pioneer Simulation F
42	34	Pioneer Simulation G

TABLE TLM-3-2-2 USER DATA TYPE CODES

Meaning	Code Eng (Octal)	Non E Code (Octal)
TCPA	013	14
TCPB	163	45
TCPC	100	51

TABLE TLM-3-2-3 DATA DEPENDENT TYPE CODES

Value (Binary)	(Octal)	Meaning	
1101000	150	PIO-F	Non-formatted display*
1110111	167	PIO-F	Input response data*
1110101	165	PIO-F	Text data (formatted)*
1111111	177	PIO-F	DSN status data*
1110110	166	PIO-F	Keyboard entry data
1111010	172	PIO-F	Card reader entry data
1100111	147	PIO-F	Conscan AGC data**

*SFOF to RIC
**PIO-F Mission Dependent Data

Table TLM-3-2-4. Sync Condition Codes (Binary)

Value (Binary)	Meaning
11	Full sync, leading and trailing PN code found
111	Full sync, leading PN only was requested and found
10	Leading PN code only
1	Trailing PN code only
0	No sync - no PN codes found

Table TLM-3-2-5. Quality Indicator (Binary)

Value (Binary)	Meaning
11	All indicators are good, data is good
10	At least one indicator is bad, data is suspect
01	At least two indicators are bad, data is suspect
0	Data is bad - no sync.

This value is computed by the following logic:

QI = FS (1+S+H), where:

FS = { 1 if data stream is in sync in 360
     { 0 if data stream not in sync

S = { 1 if average SNR over frame is ≥ a specified minimum
    { 0 if average SNR over frame is < a specified minimum

H = { 1 if HSD block was received with no error indicators
    { 0 if any bit errors were detected in HSD block

Table TLM-3-2-6. DSS Codes (Source Codes)

Value (Binary)	(Octal)	Definition
00101001	051	DSS 11
11101001	351	DSS 12
00011001	031	DSS 14
01101011	153	CTA 21
00010011	023	DSN Simulation Center (SIMCEN) DSS 27
10001001	211	DSS 41
01001001	111	DSS 42
00010110	026	DSS 51
11010110	326	DSS 61
01110110	166	DSS 62
00100110	046	DSS 71
01000110	106	Cape Building AO (DSS 70)
11001001	310	SFOF
01000000	100	Merritt Island MSFN (MIL) (DSS 90)
01001010	112	USNS Vanguard MSFN (VAN) (DSS 91)
01001100	114	Bermuda MSFN (BDA) (DSS 92)
01001111	117	Ascension MSFN (ACN) (DSS 93)
01010001	121	Canary Island MSFN (CYI) (DSS 94)
10000000	200	Boulder, Colorado (DSS 99)

Table TLM-3-2-7. Lock Status Bits (Byte Configuration)

0	1	2	3	4	5	6	7
0	0	0	R	D	B	S	K

Bits 0 - 2 = 0

R = 0, Receiver in Lock
  = 1, Out of lock
D = 0, Demodulator in Lock
  = 1, Out of Lock
B = C, Bit Sync in Lock, or not in use
  = 1, Out of Lock
S = 0, Symbol Sync in Lock or not in use
  = 1, Out of Lock
K = 0, Block Decoder or Sequential Decoder in Lock or not in use
  = 1, Out of Lock

Table TLM-3-2-8. DSS Configuration

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	R	R	D	D	D	C	C	B	S	K	V

Bits 5 through 15 contain the configuration status bits to indicate the telemetry data system configuration at the DSS. Bits 0 - 4 contain zero.

R = Receiver, 01 = 1, 10 = 2, 11 = 3, 00 = 4
D = Demodulator, 001 = 1, 010 = 2, 011 = 3, 100 = 4, 101 = 5, 110 = 6
C = Computer, 00 = Alpha, 01 = Data, 10 = Gamma
B = Internal Bit Loop Configuration, 0 = On, 1 = Off
S = External Symbol Sync Configuration, 0 = On, 1 = Off
K = Block Decoder Configuration, 0 = On, 1 = Off
V = Convolutional Decoder Configuration, 0 = On, 1 = Off (not used, set to 1)

Table TLM-3-2-9. Special Data Type Code (Binary)

Value (Binary)	Meaning
0100	Pioneer F, G Data

Table TLM-3-2-10. Gross Data Descriptor (HSD Block Extracted, Binary)

Value (Binary)	Meaning
000	Real Data, Real Time Transmission
001	Real Data, Replay from spacecraft
100	Real Data, Digital Playback from DSS
101	Real Data, Analog Playback from DSS

Table TLM-3-2-11. Rate of Data Transmission From Spacecraft (Binary)

Value (Binary)	Rate in Bits Per Second
0001	8
0010	16
0011	64
0100	256
0101	512
0110	1024
0111	2048

Table TLM-3-2-12. Data Area Per Stream and Spacecraft Type

Spacecraft Stream	Data Buffer Size (Length of Sub-frame)	Data Buffer Size (Length of Buffer Full Words)	Left Over Bits (Set to Zero)
PIONEER F	192	6	0
PIONEER F	384	12	0

TABLE TLM 3-2-13 PIONEER FORMATS

OCTAL	FORMAT COMMAND NAME	FRAME SIZE
000	B	192
001	B	"
002	C	"
003	C	"
004	C_1	"
005	C_2	"
006	C_3	"
007	C_4	"
010	A	"
011	A	"
012	C	"
013	C	"
014	C_1	"
015	C_2	"
016	C_3	"
017	C_4	192
020	B/D1	384
021	B/D2	"
022	B/D3	"
023	B/D4	"
024	B/D5	"
025	B/D6	"
026	B/D7	"
027	B/D8	"
030	A/D1	"
031	A/D2	"
032	A/D3	"
033	A/D4	"
034	A/D5	"
035	A/D6	"
036	A/D7	"
037	A/D8	384

TABLE TLM 3-2-14 NUMBER OF PIONEER FRAMES

HEX

0 = ONE - 192 bit frame

4 = TWO 192 bit frames or one 384 bit frame

8 = THREE 192 bit frames

C = FOUR 192 bit frames or two 384 bit frames

REPRODUCED FROM	TITLE: NUMBER OF PIONEER FRAMES PER LOGICAL RECORD	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.01
		FIG. 3.1.1
	REV. NO. / DATE 9/1/71	SHEET 14 OF 14

To be supplied.

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	COMMAND MASTER DATA RECORD (MDR) FORMAT	DOC. NO. PC-262.01
		FIG. 3.1.2
	REV. NO. / DATE 9/1/71	SHEET 1 OF 1

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	REARMO	DECMOO
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	377777777777_8	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 --						

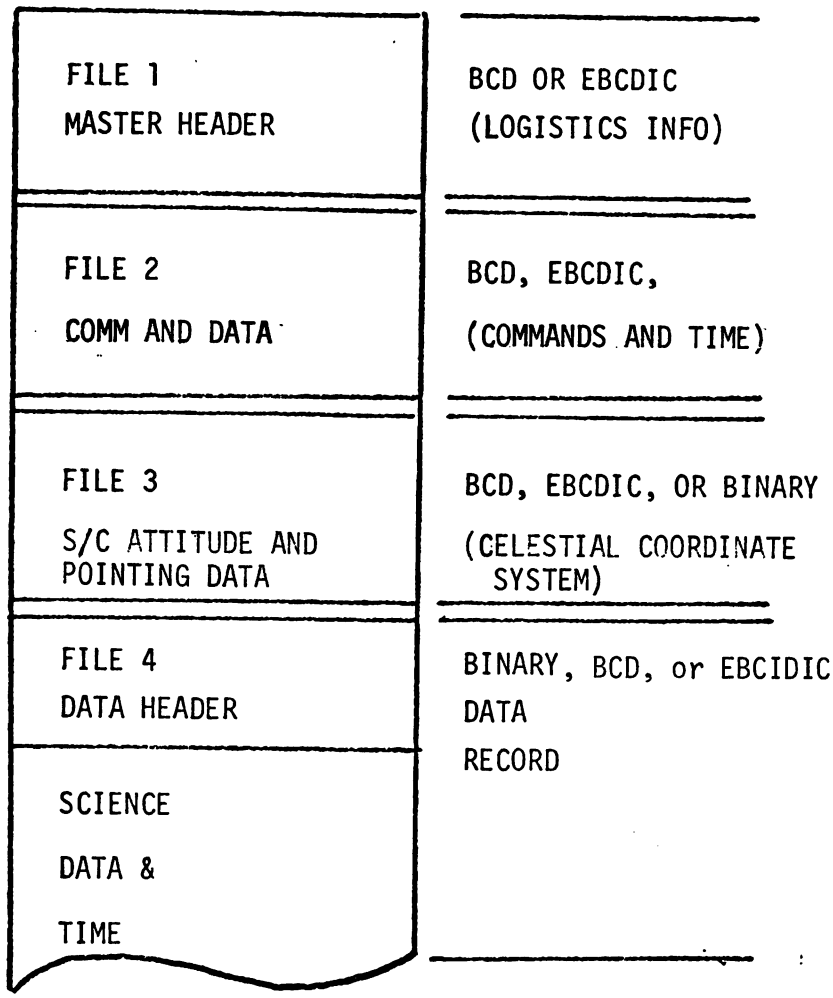
RECORD #5 (252 WORDS)

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 NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	TRAJECTORY PHYSICAL RECORD DESCRIPTION (RECORD #5 AND #6)	DOC. NO. PC-262.01
		FIG. 3.1.3
	REV. NO. 1 DATE 12/20/71	SHEET 3 OF 3



REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	EXPERIMENTER DATA RECORD (EDR) TAPE ORGANIZATION	DOC. NO. PC-262.01
		FIG. 3.2.1
	REV. NO. / DATE 9/1/71	SHEET 1 OF 7

ITEM	
1	PIONEER F (OR G) EDR
2	NUMBER OF ACQUISITIONS
3	NAME OF EXPERIMENTER AND ORGANIZATION
4	SPACECRAFT IDENTIFICATION
5	DATE OF EDR GENERATION
6	DATE OF EDR REGENERATION
7	YEAR AND DAY OF YEAR
8	DSS STATIONS
9	TLM BIT RATES
10	TLM FORMATS
11	OPERATING MODES
12	START TIME OF DATA FOR DAY (GMT) (HR. MIN.)
13	STOP TIME OF DATA FOR DAY (GMT) (HR. MIN.)
14	TAPE SEQUENCE NUMBER
15	EOF

RECORD LENGTH
GMT TIME (DAY, HR, MIN, SEC)
COMMAND #1 WITH FLAG*
GMT TIME (DAY, HR, MIN, SEC)
COMMAND #2 WITH FLAG*
GMT TIME (DAY, HR, MIN, SEC)
COMMAND #3 WITH FLAG*
⋮
GMT TIME (DAY, HR, MIN, SEC)
COMMAND # XXX
EOF

* FLAG = 00 COMMAND WAS VERIFIED
01 COMMAND WAS NOT VERIFIED
11 COMMAND NOT VERIFIABLE

TIME IS THE EXPECTED VERIFICATION TIME (EVT)

EVT (MULTIPLE COMMANDS) = TIME OF TRANSMISSION OF THE 22ND BIT OF EXECUTE COMMAND + RTLT + DELAY TIME

EVT (SINGLE COMMAND) = TIME OF TRANSMISSION OF THE 22ND BIT OF THE COMMAND + RTLT

ITEM		
1	TIME (GMT) (DAY,HR., MIN); FLAG*	PREVIOUS 30 ENTRIES (PAST HISTORY)
2	CELESTIAL LONGITUDE (XXX.XX^{o})	
3	CELESTIAL LATITUDE (± XX.XX^{o})	
4	CELESTIAL LATITUDE DRIFT/DAY (± 0.XXX^{o})	
5	TIME (SAME AS ABOVE)	
6	CELESTIAL LONGITUDE (SAME AS ABOVE)	
7	CELESTIAL LATITUDE (SAME AS ABOVE)	
8	CELISTIAL LATITUDE DRIFT/DAY (SAME AS ABOVE)	
	ETC.	
	TIME (GMT) (DAY, HR., MIN); FLAG*	MOST CURRENT ATTITUDE DATA
	CELESTIAL LONGITUDE (± XXX.XX^{o})	
	CELESTIAL LATITUDE (± XX.XX^{o}	
	CELESTIAL LATITUDE DRIFT/DAY (± 0.XXX^{o})	
	EOF	

* FLAG INTERPRETATION

00 SPECIAL REFINEMENT (± 0.1^{o} ACCURACY)
01 HIGH-GAIN ANTENNA (± 0.3^{o} ACCURACY)
10 MEDIUM-GAIN ANTENNA (± 1.3^{o} ACCURANCY)
11 DYNAMIC POSITION FOR ΔV MANEUVER (± 3.0^{o} ACCURANCY)

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	FORMAT FOR EDR FILE 3 (S/C ATTITUDE DATA)	DOC. NO. PC-262.01
		FIG. 3.2.1
	REV. NO. / DATE 9/1/71	SHEET 4 OF 7

ITEM	
1	GMT TIME (TOTAL ELAPSED MS)
2	DAY OF YEAR
3	TIME CORRECTION FLAG
4	DATA QUALITY INDICATOR
5	SIGNAL TO NOISE RATIO
6	DEEP SPACE STATION
7	BIT RATE
8	MODE AND FORMAT
9	ROUND TRIP LIGHT TIME (RTLT)
10	ROLL ATTITUDE TIMER
11	SPIN PERIOD AND FLAG
12	SUBCOM ID AND EXT. FRAME CNTR.
13	ROLL PULSE/ROLL-INDEX PULSE PHASE ERROR
14	ROLL ATTITUDE - TIME OF C-112
15	SPARE
16	SPARE
	EXPERIMENTER SCIENCE AND SPACECRAFT ENGINEERING DATA (SEE PC-262.03)
	EOR

ITEM	DESCRIPTION
1.	GMT TIME - TIME IN ELAPSED MILLISECONDS FROM START OF DAY FOR TIME OF THE FIRST DATA WORD IN THE RECORD.
2.	DAY OF YEAR - LAST DIGIT OF YEAR
3.	TIME CORRECTION FLAG - 0 = NO CORRECTION; 111 = SUSPECT TIME OR CORRECTED TIME.
4.	DATA QUALITY INDICATOR - 11 = ALL INDICATORS ARE GOOD, DATA IS GOOD. 10 = AT LEAST ONE INDICATOR IS BAD, DATA IS SUSPECT; 01 = AT LEAST TWO INDICATORS ARE BAD, DATA IS SUSPECT; 00 = DATA IS BAD. SEE FIGURE 3.1.1 (9), TABLE TLM-3-2-5.
5.	SNR - SIGNAL + NOISE/NOISE; 12 BIT FIXED POINT BINARY QUANTITY WITH THE BINARY POINT JUST TO THE RIGHT OF THE 2^5 BIT.
6.	DSS - DEEP SPACE STATION WHICH WAS TRACKING. SEE FIGURE 3.1.1 (10), TABLE TLM-3-2-6.
7.	BIT RATE - BIT RATE AT WHICH DATA RECORD WAS TAKEN. SEE FIGURE 3.1.1 (12), TABLE TLM-3-2-11.
8.	MODE - 000 = REAL TIME; 001 = TELEMETRY STORE; 100 = MEMORY READ-OUT IN HIGH ORDER BYTE. FORMATS IN LOW ORDER BYTE. SEE FIGURE 3.1.1 (13), TABLE TLM-3-2-13.
9.	RTLT - TIME WILL BE GIVEN IN TOTAL MILLISECONDS.
10.	ROLL ATTITUDE TIMER - ENGINEERING SUBCOM WORDS C-112 AND C-116. THIS TIME PERMITS CORRELATION OF THE ATTITUDE OF THE ROLL-INDEX REFERENCE LINE WITH GIVEN TELEMETERED SCIENCE AND ENGINEERING DATA. EACH COUNT IN REGISTER IS = TO 0.0078125 SECONDS.
11.	SPIN PERIOD - THIS ITEM IS A 2^{18} - 1 NUMBER MEASURING SPIN PERIOD. (ENGINEERING WORDS C-405, C-406, C-407.) ENGINEERING WORD C-417 IS FLAG FOR SPIN IN LOW ORDER BYTE OF WORD. IF LOW ORDER BIT IS 0 MEANS SPSG ROLL REFERENCE = 0°, IF SET TO 1 MEANS = 180°.

BITS 2 & 3	SPSG MODES
00	NON-SPIN AVERAGING
01	ACS
10	SPIN AVERAGING

REPRODUCED FROM	TITLE DESCRIPTION OF ITEMS IN FILE 4 OF EDR (FIXED WORDS)	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.01
		FIG. 3.2.1
	REV. NO. / DATE 9/1/71	SHEET 6 OF 7

ITEM	DESCRIPTION
12.	SUBCOM I.D. 4 EXT. FRAME CNTR - THIS ITEM WILL BE COMBINED WORD FROM THE S/C TELEMETRY OF BOTH THE SUBCOMMUTATOR IDENTIFICATION WORD AND THE EXTENDED FRAME COUNTER WORD. TOGETHER THEY COMPRISE A COUNTER 2^{13} OR 8192. THE NUMBER OF WHICH THE FIRST SCIENCE WORD FOR A USER APPEARS IN THE DATA RECORD.
13.	ROLL PULSE/ROLL INDEX PHASE ERROR-SPACECRAFT ENGINEERING WORD C-408.
14.	ROLL ATTITUDE TIME - THE TIME OF THE FRAME IN WHICH ENGINEERING WORD C-112 (ROLL ATTITUDE TIMER: ITEM 10 ABOVE) OCCURRED.
15 - 16	SPARE - POSSIBLE FUTURE USE.

OFF-LINE DATA PROCESSING SYSTEM
DETAILED PROCESSING REQUIREMENTS

SPECIFICATION PC-262.02

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

PIONEER F/G PROJECT

PIONEER F/G: OFF-LINE DATA PROCESSING SYSTEM

DETAILED PROCESSING REQUIREMENTS

SPECIFICATION PC-262.02

September 1, 1971

1. SCOPE

This document describes the detailed requirements for processing the JPL Telemetry Master Data Record (MDR) at Ames Research Center on the XDS Sigma 5 computer system.

2. APPLICABLE DOCUMENTS

2.1 NASA/ARC SPECIFICATIONS

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

PC-262.01, 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 Requirements

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

PC-220.01, Spacecraft/Scientific Instrument Interface Specification

3. GENERAL REQUIREMENTS

3.1 XDS SIGMA 5 COMPUTER SYSTEM

The computer programming system shall be constructed such that a high order of flexibility is realized. Altering or augmenting this system because of new criteria in the Pioneer F mission or to support later Pioneer missions must present a minimum of reprogramming effort. To achieve this objective, it is required that the programming system be modular in concept and structure. The following basic ground rules shall be followed:

(a) Logical functions of the programs shall be separated from arithmetic or procedural functions.
(b) Changes in the following shall be capable of implementation without effecting other unrelated functions:
    (1) Commutation and subcommutation schemes
    (2) Input or output format
    (3) Criteria for data qualification
    (4) Priority of control assignment
    (5) Engineering calibration
(c) The programming system shall be so designed for efficient utilization of the computer and the attendant operating system.

3.1.1 Data Recovery. Techniques and routines shall be devised to effect a maximum recovery of usable data from the incoming bit stream. The smallest definable repetitive sequence in the bit stream is that defined by the appearance of the 18 bit sync code. The sync code in octal is 746500 and prefaces each 384 bits of telemetry data in format D. In other formats it appears every 192 bits. For the complete break-out description of word assignments in the various telemetry formats see Figures 3.3.1.4.1, 3.3.1.4.2, 3.3.1.4.3 (11 pages), 3.3.1.4.5 (4 pages) of PC-220.01 entitled Spacecraft/Scientific Instrument Specification or Figure 6.2.2.1, 6.2.2.2-2 (14 pages) of PC-224.00 entitled ARC/DSN Ground Data System.

3.2 FUNCTIONS

The following serves to identify the minimum functions to be performed by the programming system.

3.2.1 Read Module. Routines shall be written to read data tapes generated by the JPL IBM 360-75 computer. These tapes, their formats, densities, modes, and word assignments are defined in section 3.1 of Specification PC-262.01 Pioneer F/G: Input and Output Tape Requirements.

3.2.2 Merge Module. It is expected that the JPL MDR will contain a continuous stream of telemetry data in a monotonic increasing time sequence. It is conceivable that a data outage could occur because of a DSS malfunction or a failure in the high speed data link. In this case, if the Project Office requires a Category I or II quality tape (this term is defined in PC-224.02 ARC/DSN Ground Data System Interface Specification Section 6.1 entitled Data Quantity Categories), JPL may supply a separate tape containing "replay" data. If the data outage embraces an entire station tracking period, then separate EDR's shall be generated from the "replay" MDR. If, however, the "replay" data are an interrupted segment of a station tracking period, then A routine shall be written to merge the "replay" data with the original MDR which contained the data outage. These routines shall merge on the subcommutated identification word (SCID) and the extended frame counter (EFC) of the input data frames from the "replay tape. An examination of the time words shall be made to insure that the proper SCID and EFC are being merged.

3.2.3 Data Sort and Format Module. Routines shall be written to unpack and arrange the data from the several source tapes in categories and classes of data such that a continuous history of each category is available for data qualification on the EDR. These data are defined in PC-262.01 Pioneer F Input and Output Tapes. Time words shall be assigned to the telemetry data as well as the other categories of data.

3.2.4 Data Labeling Module. The purpose of maintaining a history of the data qualifiers and the times associated with them is to provide a wide range of qualifying information to be attached to each user's telemetry data. This will afford the user a reliability factor attesting to the quality of his data. Routines shall be written such that this qualifying information can be appended as header information for each data user. The representative information included in this function is indicated in Section 3.1 of PC-262.01 in the discussion of the telemetry MDR.

3.2.5 Command Processing Module. Command information may come from a number of sources. These sources are given below and the priority of the source for processing is indicated accordingly.

(a) Engineering Data History Compiler (EDHC)
(b) Real time command print-out on hard copy either from the JPL real-time system or the ARC real-time system
(c) Command MDR from JPL. This tape from JPL contains the command mnemonic, the time of transmission of the command, and a confirm/abort message as to whether the command was sent or not.

The EDHC tape is to be considered the most reliable source of the command data; second, is the real time command list, and third the JPL Command MDR. The format for the data on the EDR is indicated in Figure 3.2.1 sheet 3 of 7 in PC-262.01 Pioneer F/G: Input and Output Tape Requirements. The content of the command file shall be such that the first word of the file will indicate the number of words in the file. For the single commands, a time word for the verification of the command shall be indicated followed by the command mnemonics. For multiple commands a unique code shall be afixed to the time words to indicate that multiple commands were sent. The time word shall be followed by the commands sent.

3.2.6 Summary Statistics Module. At the end of MDR processing a status report shall be generated on the line printer giving the following information:

(a) Day
(b) MDR start time
(c) MDR stop time
(d) Number of Experimenter Data Files created:
    (1) Number of time sequence errors
    (2) Number of SCID sequence errors
    (3) Number of data outages
    (4) Number of format changes
    (5) Number of bit rate changes
    (6) Number of mode changes
    (7) Number of changes in data quality indicator
    (8) Number of data redundancies
    (9) Number of tape errors

(e) Engineering and Science Data File Status:

(1) Experiment name
(2) Start time
(3) Stop time
(4) Number of records created
(5) Number of acquisitions
(6) DSS stations
(7) Bit rates
(8) Formats
(9) Modes

3.2.7 Decommutation Module. Routines shall be written which will decommutate the resolved data from the Telemetry MDR such that each user shall receive only the data from his specific instrument plus any of the engineering parameters he may require. The detailed decommutation requirements for each user are given in PC-262.03 Pioneer F/G: Data User Requirements.

3.2.8 Output Formatting Module. Routines shall be written which shall be capable of writing digital magnetic tapes in the format and density required by each user. The specific requirements for each user is given in PC-262.03 Pioneer F/G: Data User Requirements.

3.2.9 Computation Processors. Special processors shall be written to handle problems that require solution for all users.

3.2.9.1 Time Resolver Module.

3.2.9.1.1 Routines shall be written to originate and interpolate time in the event of missing time. Time resolution shall be computed down to milliseconds.

3.2.9.1.2 Routines shall be written to resolve time from the spacecraft Telemetry Store Mode. In this resolution, time shall be computed such that the data will appear in the proper time sequence as though it had been received in real-time. For details of this operating mode see paragraph 6.2.4.2 of PC-224.00 entitled ARC/DSN Ground Data System Interface Specification.

3.2.9.2 Spacecraft Attitude and Pointing Module. A module shall be written such that the program can accept input cards that contain spacecraft attitude and spin axis orientation data. These data shall contain time in days, hours, and minutes, followed by position data in the celestial coordinate system where the X-axis is directed at the Vernal Equinox (of date) with the XY plane in the ecliptic plane. The spacecraft attitude in this coordinate system shall be given in celestial latitude and celestial longitude. In addition, a third factor, Δ celestial latitude, shall be included to provide a drift factor due to solar pressure. The general form of these data is indicated in Figure 3.2.1 (4) of PC-262.01, Pioneer F/G: Input and Output Data Tape Formats. This module shall have the capability of translating this input information into a form that is readily usable by any experimenter on his EDR. The module therefore, must be capable of converting the input to BCD, EBCDIC, floating point number. The particular form required for each user is given in PC-262.03, Pioneer F/G: Data User Requirements.

3.2.9.3 Spacecraft Roll and Position Module. Section 6 of this specification describes the various parameters that are telemetered in the engineering format and the necessary equations that are to be used in order that each Principal Investigator may be able to compute where (during a roll period) his instrument was looking during a data taking cycle period. The main requirement for off-line processing as far as this module is concerned is that all of the parameters that are required for the computation shall always be present in the fixed words of the EDR science data record, that is, the Roll Attitude Timer, the Spin Period, the Roll Pulse/Roll Index Phase Error, and the time of the frame in which the Roll Attitude Timer occurred. If for any reason any of these data are missing, a computed value based on the previous state shall be generated and flagged as a computed value.

3.2.9.4 Spacecraft Engineering Calibration Module. This module shall have the capability of converting the spacecraft engineering data indicated in PC-262.01, Pioneer F/G: Input and Output Tape Formats and PC-262.02, Pioneer F/G: Data User Requirements into engineering units. The module shall have the capability of translating the engineering units into BCD, EBCDIC, floating point, or stated point depending on the particular users requirements as given in PC-262.03, Pioneer F/G: Data User Requirements.

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 entitled Pioneer Off-Line Data Processing System at ARC.

6.2 GLOSSARY OF TERMS

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

6.3 CLARIFICATION OF EXPERIMENTER DATA RECORD ACS PARAMETERS (Figure 6.3)

This note clarifies the inter-relationship of the Attitude Control System (ACS) parameters in the fixed header of each physical record of File 4 on the Experimenter Data Record (EDR), output by the Pioneer Off-Line Data Processing System (POLDPS) at ARC. The ACS parameters in the fixed header of the EDR are the spin period and flag, Roll Attitude Timer, Roll Pulse/Roll-Index Pulse phase error, and the GMT time of the frame in which the six most significant bits of the Roll Attitude Timer (C-112) occur. Also included will be the Roll Pulse and Roll-Index Pulse definitions which are related to the ACS parameters found on the EDR.

(a) Roll Pulse (P_R) - A pulse generated by the Attitude Control Subsystem each time the spacecraft +Y axisascends through a plane it establishes as a reference plane for the spacecraft attitude control system. Measurement Jitter and the spacecraft position relative to the sun and earth line may establish inaccuracies between this reference plane and a plane parallel to the ecliptic,Figure 6.3 shows this measurement as a possible band about the reference plane.

(b) Roll Index Pulse (P_F) - A filtered roll pulse generated by the Spin Period Sector Generator (SPSG) which occurs once per spacecraft revolution.

(c) P_8 Pulse - A square wave generated by the SPSG, which occurs with a frequency 8 times that of and in phase with the P_F pulse.

(d) P_{64} Pulse - A square wave generated by the SPSG, which occurs with a frequency 64 times that of and in phase with the P_F pulse.

(e) P_{512} Pulse - A pulse generated by the SPSG, which occurs with a frequency 64 times that of and in phase with the P_F PULSE.

(f) Roll Attitude Timing - The DTU contains a redundant 12-bit counter which is driven by a 128 bps clock and controlled by the Roll Index Pulse (P_F). The 12 bits of the counter are read out with the most significant bit first during Engineering Subcom Word C-112 and C-116 (DRATC). The counter is reset with each occurrence of the Roll-Index Pulse after the end of word gate C-125, at which time counting is resumed. The 12-bit count represents the time between the occurrence of the Roll-Index Pulse and the start of word C-112 of the Engineering Subcom. This telemetered time will permit correlating the attitude of the roll and the roll-index reference lines with given telemetered science and engineering data. Each count within the register represents 0.0078125 seconds.

(g) Roll Pulse/Roll-Index Pulse phase error (ARIPPHEC) - The phase error measurement between the Roll Pulse and Roll-Index Pulse with up to a mixiumum of x62.5 msec of phase error, generated by the SPSG.

(h) Spin Period Flag - A three bit flag extracted from Engineering Subcom Word C-417, which indicates the SPSG modes and the SPSG roll reference.

Bit 1 (ASPSGRRS):

(1) 0 indicates that the roll index pulse is in phase with the roll pulse.
(2) 1 indicates that the roll index pulse is 180 degrees out of phase with the roll pulse.

Note: The relationship between the phase of the Roll Pulse and the Roll-Index Pulse is corrected on the spacecraft by Ground Command. However, by using the spacecraft attitude information and the status of Bit 1 and ARIPPHEC, it can be verified that the correction was actually made. In general it shall never be permitted to exceed the dynamic range of ARIPPHEC.

Bits 2 and 3 (ASPSGMS):

(1) 00 - Non-averaging
(2) 01 - ACS Mode
(3) 10 - Averaging
(4) 11 - Not used

(i) GMT of the RAT - This time represents the GMT time of the first bit of the main frame in which C-112 occurs.
(j) Spin Period (ASPNPDC) - The time between two successive roll pulses.

The time of the main frame containing Engineering Subcom Word C-112 of the Roll Attitude Timer, the Spin Period and Flag, and the Roll Pulse/Roll-Index Pulse phase error is provided so that the experimenter can relate his data to the roll reference line of the spacecraft. The following will be a typical example of how these data may be used to find the time difference between the occurrence of Engineering Subcom Word C-112 and the occurrence of the Roll Reference Pulse. Also, it will show how the angle subtended between the roll reference line and any given scientific data bit can be obtained. (Reference Figure 6.3)

New RAT Determination. Data word C-112 contains the MS Bits and C-116 and LS Bits of the Roll Attitude Timer (RAT). These 12 bits shall be monitored until a change occurs between successive readings. This represents a New RAT (NEWRAT) and shall be used for processing.

Given the time of the first bit of the science main frame in which a change of Engineering Subcom Word C-112 occurs, and utilizing bit rate, the time of the first bit of Engineering Subcom Word C-112 can be extrapolated as follows:

$$GMT_{C\text{-}112_{Bit\ 1}} = T_{MF_{C\text{-}112}} + \frac{N_{Bits}}{BR\ (Bits/Sec)}$$

where: $T_{MF_{C\text{-}112}}$ - Time of the first bit of the main frame in which Engineering Subcom Word C-112 occurs.

N_{Bits} - The number of bits between the first bit of the main frame and the first bit of Engineering Subcom Word C-112. This value is equal to 108.

BR - The bit rate in which the data were transmitted.

$GMT_{C\text{-}112_{Bit\ 1}}$ - Time of the first bit of Engineering Subcom Word C-112.

At this time, the time occurrence of the Roll-Index Pulse can easily be obtained by the following relationship:

$$T_{RIP} = GMT_{C\text{-}112_{Bit\ 1}} - DRATC$$

where: T_{RIP} will be the time of the Roll-Index Pulse, which triggers the count of the Roll Attitude Timer.

(T_{PR}) is obtained by the addition or subtraction of the Roll Pulse/Roll-Index Pulse phase error. Bit 6 of Engineering Subcom Word C-408 determines whether C-408 is added or subtracted. If Bit 6 is one, the Roll Pulse occurred before the Roll-Index Pulse and the Roll Pulse/Roll-Index Pulse phase error must be subtracted from T_{RIP} as follows:

$$GMT_{PR} = T_{RIP} - ARIPPHEC$$

Otherwise, the Roll Pulse/Roll-Index Pulse phase error must be added to T_{RIP} (Bit 6 of C-408 equal to zero) as follows:

$$GMT_{PR} = T_{RIP} + ARIPPHEC$$

This indicates that the Roll-Index Pulse occurred before the Roll Pulse. However, this value on the EDR will be converted to engineering units and the proper sign is already assigned to the value of ARIPPHEC.*

After obtaining the time (GMT) of the occurrence of the Roll Pulse, the angle relationship between any bit of data and the roll reference line, of which bit rate and format must be taken into consideration, can be obtained. The following relationship is an example of how this angle is acquired:

$$\angle \text{Data Bit} = \frac{\left[\left(GMT_F\ (\text{Sec}) + \frac{M_{Bits}}{BR_{(\text{Bits/Sec})}}\right) - GMT_{PR}\ (\text{Sec})\right] \text{X360 deg/rev.}}{\text{ASPNPDC (Sec/Rev)}}$$

where: $\angle$Data Bit - Angle subtended between a specific data bit reference line and the spacecraft roll reference line.

GMT_F - Time of the first bit of the main frame in which the particular data bit occurs.

M_{Bits} - The number of bits between the data bit being examined and the first data bit of the main frame in which it occurs.

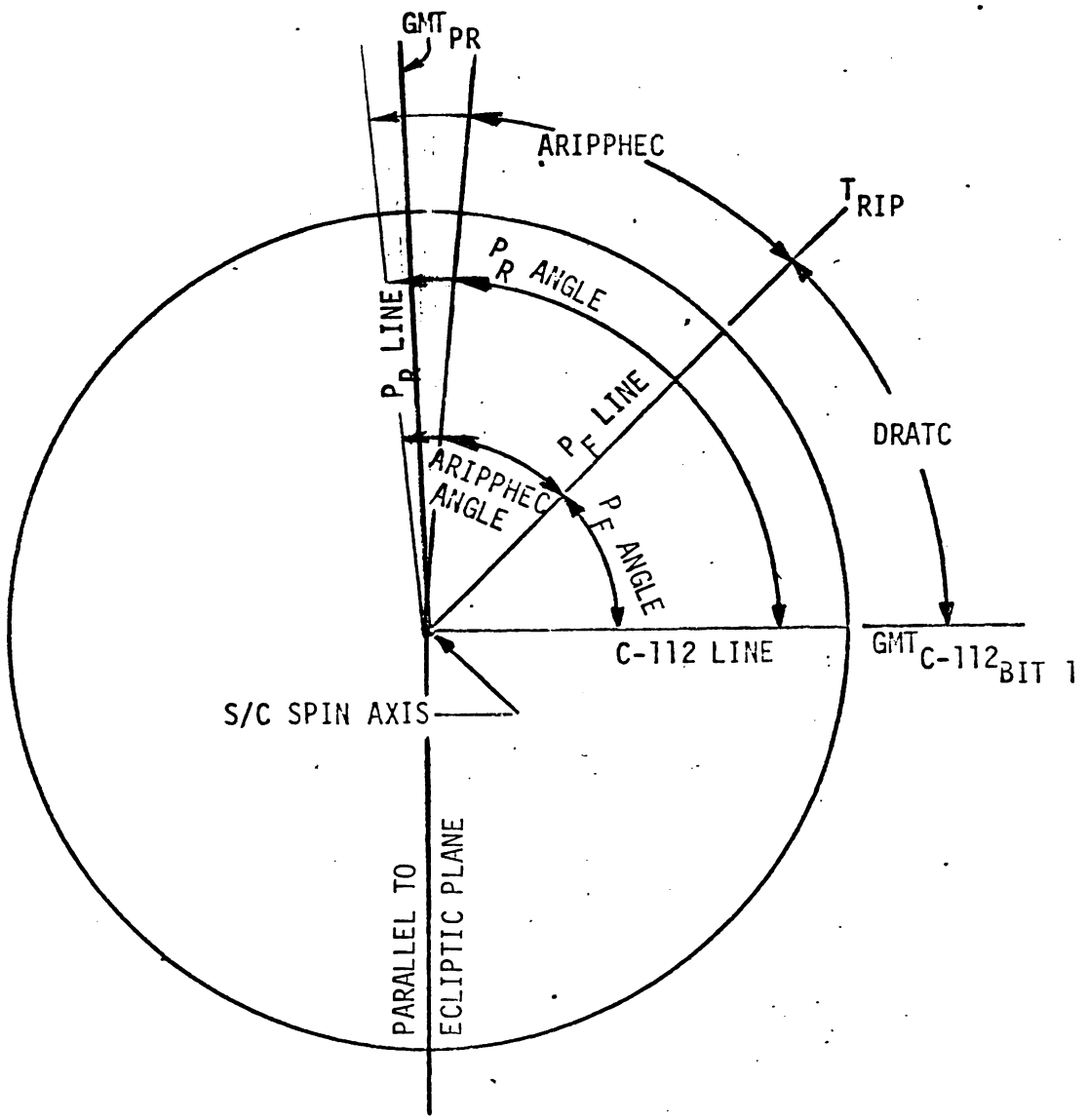
ASPNPDC - Spacecraft spin period (see definition #10).

BR - Telemetry bit rate in which the data was received.

GMT_{PR} - The time (GMT) that the spacecraft +Y axis passed, ascending, through the plane parallel to the ecliptic.

Using the instrument's look reference line, the relationship of any bit of data from the instrument to the spacecraft roll reference line can be determined.

*It should be noted that ARIPPHEC has jitter (sensor and electronic trigger errors) contained within its steady state values. To avoid the addition of this jitter into "$\angle$ Data Bit" or GMT T_{PR}", the least square Estimate (linear) Phase Error should be used in lieu of each ARIPPHEC at the time of occurrence of T_{RIP}. The technique for this utilization is a requirement in the Real-Time Data Processing System and is covered in detail in PC-261.01, Pioneer F/G: On-Line Ground Data System Software Specification for Mission Control at Space Flight Operations Facility in Section 3.5.1.1.4.



REPRODUCED FROM	TITLE S/C ROLL REFERENCE RELATIONSHIP	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.02
		FIG. 6.3
	REV. NO. / DATE 9/1/71	SHEET 1 OF 1

DATA USERS REQUIREMENTS

SPECIFICATION PC-262.03

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

PIONEER F/G PROJECT

PIONEER F/G: DATA USERS REQUIREMENTS

Specification PC-262.03

September 1, 1971

1. SCOPE

This specification defines the requirements of each of the Pioneer F/G data users for the Experimenter Data Records (EDR). The characteristics of each users data processing facility are described as to the computer utilized, the language which is inherent to the system, the bit and byte configuration of the data, as well as the digital tape characteristics in regard to the number of tracks and writing density.

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: Input and Output Tape Requirements

PC-262.02, Pioneer Off-Line Data Processing System Detailed Processing Requirements

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

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

3. REQUIREMENTS

3.1 GENERAL REQUIREMENTS

The general requirements and content for the Experimenter Data Record as to the organization of the Master Header File, the Command Data File, the Spacecraft Attitude and Pointing File, and the Science Data File have been covered in PC-262.01, Pioneer F/G: Input and Output Tape Requirements in section

3.2 SPECIFIC DATA REQUIREMENTS

The information given below is summarized in Figure 3.2.

3.2.1 Helium Vector Magnetometer (HVM). The Jet Propulsion Laboratories in Pasadena, California is the organization having the responsibility for this instrument and the analysis of the data from it. Dr. Edward Smith is the Principal Investigator and the EDR's for this experiment shall be sent to:

Mr. Elliot Goldyn
Building 183, Room 408
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103

The EDR processing will be done on the JPL Univac 1108 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under the EXEC-8 system. The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the file on the tape with a double (EOF) signifying tape end. A three-quarter (3/4) inch intra-record gap shall separate each record from the next. This bit, byte, word break-out, mode, for each file on the EDR tape are given in Figure 3.2.1.

3.2.2 Plasma Analyzer Instrument. Ames Research Center has the responsibility for this instrument and the analysis of the data from it. Dr. John Wolfe is the Principal Investigator and the EDR's for this experiment shall be sent to:

Dr. John Wolfe
NASA Building N-245-2
Ames Research Center
Moffett Field, California 94035

The EDR processing will be done on the ARC IBM 360/67 computer. The EDR tape shall be written on seven (7) track tape at 556 bpi density. The programs on the machine will operate under the Time Share System (TSS). The tape shall utilize the standard reflector tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double EOF signifying tape end.

A three-quarter (3/4) inch intra-record gap shall separate each record from the next. The bit, byte, word break-out, mode and format for each file on the EDR tape are given in Figure 3.2.2.

3.2.3 Charged Particle Instrument. The University of Chicago has the responsibility for this instrument and the analysis of the data from it. Dr. John Simpson is the Principal Investigator and the EDR's shall be sent to:

Data Tape Librarian
Laboratory for Astrophysics and Space Research
Enrico Fermi Institute
933 East 56th Street
University of Chicago
Chicago, Illinois 60637

The EDR processing will be done on an IBM 360/75 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under the IBM 360/75 OS and PL-1. The tapes shall utilize the standard reflection tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double end-of-file signifying tape end. The last three bytes of each record shall contain all 1's and a three-quarter (3/4) inch gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape are given in Figure 3.2.3.

3.2.4 Geiger Tube Telescope. The University of Iowa has the responsibility for this instrument and the analysis of the data from it. Dr. James Van Allen is the Principal Investigator and the EDR's shall be sent to:

Data Analysis Section
Physics Building
University of Iowa
Iowa City, Iowa 52240

The EDR processing will be done on a Univac 418 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under their Real Time Executive program. The tapes shall utilize the standard reflection tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double end-of-file indicator signifying tape end. A three-quarter (3/4) inch gap shall separate each record from the next. The bit, byte, word break-out, mode, and formats for each file on the EDR tape are given in Figure 3.2.4.

3.2.5 Cosmic Ray Telescope. The Goddard Space Flight Center has the responsibility for this instrument and the analysis of the data from it. Dr. F. B. McDonald is the Principal Investigator and the EDR's shall be sent to:

Dr. F. B. McDonald
Code 660
Goddard Space Flight Center
Greenbelt, Md. 20771

The EDR processing will be done on an IBM 360/75 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under IBM Standard OS. The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double end-of-file indicator signifying tape end. A three-quarter (3/4) inch inter-record gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape are given in Figure 3.2.5.

3.2.6 Trapped Radiation Detector. The University of California at San Diego has the responsibility for this instrument and the analysis of the data from it. Dr. R. W. Fillius is the Principal Investigator and the EDR's shall be sent to:

Dr. R. W. Fillius
Physics Department
University of California at San Diego
La Jolla, California 92037

The EDR processing will be done on a Burroughs 6500 computer. The EDR tape shall be written on a nine (9) track tape at 556 bpi density. The programs on the machine will operate under Burroughs Time Share System (TSS). The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double end-of-file indicator signifying tape end. A three-quarter (3/4) inch inter-record gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape are given in Figure 3.2.6.

3.2.7 Ultraviolet Photometer. The University of Southern California has the responsibility for this instrument and the analysis of the data from it. Dr. D. L. Judge is the Principal Investigator and the EDR's shall be sent to:

Professor D. L. Judge
Stauffer Hall Room 271
Department of Physics
University of Southern California
Los Angeles, California 90007

The EDR processing will be done on an IBM 370/155 computer. The EDR tape shall be written on a nine (9) track tape at 800 bpi density. The programs on the machine will operate under the standard IBM OS. The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double end-of-file indicator signifying tape end. A three-quarter (3/4) inch inter-record gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape are given in Figure 3.2.7.

3.2.8 Imaging Photo-Polarimeter. The University of Arizona has the responsibility for this instrument and the analysis of the data from it. Dr. T. Gehrels is the Principal Investigator and the EDR's shall be sent to:

Mrs. G. J. Best
Pioneer F/G Program
Optical Sciences Center
University of Arizona
Tucson, Arizona 85721

The EDR processing will be done on a CDC 6400 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under Control Data OS . The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. A single end-of-file (EOF) indicator shall separate the files on the tape with a double end-of-file indicator signifying tape end. A three-quarter (3/4) inch inter-record gap shall separate each record from the next. The bit, byte, word bread-out, mode, and formats for each file on the EDR tape are given in Figure 3.2.8.

3.2.9 Zodiacal Light Instrument. The Dudley Observatory has the responsibility for this instrument and the analysis of the data from it. It is, however, integrated as part of the University of Arizona instrument. Dr. J. L. Weinberg is the Principal Investigator and the EDR's shall be sent to:

Dr. Martha Hanner
Dudley Observatory
100 Fuller Road
Albany, New York 12205

The EDR processing will be done on a Univac 1108 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under EXEC-8 and FORTRAN V. The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. An octal 17 indicator shall separate the files on the tape with a double end-of-file indicator signifying tape end. A three-quarter (3/4) inch inter-record gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape are given in Figure 3.2.9.

3.2.10 Infrared Radiometer. T.B.S.

3.2.11 Asteroid/Meteoroid Detector. The General Electric Corporation has the responsibility for this instrument and the analysis of the data from it. Dr. R. K. Soberman is the Principal Investigator and the EDR's shall be sent to:

Dr. R. K. Soberman
Room M-9505
Space Technology Center
P. O. Box 8555
Philadelphia, Pa. 19101

The EDR processing will be done on a G.E. 635 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under General Comprehensive Operating Supervisor (GECOS III Version). The tapes shall utilize the standard reflector tabs for beginning and end of tape indicators. A word count indicator at the head of each record shall indicate the number of words in the record. A single end-of-file (EOF) indicator with octal 17 shall signify tape end. A three-quarter (3/4) inch inter-record gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape are given in Figure 3.2.11.

3.2.12 Meteoroid Detector. Langley Research Center has the responsibility for this instrument and the analysis of the data from it. Dr. W. H. Kinard is the Principal Investigator and the EDR's shall be sent to:

Mr. J. M. Alvarez
Mail Stop 214
Langley Research Center
Hampton, Virginia 23365

The EDR processing will be done on a CDC 6600 computer. The EDR tape shall be written on a seven (7) track tape at 556 bpi density. The programs on the machine will operate under CDC's SCOPE 3.1. The tapes shall utilize the standard reflector tabs for beginning and end of file. A three-quarter (3/4) inch intra-record gap shall separate each record from the next. The bit, byte, word break-out, mode, and format for each file on the EDR tape is given in Figure 3.2.12.

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.

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.

REPRODUCED FROM

TITLE
SUMMARY OF EXPERIMENTER REQUIREMENTS

REV. NO. 1

DATE 12-20-71

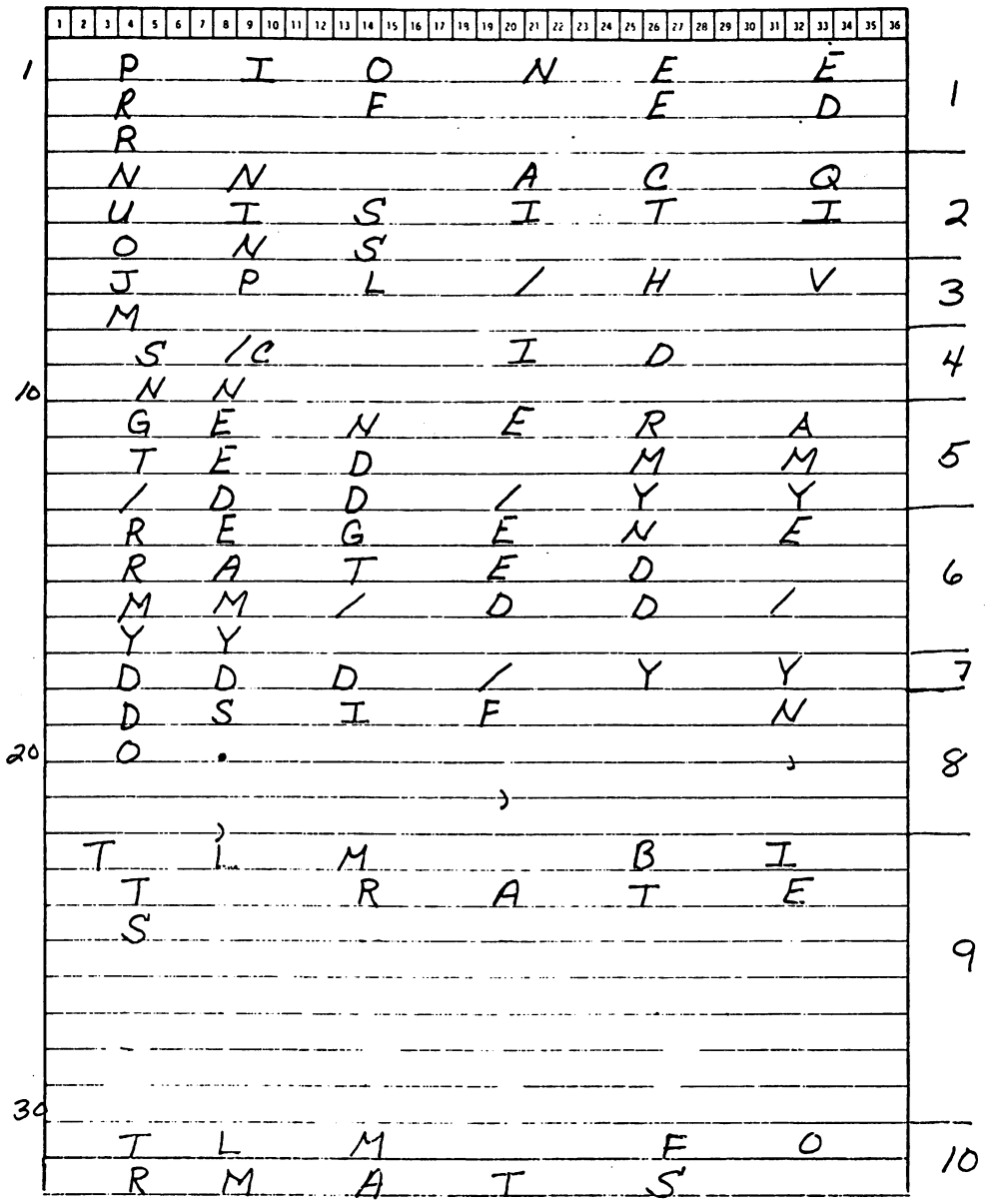
PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.03

FIG. 3.2

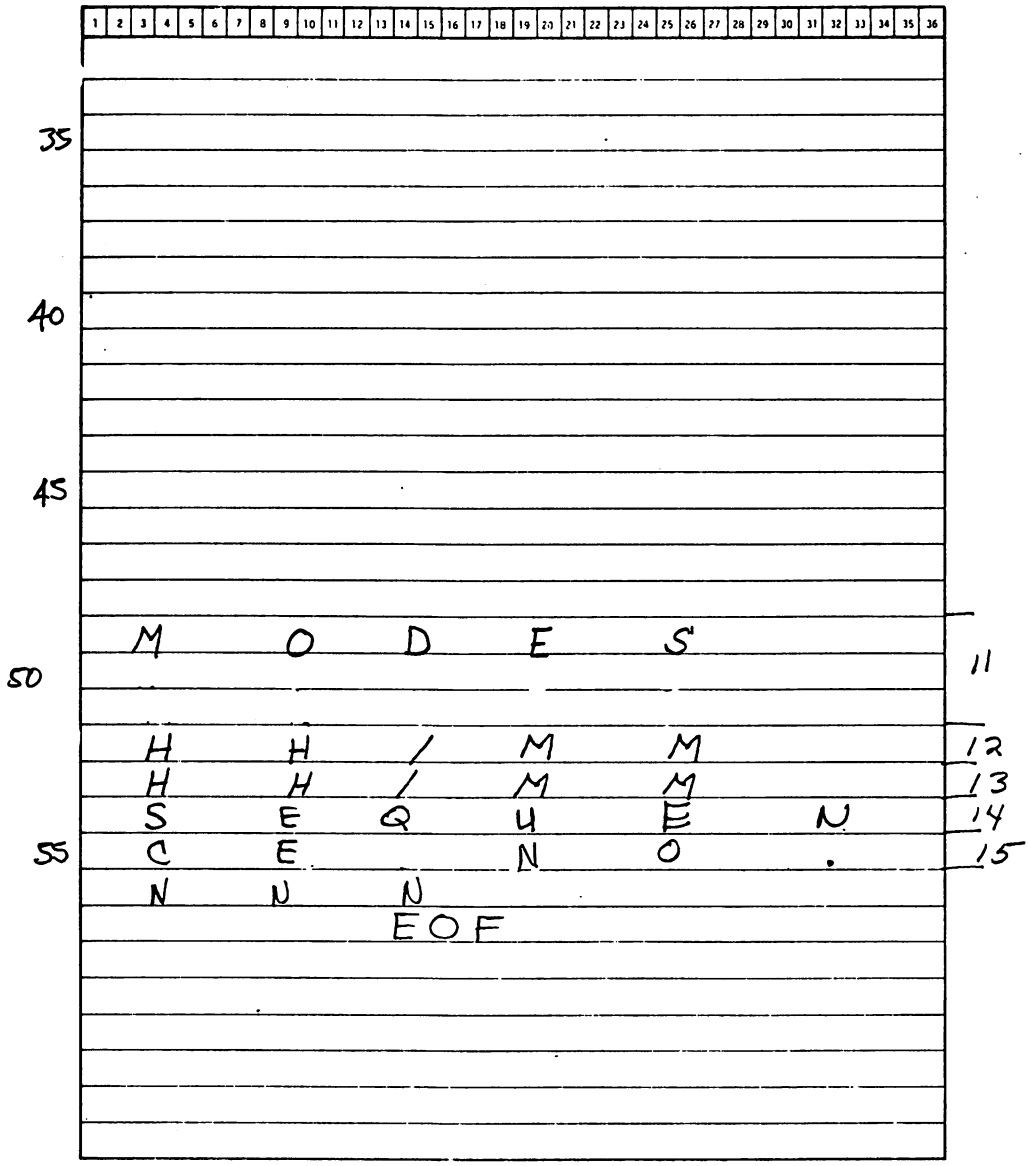
SHEET 1 OF 1

	EXPERIMENT	COMPUTER	OPERATING SYSTEM	NO. OF TRACKS (DIGITAL TAPE)	TAPE DENSITY (bpi)
1.	JPL/HVM	UNIVAC 1108	EXEC - 8	7	556
2.	ARC/PA	IBM 360/67	TSS	7	556
3.	UC/CPI	XDS - 930	METASYMBOL & FORTRAN II	7	556
4.	UI/GTT	UNIVAC 418	R/T EXECUTIVE	7	556
5.	GSFC/CRT	IBM 360-75	IBM 360/75 OS	9	800
6.	UCSD/TRD	BURROUGHS 6500	BURROUGHS TSS	7	556
7.	USC/UV	IBM 370/155	IBM 370/155 OS	9	800
8.	UA/IPP	CDC 6400	CONTROL DATA OS	7	556
9.	UA/IPP (Mode 2;Dudley)	UNIVAC 1108	EXEC - 8	7	556
10.	CIT/IR	IBM 370/155	IBM 370/155 OS	7	556
11.	GE/AMD	GE 635	GECOS III	7	556
12.	LaRC/MD	CDC 6600	SCOPE 3.1	7	556



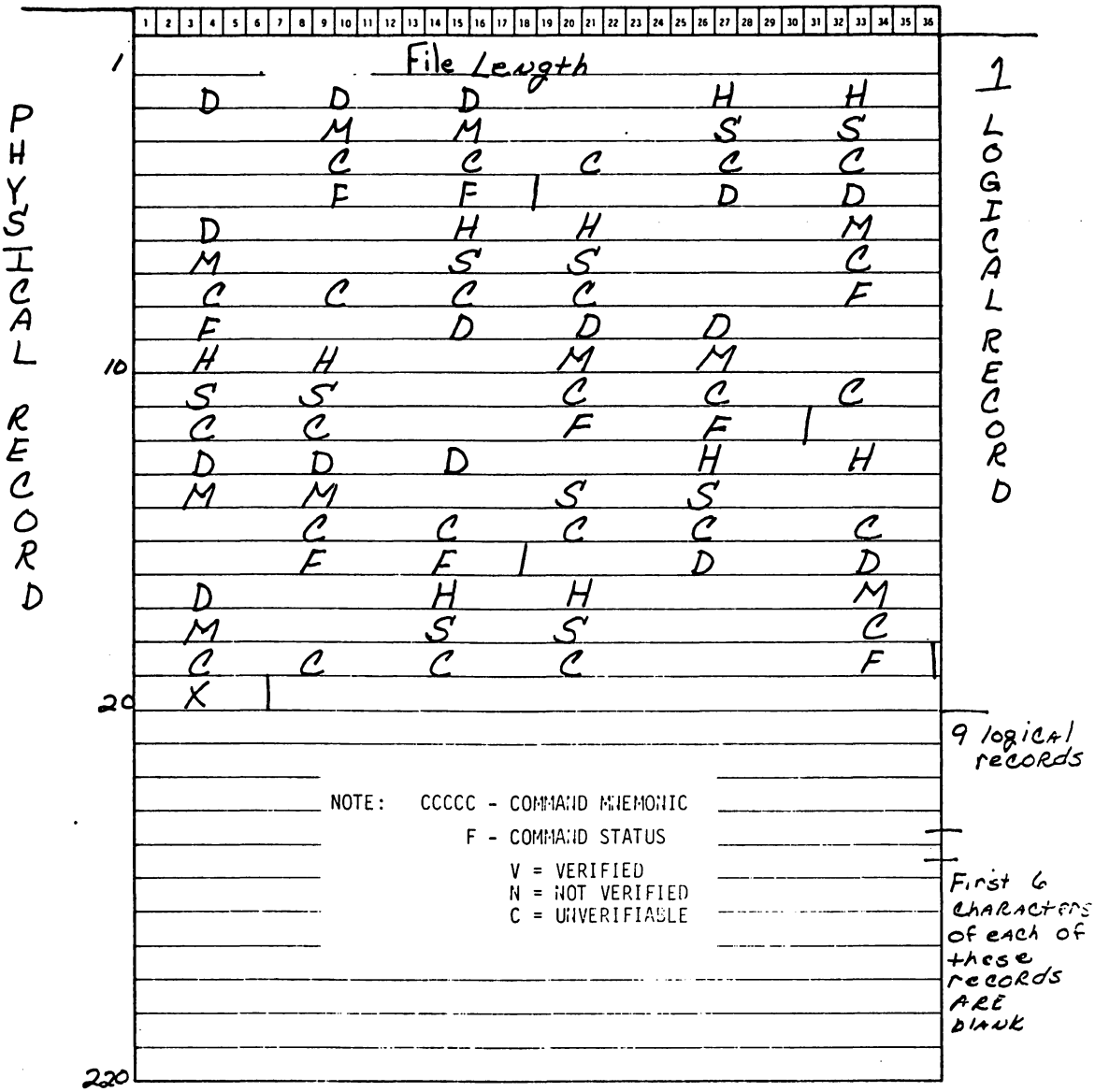
JPL/HVM FILE 1 LOGISTICS
TYPE - BCD
LOGICAL RECORD LENGTH - 56 WORDS
PHYSICAL RECORD LENGTH - 56 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: JPL/HVM FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.1	
	REV. NO. / DATE 9/1/71	SHEET 1 OF 6	



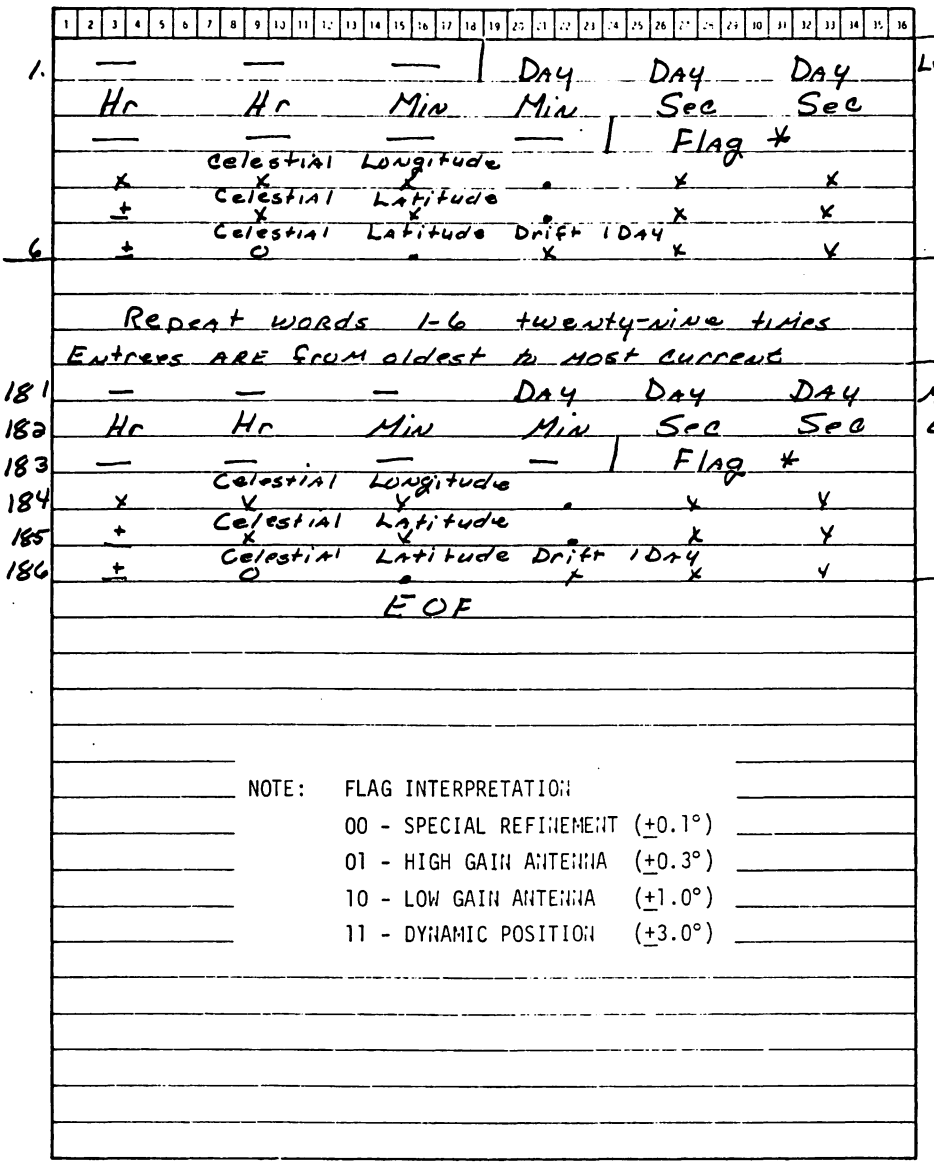
JPL/HVM FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: JPL/HVM FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.1	
	REV. NO. / DATE 9/1/71	SHEET 2 OF 6	



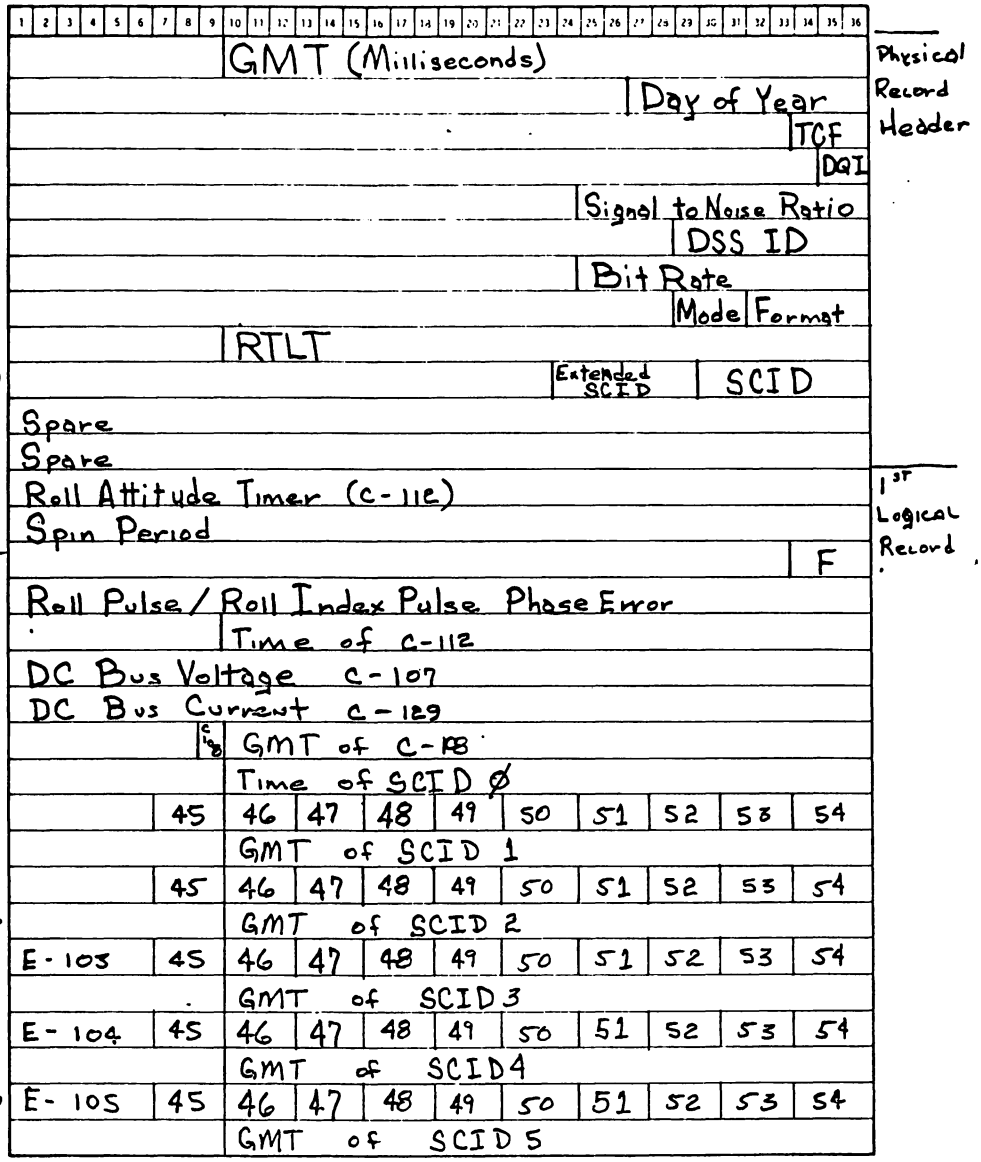
JPL/HVM FILE 2 COMMAND
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 220 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: JPL/HVM FILE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.1
	REV. NO. / DATE 9/1/71	SHEET 3 OF 6



JPL/HVM FILE 3 ATTITUDE DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 186 WORDS
PHYSICAL RECORD LENGTH - 186 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	JPL/HVM FILE 3 S/C ATTITUDE DATA	DOC. NO. PC-262.03
		FIG. 3.2.1
	REV. NO. DATE 9/1/71	SHEET 4 OF 6



JPL/HVM FILE 4 EXPERIMENT DATA
TYPE - BINARY
LOGICAL RECORD LENGTH - 532 WORDS
PHYSICAL RECORD LENGTH - 3736 WORDS
FILE SIZE - VARIABLE

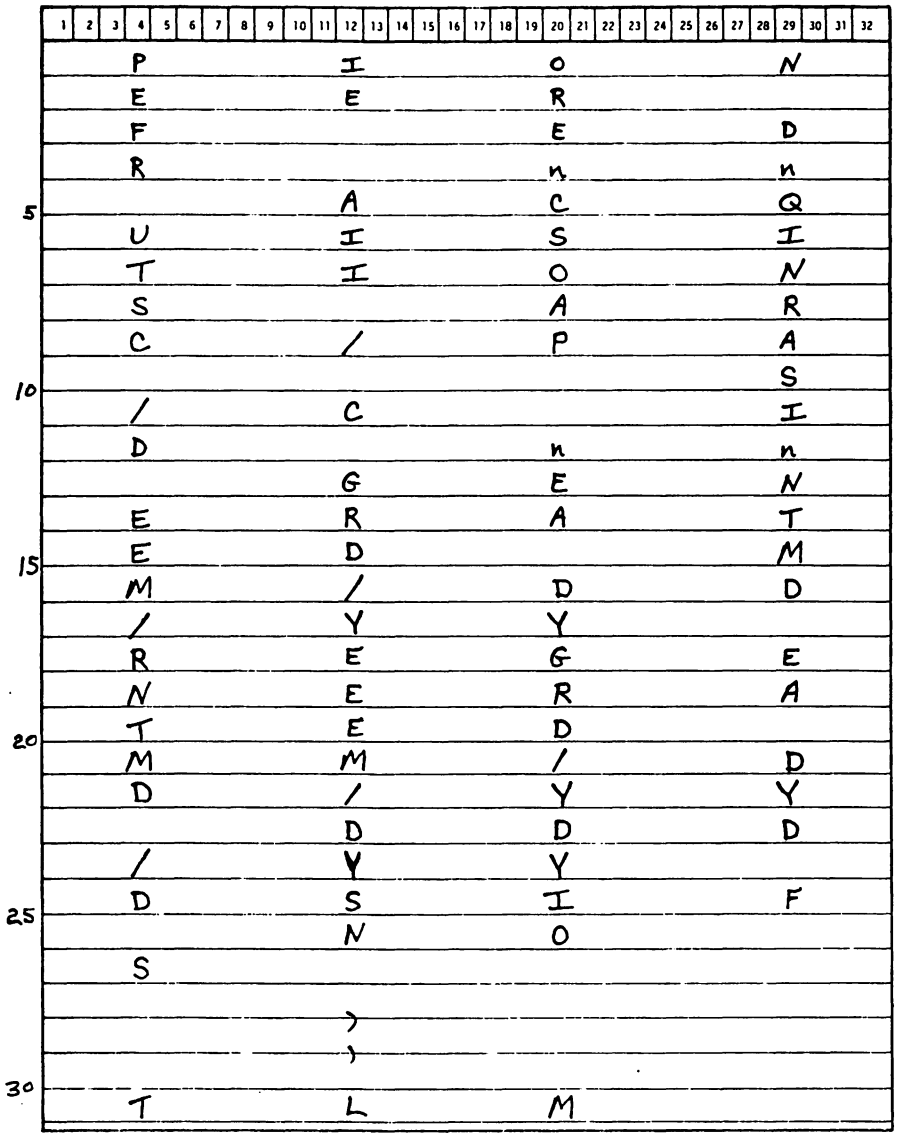
REPRODUCED FROM	TITLE: JPL/HVM FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.1
	REV. NO. / DATE 9/1/71	SHEET 5 OF 6

	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
32								45		46			47			48			49			50			51			52			53			54		
										GMT of SCID 6																										
								45		46			47			48			49			50			51			52			53			54		
35	Repeat Words 33, 34 for Words 35-86, SCID 7-32																																			
⋮																																				
87										GMT of SCID 33																										
	E-202							45		46			47			48			49			50			51			52			53			54		
										GMT of SCID 34																										
90	E-203							45		46			47			48			49			50			51			52			53			54		
										GMT of SCID 35																										
	E-204							45		46			47			48			49			50			51			52			53			54		
										GMT of SCID 36																										
	E-205							45		46			47			48			49			50			51			52			53			54		
95										GMT of SCID 37																										
								45		46			47			48			49			50			51			52			53			54		
97	Repeat words 95, 96 for Words 97-146, SCID 38-62																																			
⋮																																				
147										GMT of SCID 63																										
								45		46			47			48			49			50			51			52			53			54		
149	Repeat Words 21-146 for Words 149-276 SCID 64-126																																			
⋮																																				
277										GMT of SCID 127																										
278								45		46			47			48			49			50			51			52			53			54		
⋮	Repeat Words 13-278 for words 279-544, D																																			
544	There are 3 Logical Records. Continued After 1ST Logical Record.																																			
⋮																																				
3736																																				
	EOR																																			

END of 1ST LOGICAL Records

JPL/HVM FILE 4 EXPERIMENT DATA (CONTD)

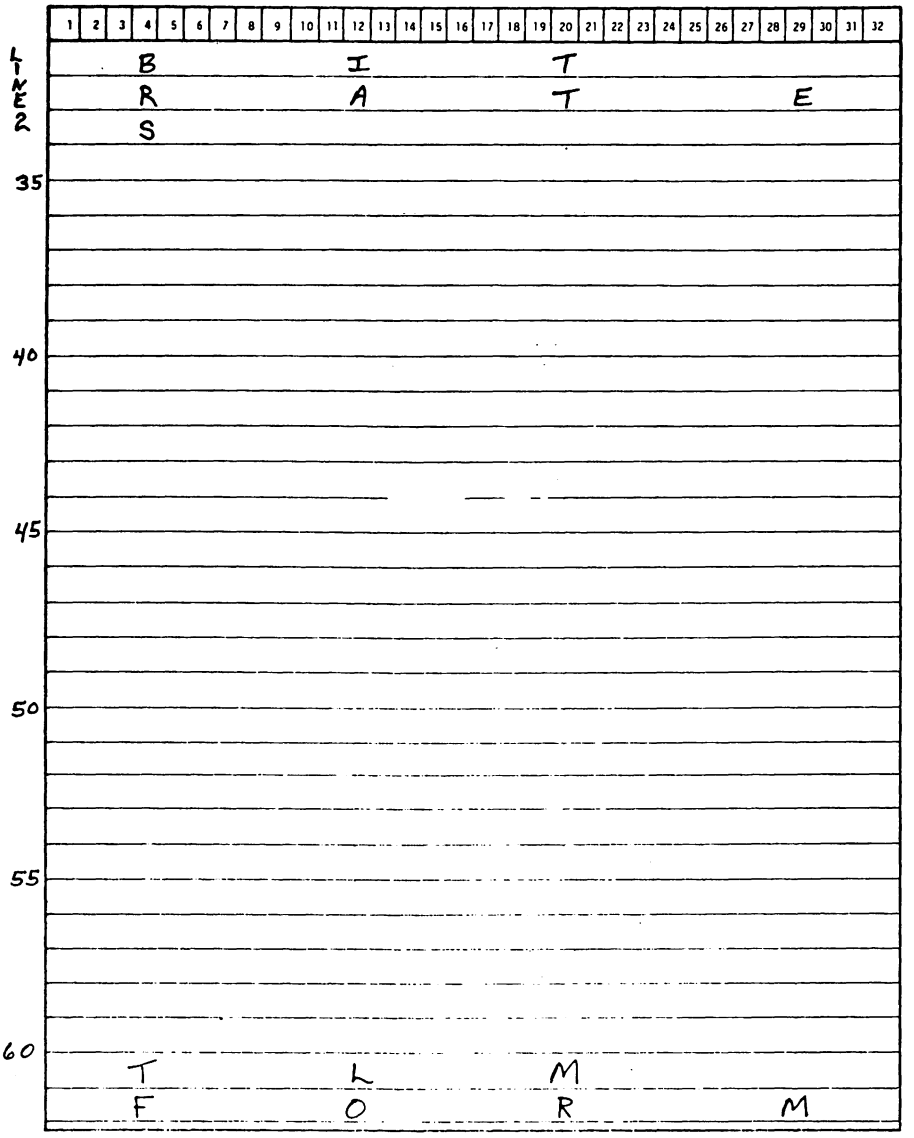
REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	JPL/HVM FILE 4 EXPERIMENT DATA	DOC. NO. PC-262.03
		FIG. 3.2.1
	REV. NO. DATE 9/1/71	SHEET 6 OF 6



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
		P									I								o									N		
		E									E								R											
		F																	E									D		
		R																	n									n		
											A								C									Q		
		U									I								S									I		
		T									I								O									N		
		S																	A									R		
		C									/								P									A		
																													S		
		/									C																	I		
		D																	n									n		
											G								E									N		
		E									R								A									T		
		E									D																	M		
		M									/								D									D		
		/									Y								Y											
		R									E								G									E		
		N									E								R									A		
		T									E								D											
		M									M								/									D		
		D									/								Y									Y		
											D								D									D		
		/									Y								Y											
		D									S								I									F		
											N								O											
		S																												
											)																			
											)																			
		T									L								M											

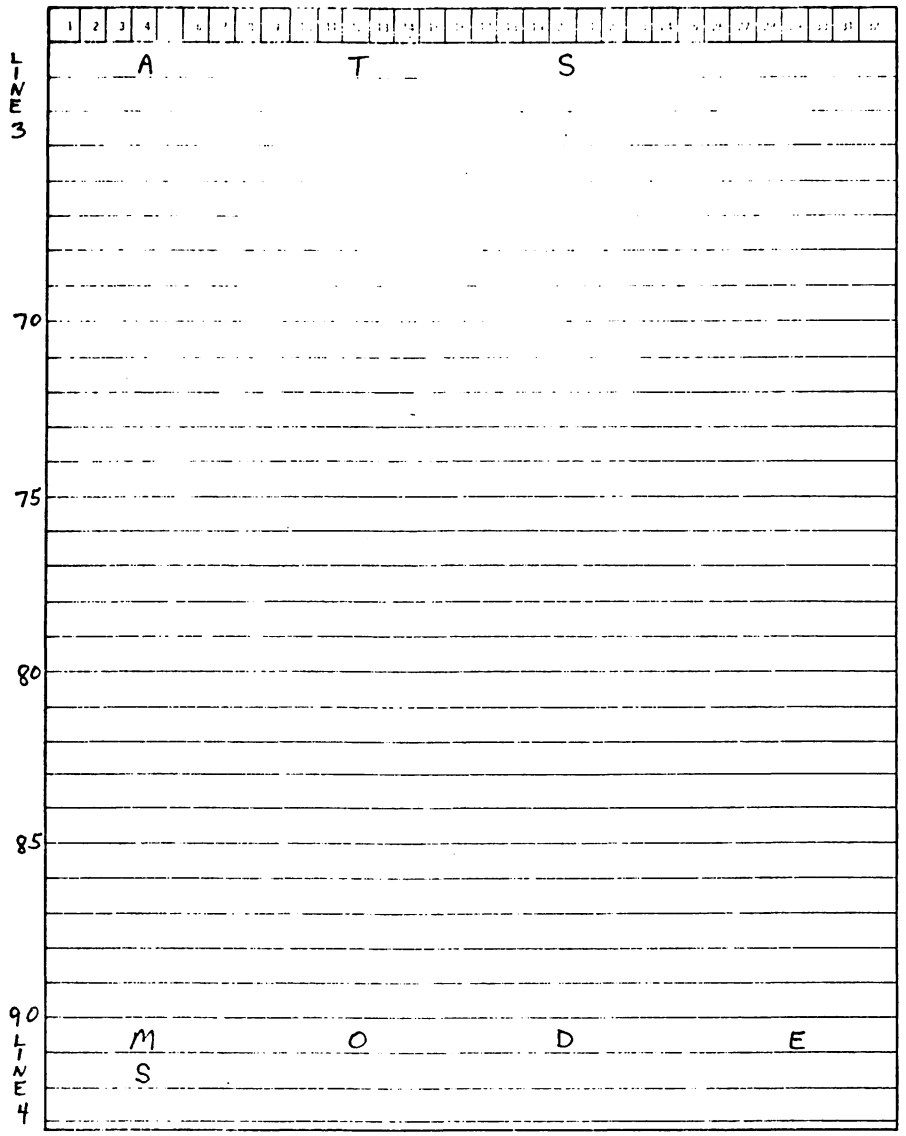
ARC/PA FILE 1 LOGISTICS
TYPE - EBCDIC
LOGICAL RECORD SIZE - 30 WORDS
PHYSICAL RECORD SIZE - 120 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE ARC/PA FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. / DATE 9/1/71	SHEET 1 OF 10



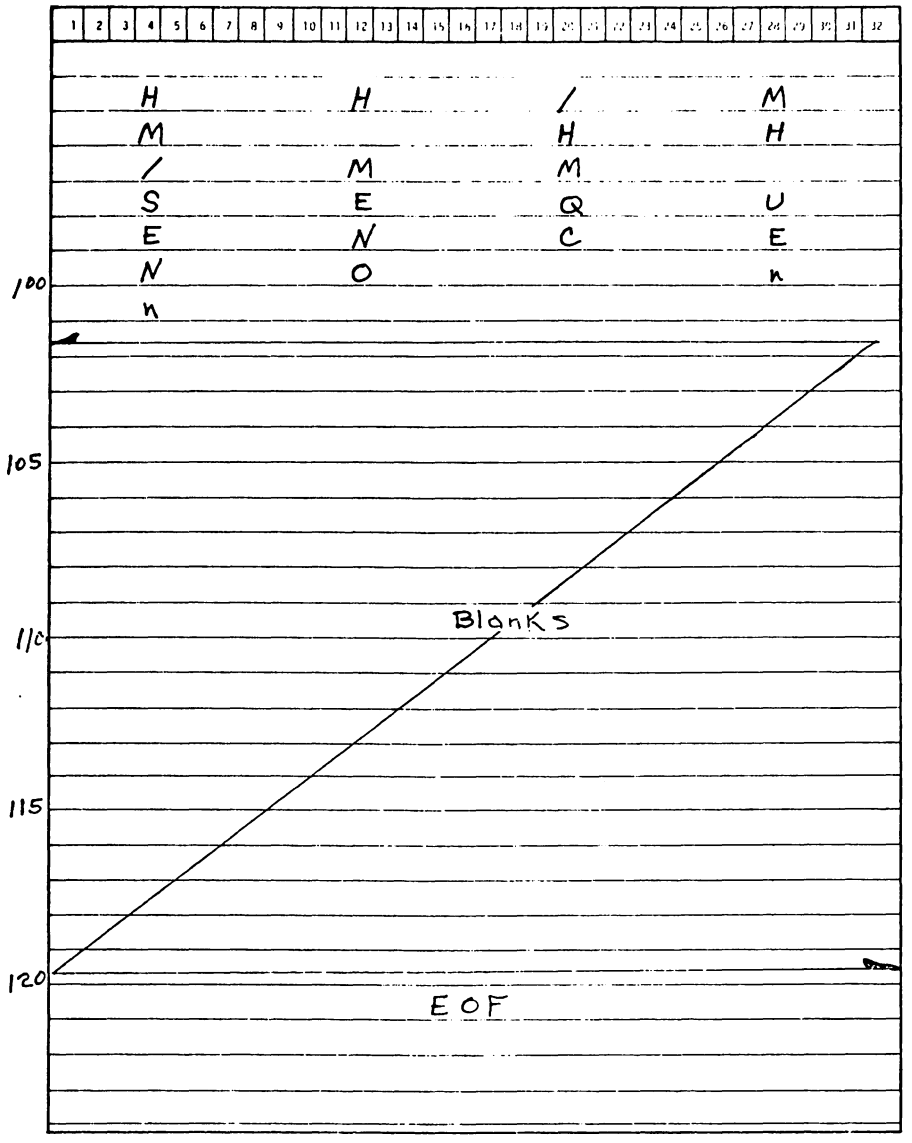
ARC/PA FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: ARC/PA FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. / DATE 9/1/71	SHEET 2 OF 10



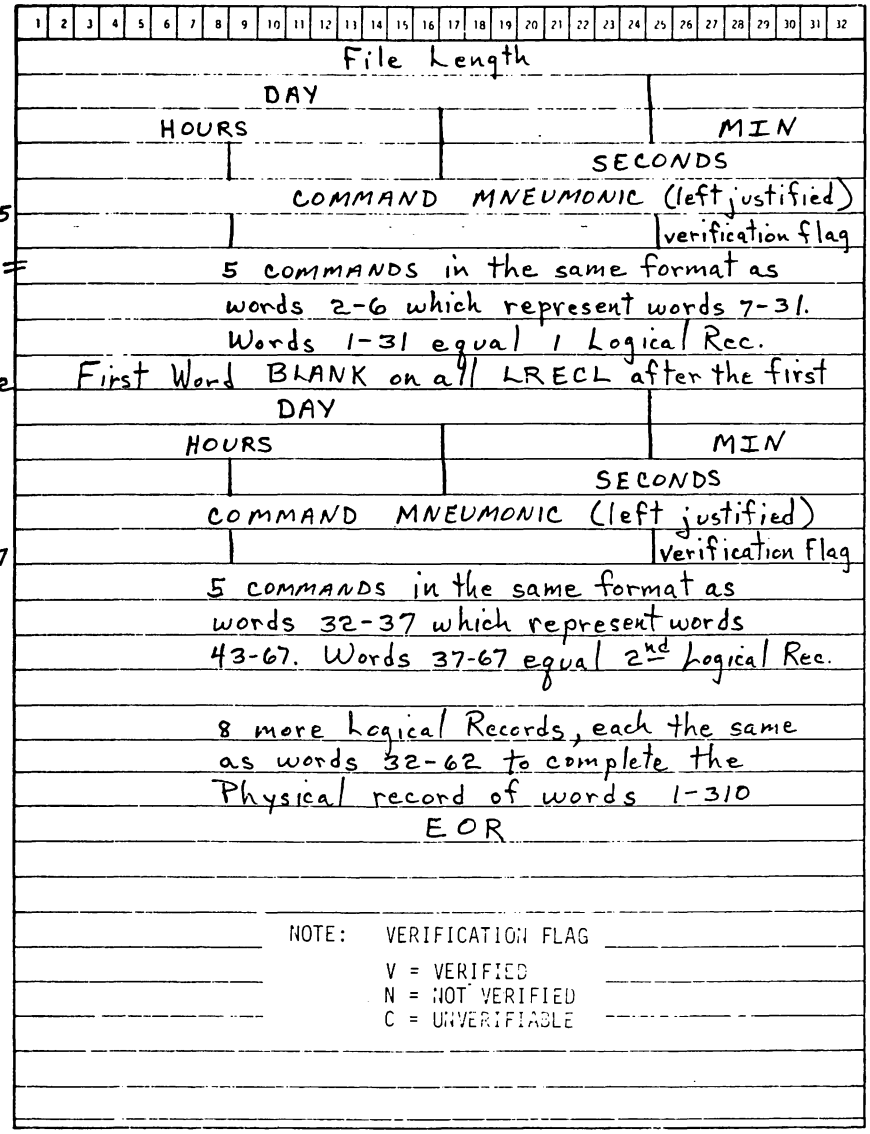
ARC/PA FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: ARC/PA FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. / DATE 9/1/71	SHEET 3 OF 10



ARC/PA FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE ARC/PA FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. DATE 9/1/71	SHEET 4 OF 10



ARC/PA FILE 2 COMMAND
TYPE - EBCDIC
LOGICAL RECORD SIZE - 31 WORDS
PHYSICAL RECORD SIZE - 310 WORDS
FILE SIZE - VARIABLE

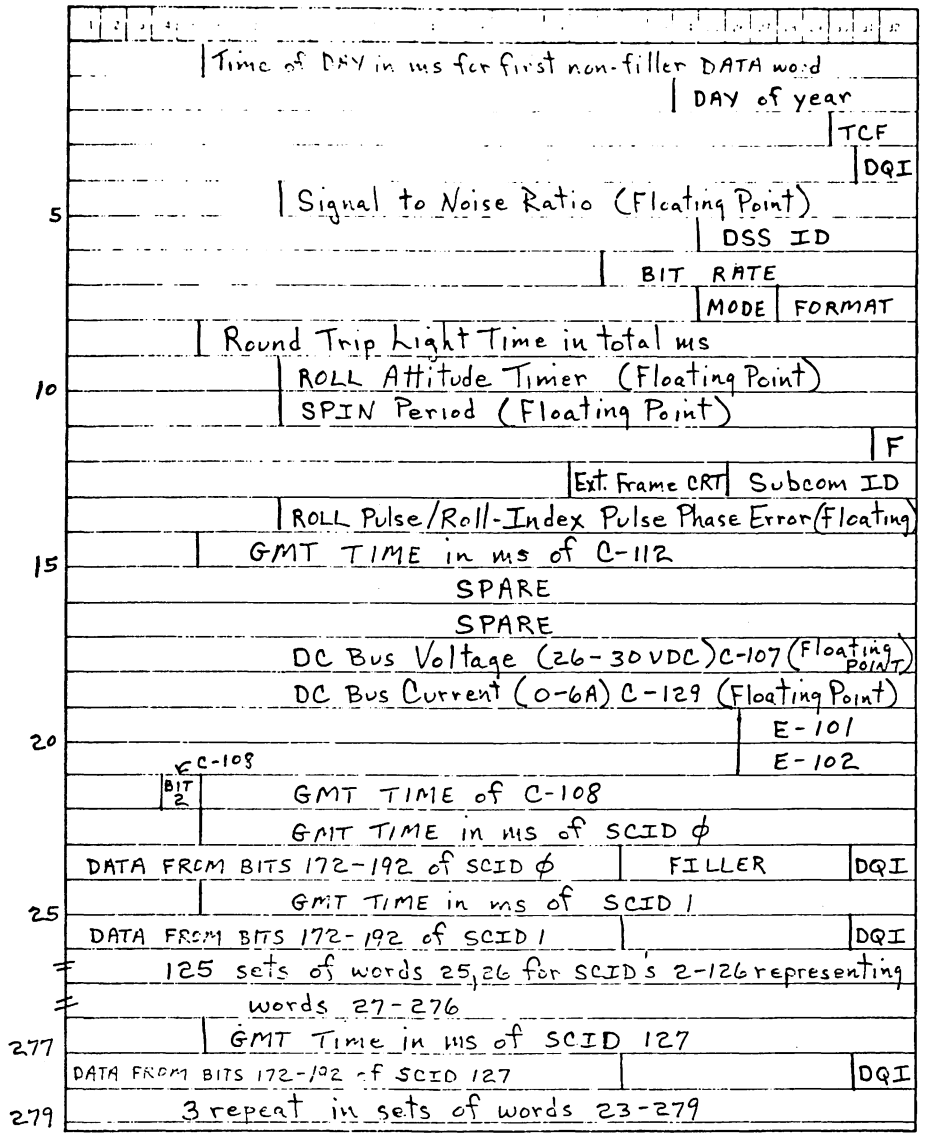
REPRODUCED FROM	TITLE: ARC/PA FILE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. / DATE 9/1/71	SHEET 5 OF 10

	FLAG *	GMT TIME OF DAY TOTAL ms
		Celestial Latitude XXX.XX
		Celestial Longitude ± XX.XX
4		Celestial Latitude drift deg/day ± 0.XXX
=	Repeat word 1-4 29 more times to complete	
=	the previous 30 entries for words 5-120	
121		GMT TIME for the most recent entry
		Celestial Latitude
		Celestial Longitude
124		Celestial Latitude drift deg/day
	EOF	

NOTE: FLAG INTERPRETATION

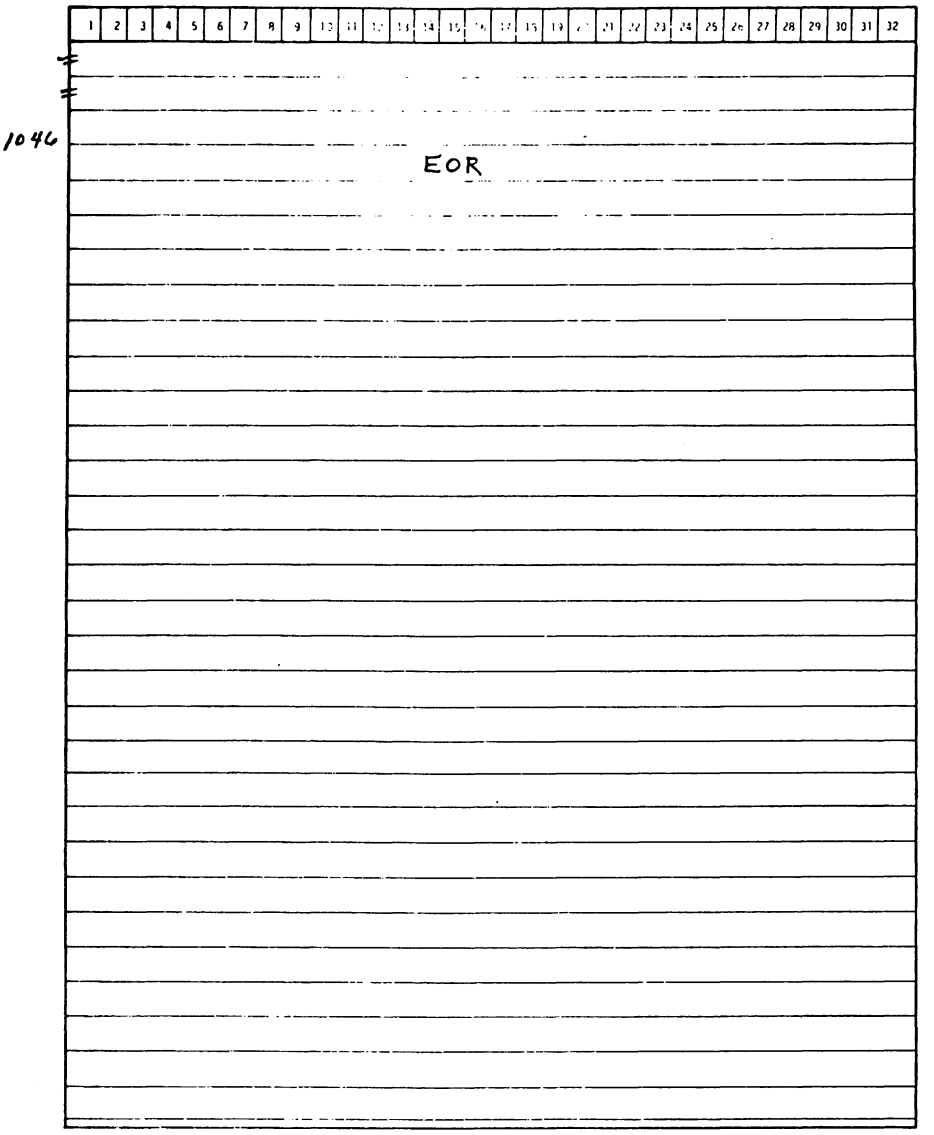
00 - SPECIAL REFINEMENT (±0.1°)
01 - HIGH GAIN ANTENNA (±0.3°)
10 - LOW GAIN ANTENNA (±1.0°)
11 - DYNAMIC POSITION (±3.0°)

ARC/PA FILE 3 ATTITUDE DATA
TYPE - BINARY
LOGICAL RECORD SIZE - 4 WORDS
PHYSICAL RECORD SIZE - 124 WORDS
FILE SIZE - 1 PHYSICAL RECORD



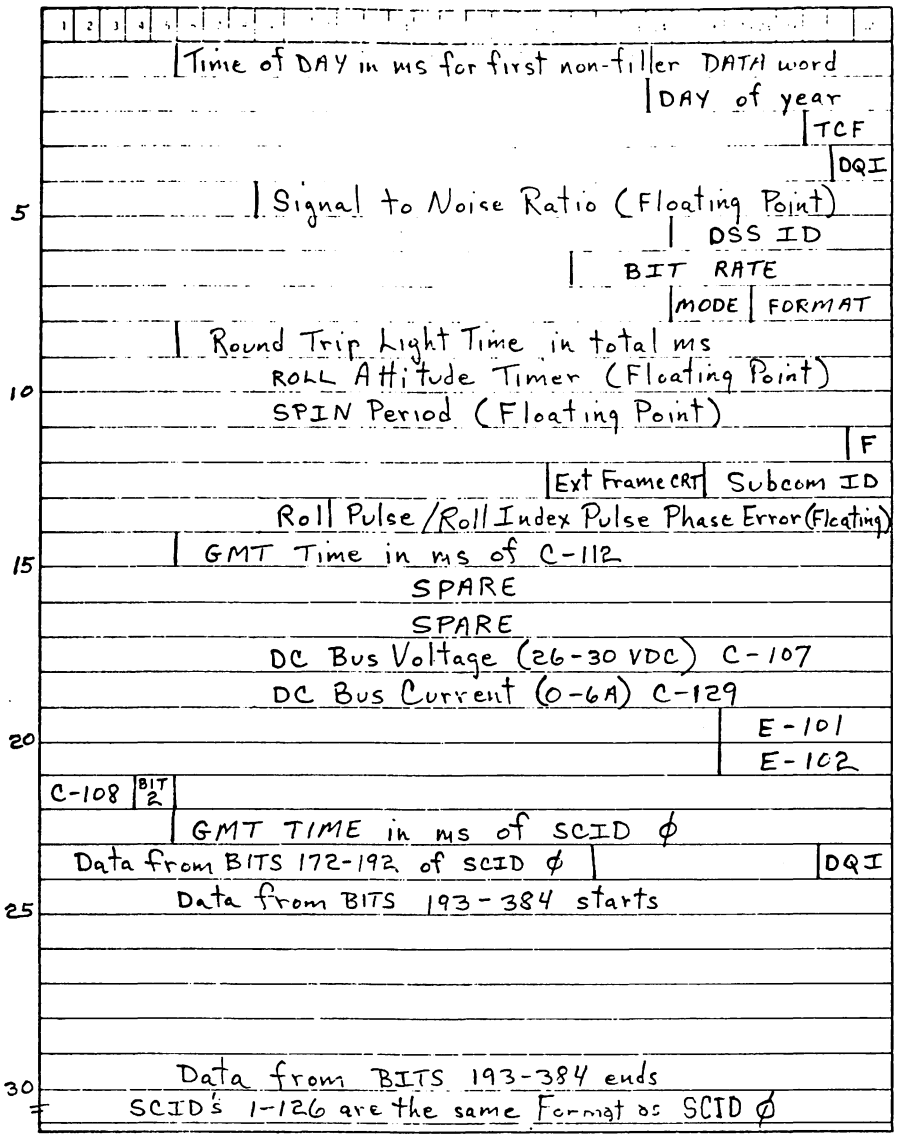
ARC/PA FILE 4 EXPERIMENT DATA
TYPE - BINARY FORMAT A OR B
LOGICAL RECORD SIZE - 1046 WORDS
PHYSICAL RECORD SIZE - 1046 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: ARC/PA FILE 4 EXPERIMENT DATA FORMAT A OR B	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. / DATE 9/1/71	SHEET 7 OF 10



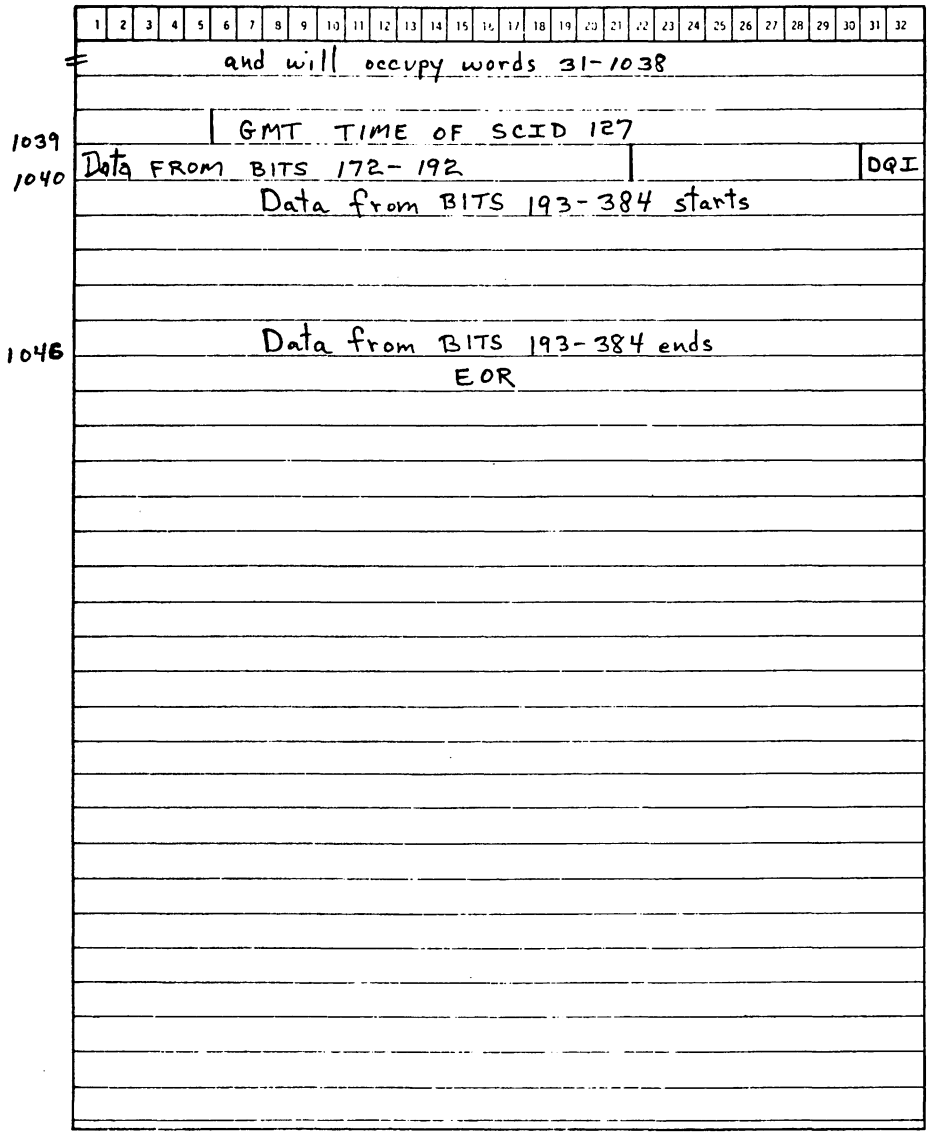
ARC/PA FILE 4 EXPERIMENT DATA
FORMAT A OR B (CONTD)

REPRODUCED FROM	TITLE: ARC/PA FILE 4 EXPERIMENT DATA FORMAT A OR B	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. / DATE 9/1/71	SHEET 8 OF 10



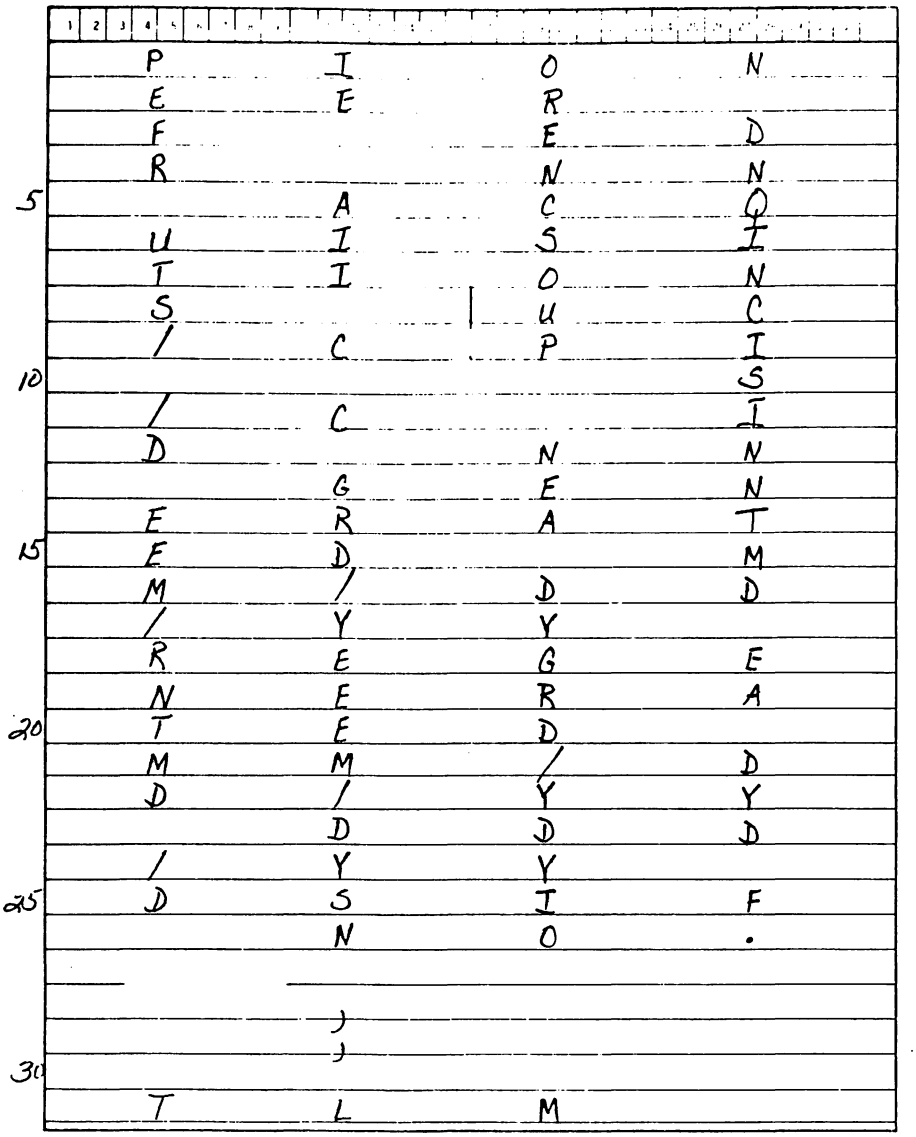
ARC/PA FILE 4 EXPERIMENT DATA
TYPE - BINARY FORMAT A/D3 OR B/D3
LOGICAL RECORD SIZE - 1046 WORDS
PHYSICAL RECORD SIZE - 1046 WORDS
FILE SIZE -

REPRODUCED FROM	TITLE: ARC/PA FILE 4 EXPERIMENT DATA FORMAT A/D3 OR B/D3	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. DATE 9/1/71	SHEET 9 OF 10



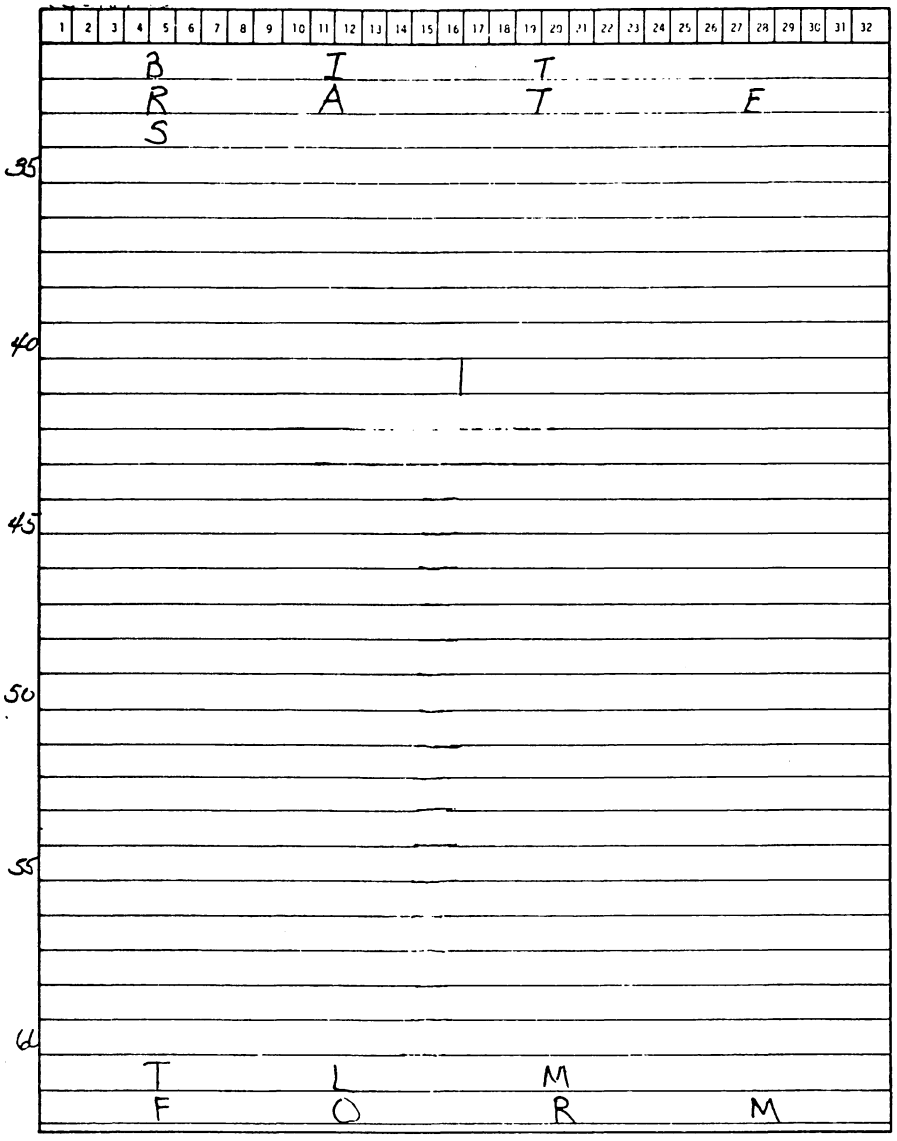
ARC/PA FILE 4 EXPERIMENT DATA
FORMAT A/D3 OR B/D3 (CONTD)

REPRODUCED FROM	TITLE ARC/PA FILE 4 EXPERIMENT DATA FORMAT A/D3 OR B/D3	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.2
	REV. NO. DATE 9/1/71	SHEET 10 OF 10



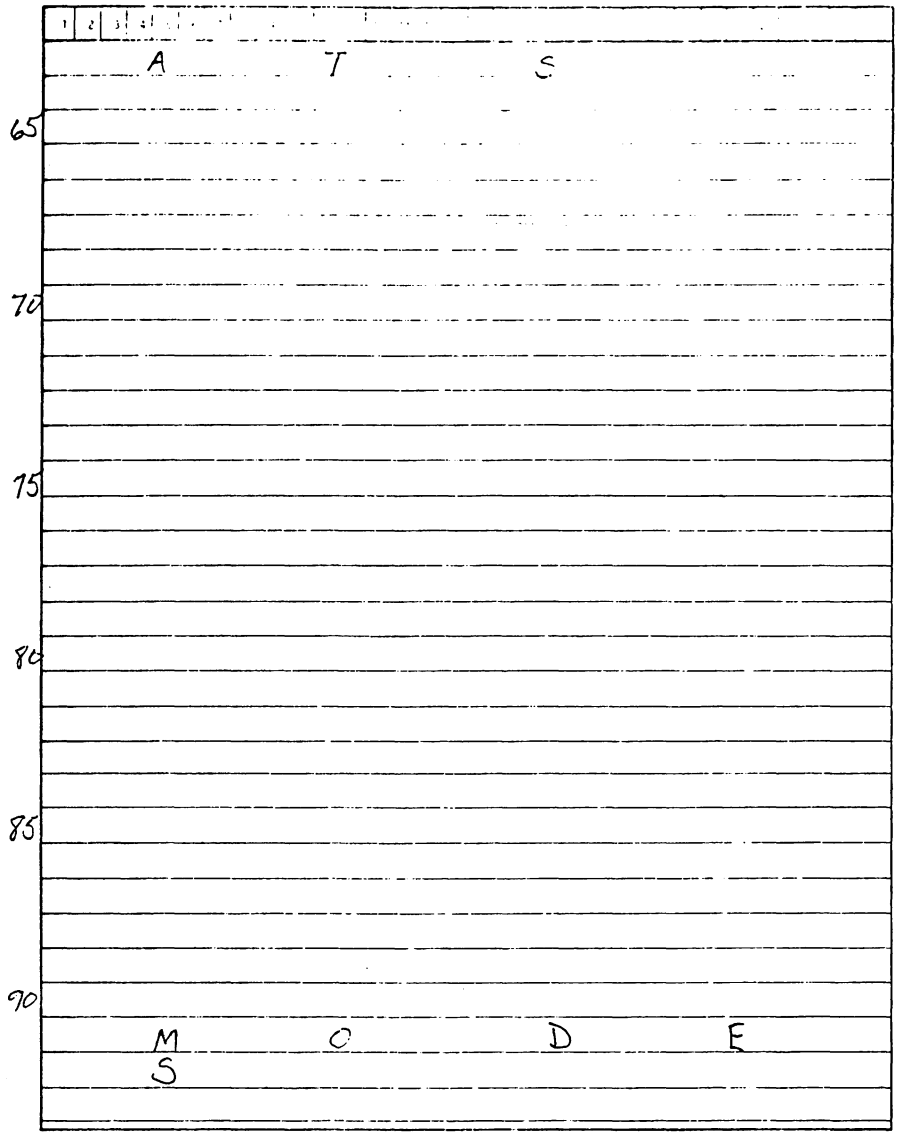
UC/CPI FILE 1 LOGISTICS
TYPE - EBCDIC
LOGICAL RECORD LENGTH - 30 WORDS
PHYSICAL RECORD LENGTH - 120 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: UC/CPI FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 1 OF 9

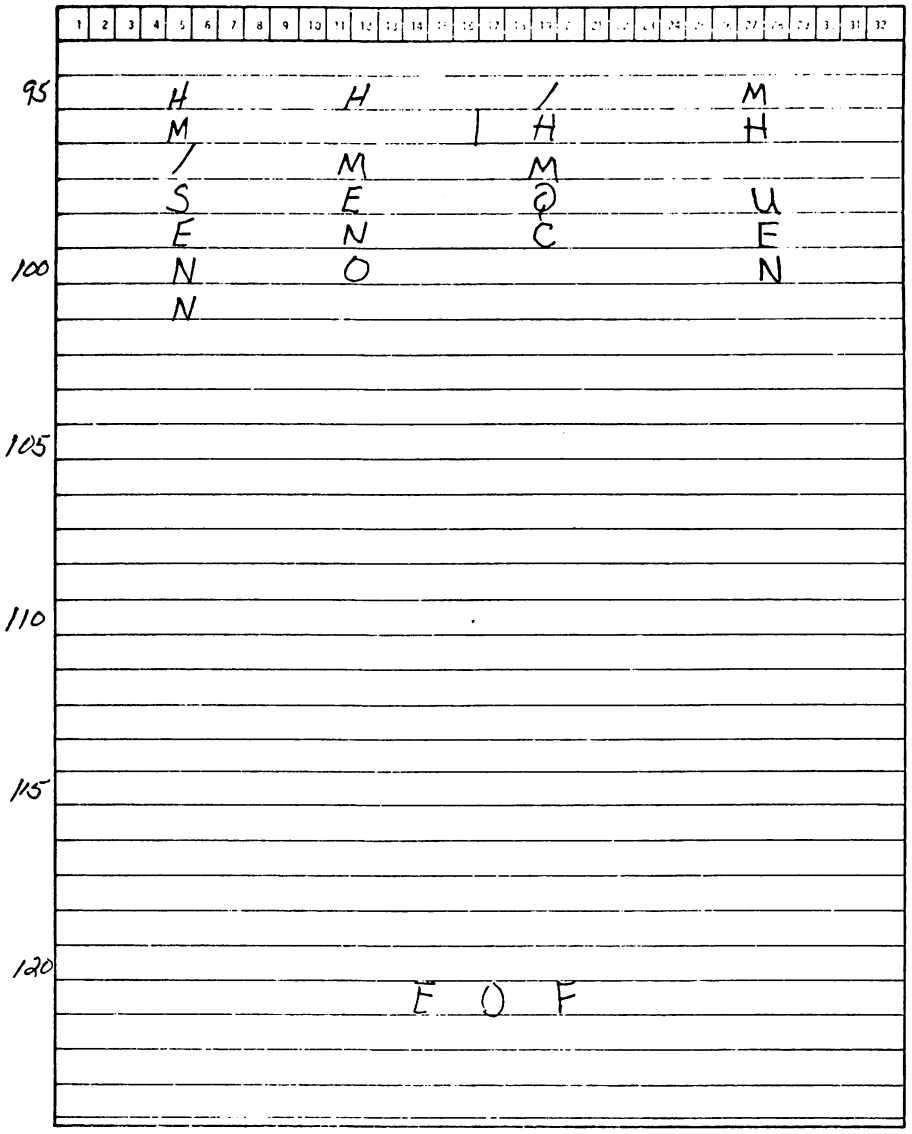


UC/CPI FILE 1 LOGISTICS (CONTD)

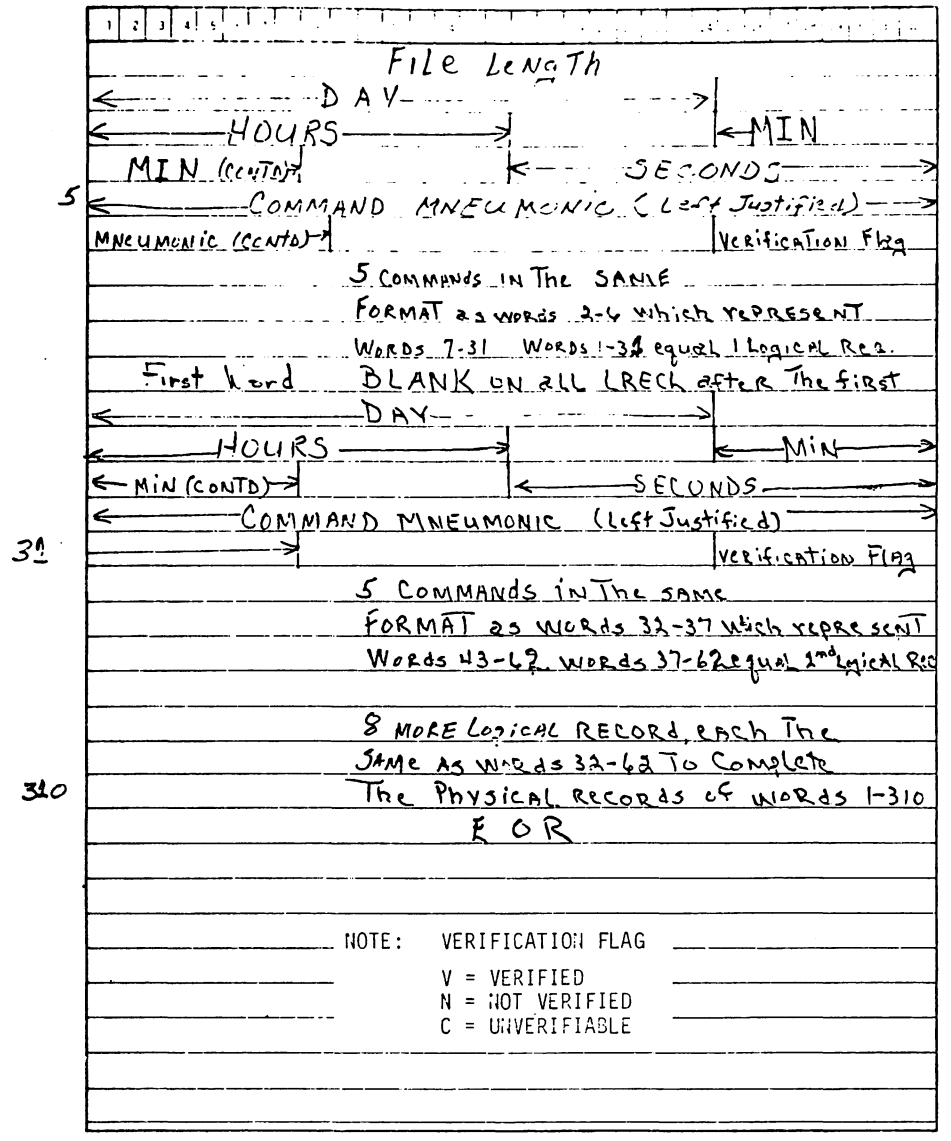
REPRODUCED FROM	TITLE: UC/CPI FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 2 OF 9



REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	UC/CPI FILE 1 LOGISTICS DATA	DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 3 OF 9



REPRODUCED FROM	TITLE: UC/CPI FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 4 OF 9



UC/CPI FILE 2 COMMAND
TYPE - EBCDIC
LOGICAL RECORD LENGTH - 31 WORDS
PHYSICAL RECORD LENGTH - 310 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: UC/CPI FILE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 5 OF 9

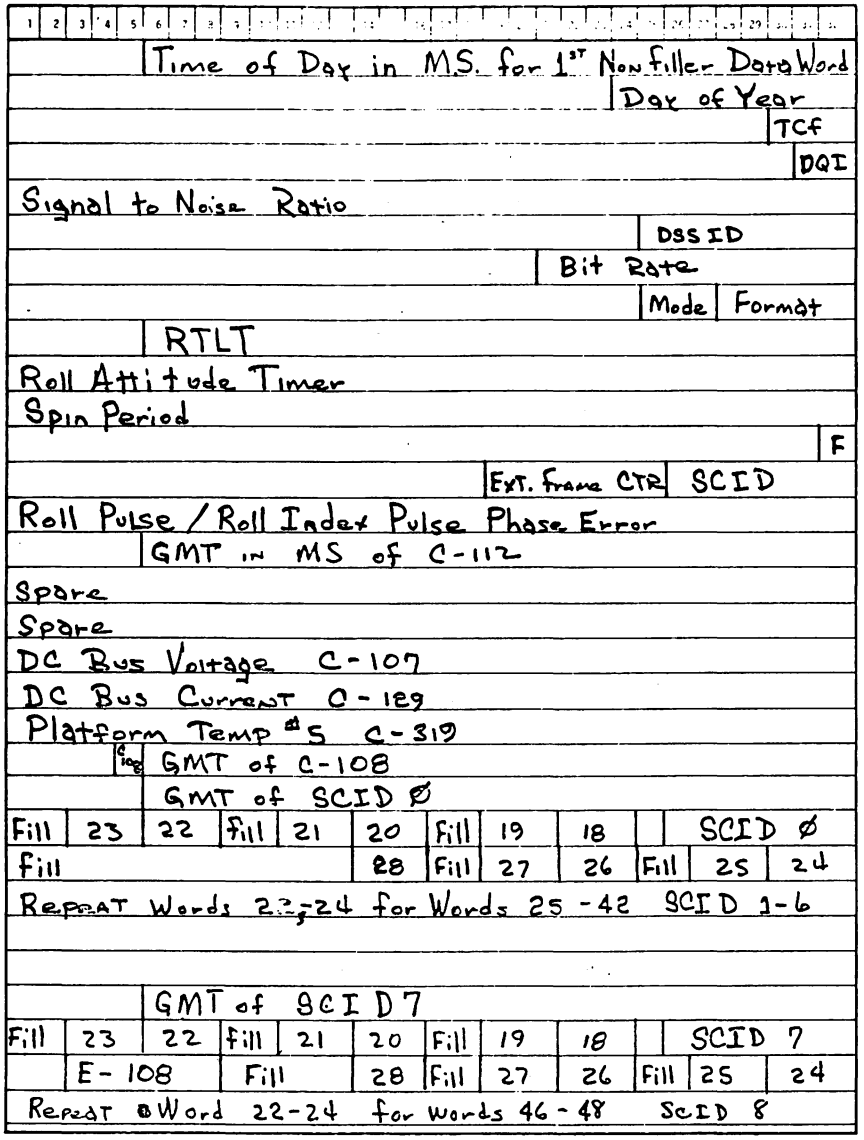
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	Flag*					GMT In Total MS																										
	Celestial Latitude																															
	Celestial Longitude																															
4	Celestial Latitude Drift Deg/Day																															
	Repeat Words 1-4 for Words 5-120																															
121	Flag					GMT In Total MS (Most recent Entry)																										
	Celestial Latitude																															
	Celestial Longitude																															
124	Celestial Latitude Drift Deg/Day																															
	EOF																															

NOTE: FLAG INTERPRETATION

00 = SPECIAL REFINEMENT (±0.1°)
01 = HIGH GAIN ANTENNA (±0.3°)
10 = LOW GAIN ANTENNA (±1.0°)
11 = DYNAMIC POSITION (±3.0°)

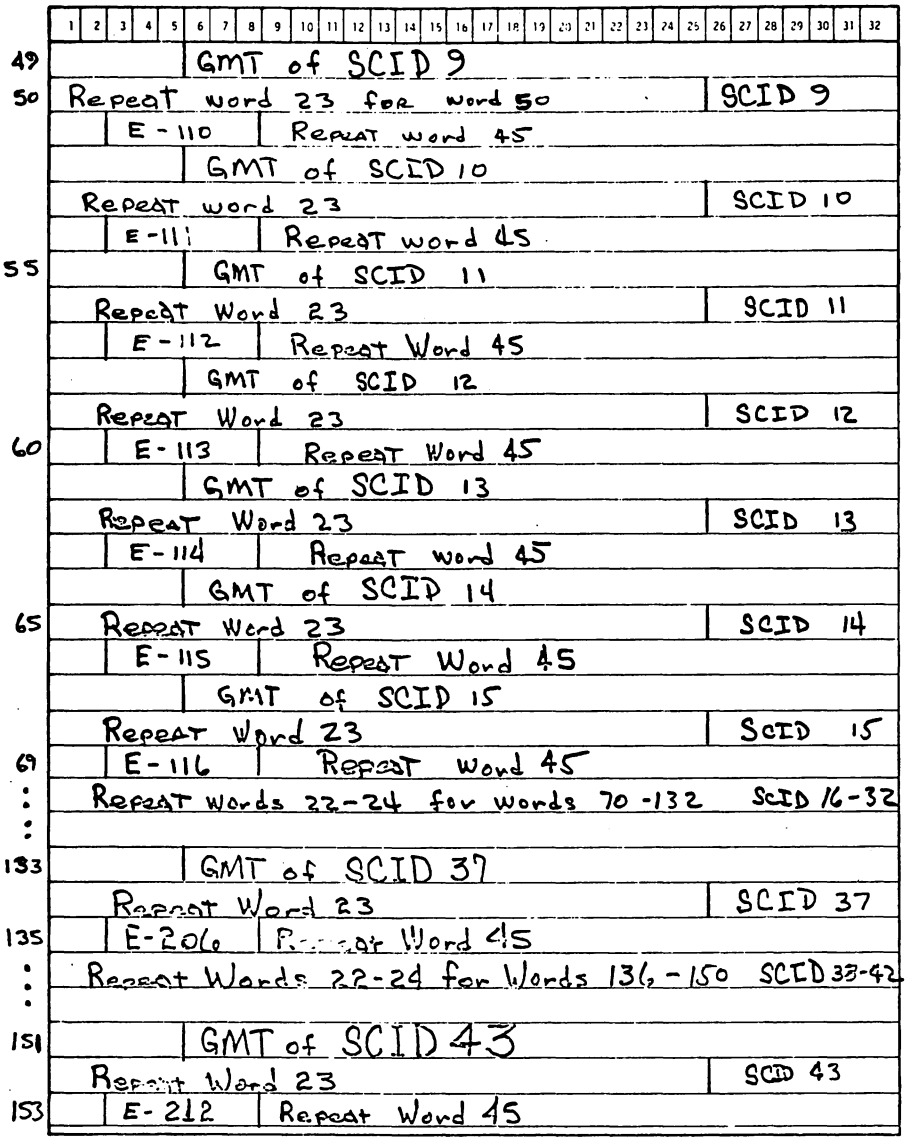
UC/CPI FILE 3 ATTITUDE DATA
TYPE - BINARY
LOGICAL RECORD LENGTH - 4 WORDS
PHYSICAL RECORD LENGTH - 124 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: UC/CPI FILE 3 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 6 OF 9

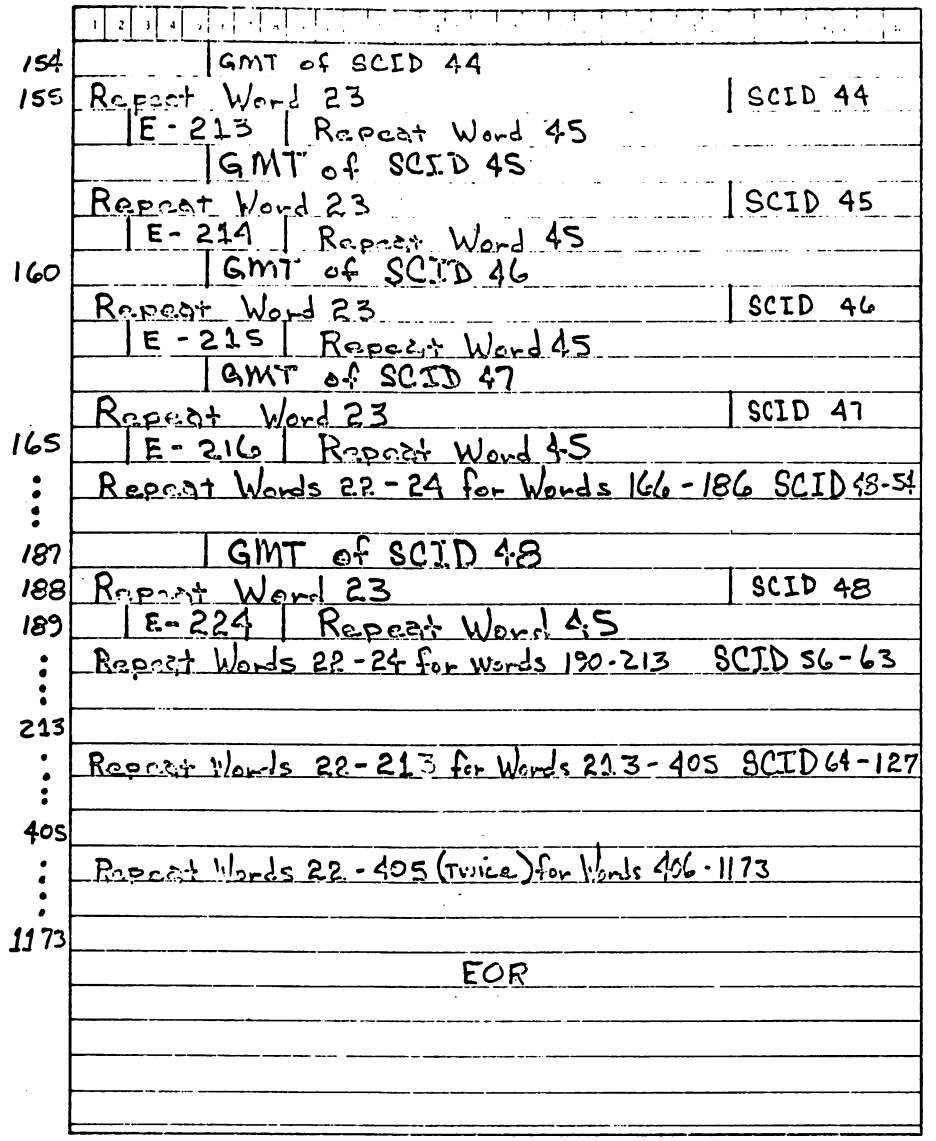


UC/CPI FILE 4 EXPERIMENT DATA
TYPE - BINARY
LOGICAL RECORD LENGTH - 384 WORDS
PHYSICAL RECORD LENGTH - 1173 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	UC/CPI FILE 4 EXPERIMENT DATA	DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. DATE 9/1/71	SHEET 7 OF 9

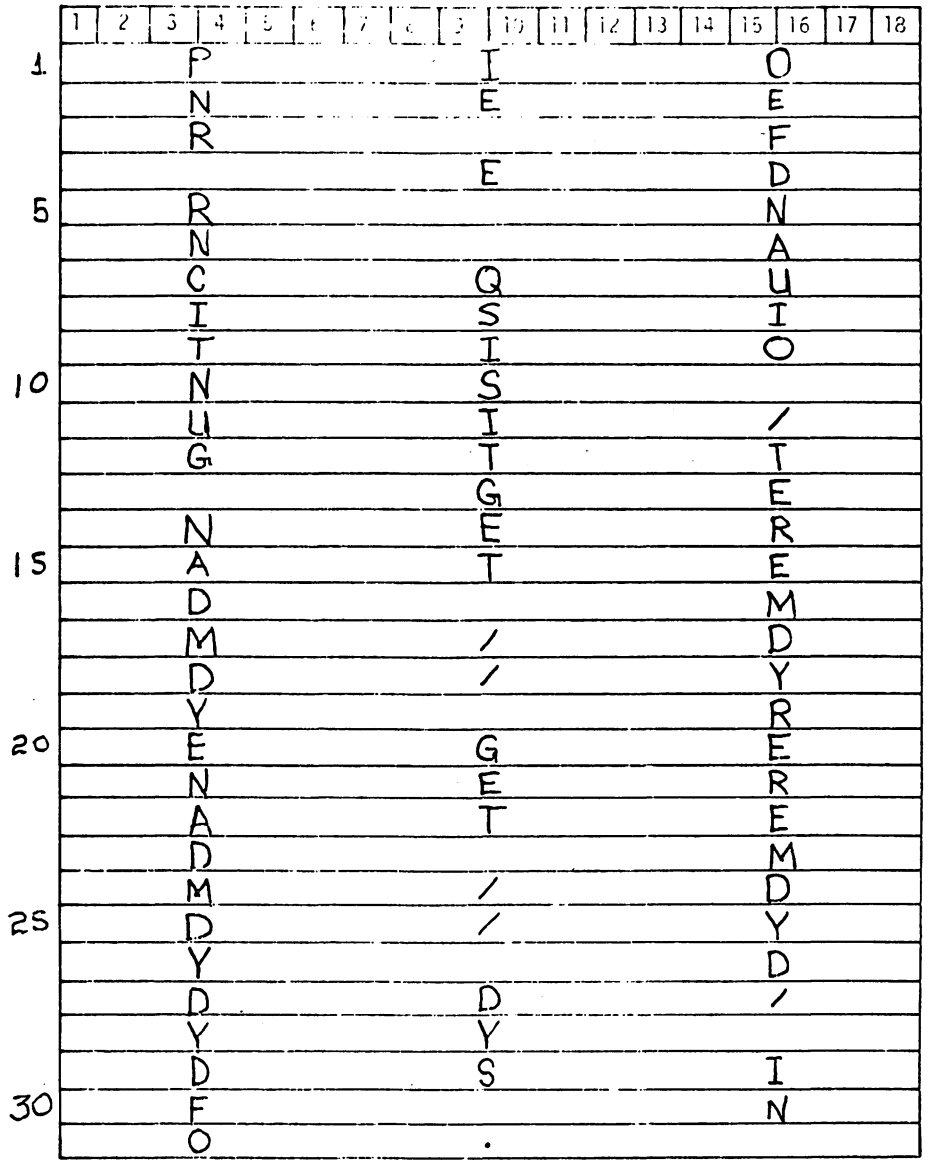


REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	UC/CPI FILE 4 EXPERIMENT DATA	DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. DATE 9/1/71	SHEET 8 OF 9



UC/CPI FILE 4 EXPERIMENT DATA (CONTD)

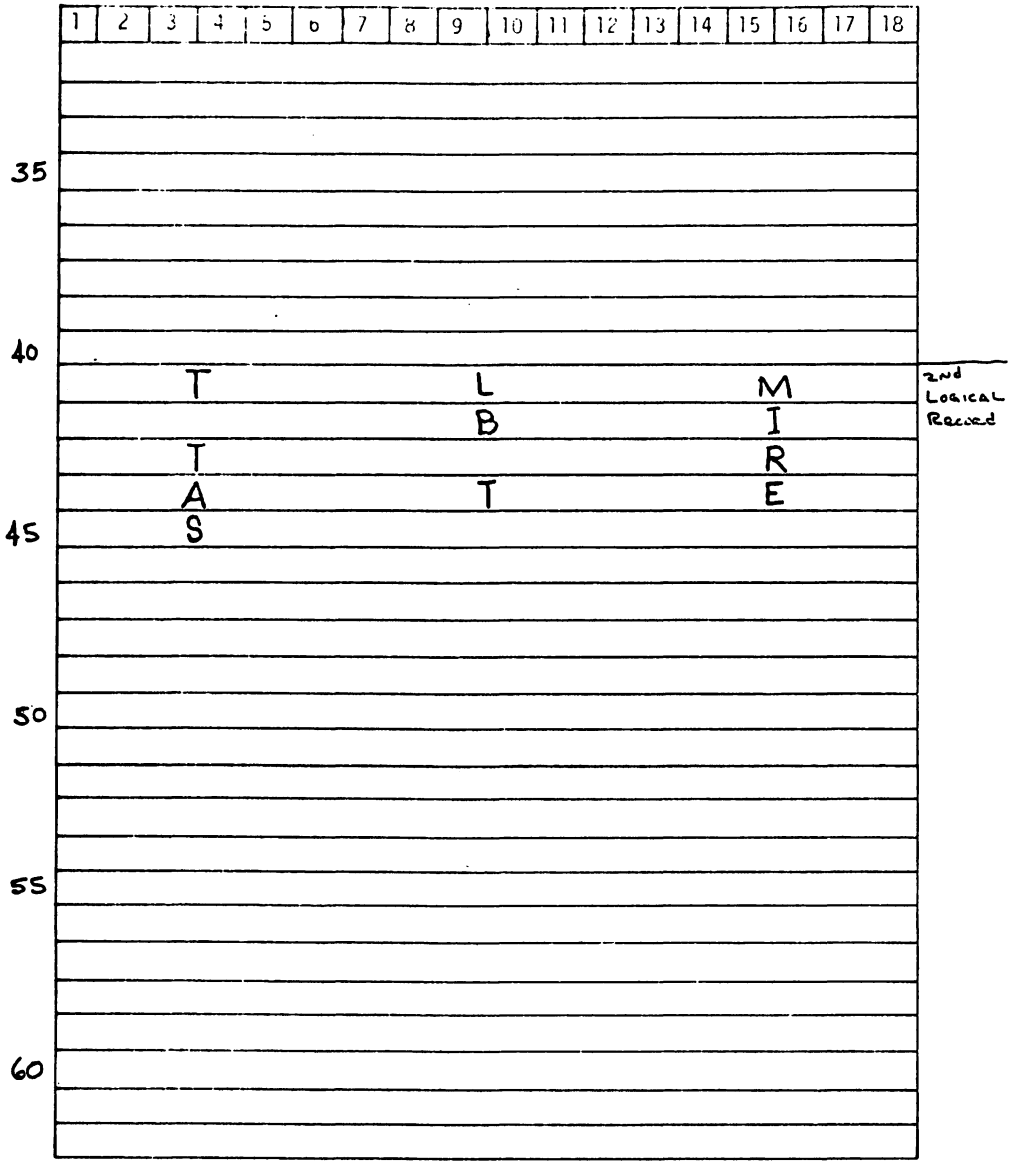
REPRODUCED FROM	TITLE: UC/CPI FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.3
	REV. NO. / DATE 9/1/71	SHEET 9 OF 9



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1			P						I							O		
			N						E							E		
			R													F		
									E							D		
5			R													N		
			N													A		
			C						Q							U		
			I						S							I		
			T						I							O		
10			N						S									
			U						I							/		
			G						T							T		
									G							E		
			N						E							R		
15			A						T							E		
			D													M		
			M						/							D		
			D						/							Y		
			Y													R		
20			E						G							E		
			N						E							R		
			A						T							E		
			D													M		
			M						/							D		
25			D						/							Y		
			Y													D		
			D						D							/		
			Y						Y									
			D						S							I		
30			F													N		
			O						.									

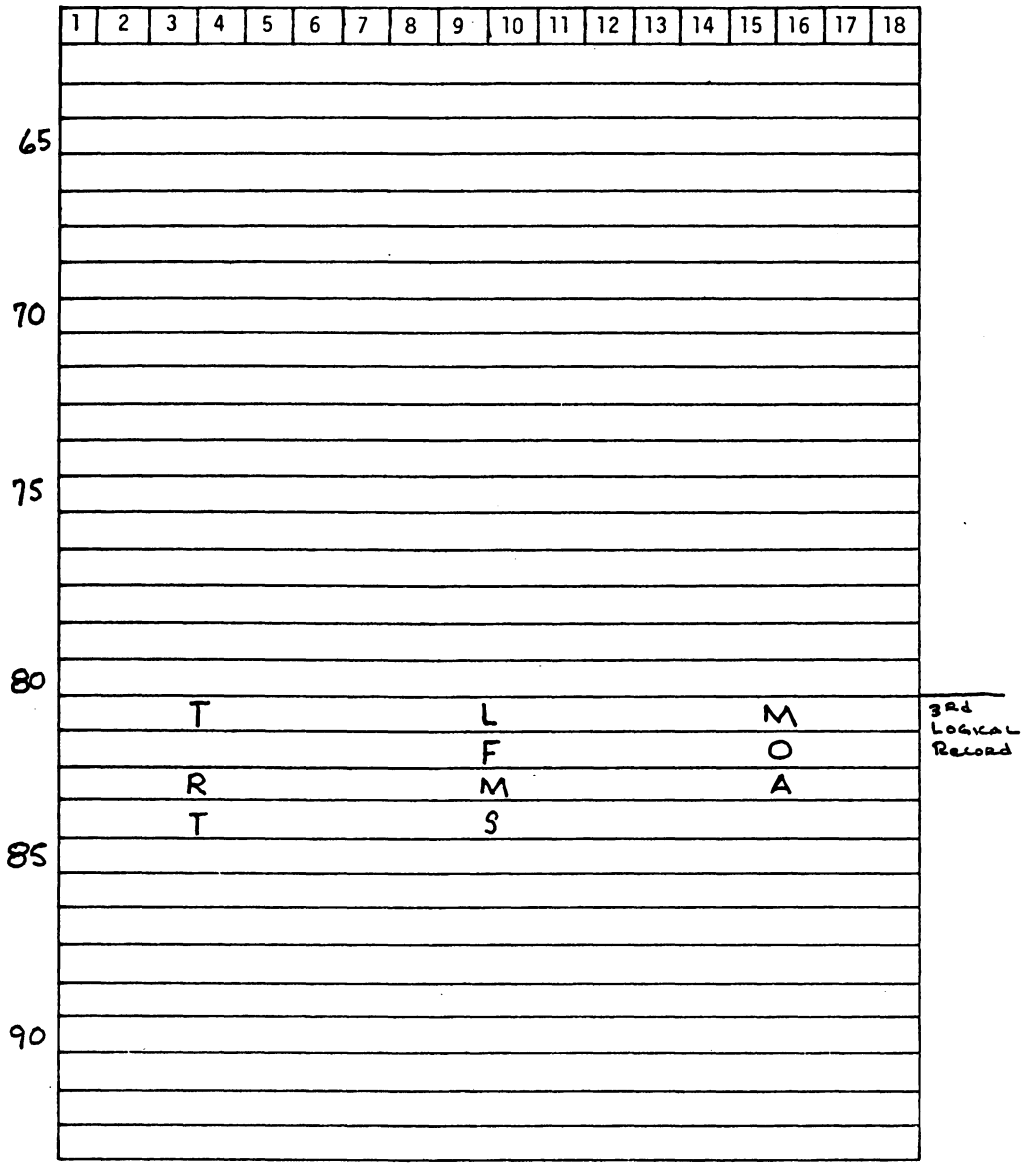
UI/GTT FILE 1 LOGISTICS
TYPE - BCD
LOGICAL RECORD LENGTH - 40 WORDS
PHYSICAL RECORD LENGTH - 160 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE UI/GTT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. / DATE 9/1/71	SHEET 1 OF 10



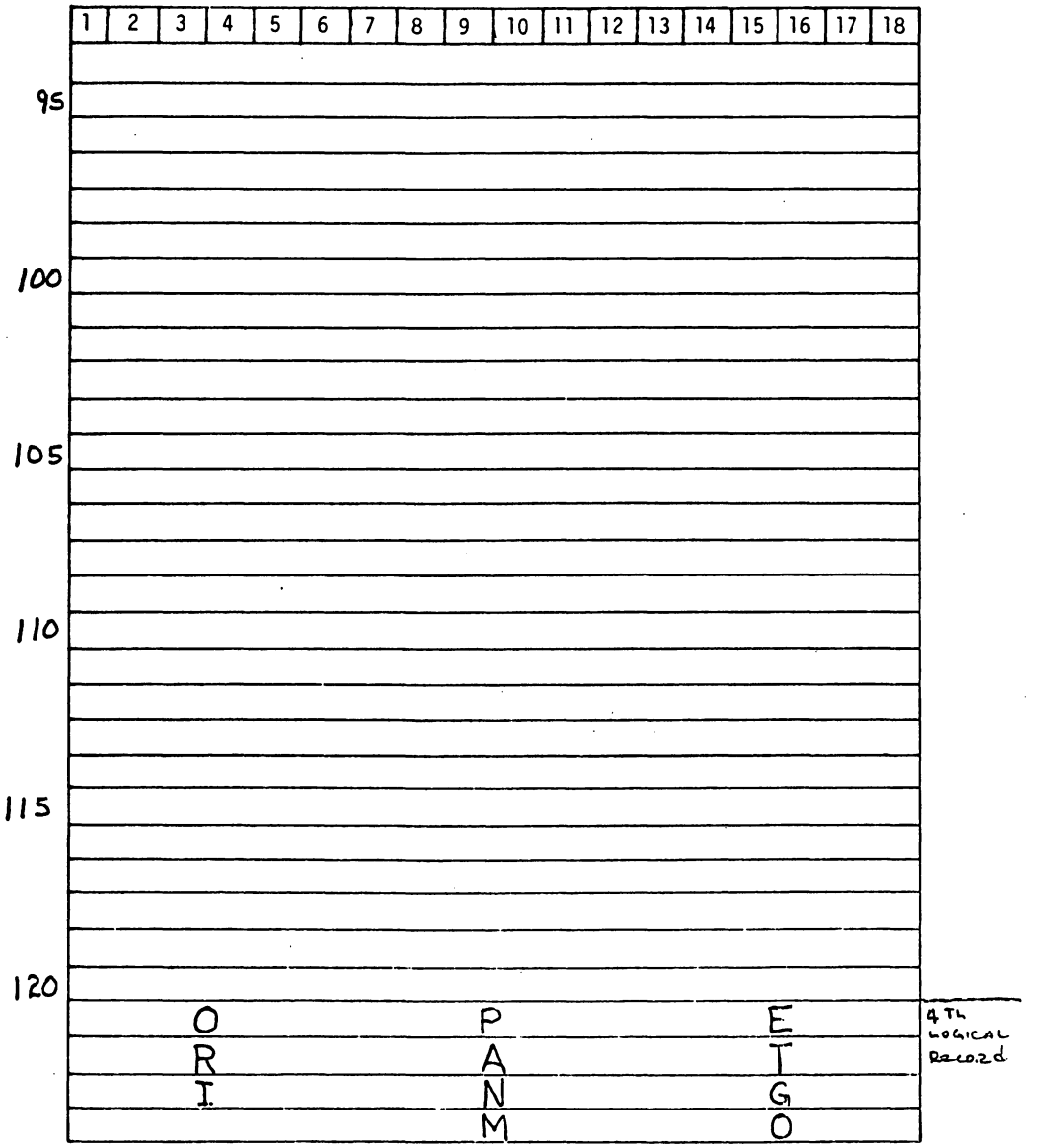
UI/GTT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UI/GTT FILE 1 LOGISTICS DATA		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
			DOC. NO. PC-262.03
			FIG. 3.2.4
	REV. NO.	DATE 9/1/71	SHEET 2 OF 10



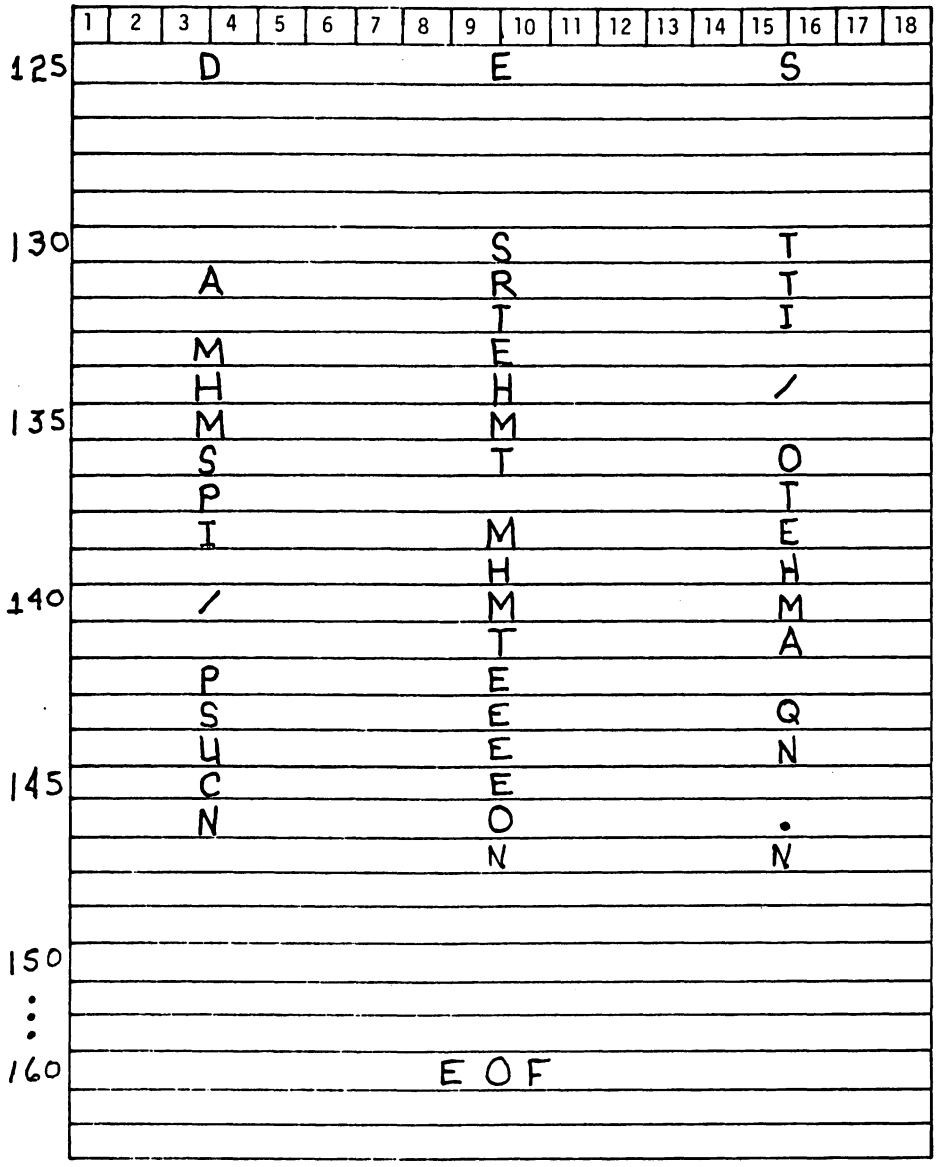
UI/GTT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UI/GTT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. / DATE 9/1/71	SHEET 3 OF 10



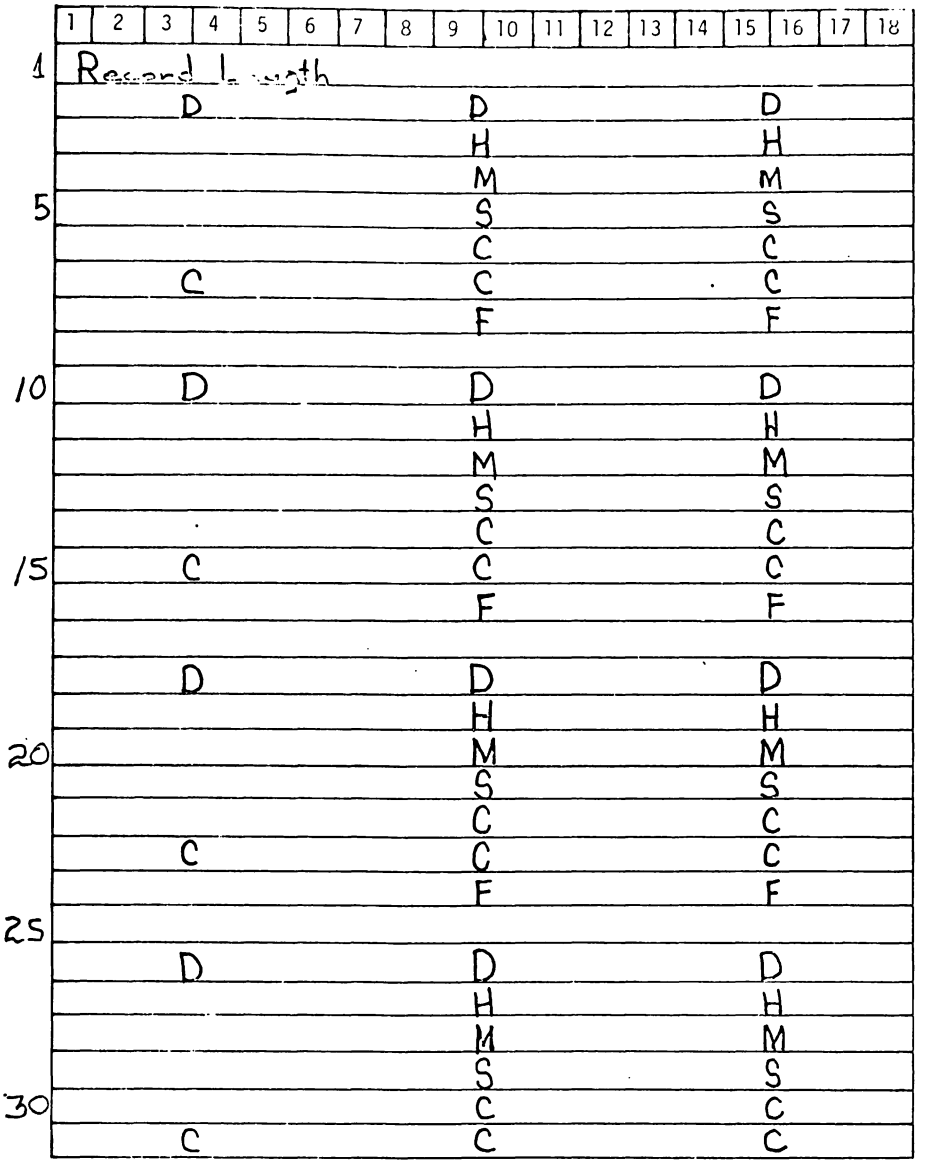
UI/GTT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UI/GTT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.4	
	REV. NO.	DATE 9/1/71	SHEET 4 OF 10



UI/GTT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UI/GTT FILE 1 LOGISTICS DATA		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
			DOC. NO. PC-262.03
			FIG. 3.2.4
	REV. NO.	DATE 9/1/71	SHEET 5 OF 10

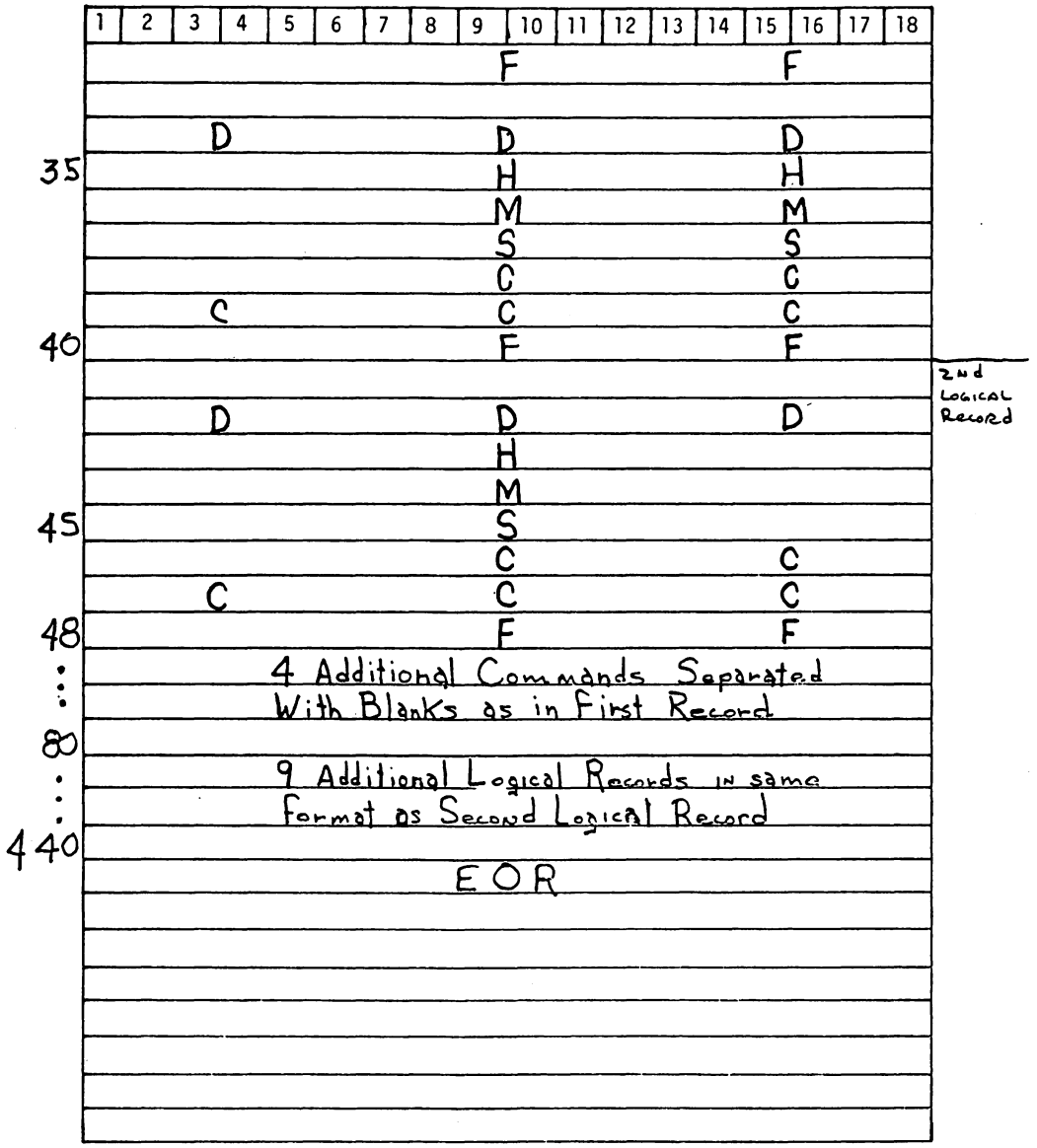


NOTE: CCCCC - COMMAND MNEMONIC
F - COMMAND STATUS

V = VERIFIED
N = NOT VERIFIED
C = UNVERIFIABLE

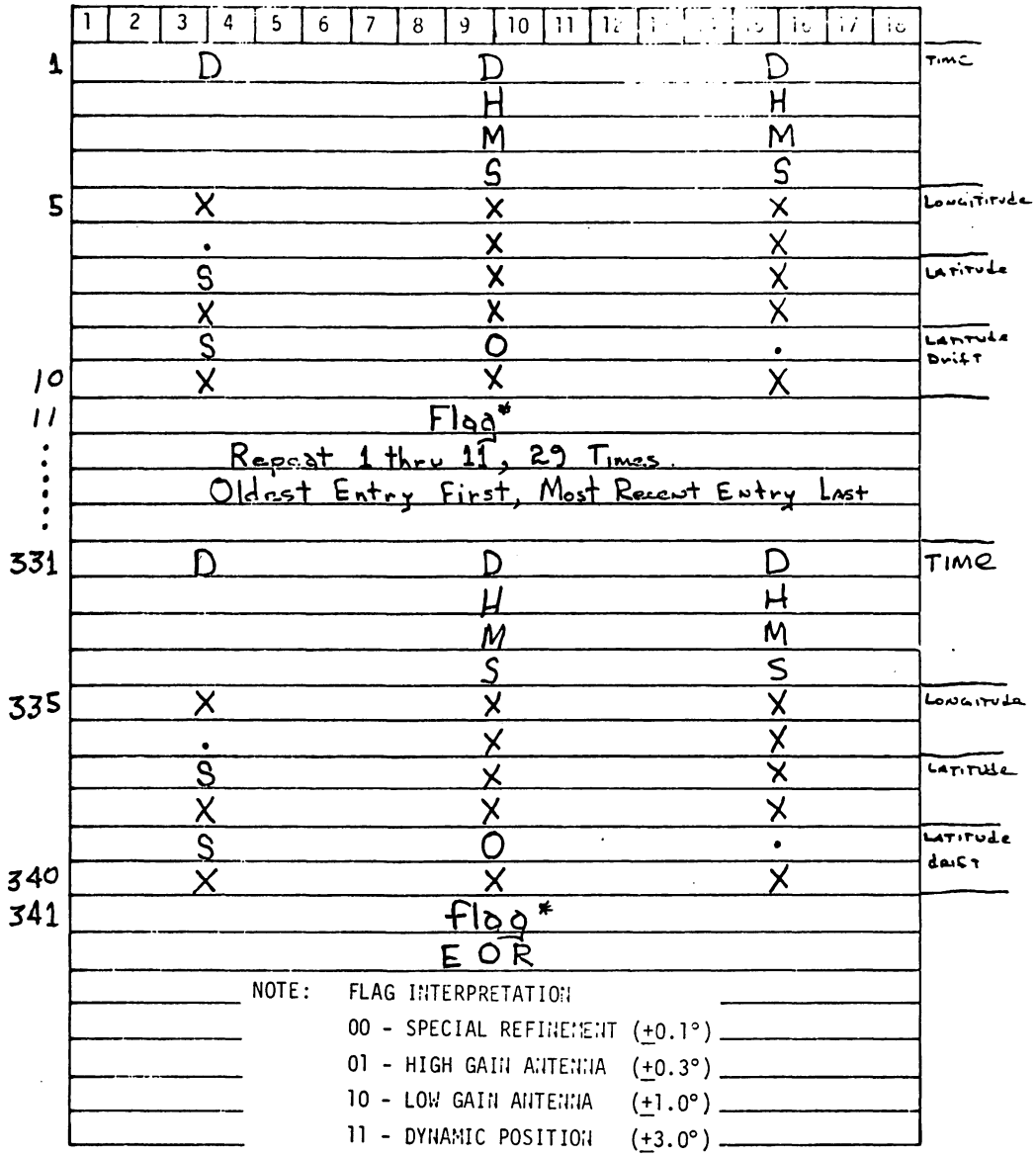
UI/GTT FILE 2 COMMAND
TYPE - BCD
LOGICAL RECORD LENGTH - 40 WORDS
PHYSICAL RECORD LENGTH - 440 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	UI/GTT FILE 2 COMMAND DATA	DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. DATE 9/1/71	SHEET 6 OF 10



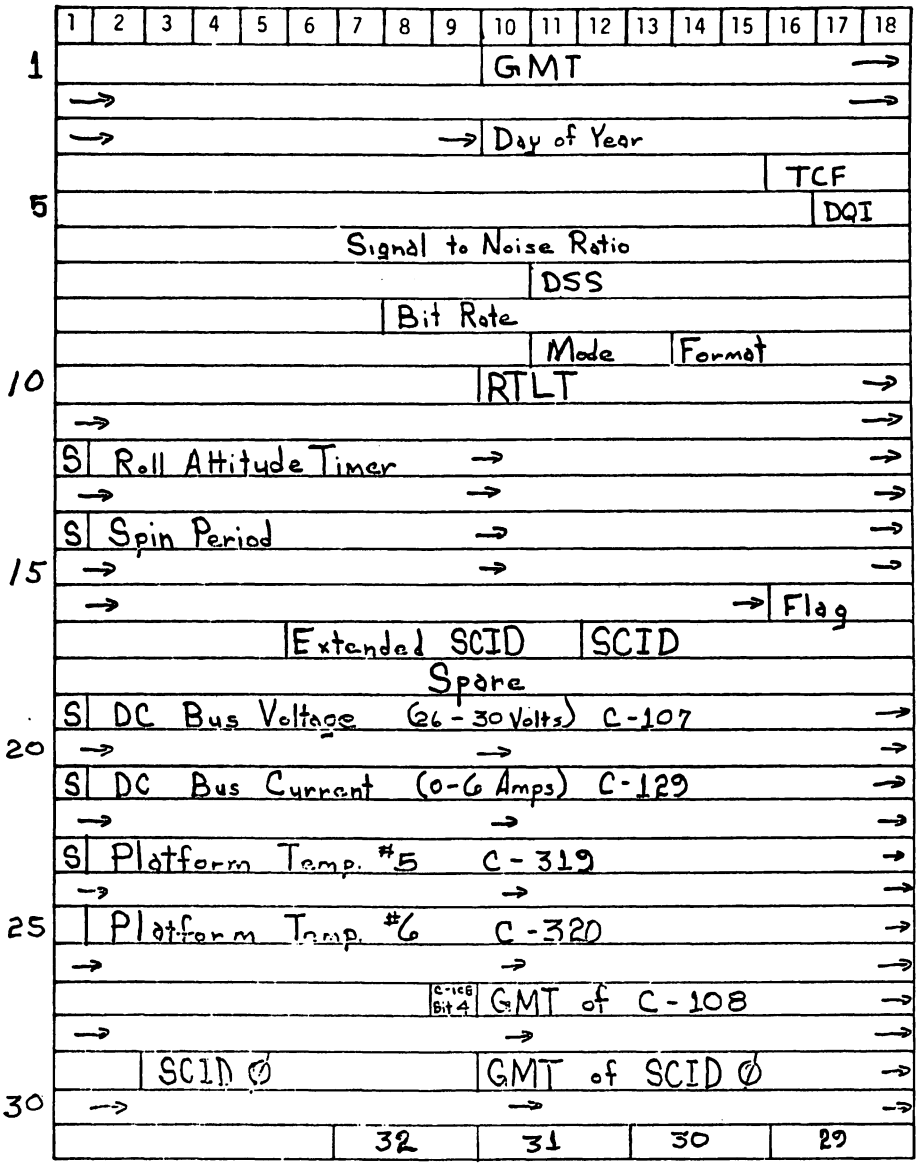
UI/GTT FILE 2 COMMAND (CONTD)

REPRODUCED FROM	TITLE: UI/GTT FILE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. / DATE 9/1/71	SHEET 7 OF 10



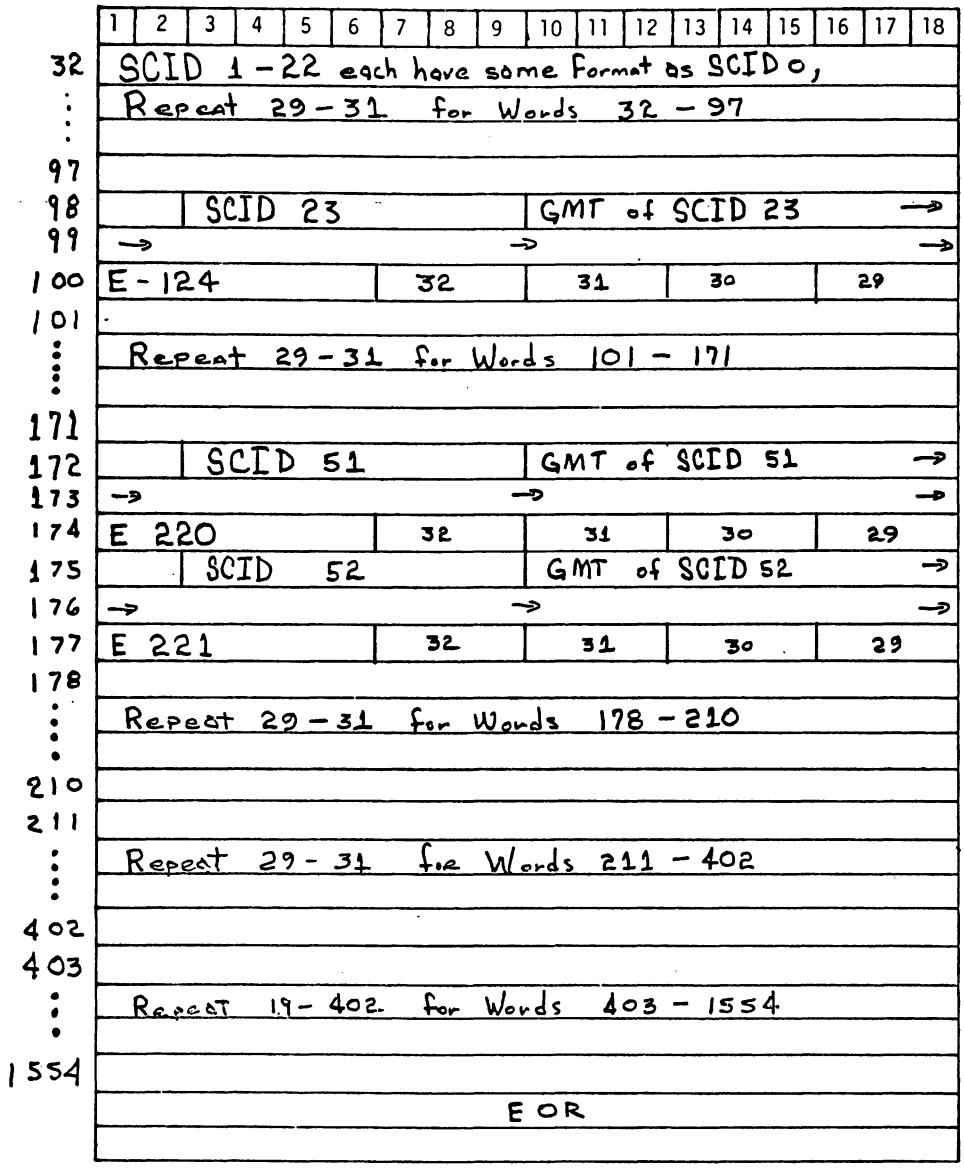
UI/GTT FILE 3 ATTITUDE DATA
TYPE -
LOGICAL RECORD LENGTH - 341 WORDS
PHYSICAL RECORD LENGTH - 341 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	UI/GTT FILE 3 S/C ATTITUDE DATA	DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. DATE 9/1/71	SHEET 8 OF 10



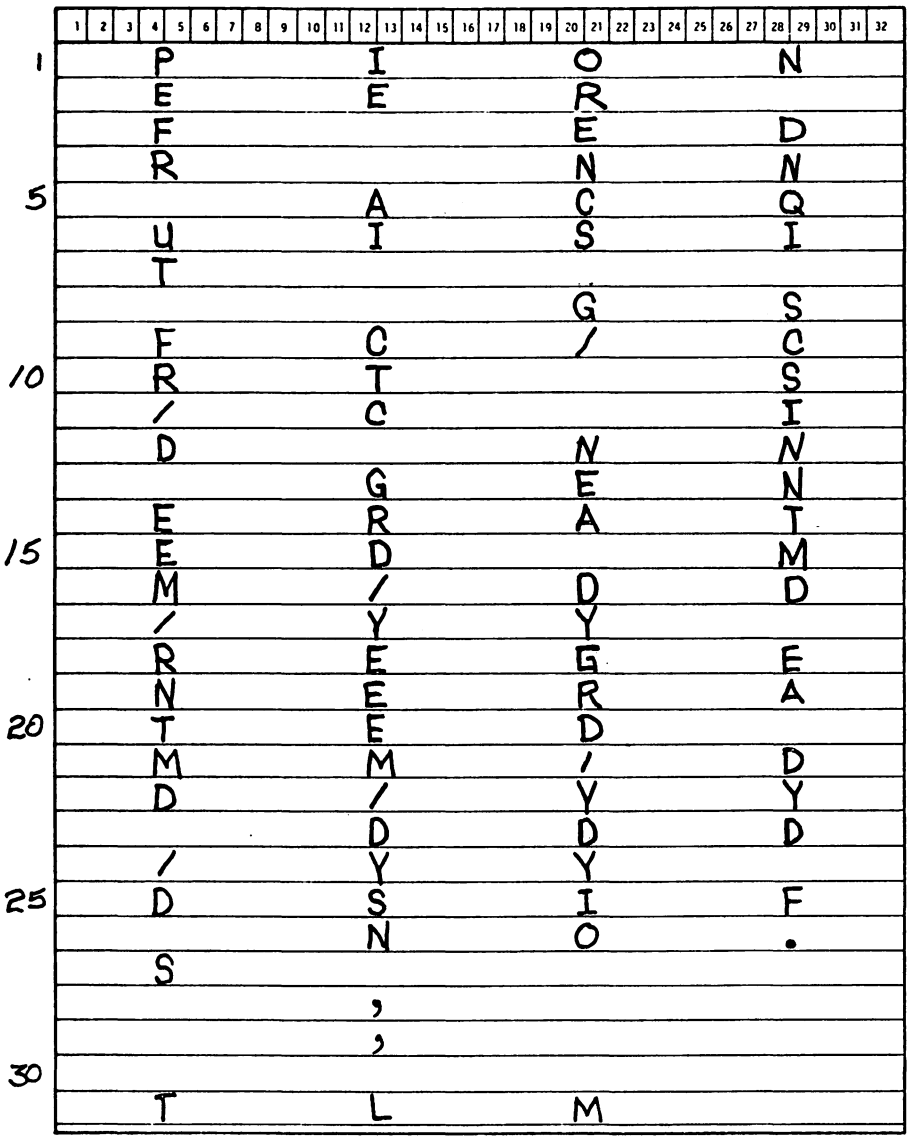
UI/GTT FILE 4 EXPERIMENT DATA
TYPE - BINARY
LOGICAL RECORD LENGTH - 384 WORDS
PHYSICAL RECORD LENGTH - 1554 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: UI/GTT FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. DATE 9/1/71	SHEET 9 OF 10



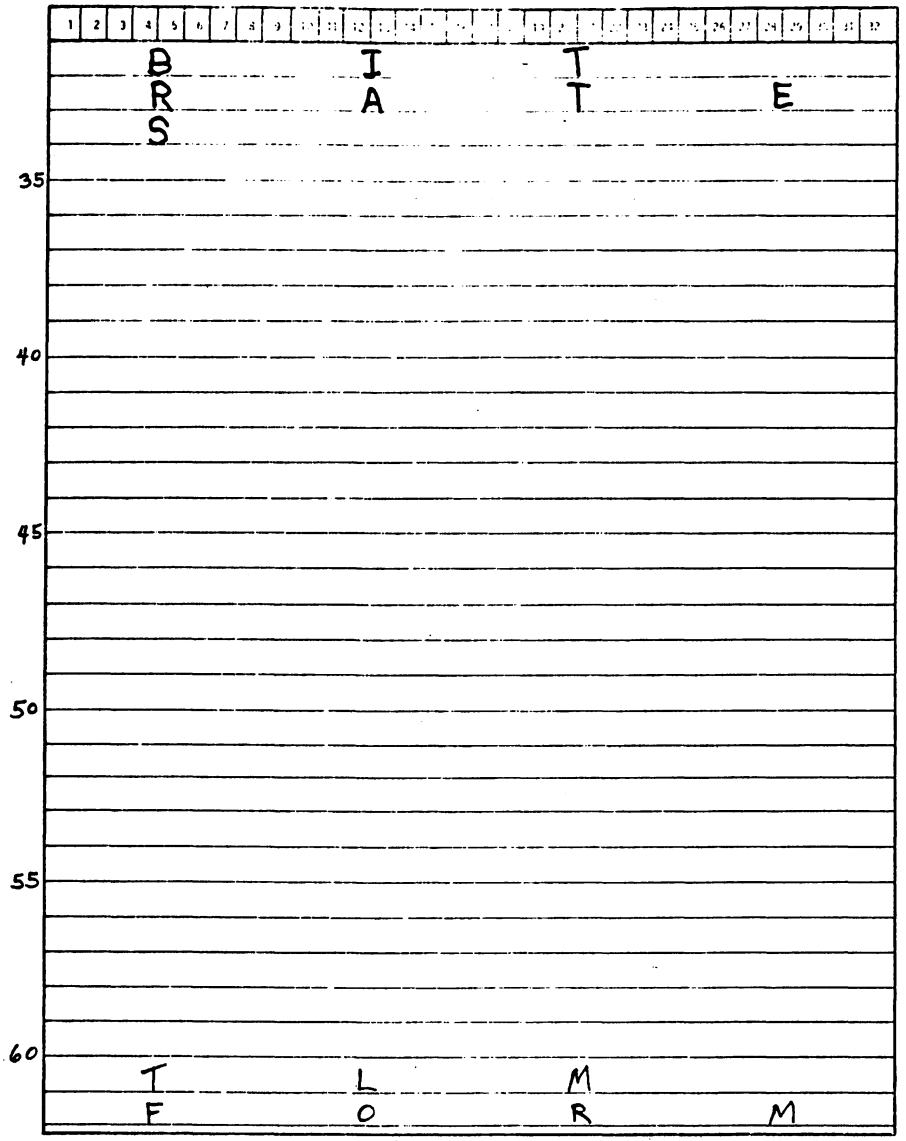
UI/GTT FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE: UI/GTT FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.4
	REV. NO. / DATE 9/1/71	SHEET 10 OF 10



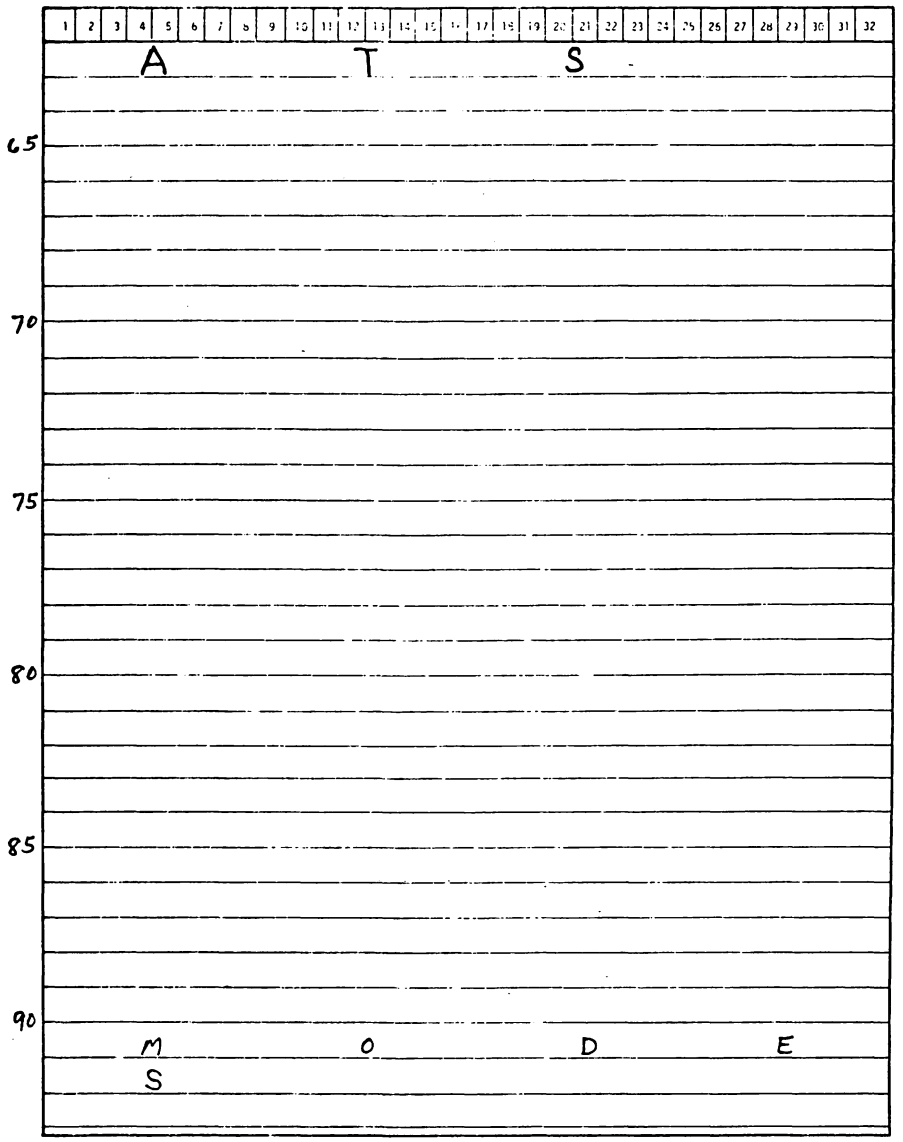
GSFC/CRT FILE 1 LOGISTICS
TYPE - EBCDIC
LOGICAL RECORD SIZE - 30 WORDS
PHYSICAL RECORD SIZE - 120 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: GSFC/CRT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. / DATE 9/1/71	SHEET 1 OF 10



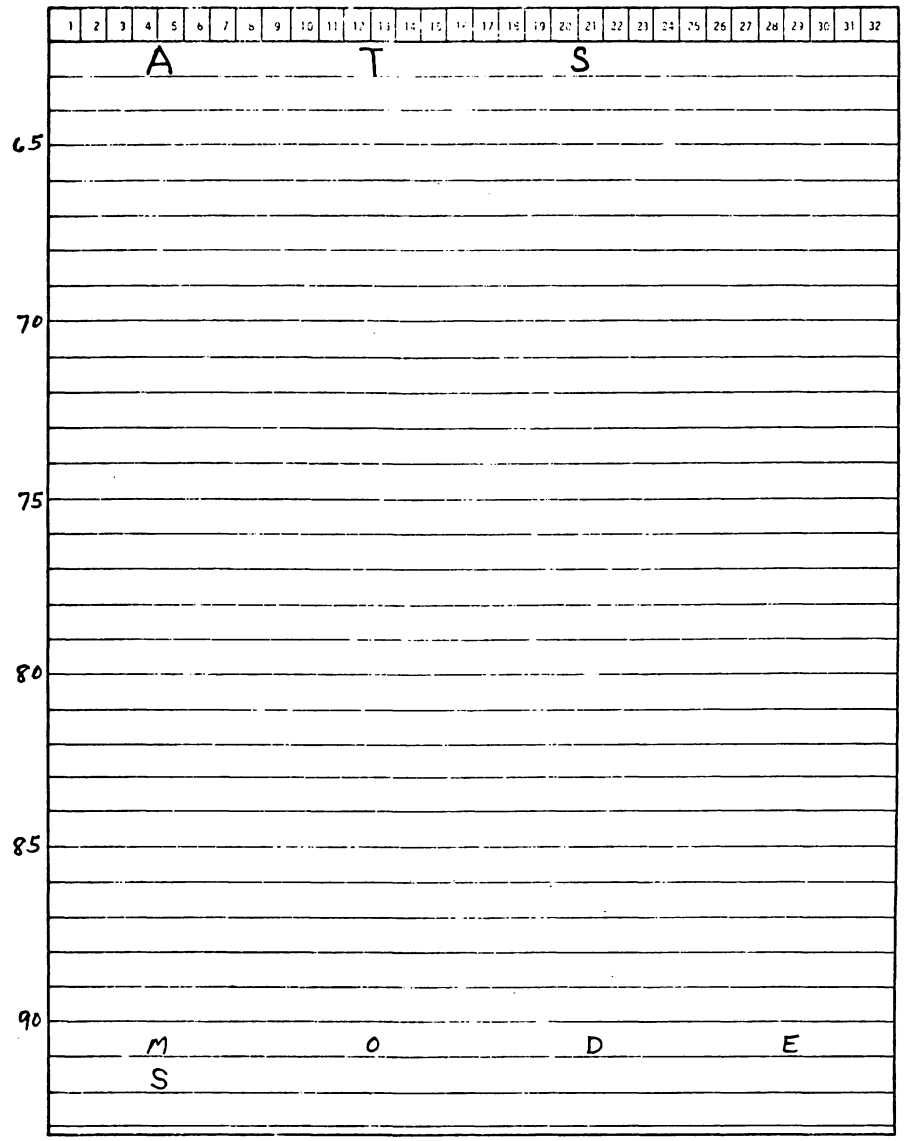
GSFC/CRT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: GSFC/CRT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. / DATE 9/1/71	SHEET 2 OF 10



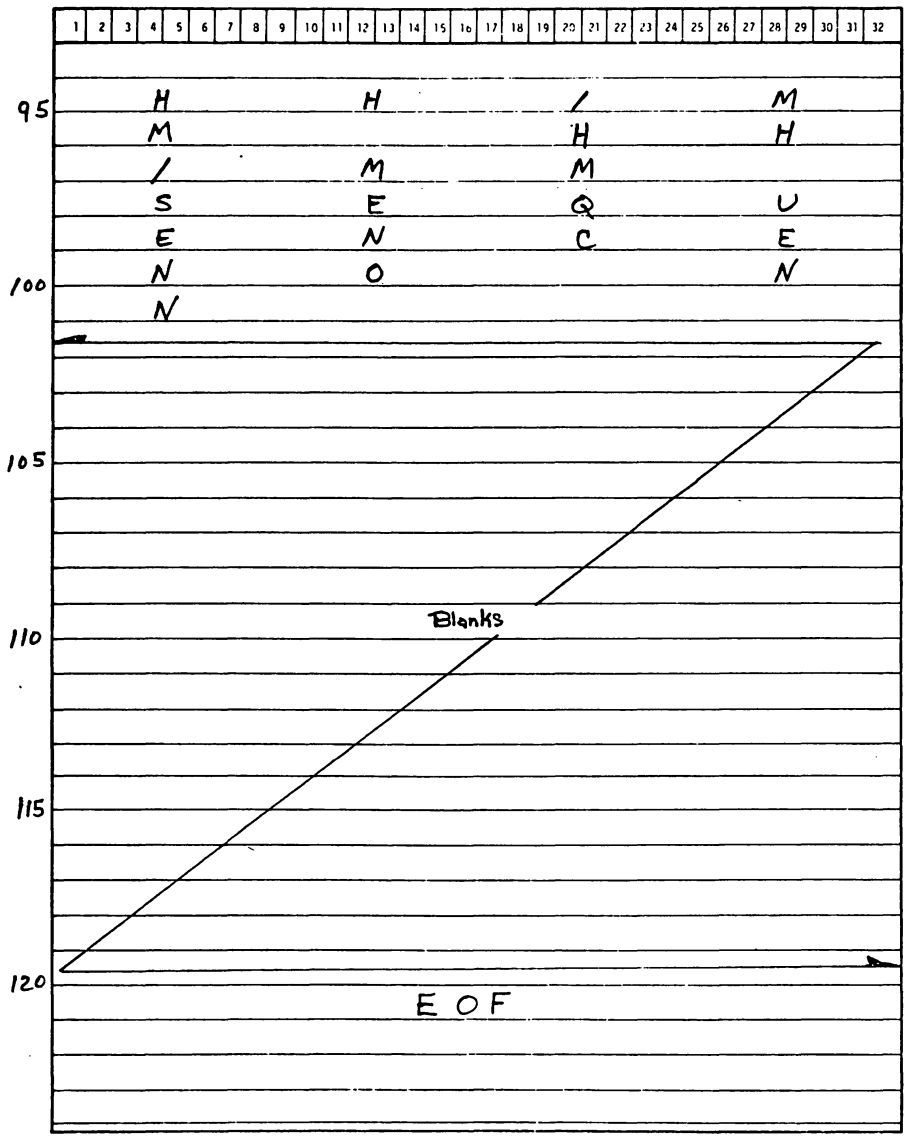
GSFC/CRT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE GSFC/CRT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. / DATE 9/1/71	SHEET 3 OF 10



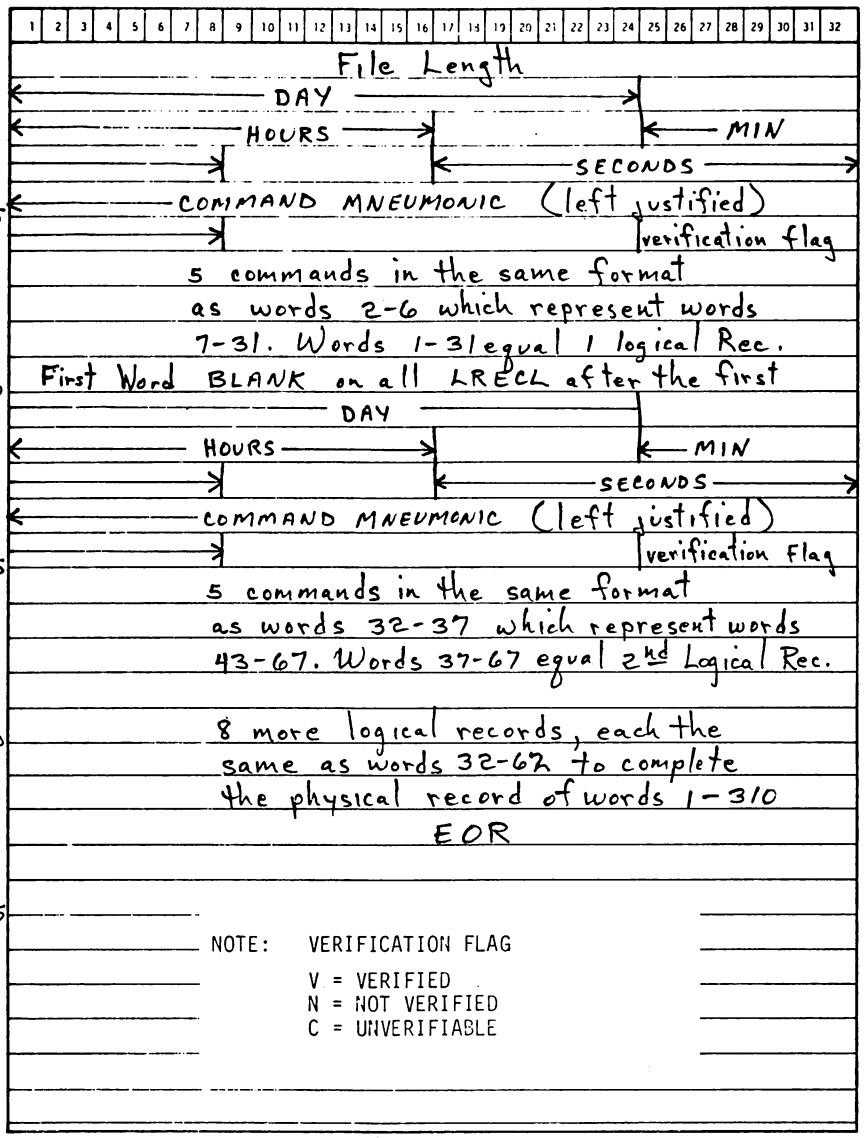
GSFC/CRT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: GSFC/CRT FILE 1 LOGISTICS DATA		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
			DOC. NO. PC-262.03
			FIG. 3.2.5
	REV. NO.	DATE 9/1/71	SHEET 3 OF 10



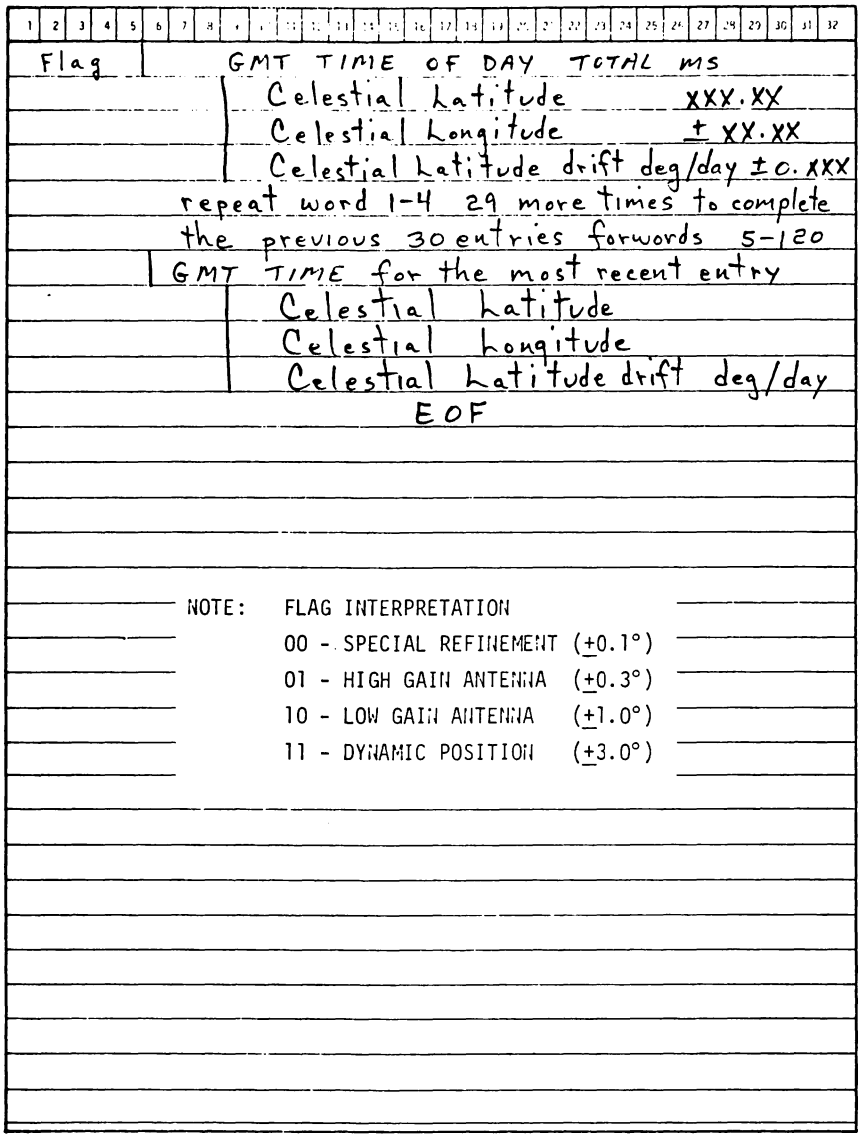
GSFC/CRT FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: GSFC/CRT FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. / DATE 9/1/71	SHEET 4 OF 10



GSFC/CRT FILE 2 COMMAND
TYPE - EBCDIC
LOGICAL RECORD LENGTH - 31 WORDS
PHYSICAL RECORD LENGTH - 310 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: GSFC/CRT FILE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. / DATE 9/1/71	SHEET 5 OF 10



GSFC/CRT FILE 3 ATTITUDE DATA
TYPE - BINARY
LOGICAL RECORD SIZE - 124 WORDS
PHYSICAL RECORD SIZE - 124 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE GSFC/CRT FILE 3 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. DATE 9/1/71	SHEET 6 OF 10

	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						Time of Day in MS for First Non Filler Data Word																											
																														Day of Year		
																														TCF		
																														DQI		
5	Signal to Noise Ratio																															
																													DSS ID			
																													Bit Rate			
																													Mode	Format		
						RTLT																										
10	Roll Attitude Timer																															
	Spin Period																															
																															F	
																													Ext. Frame Ctr.	SCID		
	Roll Pulse / Roll Index Pulse Phase Error																															
15						GMT in MS of C-112																											
	Spare																															
	Spare																															
	DC Bus Voltage C-107																															
	DC Bus Current C-129																															
20	S/C Platform Temp #6 C-320																															
	Ends					GMT of C-108																										
						GMT of SCID 0																										
	Fill		17		16	Fill		15		14	Fill								12		11	Fill			10		9				
																			44		43	Fill			42		41				
25	Repeat Word 22-24 for Words 25-90 SCID 1-22																															
	⋮																															
91						GMT of SCID 23																											
	Fill		17		16	Fill		15		14	Fill								12		11	Fill			10		9				
								E-124			Fill								44		43	Fill			42		41				
94						GMT of SCID 24																										

GSFC/CRT
TYPE - BINARY
LOGICAL RECORD SIZE - 1301 WORDS
PHYSICAL RECORD SIZE - 1301 WORDS
FILE SIZE - VARIABLE

FILE 4

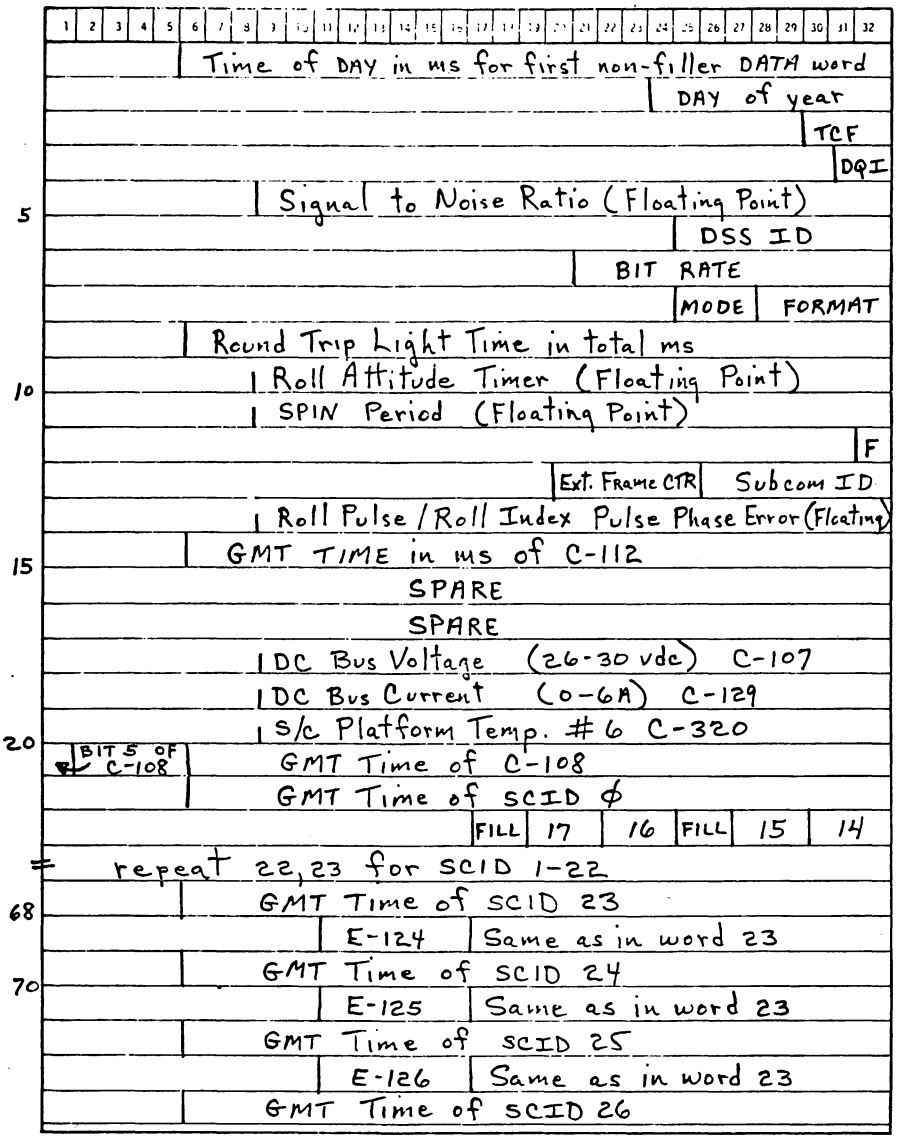
EXPERIMENT DATA
FORMAT A

REPRODUCED FROM	TITLE: GSFC/CRT FILE 4 EXPERIMENT DATA FORMAT A	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.5	
	REV. NO. / DATE 9/1/71	SHEET 7 OF 10	

	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
95	Fill				17			16	Fill		15			14	Fill		12			11	Fill			10			9
											E-125				Fill		44			43	Fill			42			41
	GMT of SCID 25																															
	Fill				17			16	Fill		15			14	Fill		12			11	Fill			10			9
											E-126				Fill		44			43	Fill			42			41
100	GMT of SCID 26																															
	Fill				17			16	Fill		15			14	Fill		12			11	Fill			10			9
											E-127				Fill		44			43	Fill			42			41
	GMT of SCID 27																															
	Fill				17			16	Fill		15			14	Fill		12			11	Fill			10			9
105											E-128				Fill		44			43	Fill			42			41
	GMT of SCID 28																															
	Fill				17			16	Fill		15			14	Fill		12			11	Fill			10			9
											E-129				Fill		44			43	Fill			42			41
	GMT of SCID 29																															
110	Fill				17			16	Fill		15			14	Fill		12			11	Fill			10			9
111											E-130				Fill		44			43	Fill			42			41
⋮	Repeat Words 22-24 for Words 112-405 SCID 30-127																															
405	Repeat Words 22-405 for Words 406-1173 + 128 Words of filler																															
⋮																																
1301																																
	EOR																															

GSFC/CRT FILE 4 EXPERIMENT DATA
FORMAT A (CONTD)

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	GSFC/CRT FILE 4 EXPERIMENT DATA FORMAT A	DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. DATE 9/1/71	SHEET 8 OF 10



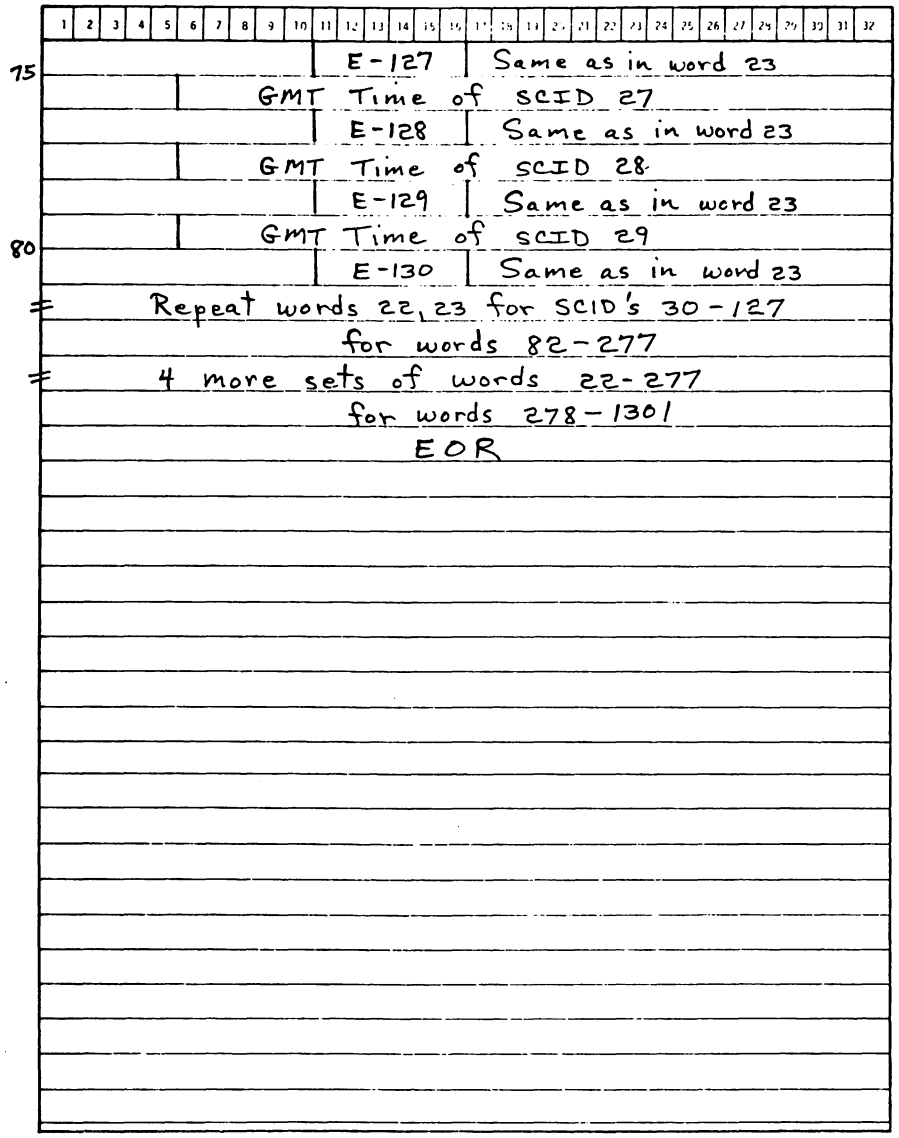
GSFC/CRT FILE 4 EXPERIMENT DATA
TYPE - BINARY FORMAT B
LOGICAL RECORD LENGTH - 1301 WORDS
PHYSICAL RECORD LENGTH - 1301 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM

TITLE
GSFC/CRT
FILE 4
EXPERIMENT DATA
FORMAT B

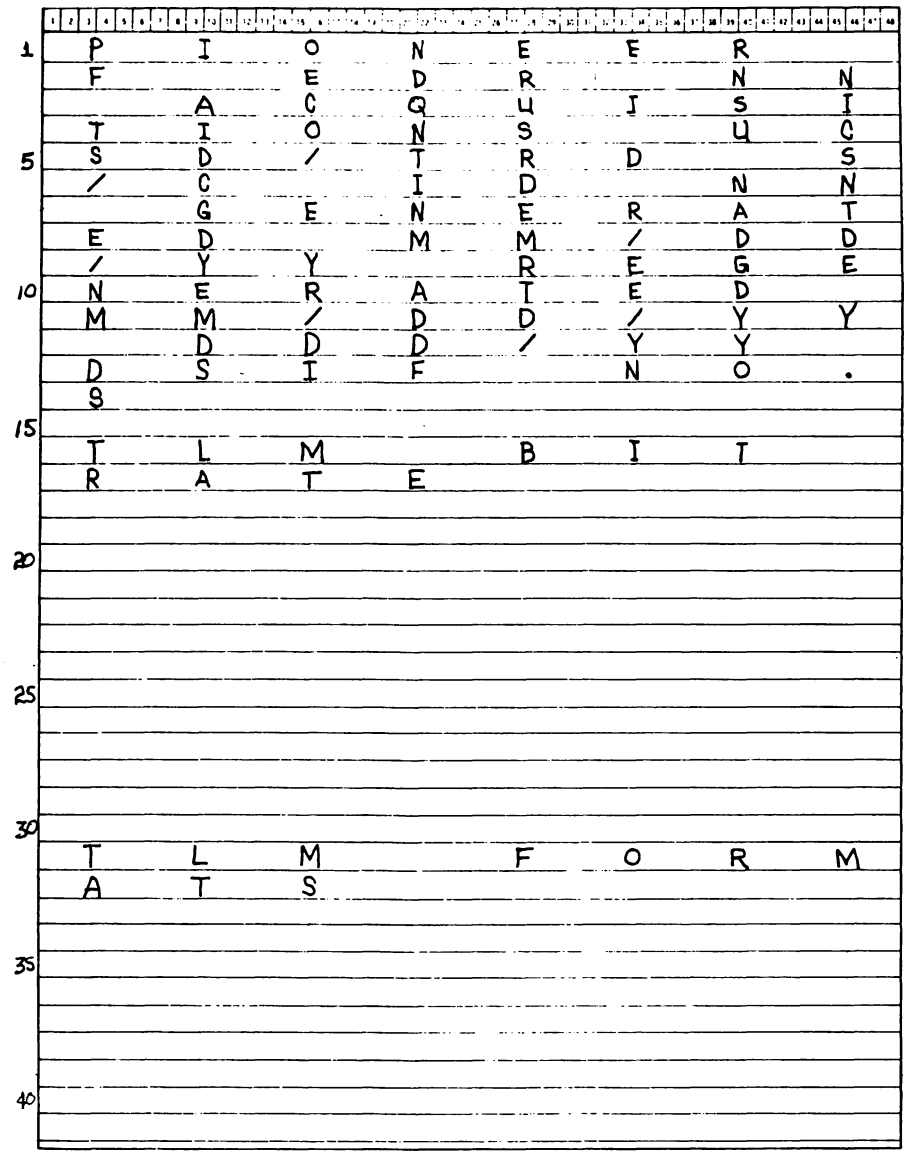
PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.03
FIG. 3.2.5
REV. NO.
DATE 9/1/71
SHEET 9 OF 10



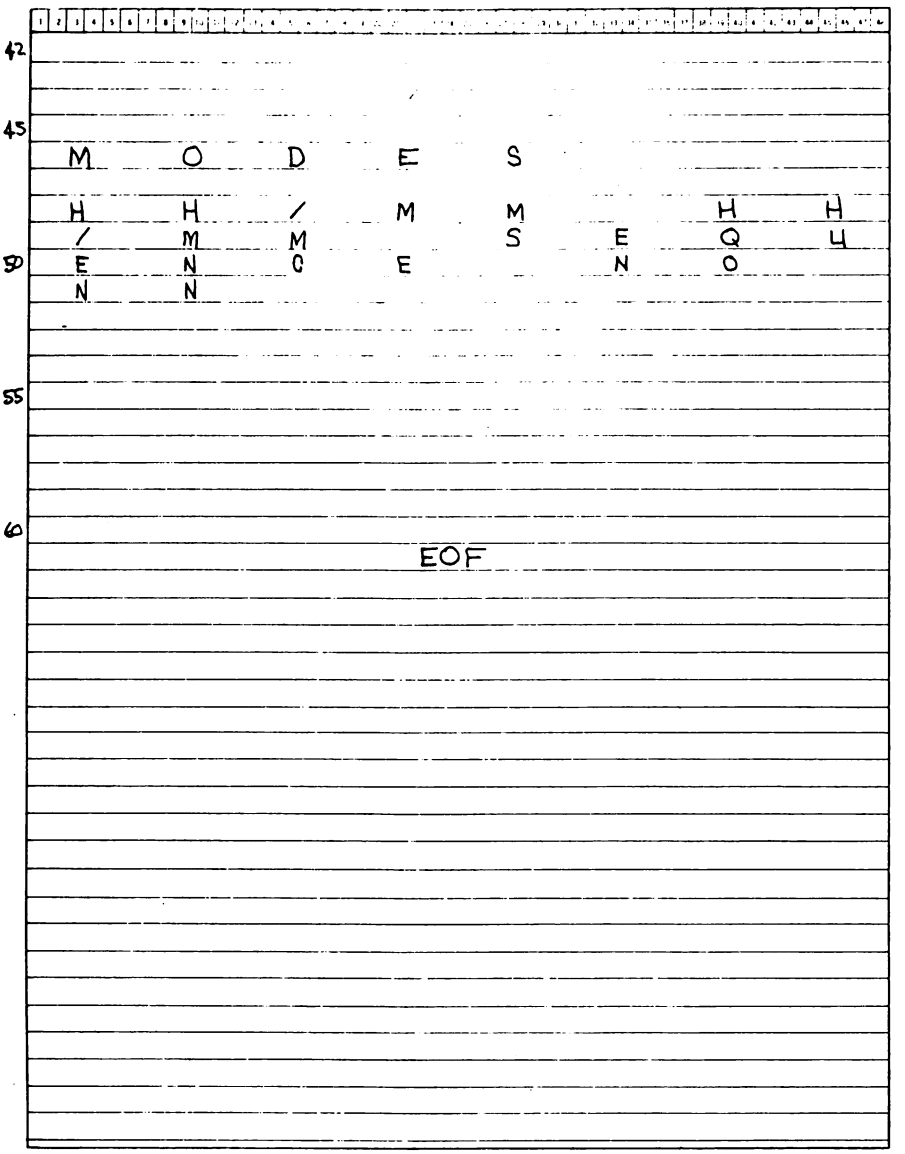
GSFC/CRT FILE 4 EXPERIMENT DATA
FORMAT B (CONTD)

REPRODUCED FROM	TITLE: GSFC/CRT FILE 4 EXPERIMENT DATA FORMAT B	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.5
	REV. NO. / DATE 9/1/71	SHEET 10 OF 10



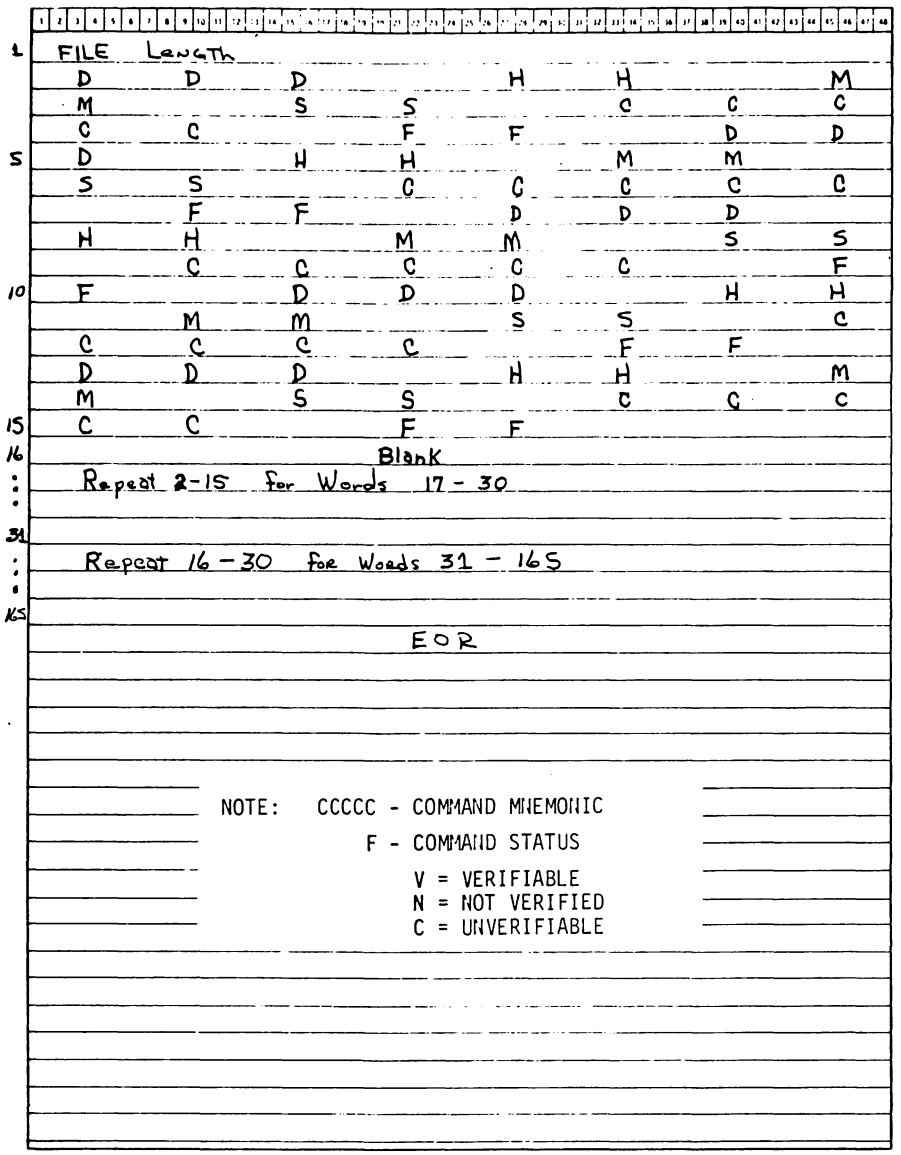
UCSD/TRD FILE 1 LOGISTICS
TYPE - BCD
LOGICAL RECORD LENGTH - 15 WORDS
PHYSICAL RECORD LENGTH - 60 WORDS
FILE SIZE - 4 PHYSICAL RECORDS

REPRODUCED FROM	TITLE: UCSD/TRD FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.6
	REV. NO. / DATE 9/1/71	SHEET 1 OF 7



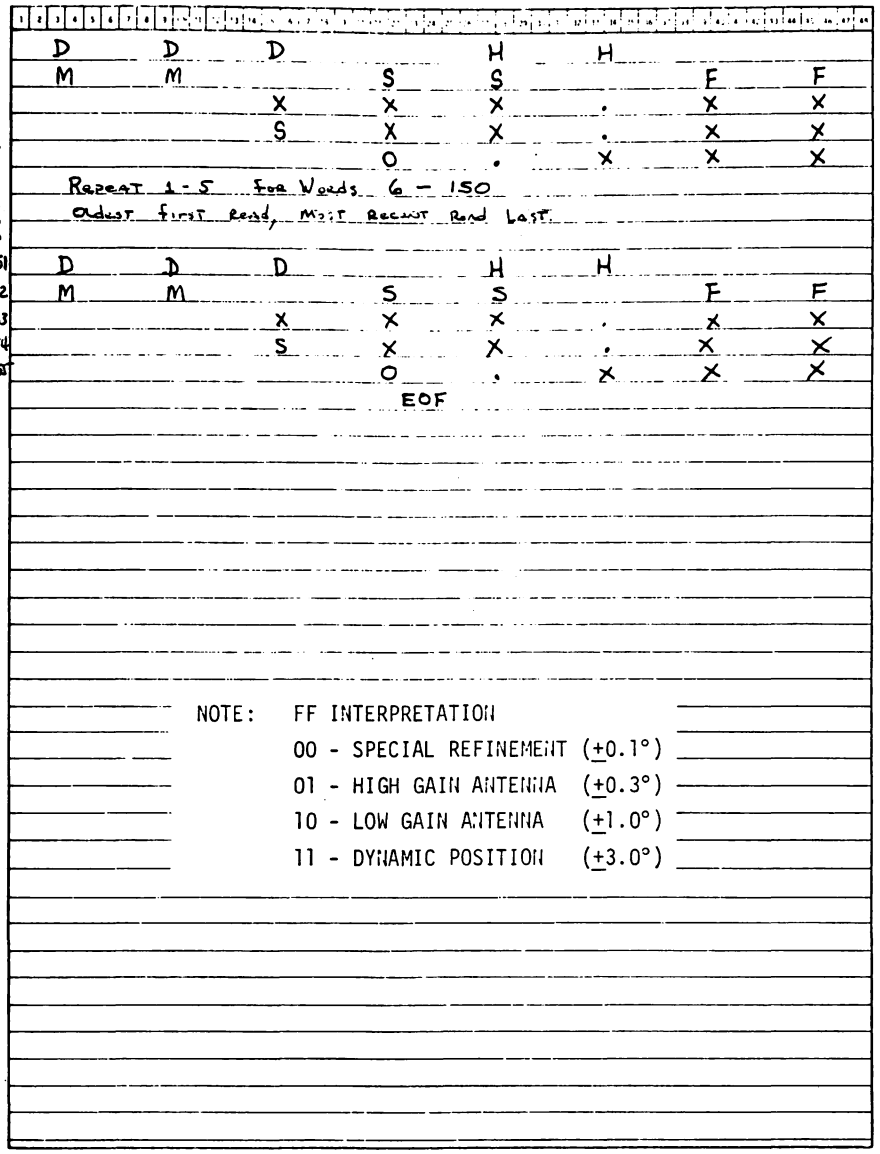
UCSD/TRD FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UCSD/TRD FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.6
	REV. NO. / DATE 9/1/71	SHEET 2 OF 7



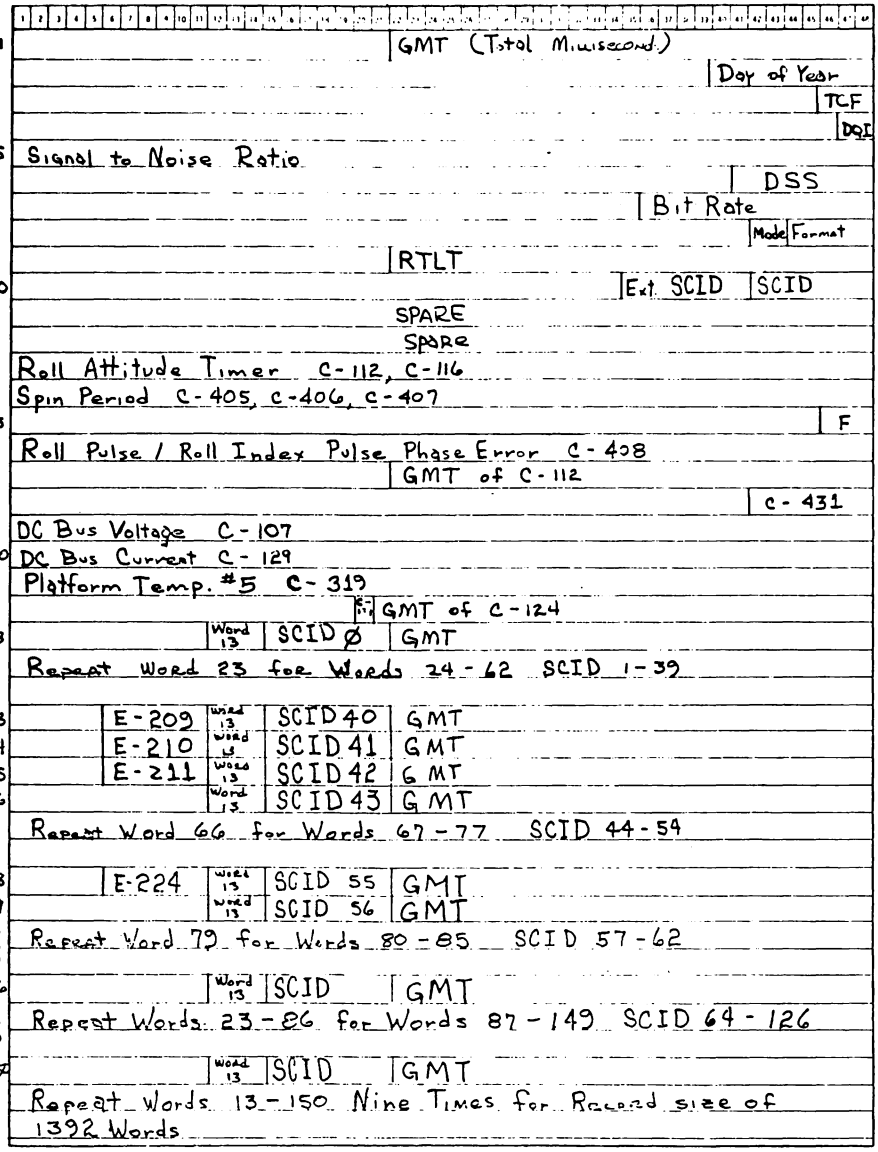
UCSD/TRD FILE 2 COMMAND
TYPE - BCD
LOGICAL RECORD LENGTH - 15 WORDS
PHYSICAL RECORD LENGTH - 165 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	UCSD/TRD FILE 2 COMMAND DATA	DOC. NO. PC-262.03
		FIG. 3.2.6
	REV. NO. DATE 9/1/71	SHEET 3 OF 7



UCSD/TRD FILE 3 ATTITUDE DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 155 WORDS
PHYSICAL RECORD LENGTH - 155 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: UCSD/TRD FILE 3 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.6
	REV. NO. / DATE 9/1/71	SHEET 4 OF 7



UCSD/TRD FILE 4 EXPERIMENT DATA
TYPE - BINARY FORMAT A
LOGICAL RECORD LENGTH - 1392 WORDS
PHYSICAL RECORD LENGTH - 1392 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: UCSD/TRD FILE 4 EXPERIMENT DATA FORMAT A	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.6
	REV. NO. / DATE 9/1/71	SHEET 5 OF 7

1	GMT (milliseconds)									
	Day of Year									
	TCF									
	DQI									
5	Signal to Noise Ratio									
	DSS									
	Bit Rate									
	Mode	Format								
	RTLT									
10	Ext. SCID	SCID								
	Spare									
	Spare									
	Roll Attitude Timer C-112, C-116									
	Spin Period C-405 C-406 C-407									
15	F									
	Roll Pulse / Roll-Index Pulse Phase Error C-408									
	GMT for C-112									
	C-431									
	DC Bus Voltage C-107									
20	DC Bus Current C-129									
	Platform Temp #5 C-319									
	4 Time of C-124									
	SCID ∅	GMT								
24		44	43	42	41	13	12	11	10	9
	Repeat Words 23, 24 for Words 25 - 102 SCID 1 - 39									
103	SCID 40	GMT								
	E-209	44	43	42	41	13	12	11	10	9
105	SCID 41	GMT								
	E-210	44	43	42	41	13	12	11	10	9
	SCID 42	GMT								
	E-211	44	43	42	41	13	12	11	10	9
	SCID 43	GMT								
110		44	43	42	41	13	12	11	10	9
	Repeat Words 109, 110 for words 111 - 132 SCID 44 - 54									
133	SCID 55	GMT								
	E-224	44	43	42	41	13	12	11	10	9
135	SCID 56	GMT								
138		44	43	42	41	13	12	11	10	9

UCSD/TRD FILE 4 EXPERIMENT DATA
TYPE - BINARY FORMAT B
LOGICAL RECORD LENGTH - 1392 WORDS
PHYSICAL RECORD LENGTH - 1392 WORDS
FILE SIZE - VARIABLE

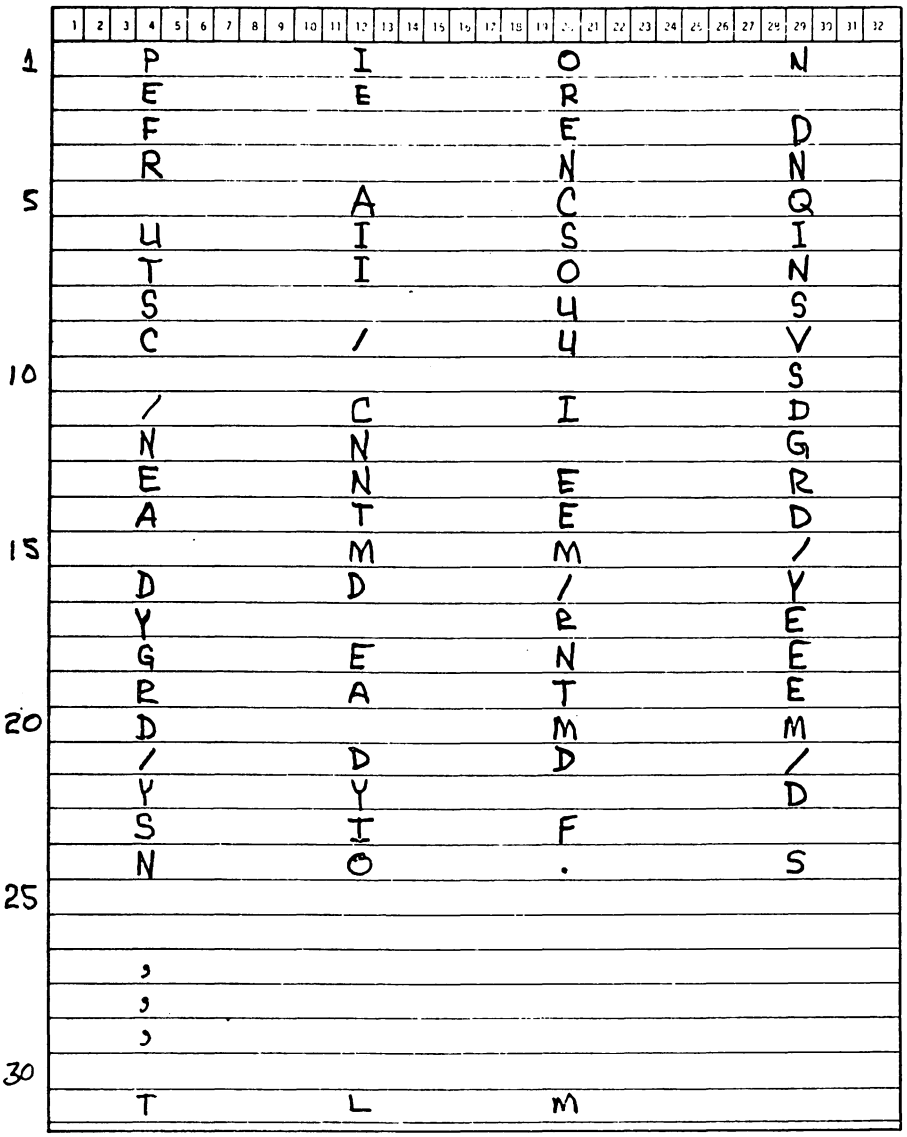
Repeat 135, 136 for Words 137 - 150 SCID 57 - 63
Repeat Words 23 - 150 for Words 151 - 278 SCID 64 - 127
Repeat Words 13 - 278 Four Times for 1342 Data Words at end
Add 50 Words of Filler To Give 1392 words
EOR

REPRODUCED FROM

TITLE
UCSD/TRD
FILE 4
EXPERIMENT DATA

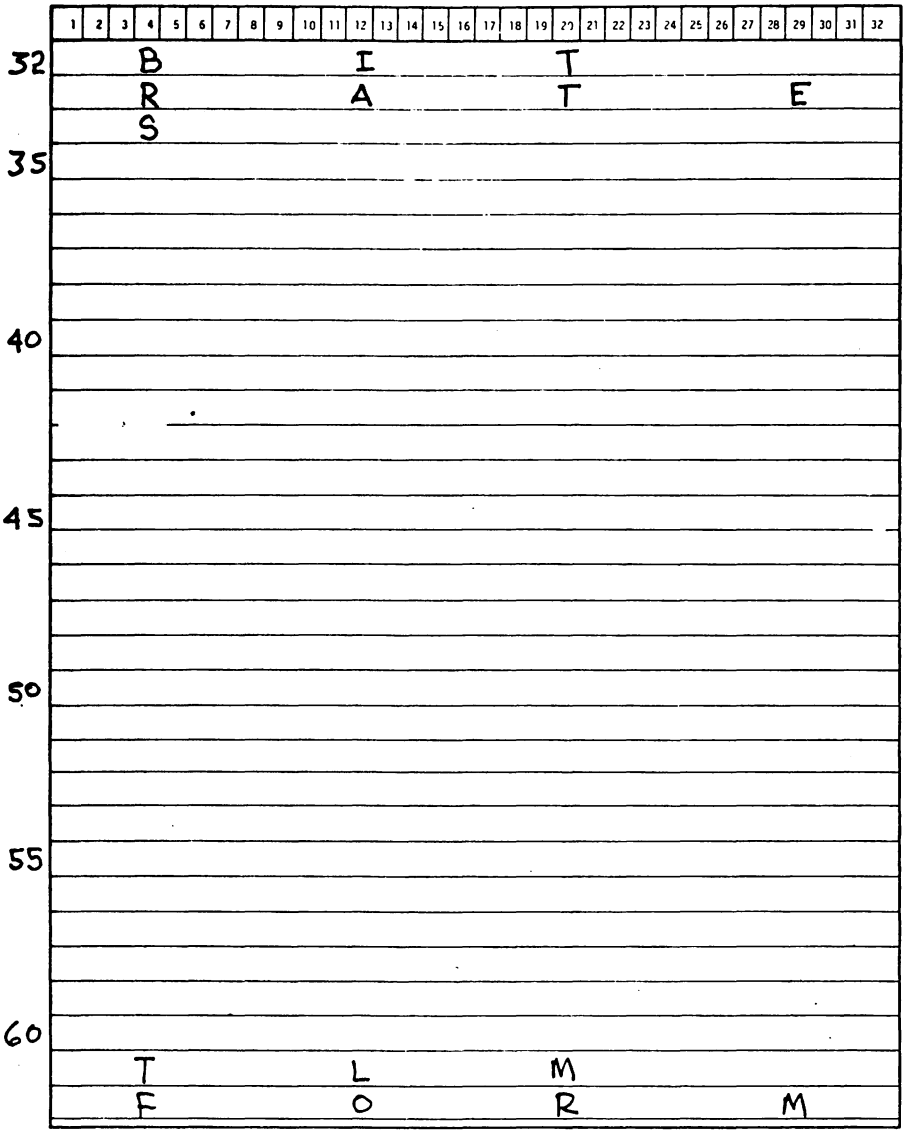
PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.03
FIG. 3.2.6
REV. NO.
DATE 9/1/71
SHEET 7 OF 7



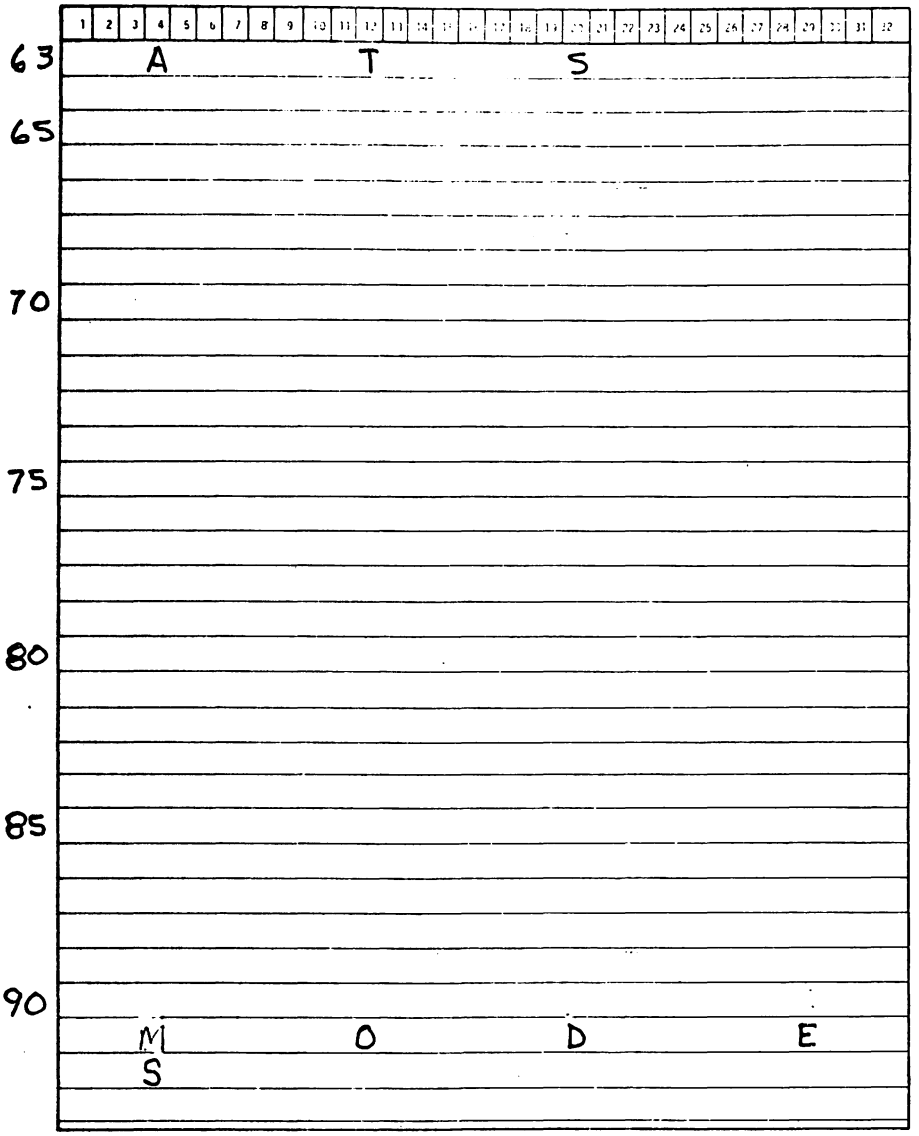
USC/UV FILE 1 LOGISTICS
TYPE - EBCDIC
LOGICAL RECORD LENGTH - 30 WORDS
PHYSICAL RECORD LENGTH - 120 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: USC/UV FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.7
	REV. NO. / DATE 9/1/71	SHEET 1 OF 8

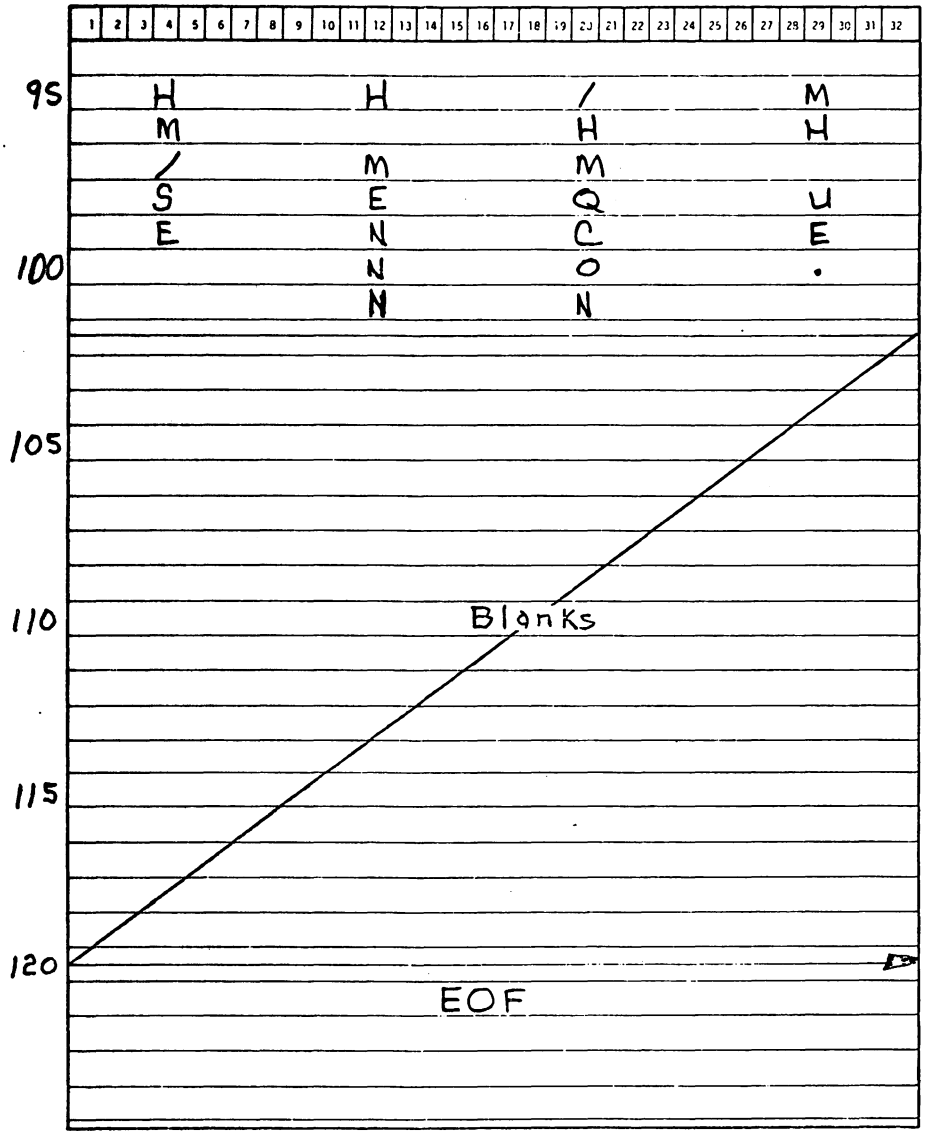


USC/UV FILE 1 LOGISTICS (CONTD)

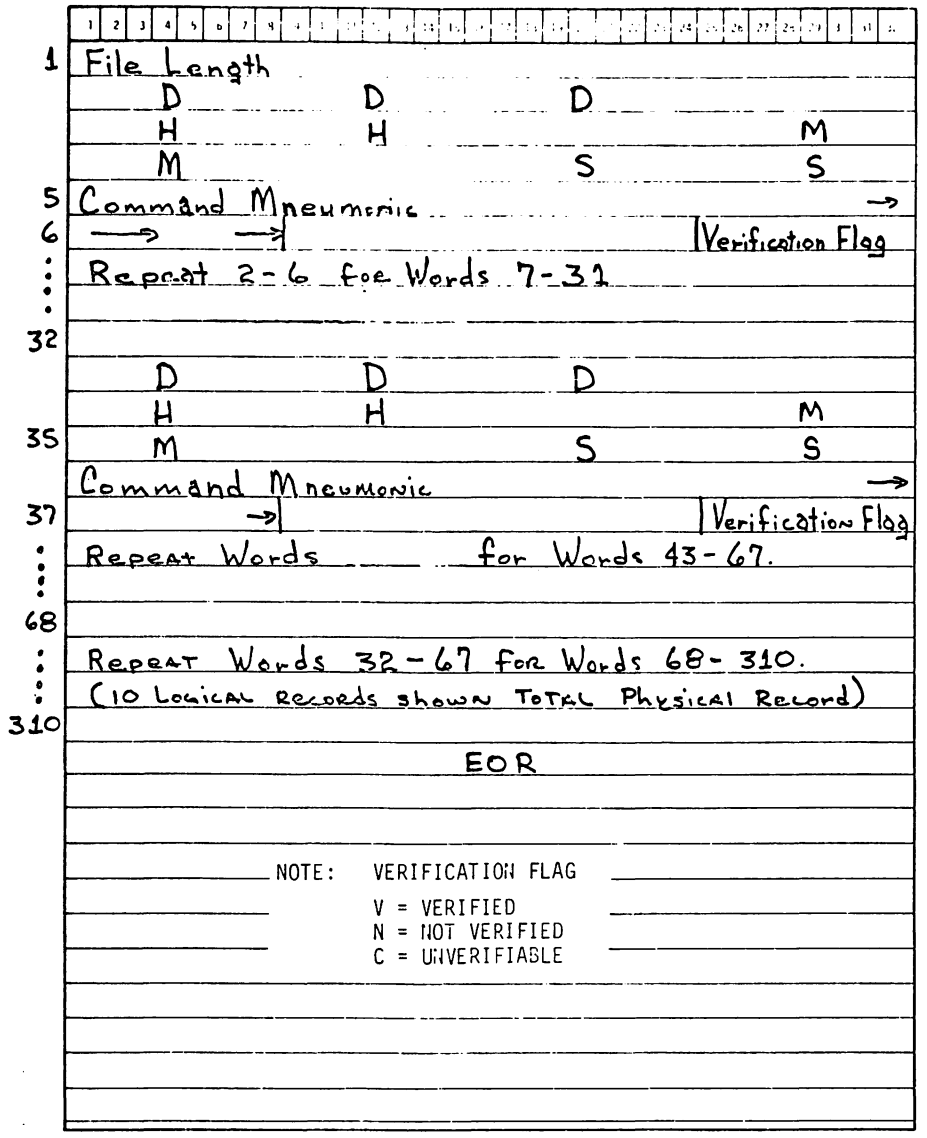
REPRODUCED FROM	TITLE: USC/UV FILE 1 LOGISTICS DATA		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
			DOC. NO. PC-262.03
			FIG. 3.2.7
	REV. NO.	DATE 9/1/71	SHEET 2 OF 8



REPRODUCED FROM	TITLE: USC/UV FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.7
	REV. NO. / DATE 9/1/71	SHEET 3 OF 8



REPRODUCED FROM	TITLE: USC/UV FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.7
	REV. NO. / DATE 9/1/71	SHEET 4 OF 8



USC/UV FILE 2 COMMAND
TYPE - EBCDIC
LOGICAL RECORD LENGTH - 31 WORDS
PHYSICAL RECORD LENGTH - 310 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	USC/UV FILE 2 COMMAND DATA	DOC. NO. PC-262.03
		FIG. 3.2.7
	REV. NO. / DATE 9/1/71	SHEET 5 OF 8

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
FLAG	GMT TIME OF DAY TOTAL ms																														
	Celestial Latitude XXX.XX																														
	Celestial Longitude ± XX.XX																														
	Celestial Latitude drift deg/day ±0.XXX																														
Repeat word 1-4 29 more times to complete the previous 30 entries for words 5-120																															
121	GMT TIME for the most recent entry																														
	Celestial Latitude																														
	Celestial Longitude																														
124	Celestial Latitude drift deg/day																														
EOF																															

NOTE: FLAG INTERPRETATION

00 - SPECIAL REFINEMENT (±0.1°)
01 - HIGH GAIN ANTENNA (±0.3°)
10 - LOW GAIN ANTENNA (±1.0°)
11 - DYNAMIC POSITION (±3.0°)

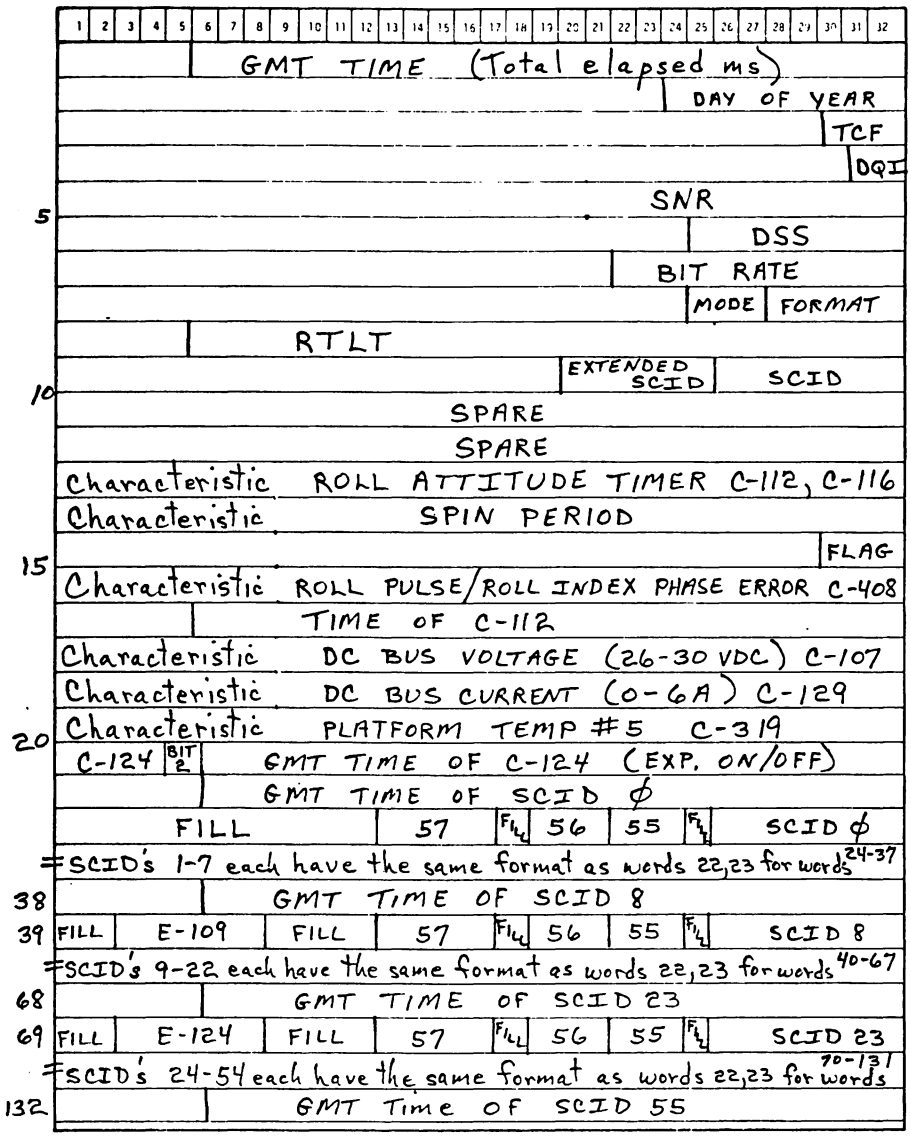
USC/UV FILE 3 ATTITUDE DATA
TYPE - BINARY
LOGICAL RECORD LENGTH - 124 WORDS
PHYSICAL RECORD LENGTH - 124 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM

TITLE
USC/UV
FILE 3
S/C ATTITUDE DATA

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.03
FIG. 3.2.7
REV. NO.
DATE 9/1/71
SHEET 6 OF 8



USC/UV FILE 4 EXPERIMENT DATA
TYPE - BINARY
LOGICAL RECORD LENGTH - 256 WORDS
PHYSICAL RECORD LENGTH - 1072 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: USC/UV FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.7
	REV. NO. / DATE 9/1/71	SHEET 7 OF 8

	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
133	FILL			E-224					FILL				57				FILL		56			55			FILL			SCID 55				

#SCID's 56-63 each have the same format as words 22,23 for words 134-149

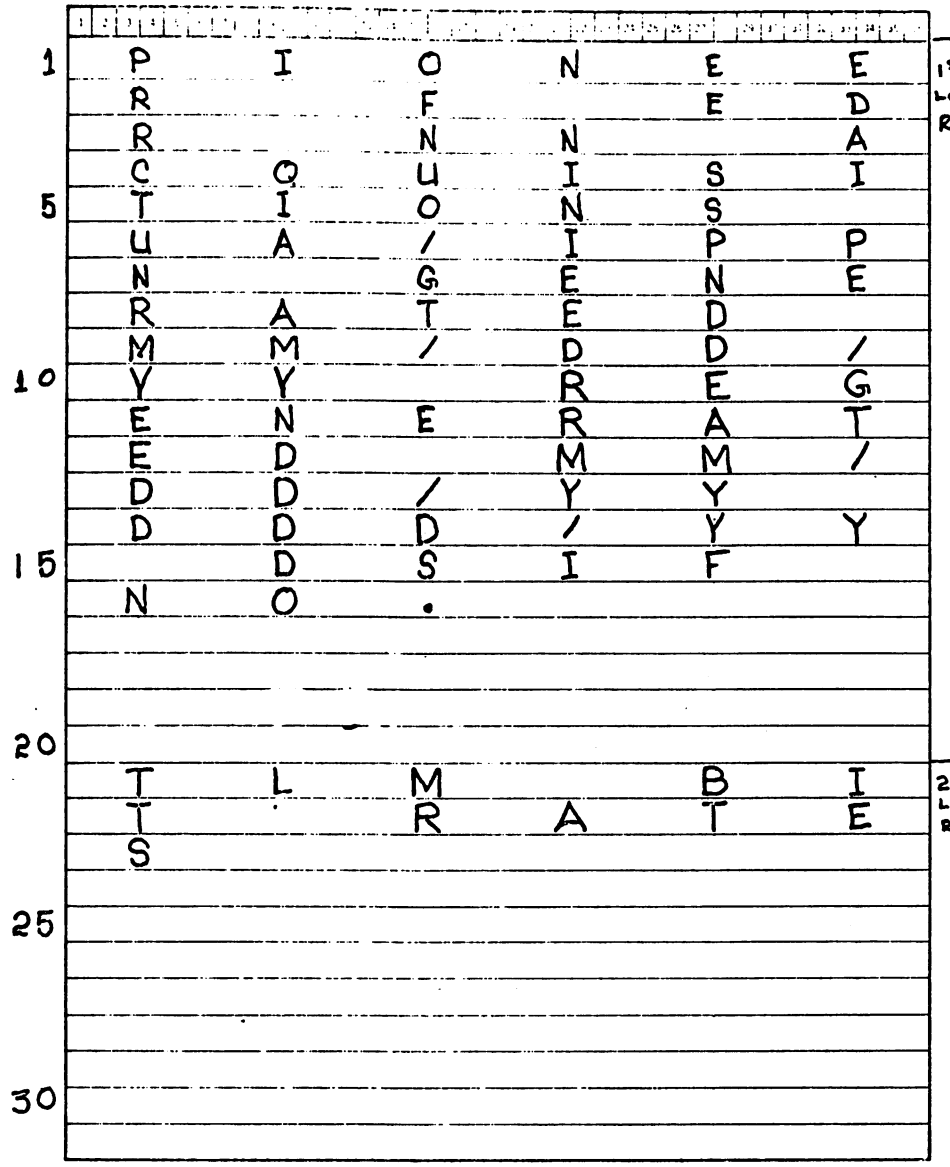
#SCID's 64-127 each have the same format as words 22-149 for words 150-277

3 more sets of Data in the same format as Words 13-277

1072 EOR

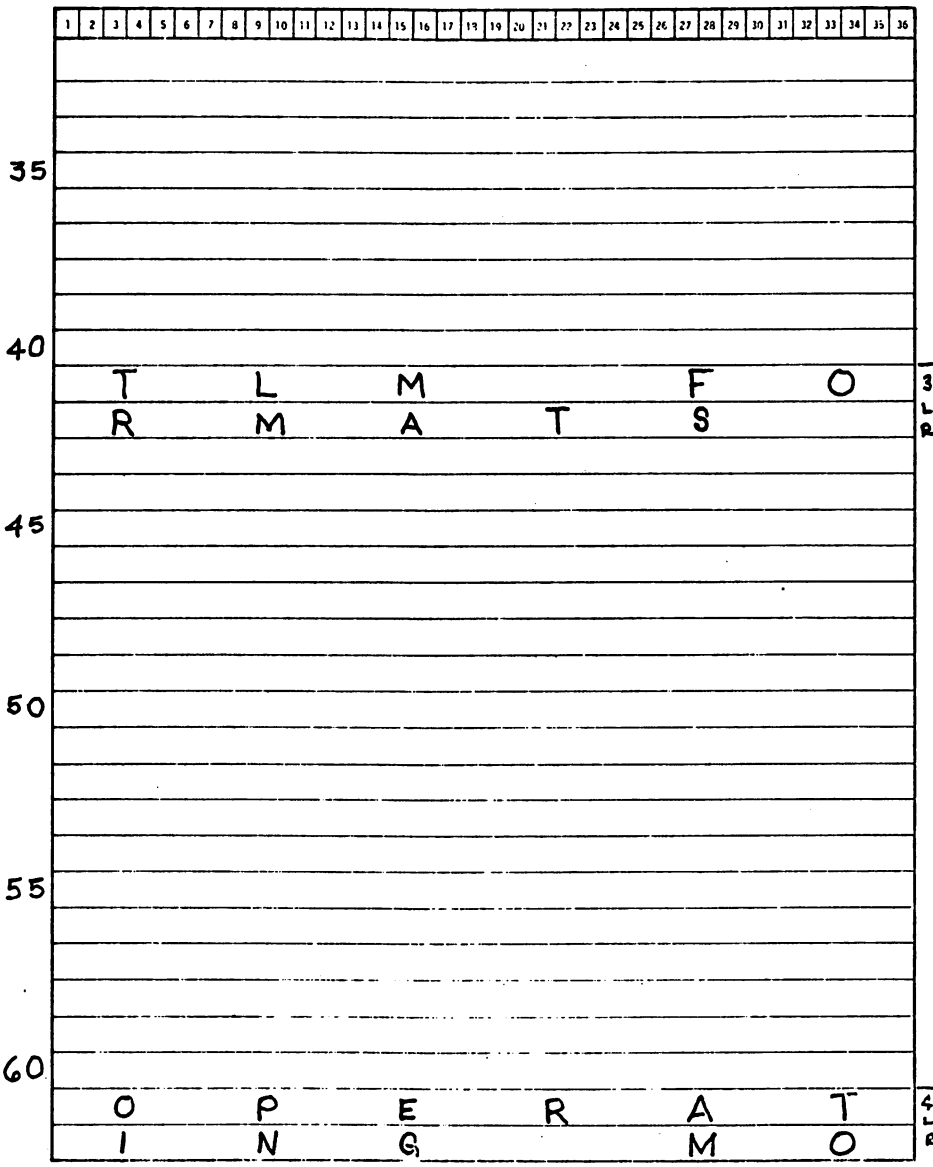
USC/UV FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE: USC/UV FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.7
	REV. NO. / DATE 9/1/71	SHEET 8 OF 8



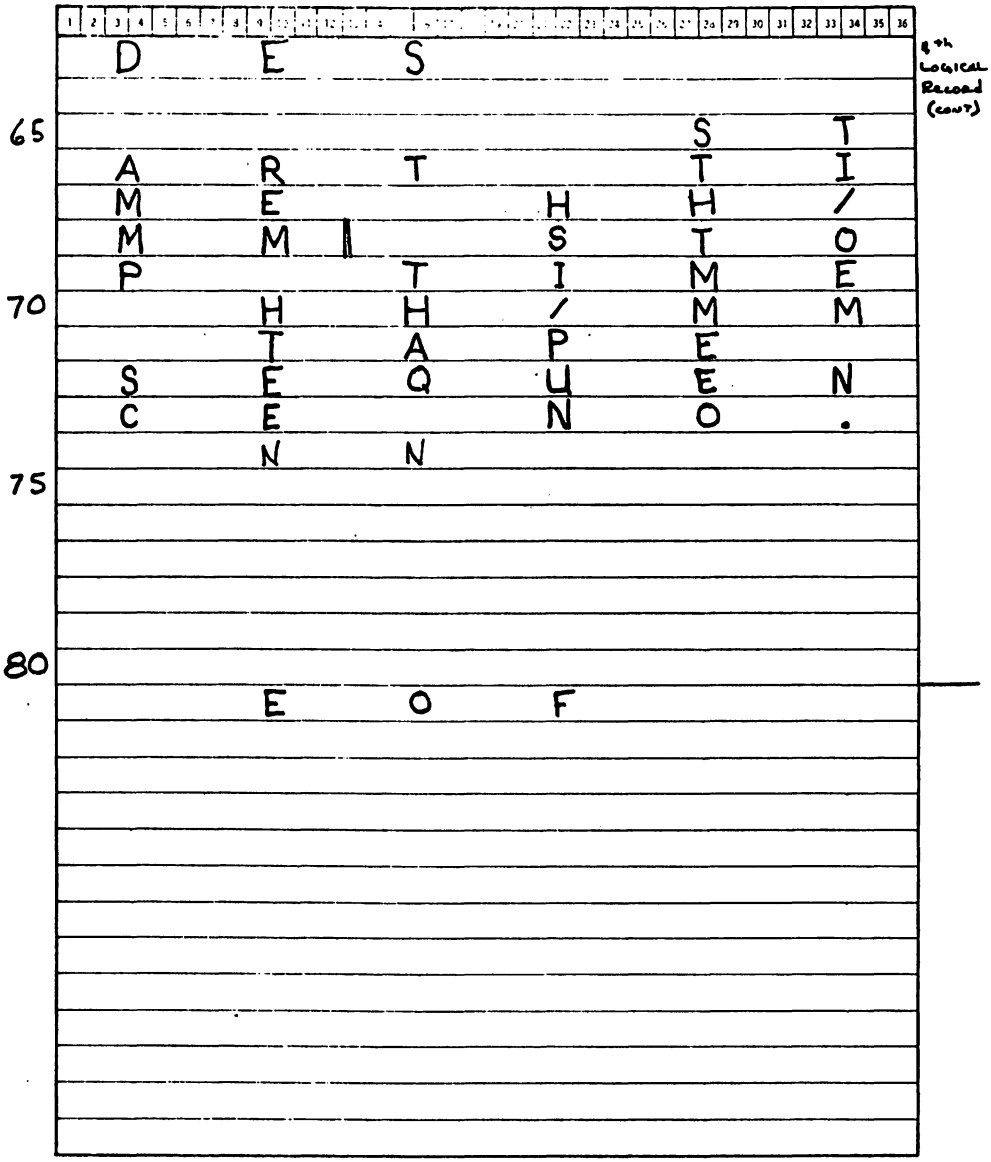
UA/IPP MODE 3 & 4 FILE 1 LOGISTICS
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 80 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: UA/IPP FILE 1 MODE 3&4 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. / DATE 9/1/71	SHEET 1 OF 11



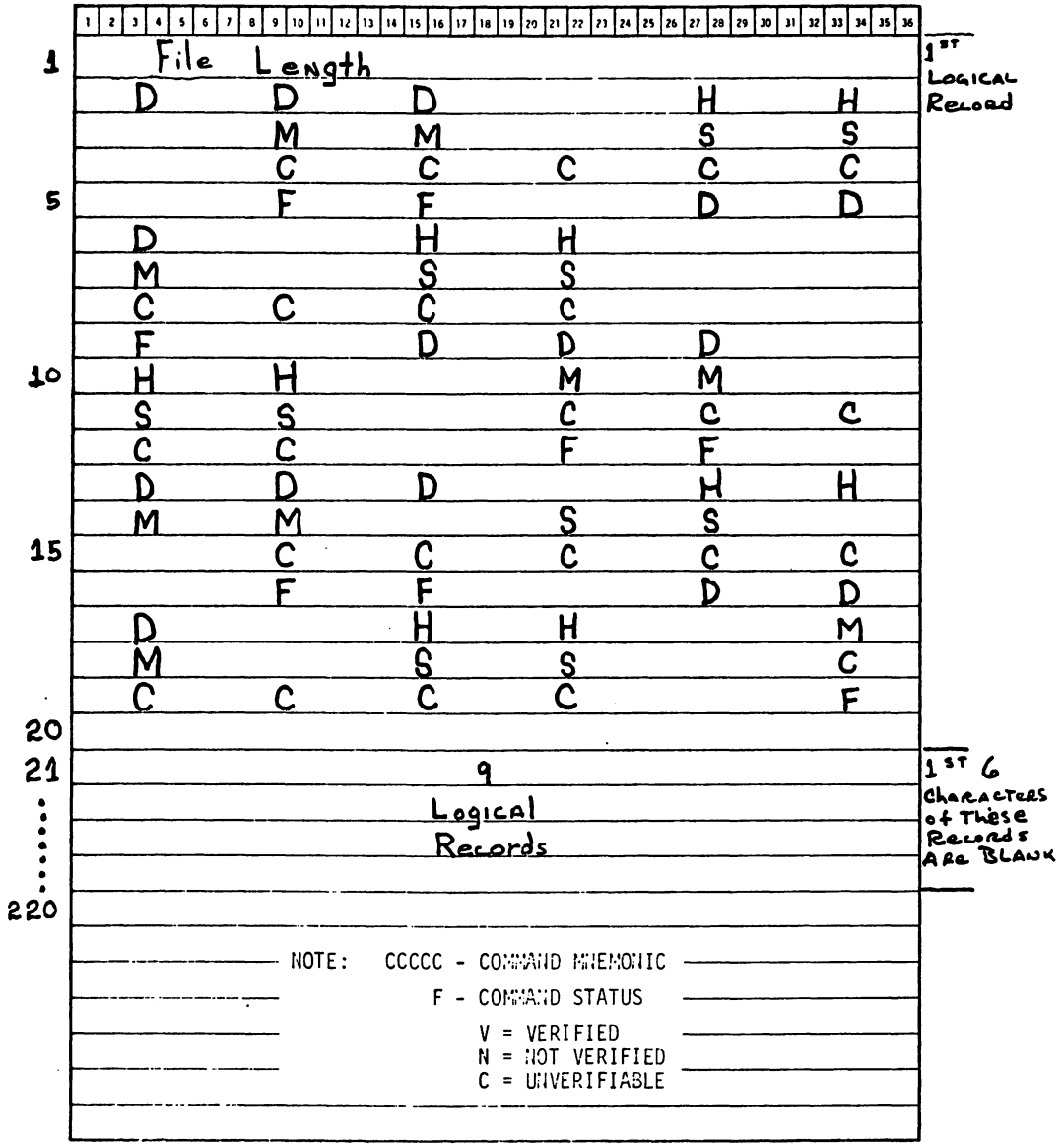
UA/IPP MODE 3 & 4 FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UA/IPP FILE 1 MODE 3&4 LOGISTICA DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262 03	
		FIG. 3.2.8	
	REV. NO.	DATE 9/1/71	SHEET 2 OF 11



UA/IPP MODE 3 & 4 FILE 1 LOGISTICS (CONTD)

REPRODUCED FROM	TITLE: UA/IPP FILE 1 MODE 3&4 LOGISTICA DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.8	
	REV. NO. / DATE 9/1/71	SHEET 3 OF 11	



UA/IPP MODE 3 & 4 FILE 2 COMMAND
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 220 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	UA/IPP FILE 2 MODE 3&4 COMMAND DATA	DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. DATE 9/1/71	SHEET 4 OF 11

1	D	D	D	Blank	H	H	
	Blank	M	M	Blank	S	S	
	;	FLAG		BLANK			
	X	X	X	.	X	X	Celestial Longitude
5	Blank	X	X	X	.	X	Celestial Latitude
	X	Blank	±	0	.	X	Celestial drift
	X	X	Blank		D	D	
	D	Blank	H	H	Blank	M	
	M	Blank	S	S	;	Flag	
10		Blank		X	X	X	Celestial Longitude
	.	X	X	Blank	±	X	Celestial Latitude
	X	.	X	X	Blank	±	Celestial Drift
	0	.	X	X	X	Blank	
	Blank	D	D	D	Blank	H	
15	H	Blank	M	M	Blank	S	
	S	Blank	Flag		BLANK		
	X	X	X	.	X	X	Celestial Longitude
	Blank	±	X	X	.	X	Celestial Latitude
	X	Blank	±	0	.	X	Celestial Drift
20	X	X	Blank				
	Repeat Items 1 thru 20 ten Times						

NOTE: FLAG INTERPRETATION

00 - SPECIAL REFINEMENT (±0.1°)

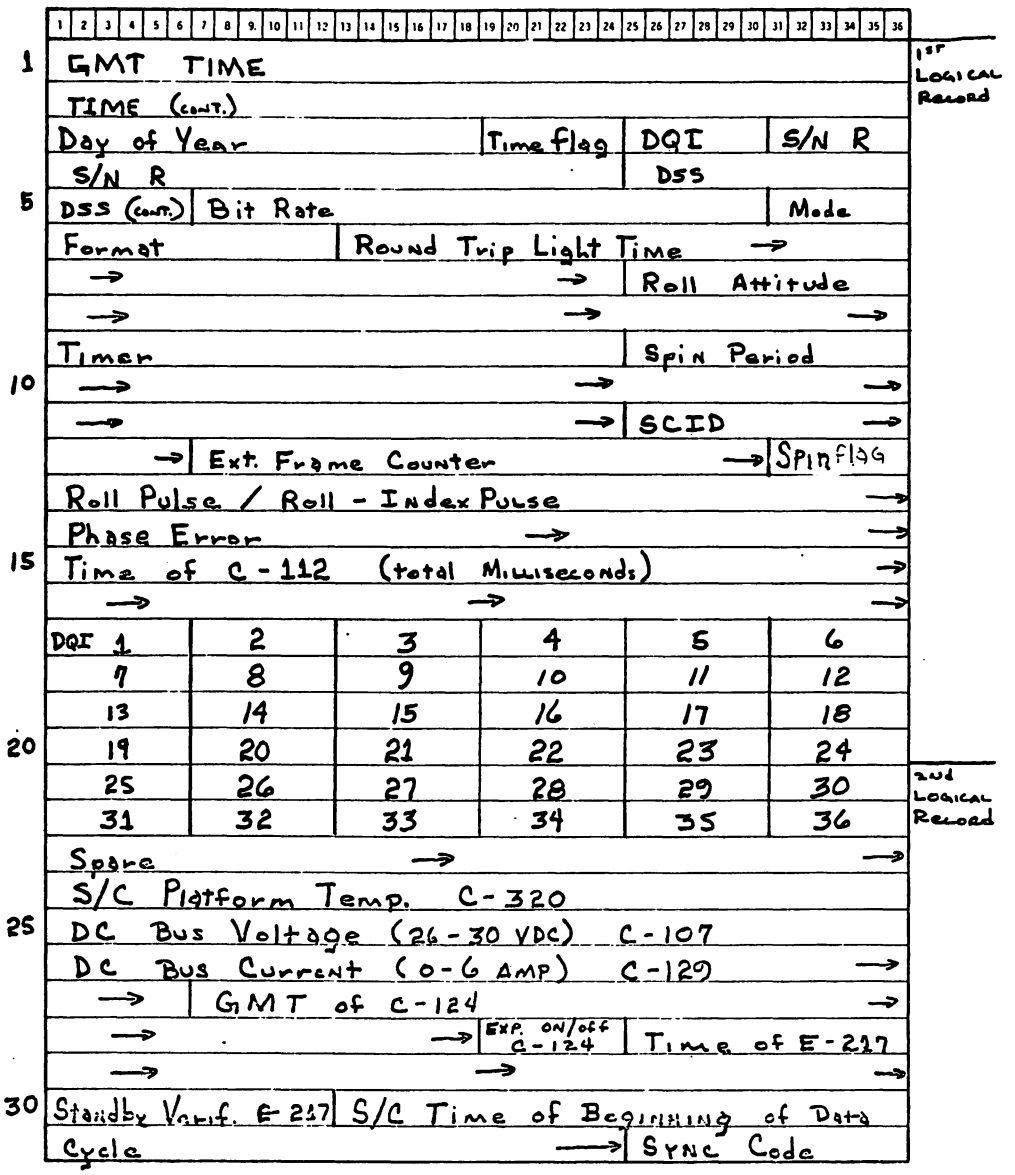
01 - HIGH GAIN ANTENNA (±0.3°)

10 - LOW GAIN ANTENNA (±1.0°)

11 - DYNAMIC POSITION (±3.0°)

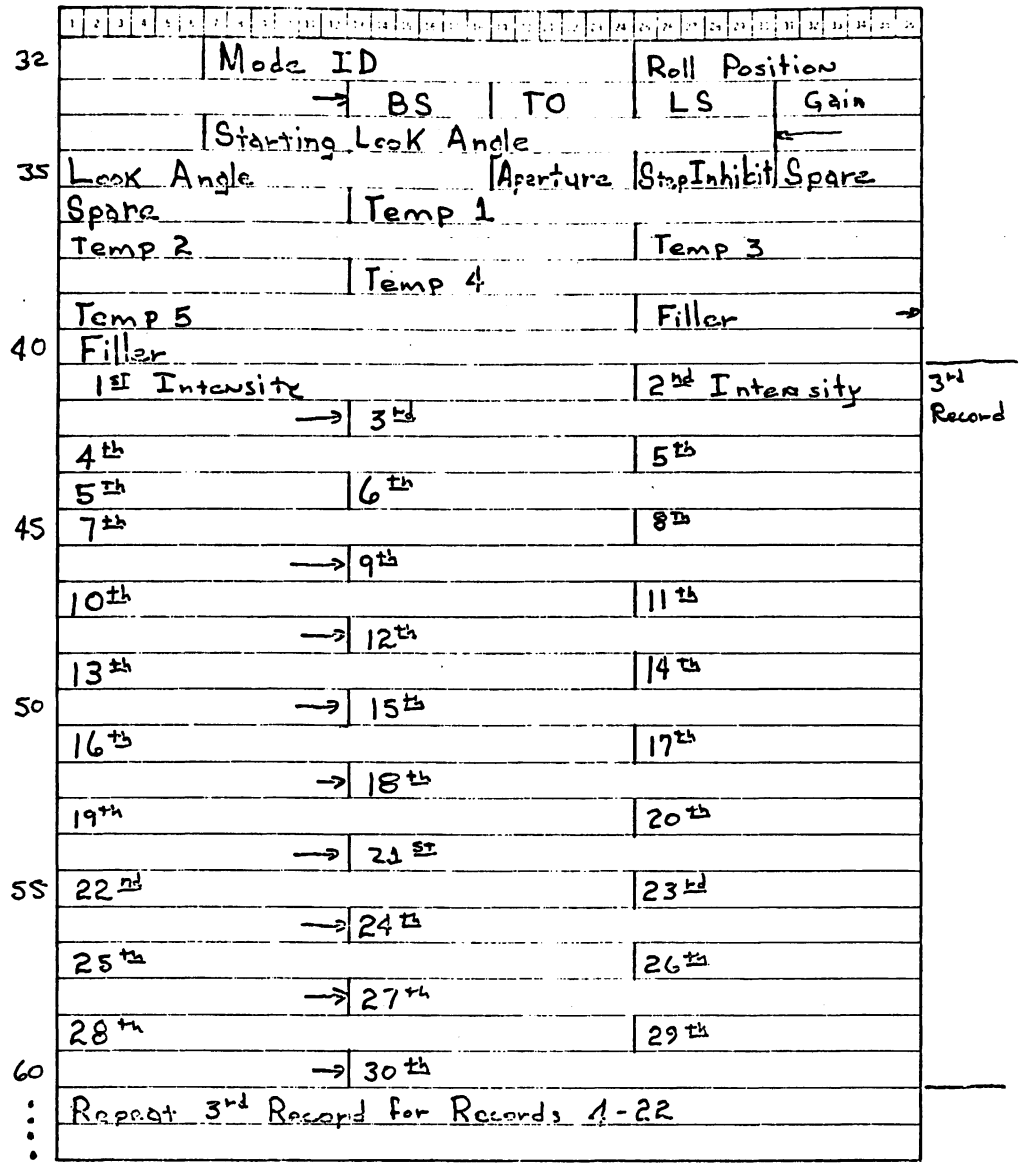
UA/IPP MODE 3 & 4 FILE 3 ATTITUDE DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 220 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: UA/IPP FILE 3 MODE 3&4 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. DATE 9/1/71	SHEET 5 OF 11



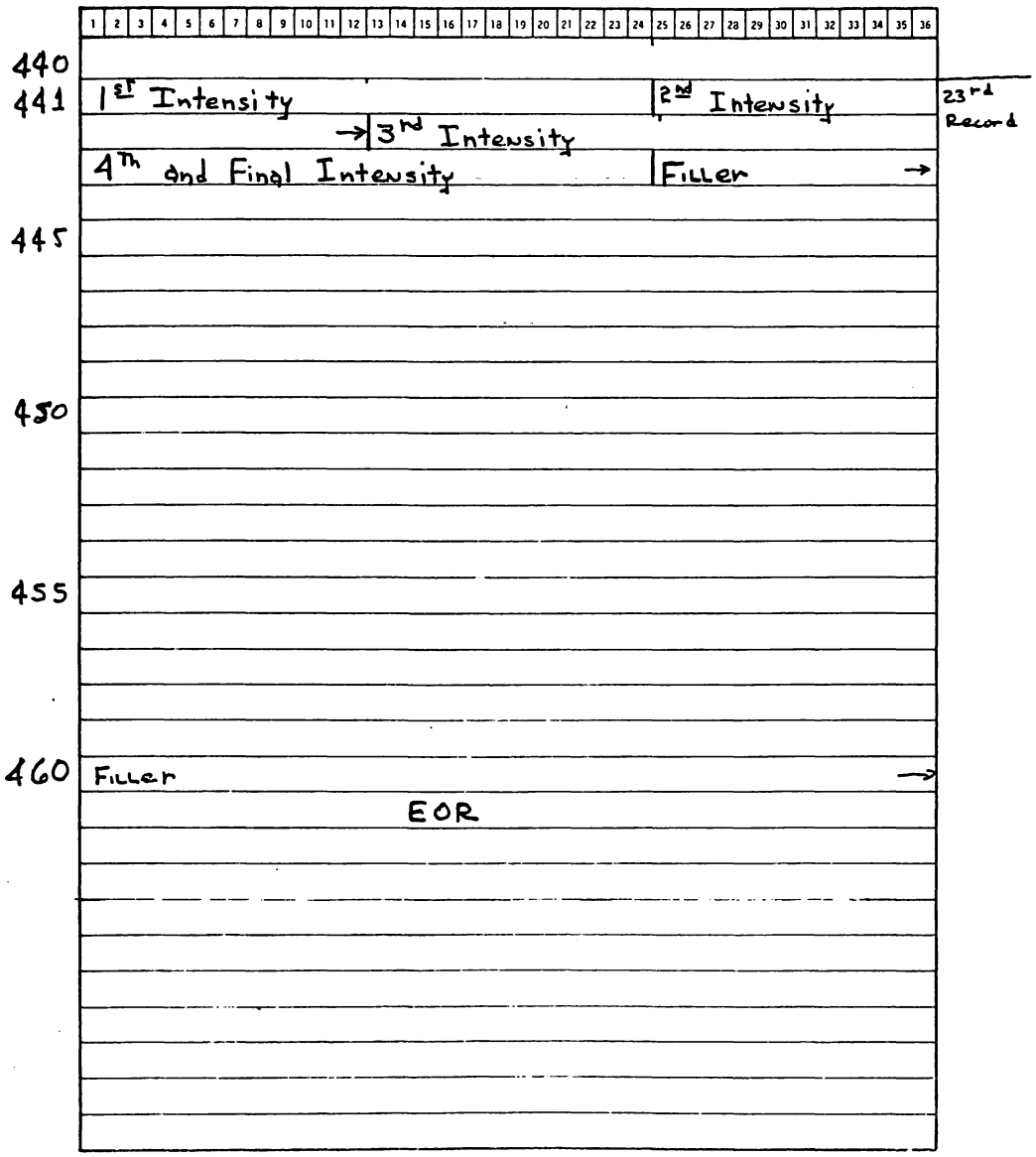
UA/IPP MODE 3 FILE 4 EXPERIMENT DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 460 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: UA/IPP FILE 4 MODE 3 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. / DATE 9/1/71	SHEET 6 OF 11



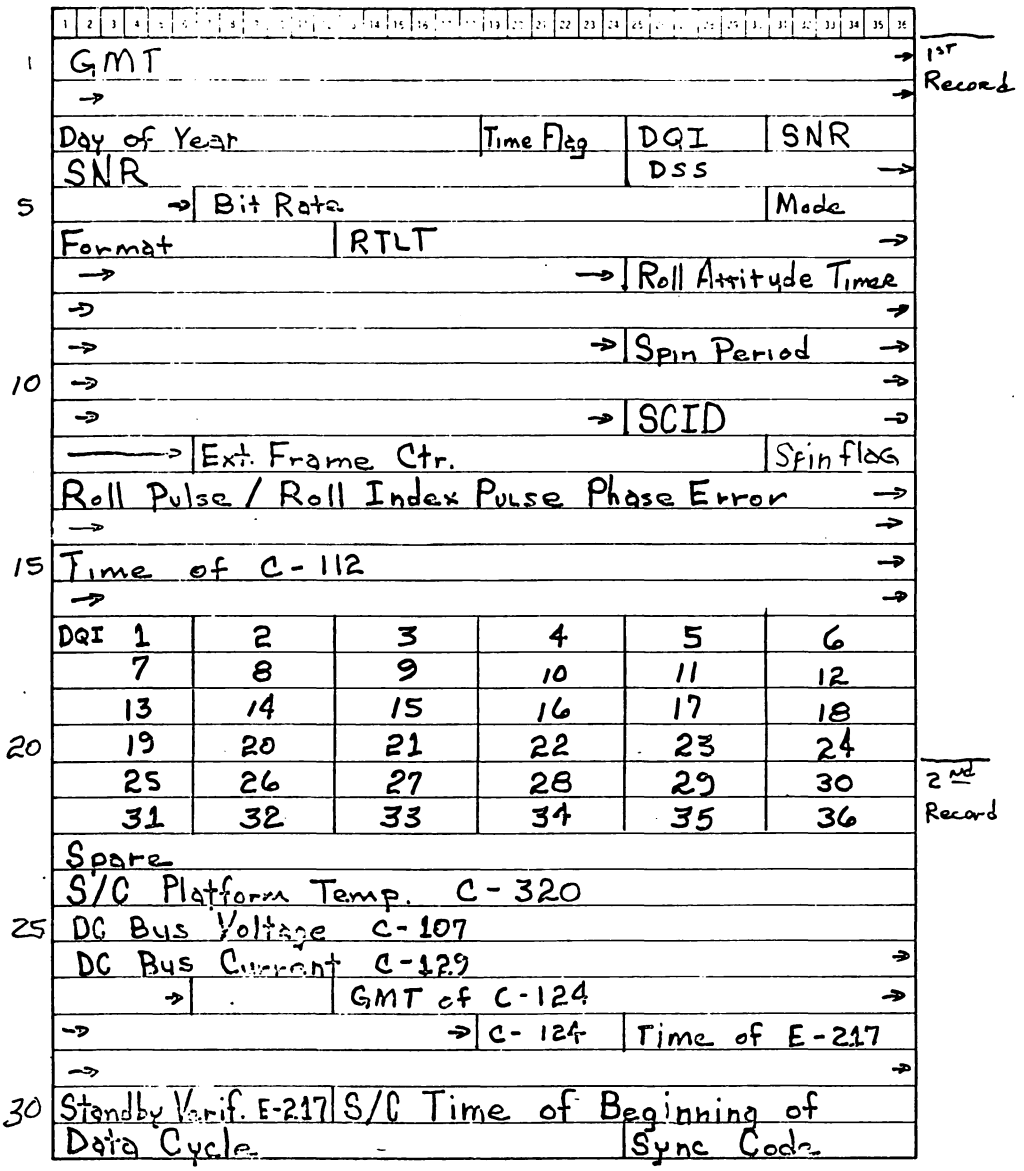
UA/IPP MODE 3 FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE: UA/IPP FILE 4 MODE 3 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. / DATE 9/1/71	SHEET 7 OF 11



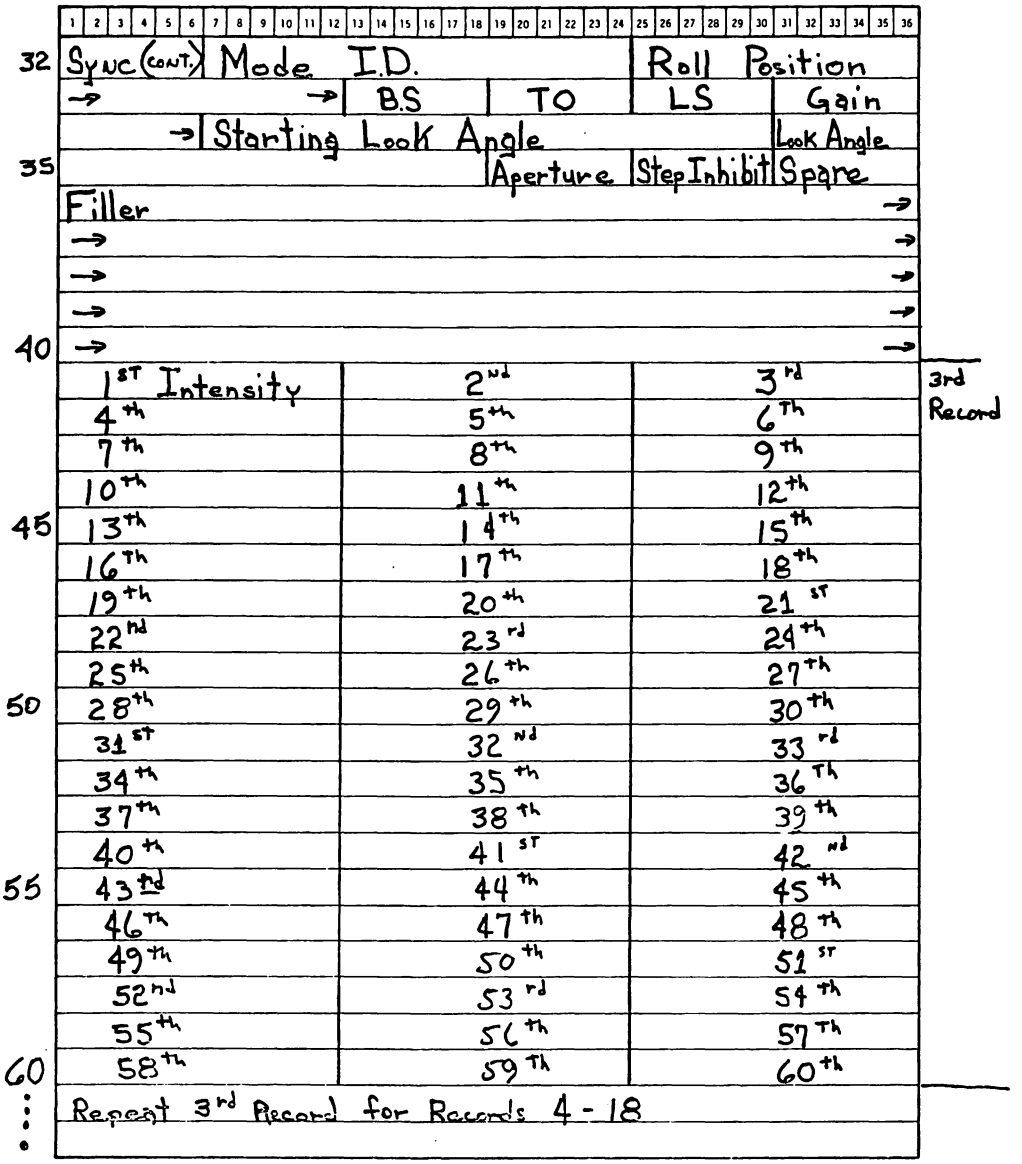
UA/IPP MODE 3 FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE: UA/IPP FILE 4 MODE 3 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. / DATE 9/1/71	SHEET 8 OF 11



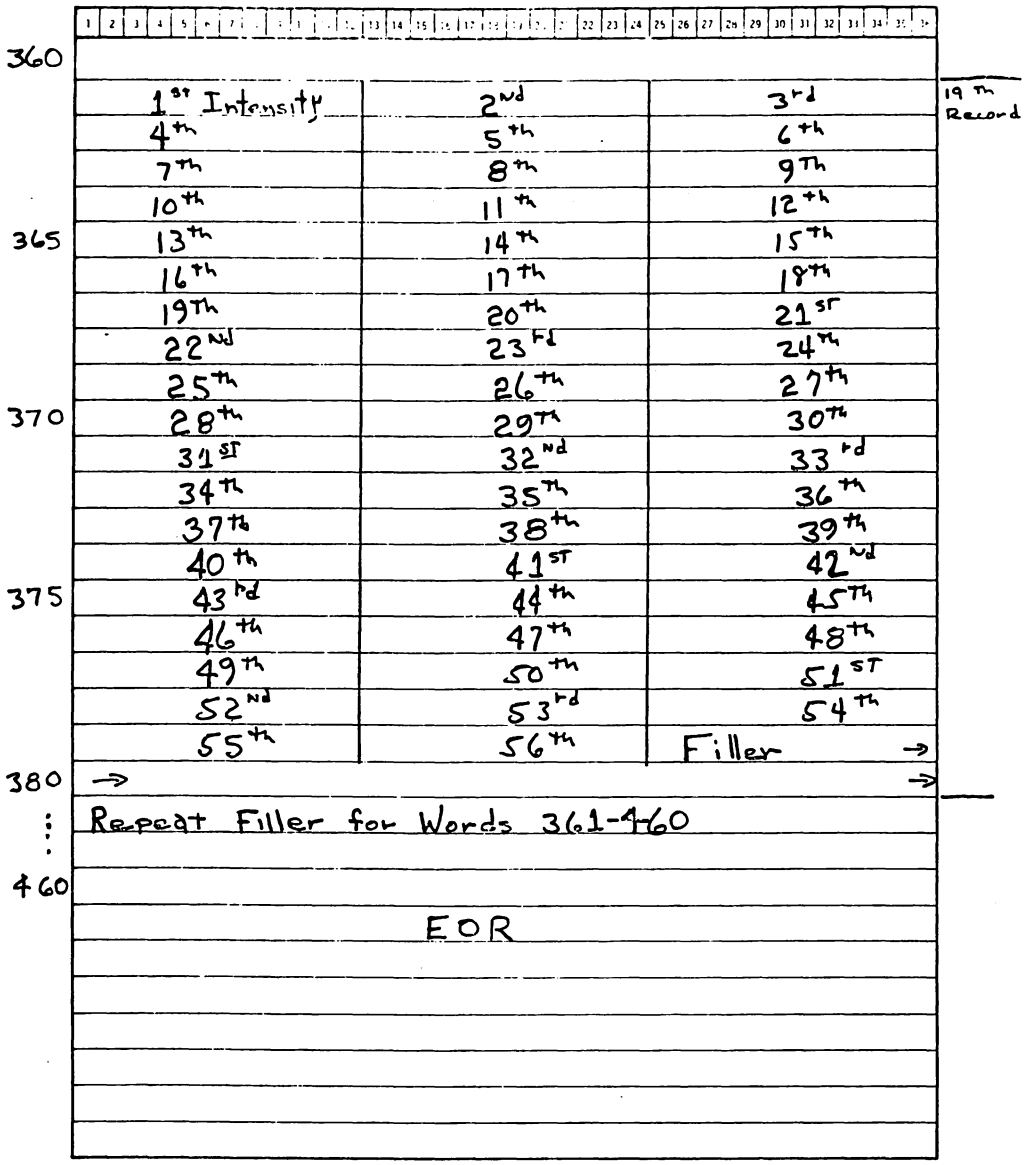
UA/IPP MODE 4 FILE 4 - EXPERIMENT DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 460 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: UA/IPP FILE 4 MODE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. / DATE 9/1/71	SHEET 9 OF 11



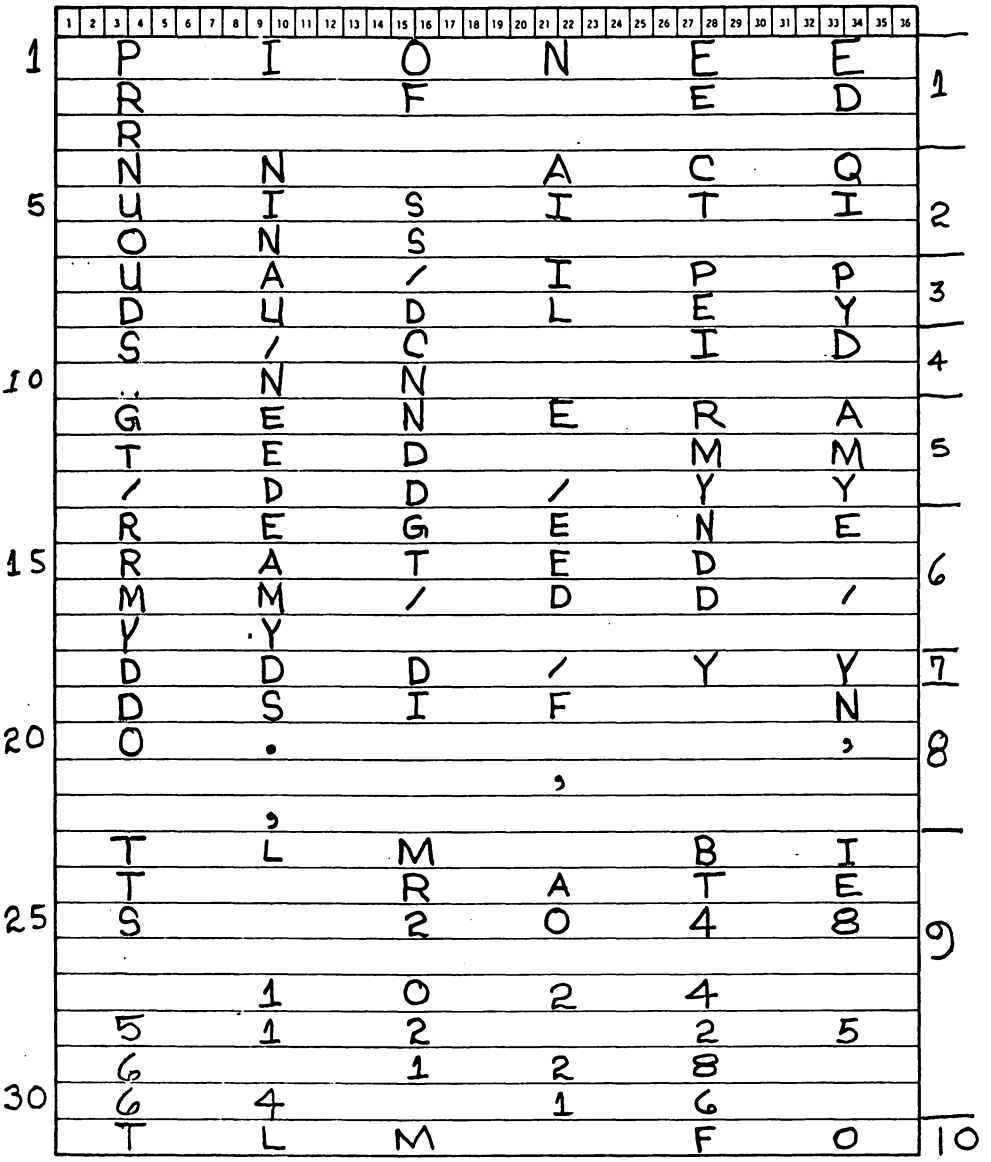
UA/IPP MODE 4 FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE: UA/IPP FILE 4 MODE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.8	
	REV. NO. / DATE 9/1/71	SHEET 10 OF 11	



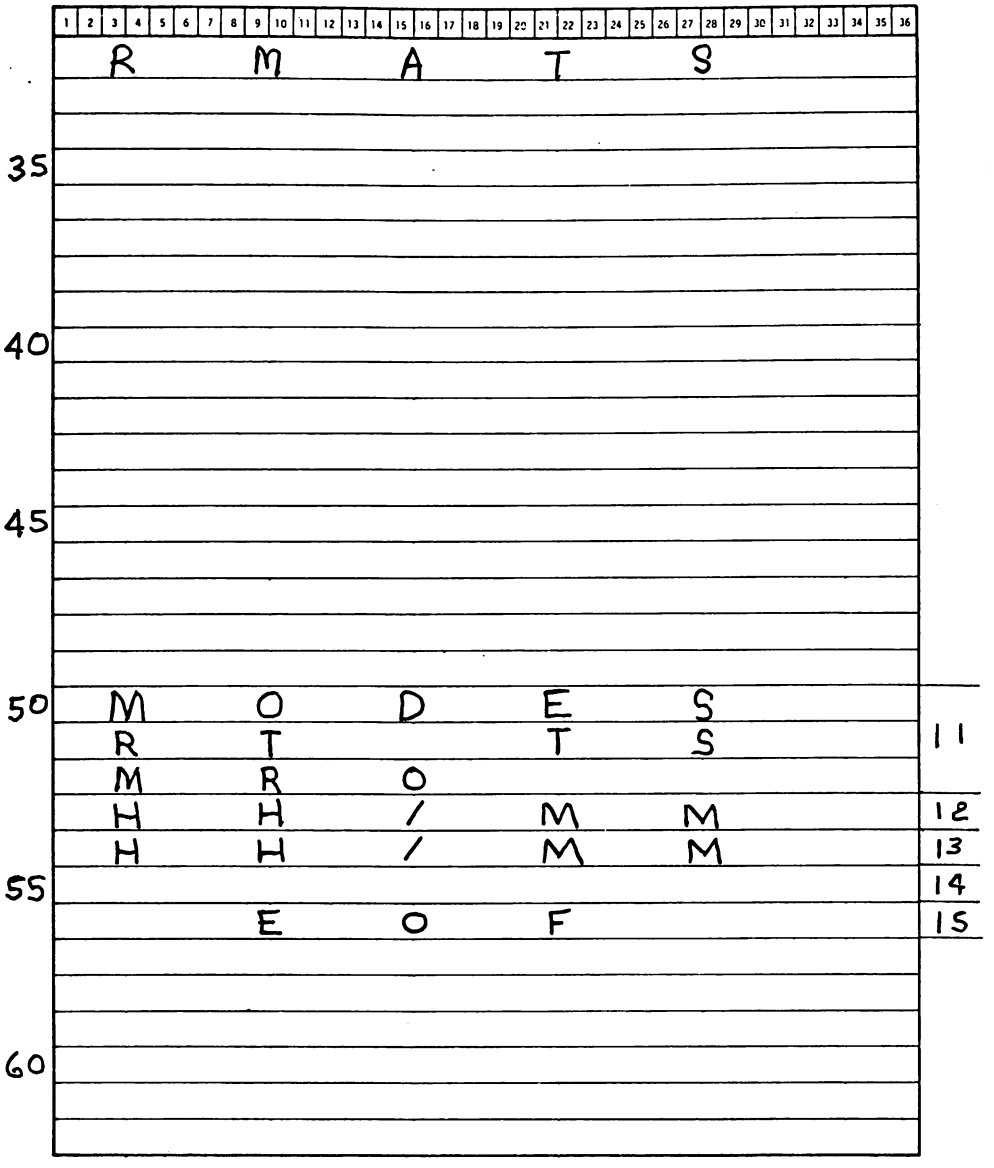
UA/IPP MODE 4 FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE: UA/IPP FILE 4 MODE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.8
	REV. NO. / DATE 9/1/71	SHEET 11 OF 11



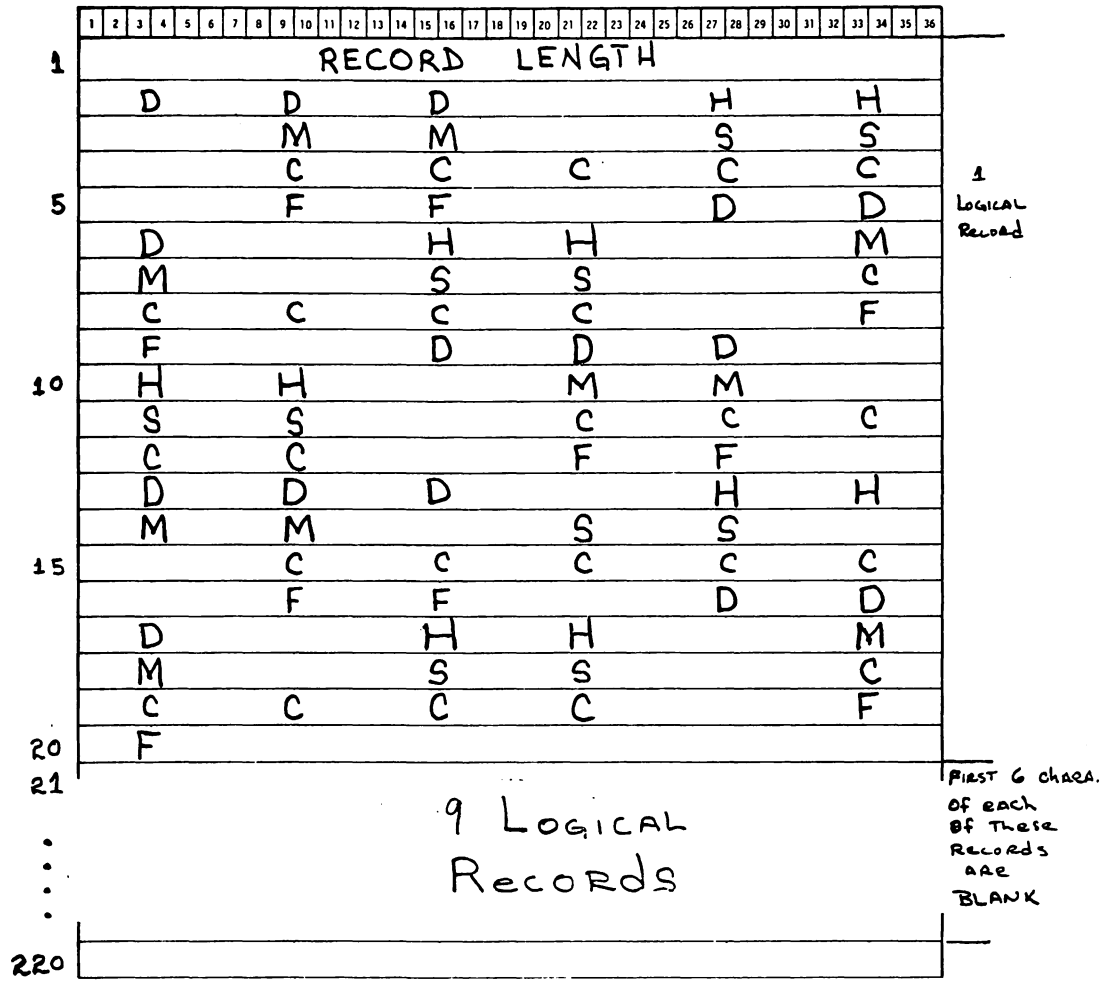
UA/IPP MODE 2 FILE 1 LOGISTICS
TYPE - BCD
LOGICAL RECORD SIZE - 56 WORDS
PHYSICAL RECORD SIZE - 56 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 1 MODE 2 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.9
	REV. NO. / DATE 9/1/71	SHEET 1 OF 7



UA/IPP MODE 2 FILE 1 LOGISTICS (CONTD)

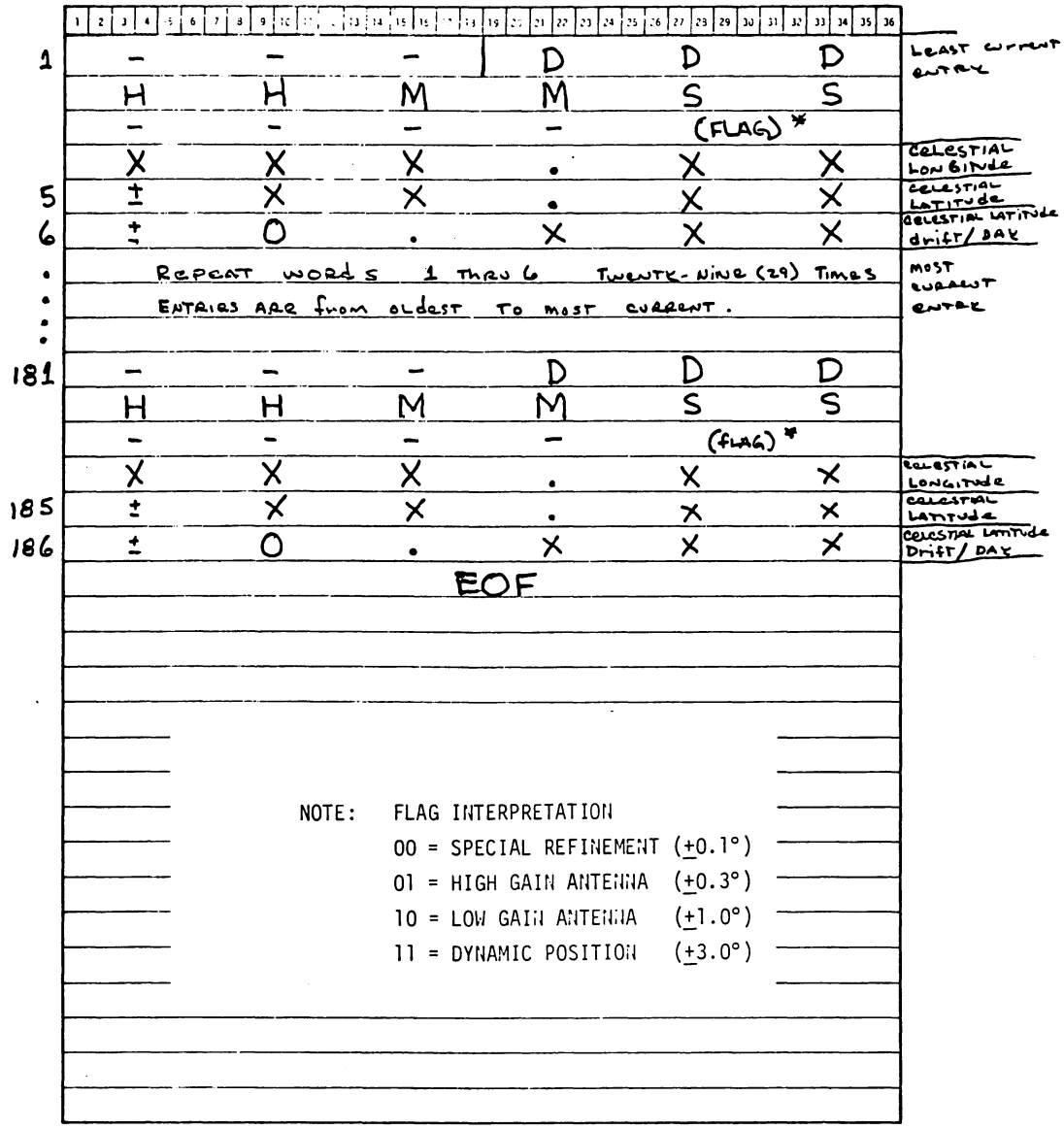
REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 1 MODE 2 LOGISTICA DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.9
	REV. NO. DATE 9/1/71	SHEET 2 OF 7



NOTE: CCCCC - COMMAND MNEMONIC
FF - COMMAND STATUS
V = VERIFIED
N = NOT VERIFIED
C = UNVERIFIABLE

UA/IPP MODE 2 FILE 2 COMMAND
TYPE - BCD
LOGICAL RECORD SIZE - 20 WORDS
PHYSICAL RECORD SIZE - 220 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 2 MODE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.9
	REV. NO. DATE 9/1/71	SHEET 3 OF 7

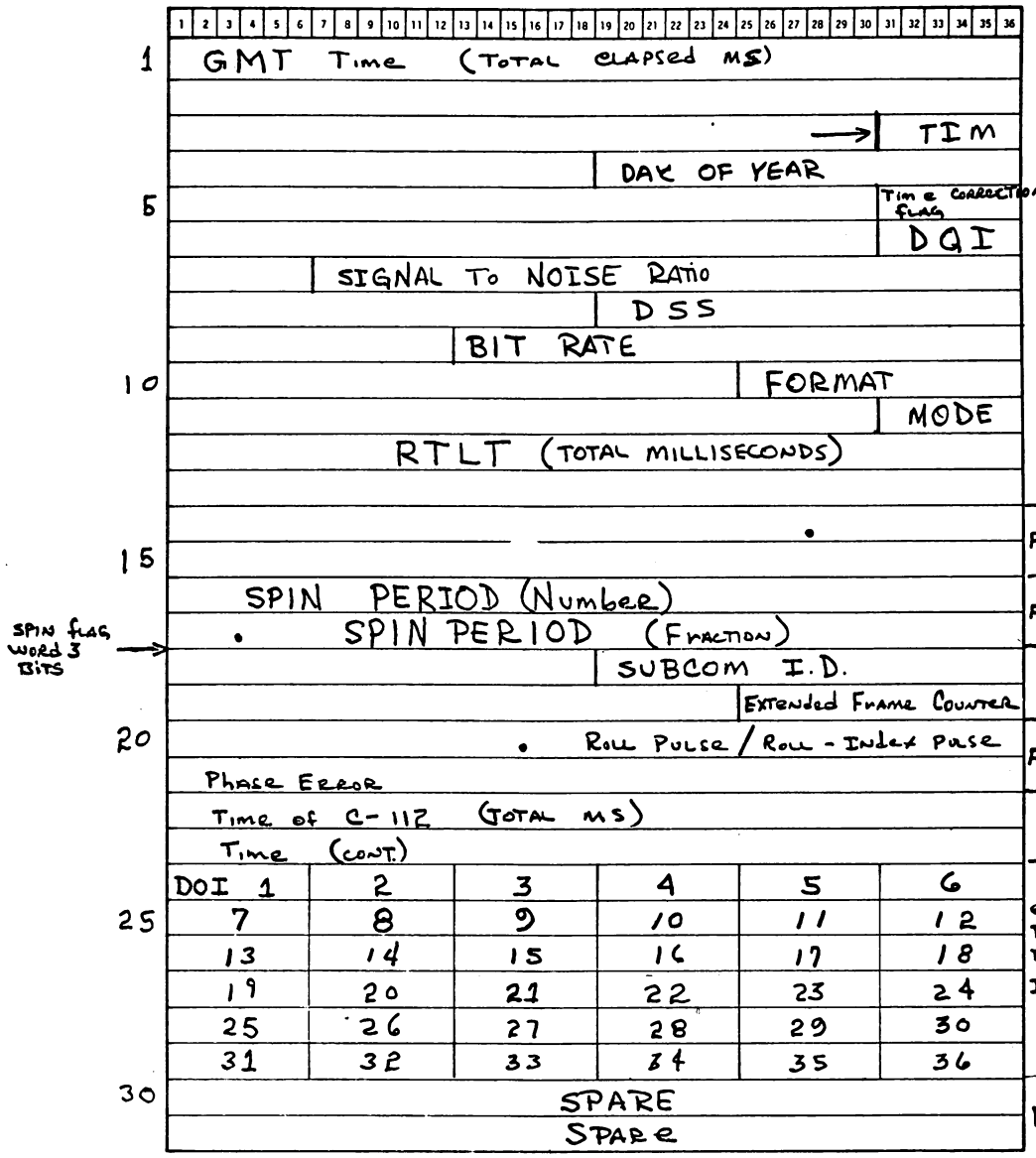


NOTE: FLAG INTERPRETATION

00 = SPECIAL REFINEMENT (±0.1°)
01 = HIGH GAIN ANTENNA (±0.3°)
10 = LOW GAIN ANTENNA (±1.0°)
11 = DYNAMIC POSITION (±3.0°)

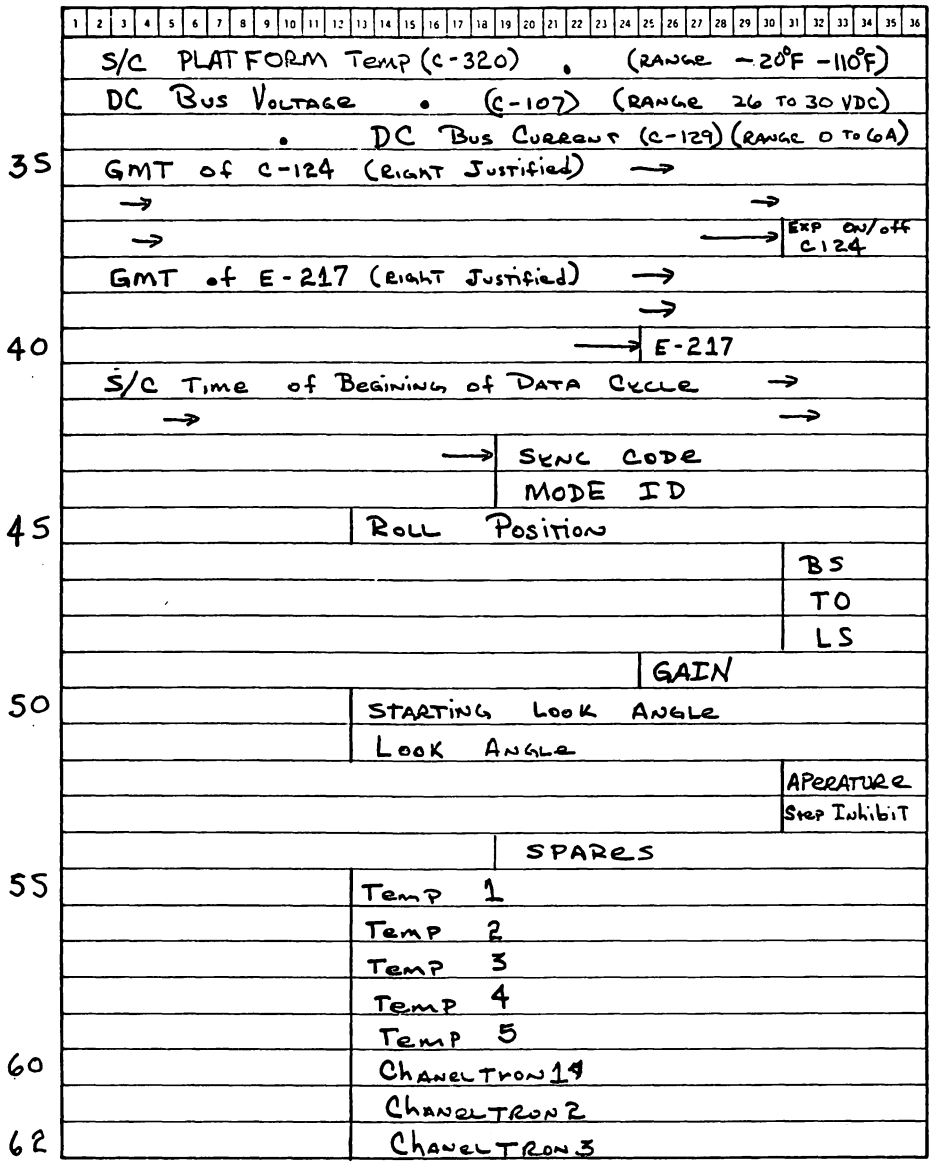
UA/IPP MODE 2 FILE 3 ATTITUDE DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 6 WORDS
PHYSICAL RECORD LENGTH - 186 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 3 MODE 2 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.9
	REV. NO. / DATE 9/1/71	SHEET 4 OF 7



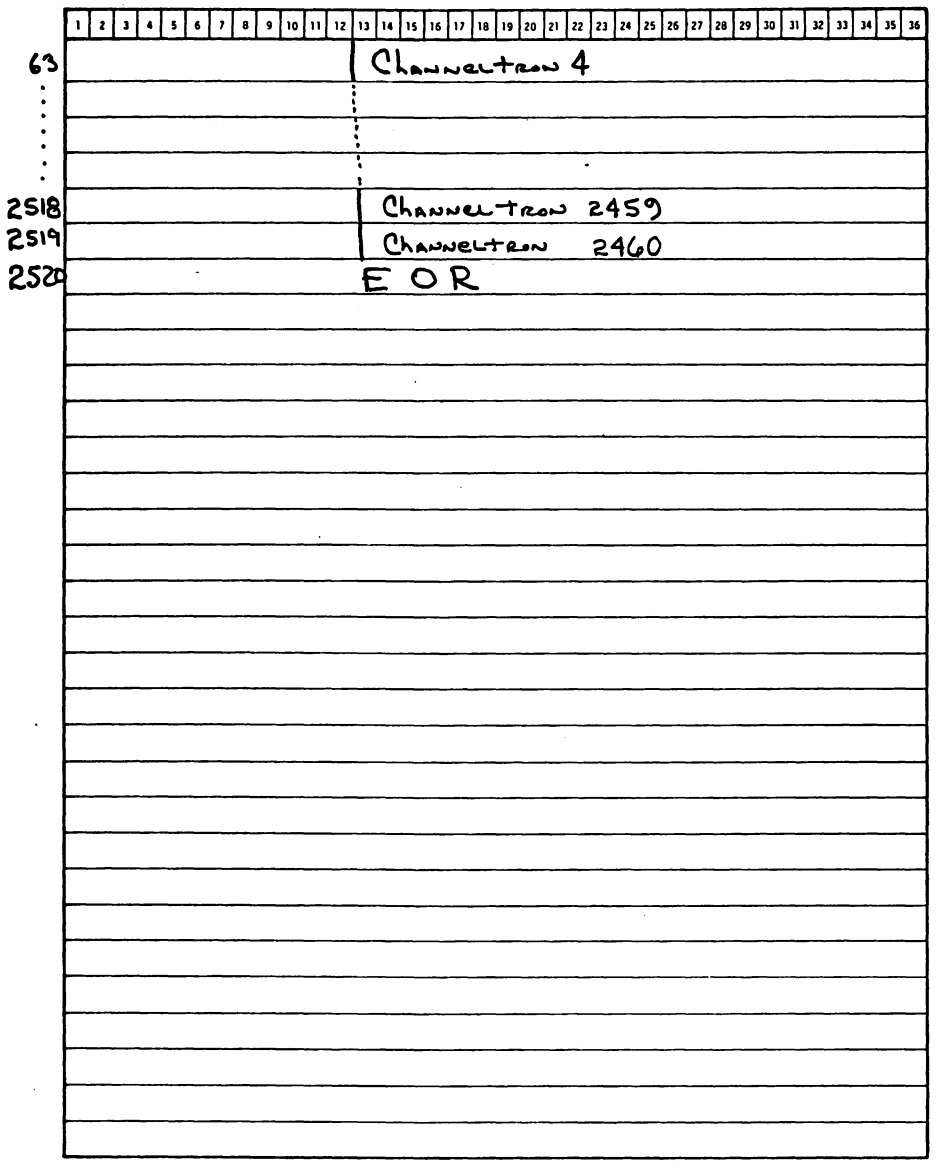
UA/IPP MODE 2 FILE 4 EXPERIMENT DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 2520 WORDS
PHYSICAL RECORD LENGTH - 2520 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 4 MODE 2 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.9
	REV. NO. DATE 9/1/71	SHEET 5 OF 7



UA/IPP MODE 2 FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 4 MODE 2 EXPERIMENT DATA		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
			DOC. NO. PC-262.03
			FIG. 3.2.9
	REV. NO.	DATE 9/1/71	SHEET 6 OF 7



UA/IPP MODE 2 FILE 4 EXPERIMENT DATA (CONTD)

REPRODUCED FROM	TITLE DUDLEY/ZODIACAL LIGHT FILE 4 MODE 2 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.9
	REV. NO. / DATE 9/1/71	SHEET 7 OF 7

T.B.S.

REPRODUCED FROM	TITLE CIT/IR FILE 1 LOGISTICA DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.10
	REV. NO. / DATE 9/1/71	SHEET 1 OF 4

T.B.S.

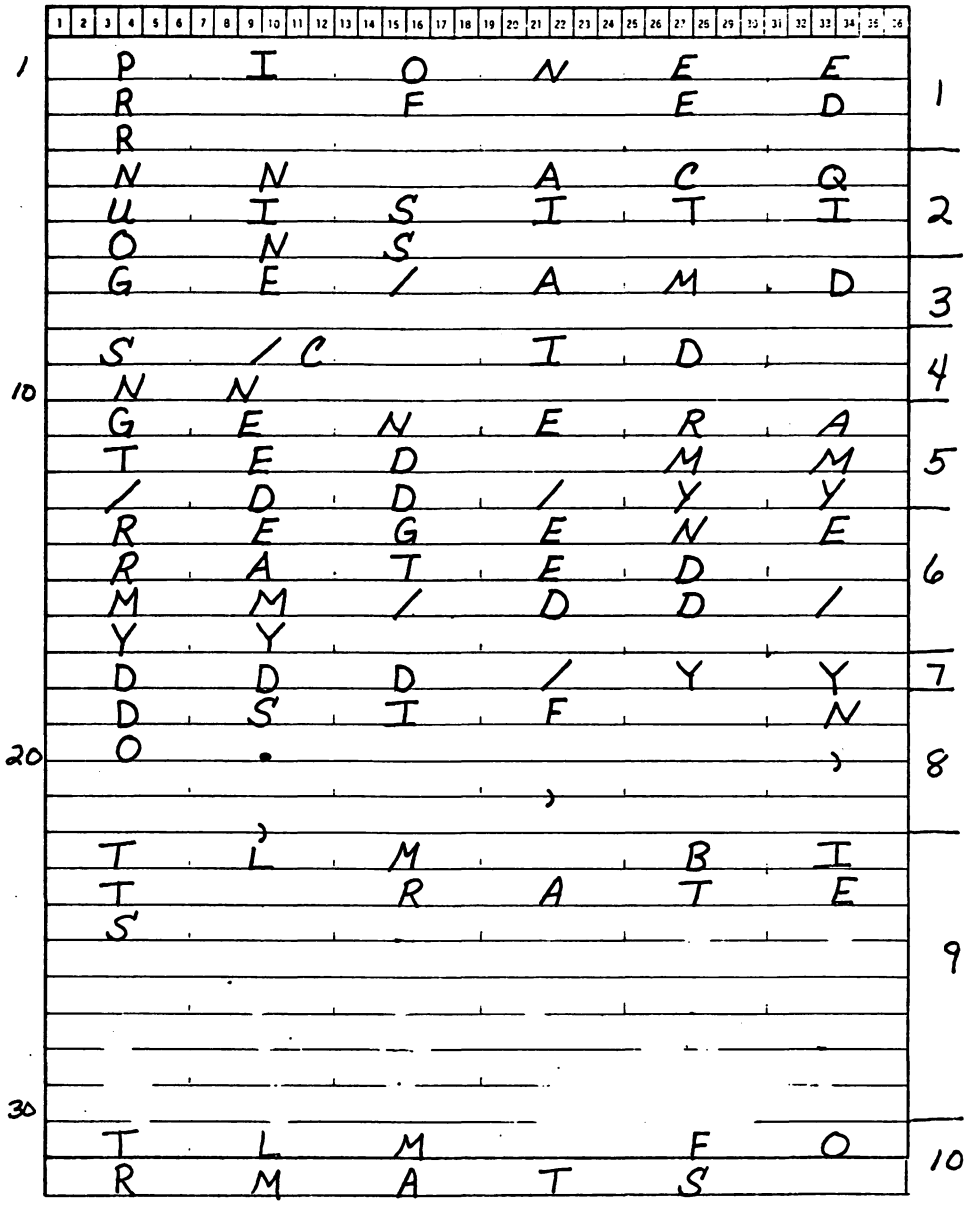
REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	CIT/IR FILE 2 COMMAND DATA	DOC. NO. PC-262.03
		FIG. 3.2.10
	REV. NO. / DATE 9/1/71	SHEET 2 OF 4

T.B.S.

REPRODUCED FROM	TITLE CIT/IR FILE 3 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.10
	REV. NO. / DATE 9/1/71	SHEET 3 OF 4

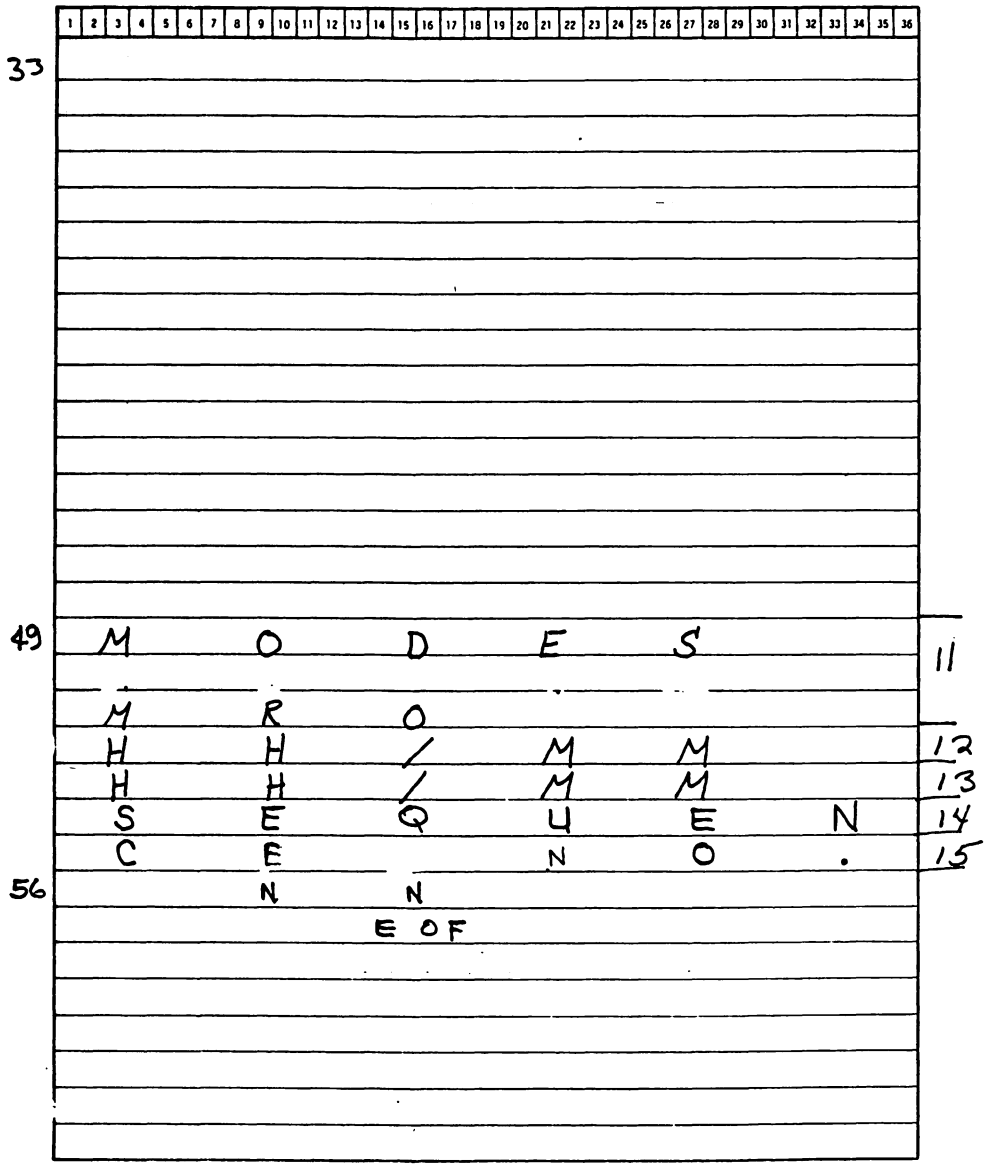
T.B.S.

REPRODUCED FROM	TITLE CIT/IR FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.10
	REV. NO. / DATE 9/1/71	SHEET 4 OF 4



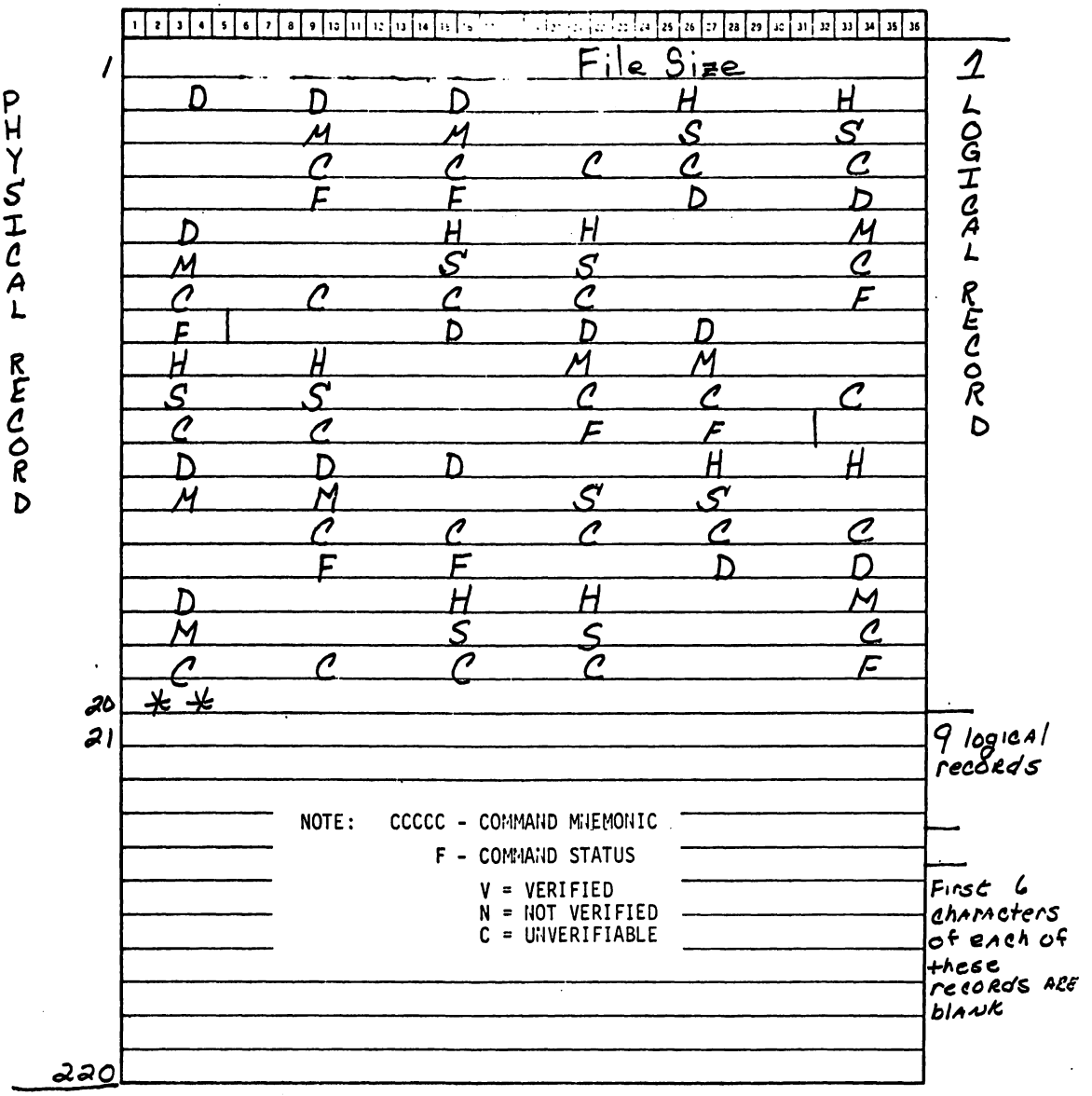
GE/AMD FILE 1 LOGISTICS
TYPE - BCD
LOGICAL RECORD LENGTH - 56 WORDS
PHYSICAL RECORD LENGTH - 56 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: GE/AMD FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.11
	REV. NO. / DATE 9/1/71	SHEET 1 OF 5



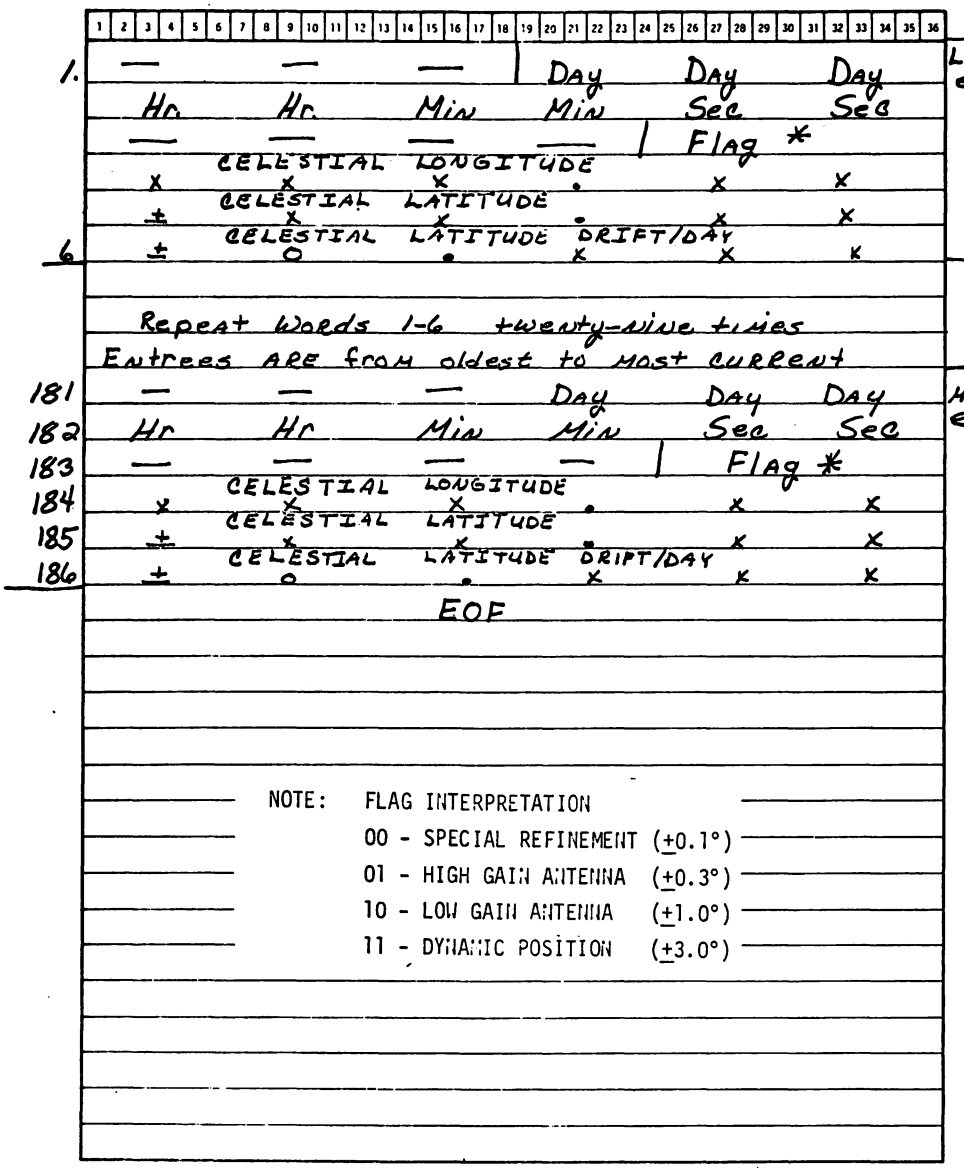
GE/AMD FILE 1 LOGISTICS (CO'ITD)

REPRODUCED FROM	TITLE: GE/AMD FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA	
		DOC. NO. PC-262.03	
		FIG. 3.2.11	
	REV. NO.	DATE 9/1/71	SHEET 2 OF 5



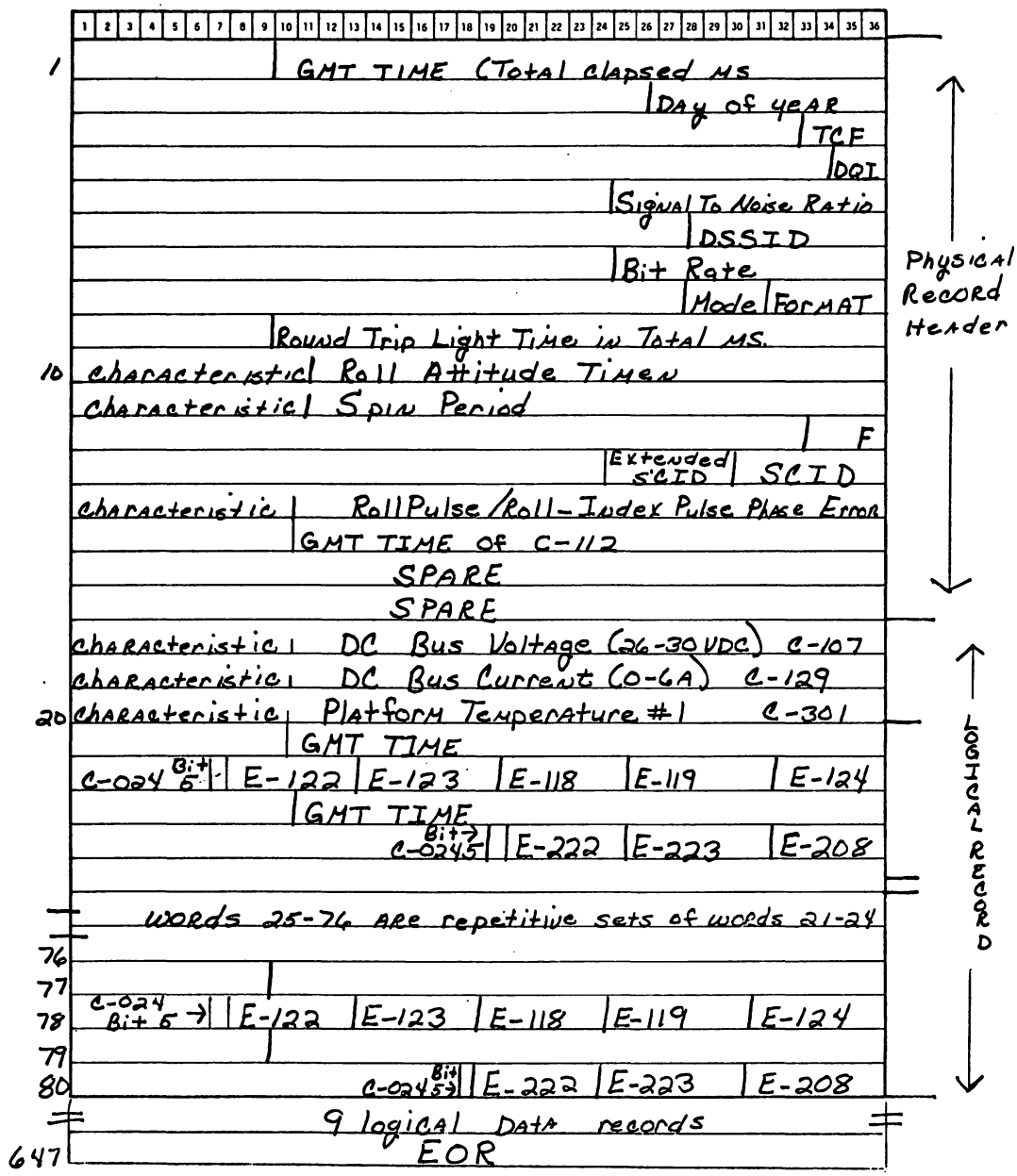
GE/AMD FILE 2 COMMAND
TYPE - BCD
LOGICAL RECORD LENGTH - 20 WORDS
PHYSICAL RECORD LENGTH - 220 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: GE/AMD FILE 2 COMMAND DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.11
	REV. NO. / DATE 9/1/71	SHEET 3 OF 5



GE/AMD FILE 3 ATTITUDE DATA
TYPE - BCD
LOGICAL RECORD LENGTH - 186 WORDS
PHYSICAL RECORD LENGTH - 186 WORDS
FILE SIZE - 1 PHYSICAL RECORD

REPRODUCED FROM	TITLE: GE/AMD FILE 3 S/C ATTITUDE DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.11
	REV. NO. DATE 9/1/71	SHEET 4 OF 5



GE/AMD FILE 4 EXPERIMENT DATA

TYPE - BINARY
LOGICAL RECORD LENGTH - 63 WORDS
PHYSICAL RECORD LENGTH - 647 WORDS
FILE SIZE - VARIABLE

REPRODUCED FROM	TITLE: GE/AMD FILE 4 EXPERIMENT DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.11
	REV. NO. / DATE 9/1/71	SHEET 5 OF 5

T.B.S.

REPRODUCED FROM	TITLE LaRC/MD FILE 1 LOGISTICS DATA	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.03
		FIG. 3.2.12
	REV. NO. / DATE 9/1/71	SHEET 1 OF 4

T.B.S.

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	LaRC/MD FILE 2 COMMAND DATA	DOC. NO. PC-262.03
		FIG. 3.2.12
	REV. NO. / DATE 9/1/71	SHEET 2 OF 4

T.B.S.

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	LaRC/MD FILE 3 S/C ATTITUDE DATA	DOC. NO. PC-262.03
		FIG. 3.2.12
	REV. NO. / DATE 9/1/71	SHEET 3 OF 4

T.B.S.

REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	LaRC/MD FILE 4 EXPERIMENT DATA	DOC. NO. PC-262.03
		FIG. 3.2.12
	REV. NO. / DATE 9/1/71	SHEET 4 OF 4

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, 1968, Jet Propulsion Laboratory, Technical Report 32-1306. (2)

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.

BCD NAME	TIME GROUP
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).

Revision

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 on Figure 3.1.4. (2)

- 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)

XPI	(108)	X-component of the spacecraft (km)
YPI	(109)	Y-component of the spacecraft (km)
ZPI	(110)	Z-component of the spacecraft (km)
DXPI	(111)	$\dot{X}$-time rate of change in the X-component (km/sec)
DYPI	(112)	$\dot{Y}$-time rate of change in the Y-component (km/sec)
DZPI	(113)	$\dot{Z}$-time rate of change in the Z-component (km/sec)
XEI	(114)	X-component of the Earth (km)
YEI	(115)	Y-component of the Earth (km)
ZEI	(116)	Z-component of the Earth (km)
DXEI	(117)	$\dot{X}$-time rate of change in the X-component (km/sec)
DYEI	(118)	$\dot{Y}$-time rate of change in the Y-component (km/sec)
DZEI	(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)

Revision

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 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.

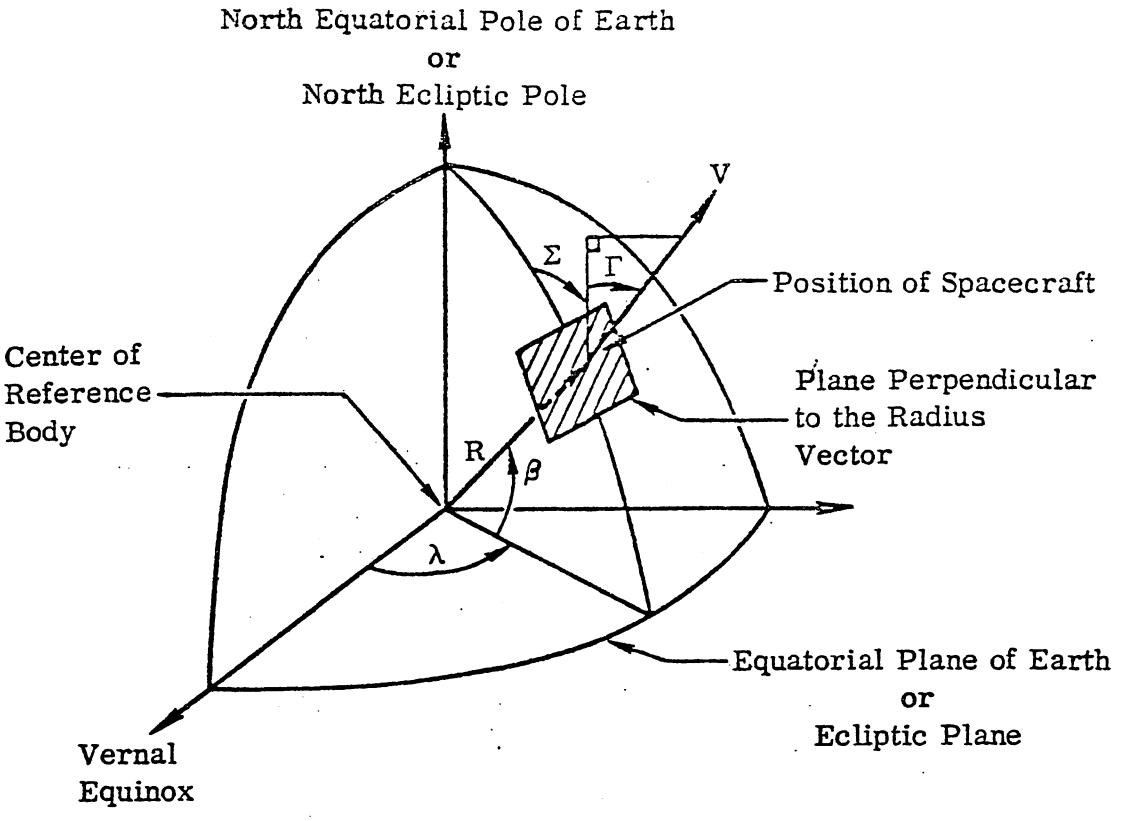
6. NOTES

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

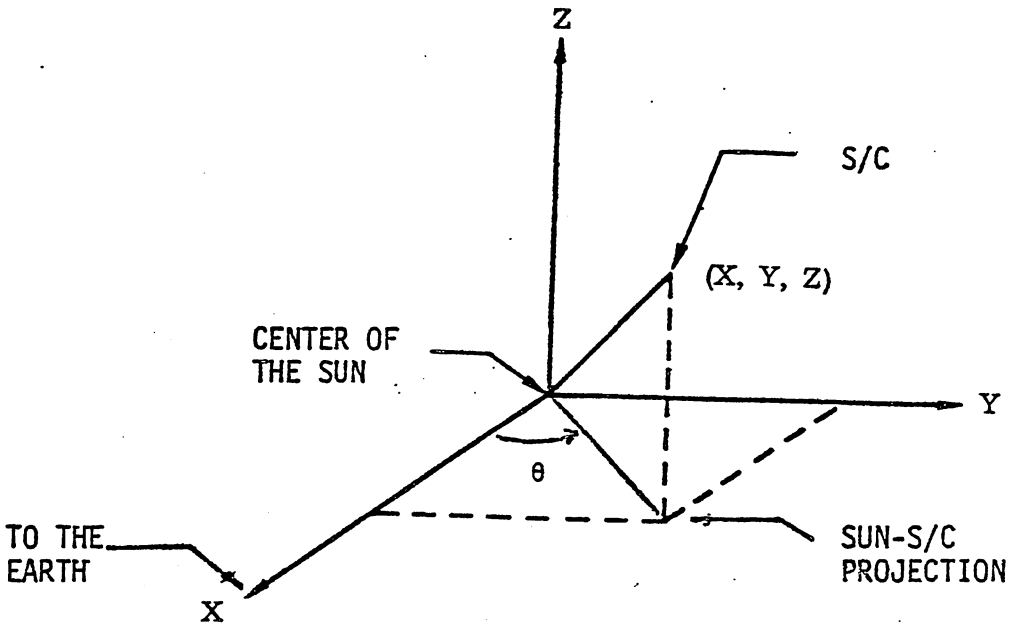
REPRODUCED FROM	TITLE	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	INERTIAL SPHERICAL COORDINATE SYSTEM	DOC. NO. PC-262.04
		FIG. 3.1.1
	REV. NO. 1 / DATE 12/20/71	SHEET 1 OF 2

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



X Positive towards the Earth

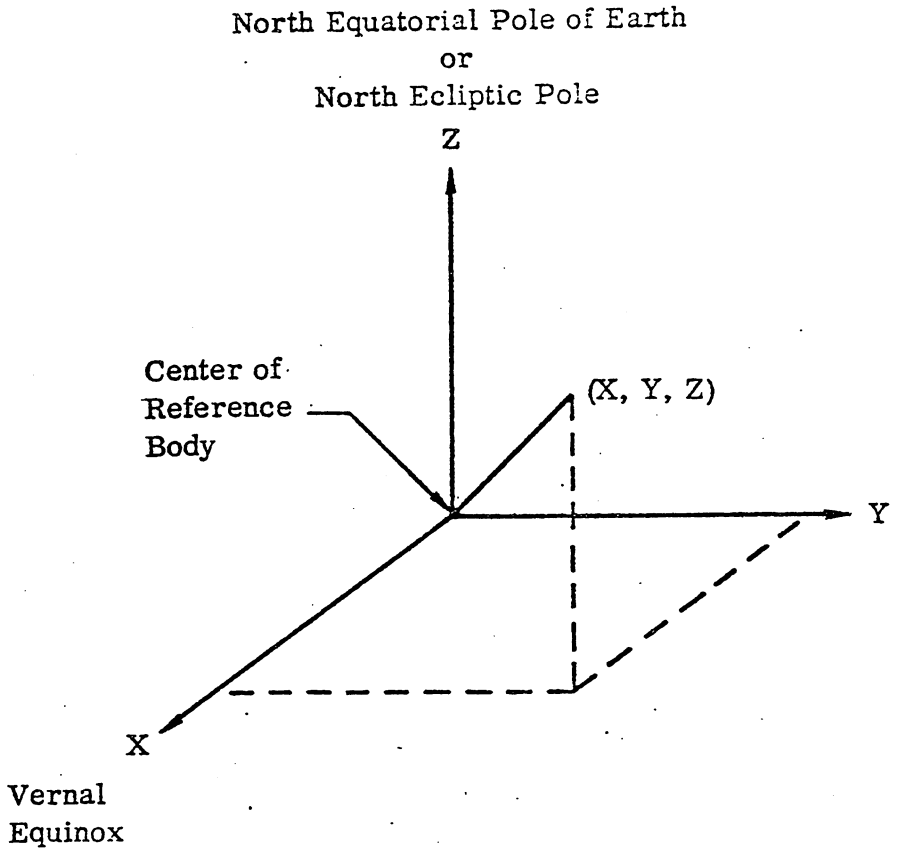
Y Positive from the Sun and perpendicular to the X-axis and lying in the ecliptic plane of date

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



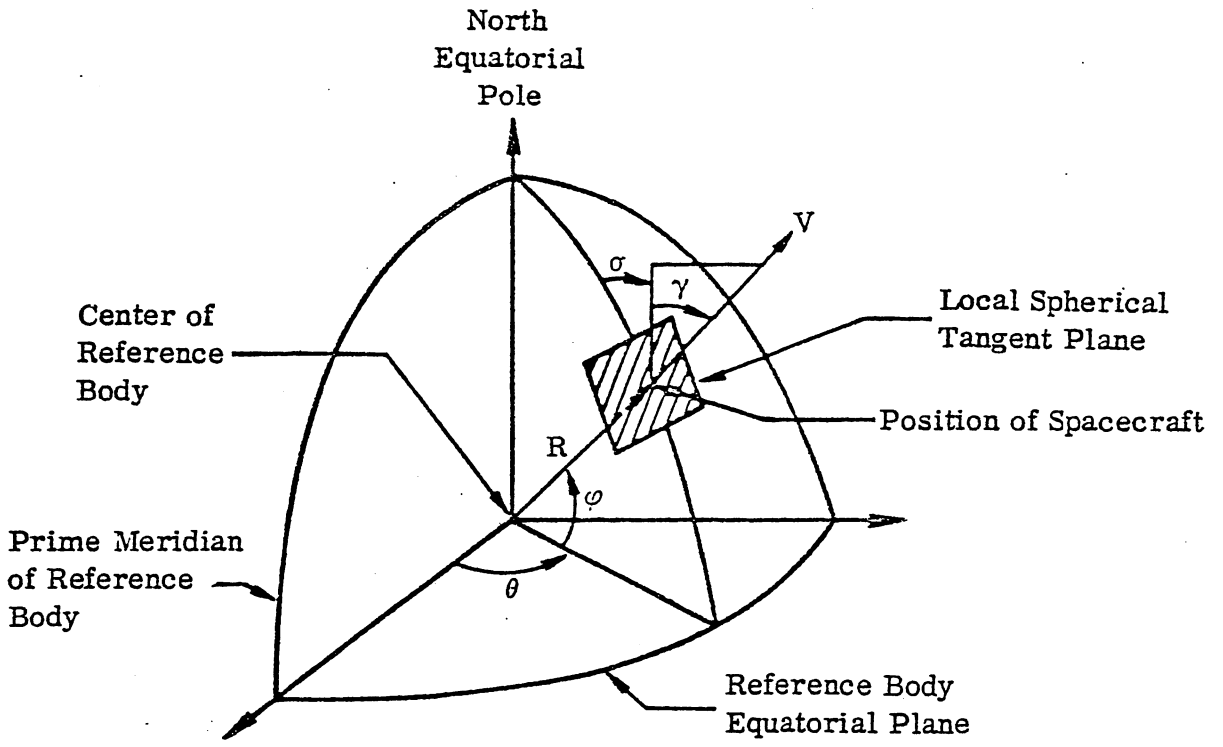
The plane of reference in the Inertial Cartesian System shall be either the ecliptic plane or equatorial plane of the Earth.

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

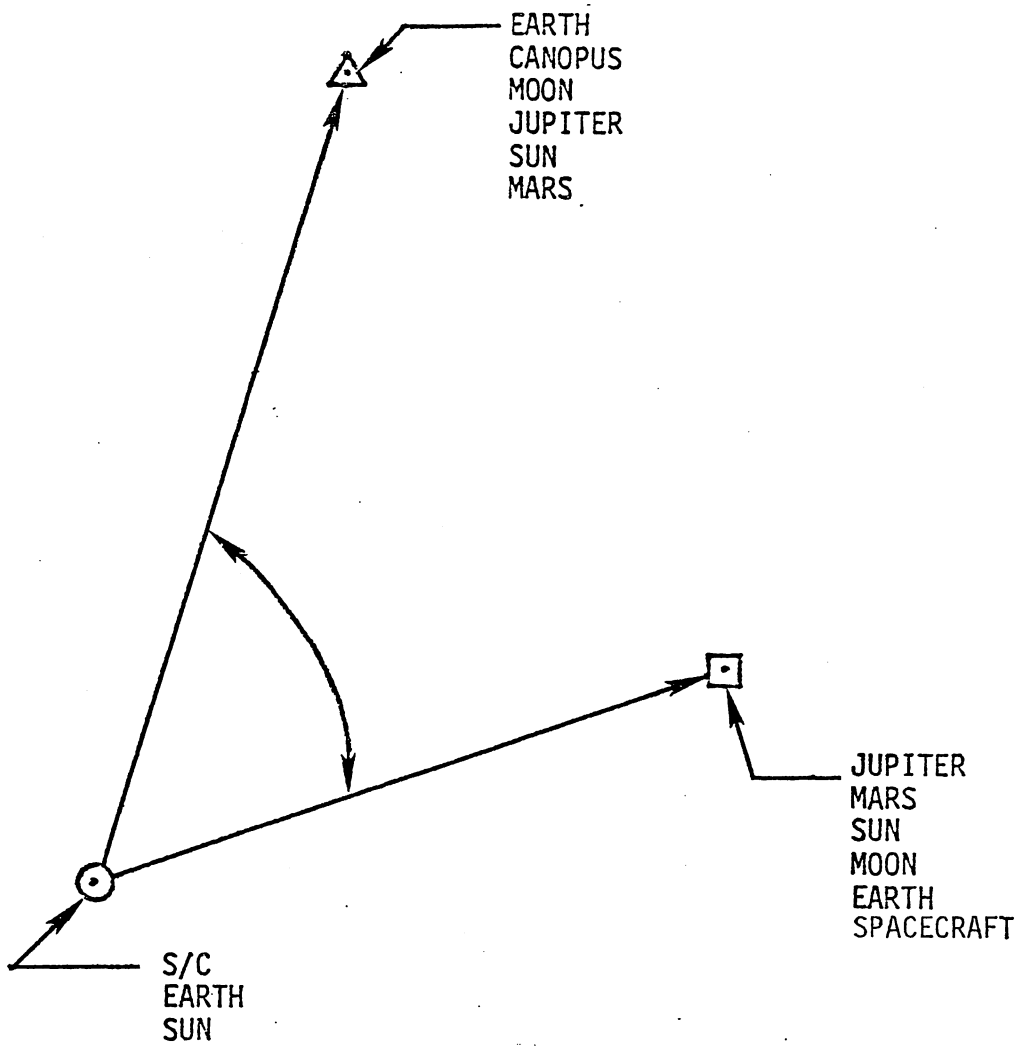
Z positive toward the north ecliptic or equatorial pole of Earth and completes the orthogonal system

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

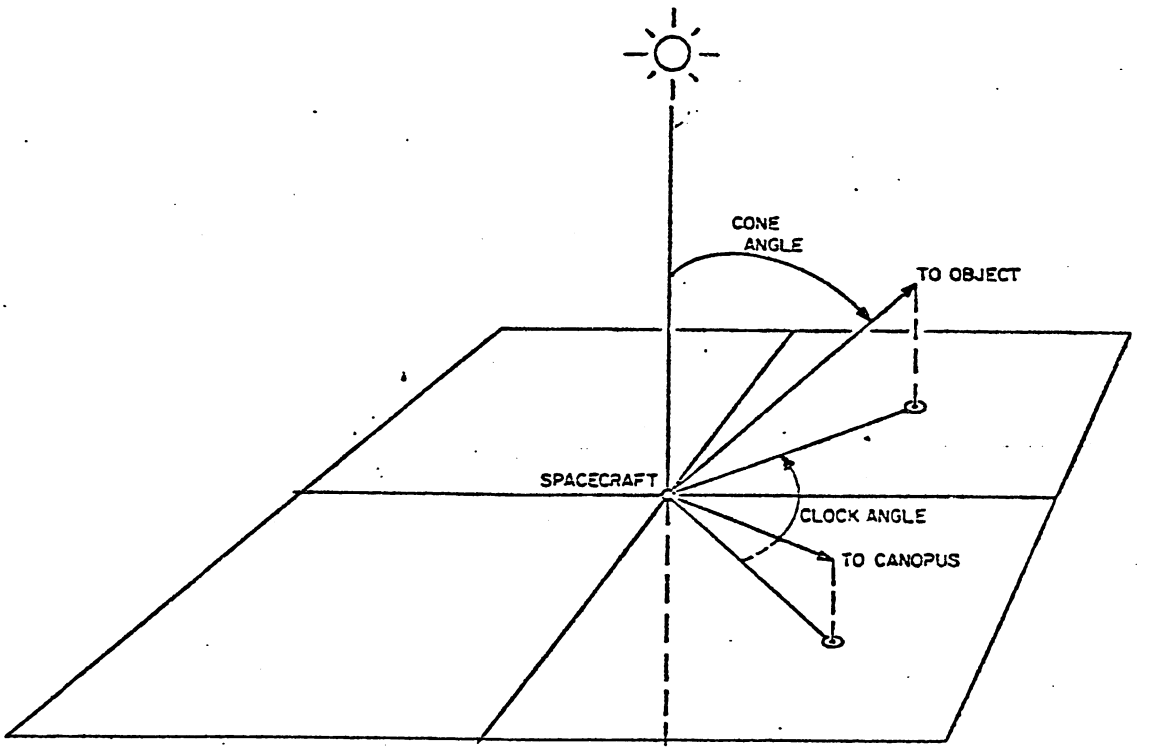


R	radius: the distance from the center of the reference body to the spacecraft
φ	latitude: the body-centered latitude of the spacecraft measured positive north of the reference body's equator
θ	longitude: the longitude of the spacecraft measured eastward from the prime meridian of the reference body 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 BODY-FIXED SPHERICAL COORDINATE SYSTEM	PIONEER PROGRAM NASA 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 NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
	THREE BODY ANGLES	DOC. NO. PC-262.04
		FIG. 3.1.5
	REV. NO. 2 DATE 1/15/76	SHEET 1 OF 2

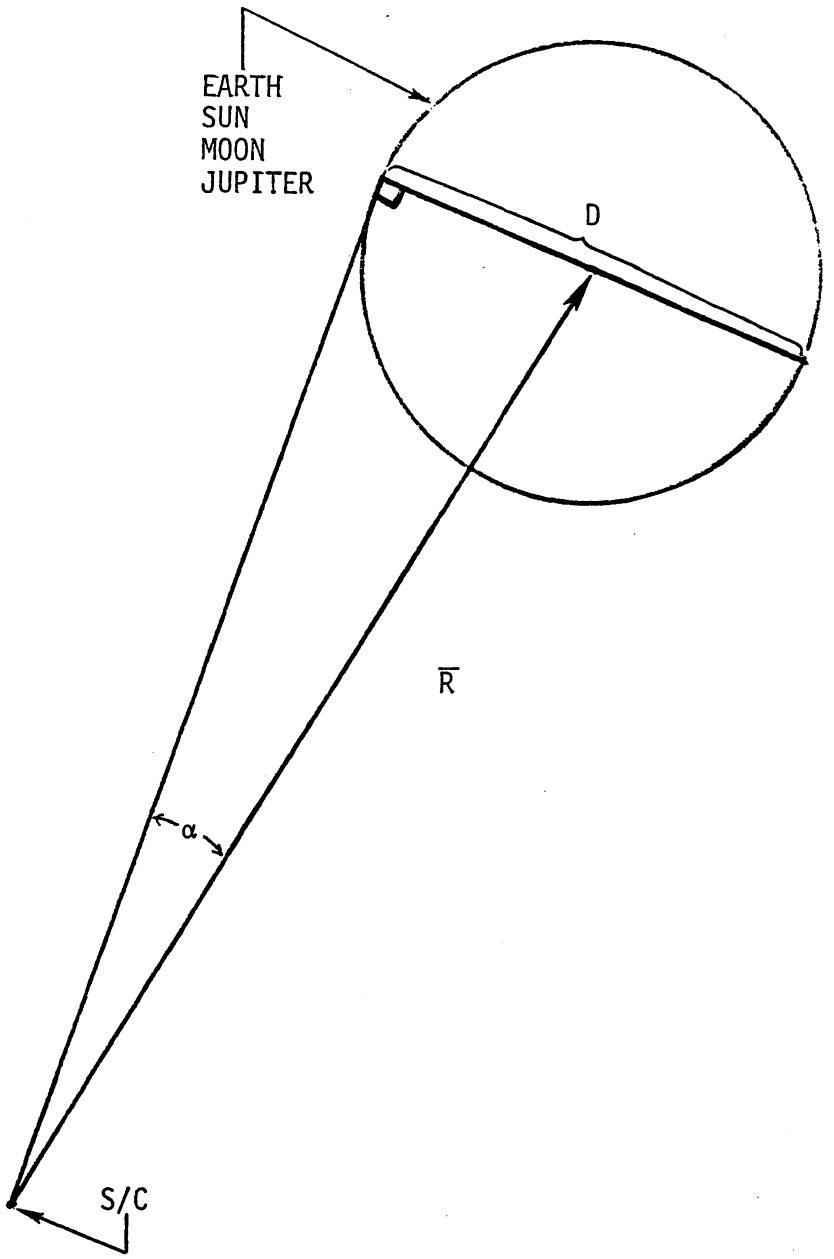


Cone Angle of Object: The angle from the spacecraft-Sun vector to the spacecraft-object-vector

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	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	CONE, CLOCK ANGLES	DOC. NO. PC-262.04
		FIG. 3.1.5
	REV. NO. 1 DATE 12/20/71	SHEET 2 OF 2



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

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

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

REPRODUCED FROM

TITLE

SUMMARY OF EXPERIMENTER TRAJECTORY TAPE REQUIREMENTS

REV. NO. 2 | DATE 1/15/76

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

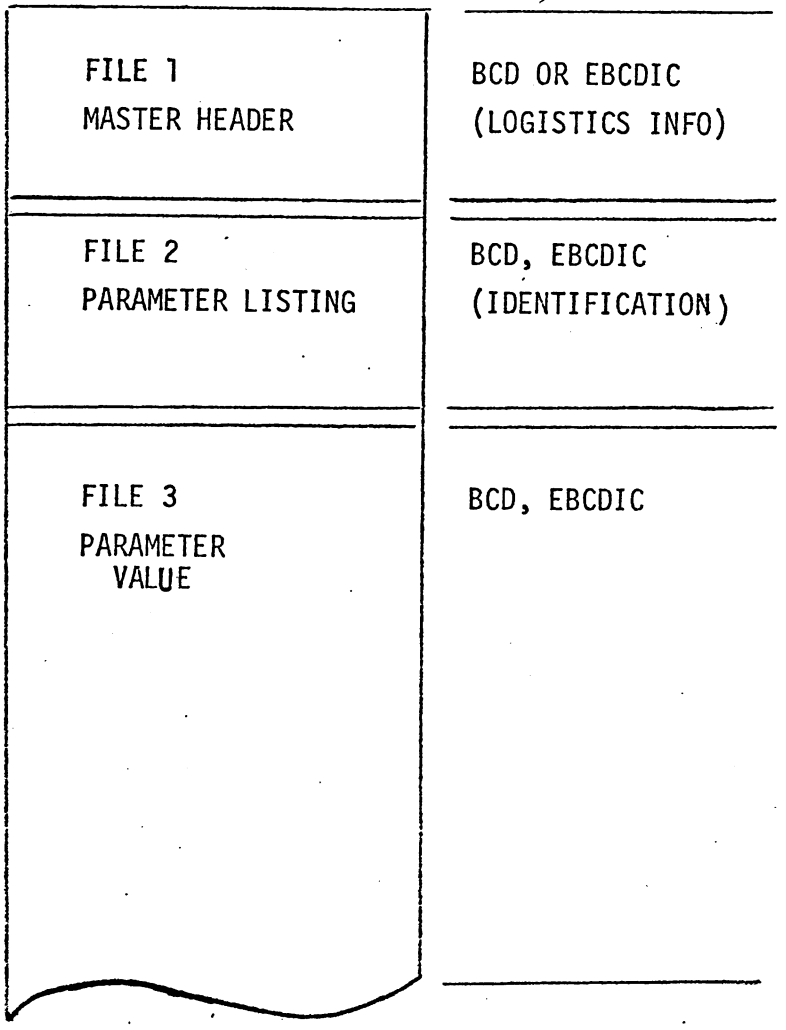
DOC. NO. PC-262.04

FIG. 3.2

SHEET 1 OF 2

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

Trajectory Tape Organization



REPRODUCED FROM	TITLE PROCESSED TRAJECTORY TAPE GENERAL ORGANIZATION	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 2 OF 2

	MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENT	
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)

	MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENT	
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)

	MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENT	
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)

MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENT

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)

	MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENT
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.

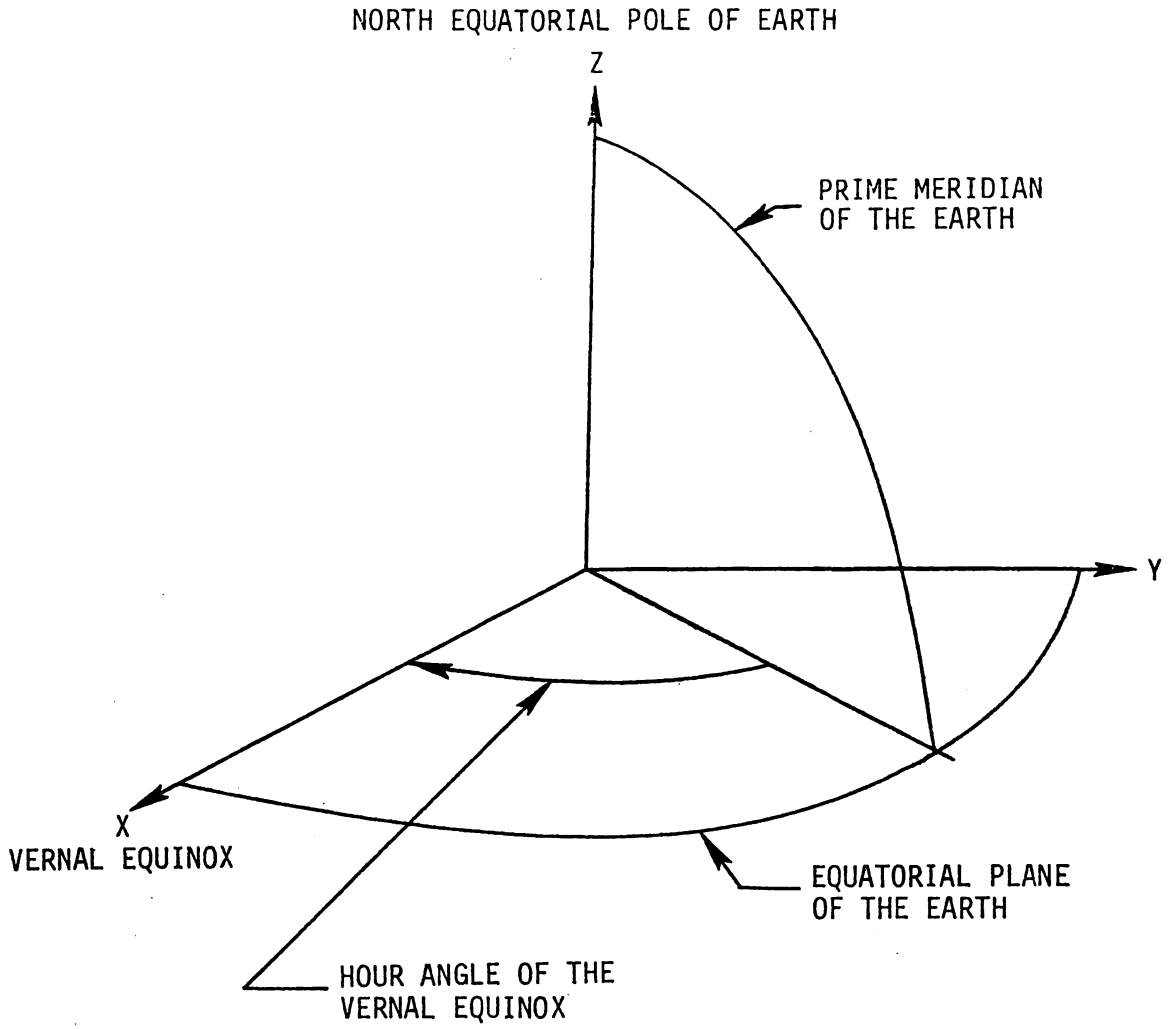
128	XE	129	X-component of the Earth (km) DPTRAJ variable (132) minus DPTRAJ variable (138)
129	YE	130	Y-component of the Earth (km) DPTRAJ variable (133) minus DPTRAJ variable (139)

	MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENT
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)

	MNEMONIC	ENTRY	DESCRIPTION/COMPUTATION REQUIREMENTS	
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 AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	HOUR ANGLE OF THE VERNAL EQUINOX		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
.
.
.
mnemonic 156 .. Entry 157

REPRODUCED FROM	TITLE FORMAT DESCRIPTION FOR 24-BIT MACHINES	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 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

HEADER
FILE 1
(24-BIT MACHINE)

REV. NO. 1 | DATE 12-20-71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.1

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
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						D									
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															BLANK									
56																								
57																								
58																								
59																								
60																								
									EOF															

REPRODUCED FROM	TITLE		PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	HEADER FILE 1 (24-BIT MACHINE)		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
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 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 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 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

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 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						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

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	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER MNEMONICS FILE 2 (24-BIT MACHINE)	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
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

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 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

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(24-BIT MACHINE)

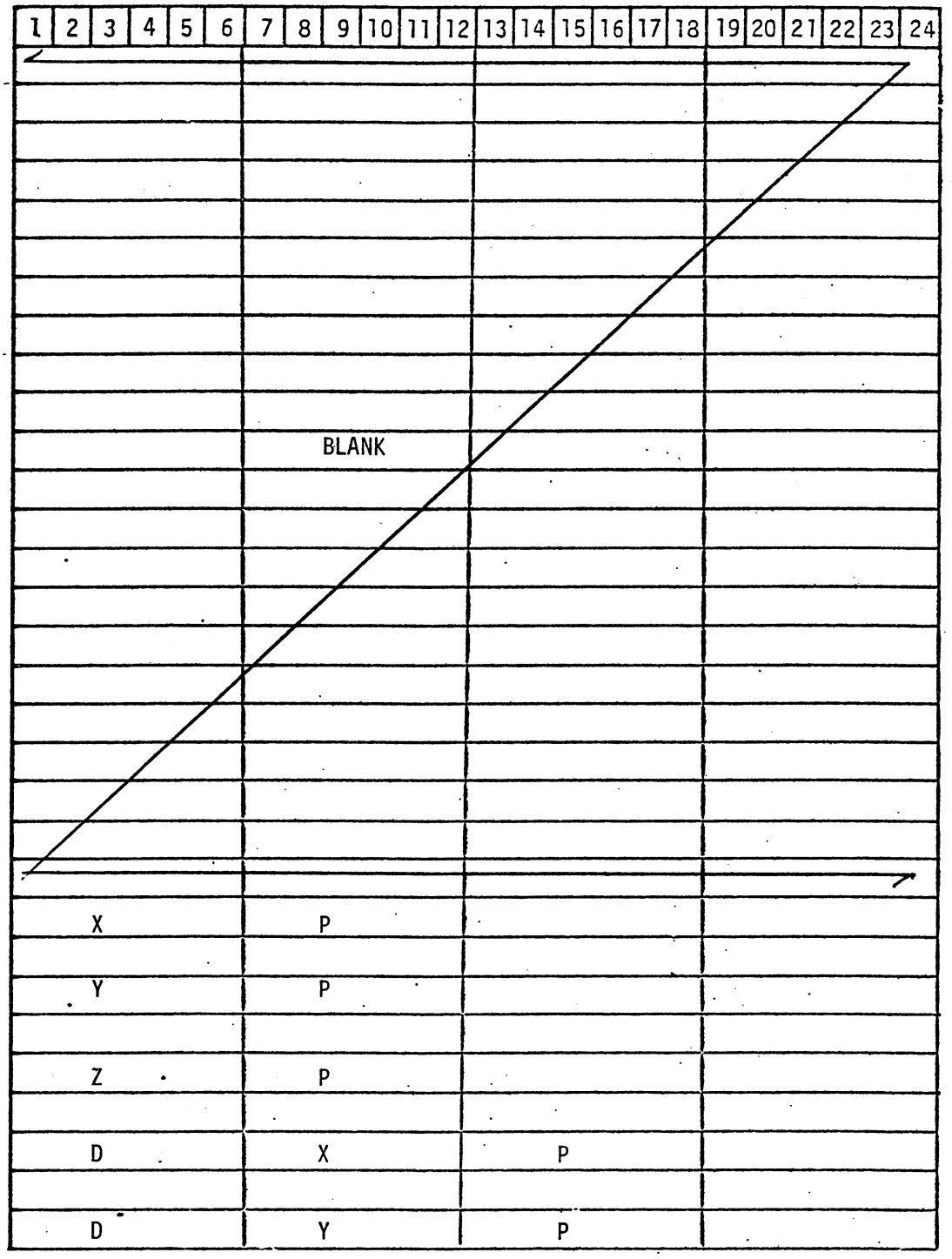
REV. NO. 1 | DATE 12-20-71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.1

SHEET 11 OF 17



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 12 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

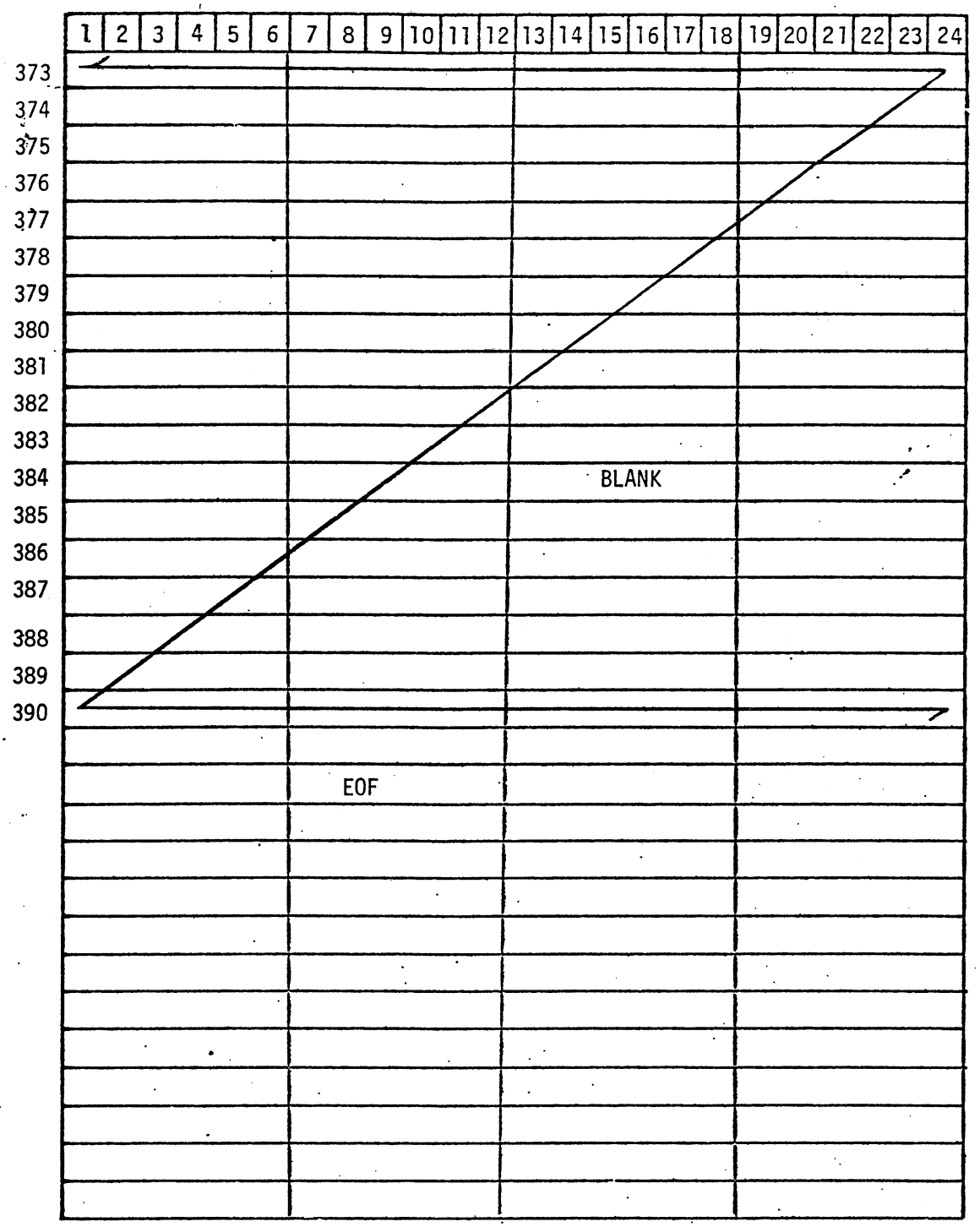
REV. NO. 1 | DATE 12-20-71 | SHEET 13 OF 17

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
	PARAMETER MNEMONICS FILE 2 (24-BIT MACHINE)	DOC. NO. PC-262.04
		FIG. 3.2.1
	REV. NO. 1 DATE 12-20-71	SHEET 15 OF 17



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 16 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) ±																							
2																								
3									ENTRY				1											
4																								
5																								
6							BLANK						BLANK						BLANK					
937	(SIGN) ±																							
938																								
939									ENTRY				157											
940																								
941																								
942							BLANK						BLANK						BLANK					
									EOR															

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

REPRODUCED FROM	TITLE PARAMETER VALUES FILE 3 (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 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 FORMAT DESCRIPTION FOR 32-BIT MACHINES	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD. CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.2
	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	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
	HEADER FILE 1 (32-BIT MACHINE)	DOC. NO. 262.04
		FIG. 3.2.2
	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		BLANK		
57				
58				
59				
60				
		EOF		

REPRODUCED FROM	TITLE HEADER FILE 1 (32-BIT MACHINE)	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.2
	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	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
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)	DOC. NO. PC-262.04
		FIG. 3.2.2
	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

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.2

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	1	S
F	F		
Y	P	1	S
F	F		
Z	P	1	S
F	F		
D	X	P	1

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	O
N	P		
E	A	V	E
L	P		

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.2

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	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	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
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
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								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										F	
C								1																							
C								L										C										K	
C								1																							

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

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

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.2

REV. NO. 1 | DATE 12-20-71 | 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	25	26	27	28	29	30	31	32

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

REV. NO. 1 | DATE 12-20-71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

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
		X								P																					
		Y								P																					
		Z								P																					
		D								X									P												
		D								Y									P												

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.2

REV. NO. 1 | DATE 12-20-71

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

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.2

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

PARAMETER MNEMONICS
FILE 2
(32-BIT MACHINE)

REV. NO. 1

DATE 12-20-71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

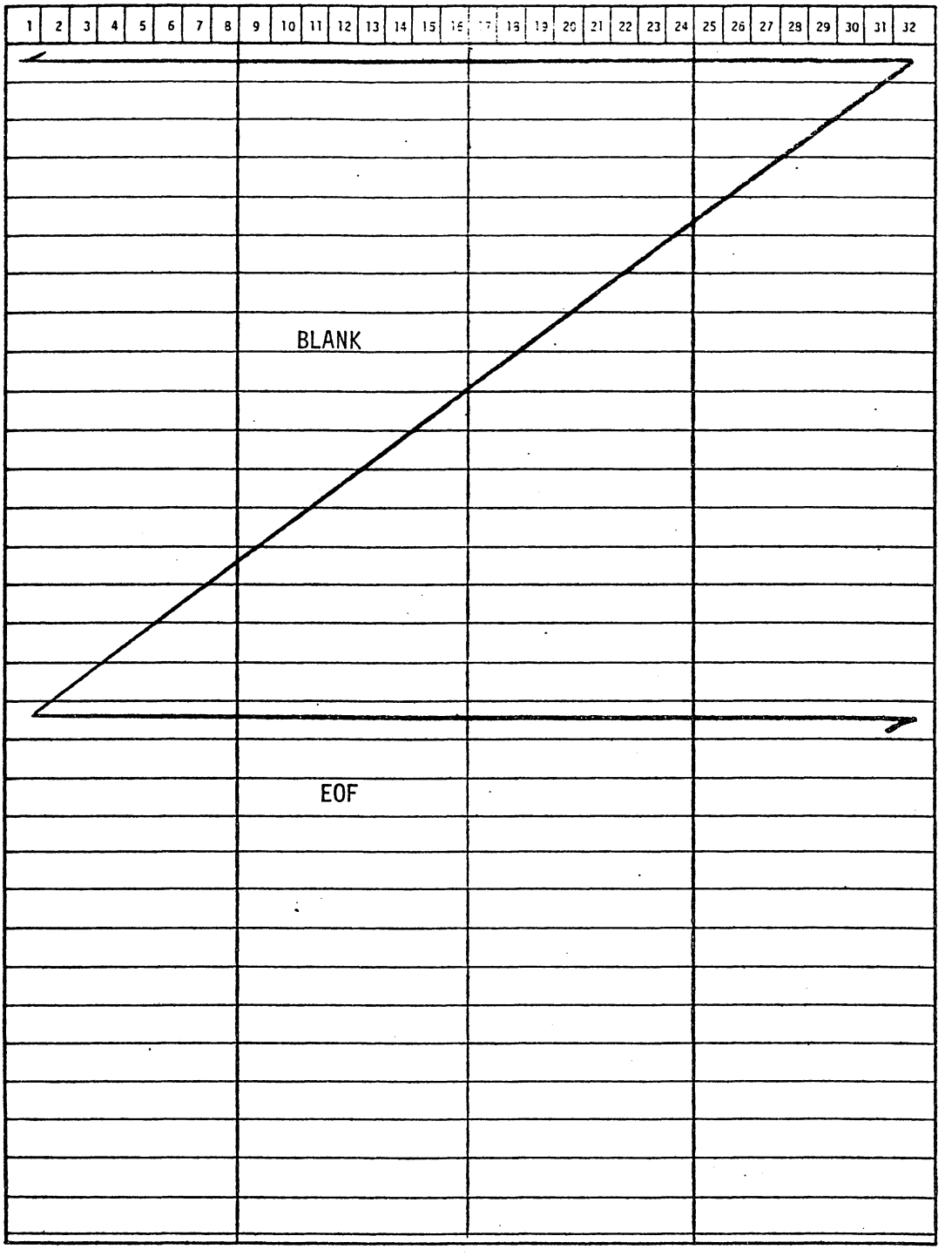
DOC. NO. PC-262.04

FIG. 3.2.2

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
		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
	PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)	DOC. NO. PC-262.04
		FIG. 3.2.2
	REV. NO. 1 DATE 12-20-71	SHEET 15 OF 17



REPRODUCED FROM	TITLE PARAMETER MNEMONICS FILE 2 (32-BIT MACHINE)	PIONEER PROGRAM NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
		DOC. NO. PC-262.04
		FIG. 3.2.2
	REV. NO. 1 DATE 12-20-71	SHEET 16 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) ±			
2				
3		ENTRY	1	
4				
5				
6		BLANK	BLANK	BLANK
937	(SIGN) ±			
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 NASA AMES RESEARCH CENTER MOFFETT FIELD, CALIFORNIA
	PARAMETER VALUE FILE 3 (32-BIT MACHINE)	DOC. NO. PC-262.04
		FIG. 3.2.2
	REV. NO. 1 DATE 12-20-71	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 FORMAT DESCRIPTION FOR 36-BIT MACHINES	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 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	/	È	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

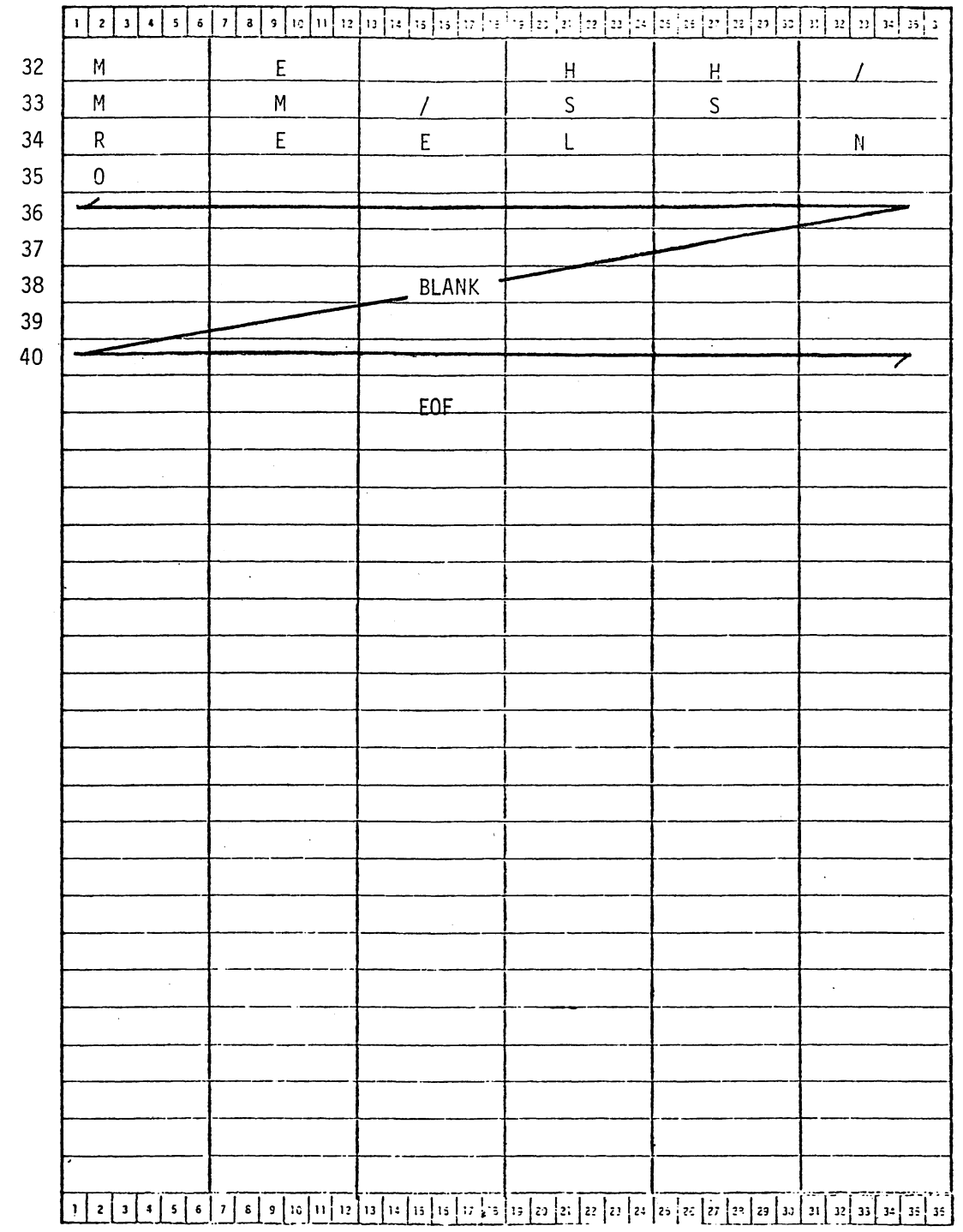
HEADER
FILE 1
(36-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.3

REV. NO. 1 | DATE 2-20-71 | SHEET 2 OF 13



REPRODUCED FROM	TITLE: HEADER FILE 1 (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 3 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						0					
												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

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 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				1				S													
F					F												Y				P													
1					S				F				F																					
Z					P				1				S				F				F													
									D				X				P				1													
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

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 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	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
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

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(36-BIT MACHINE)

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

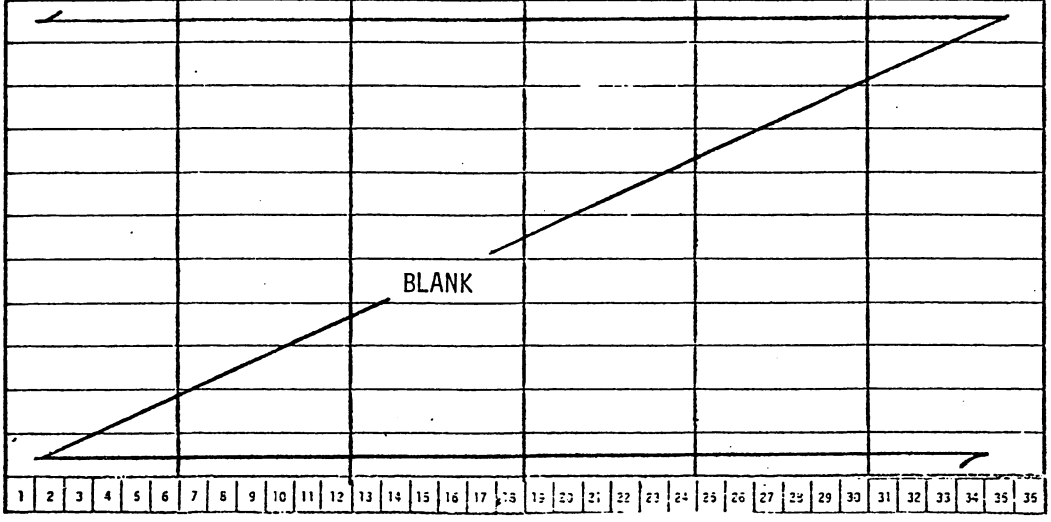
FIG. 3.2.3

REV. NO. 1 | DATE 12-20-71 | SHEET 6 OF 13

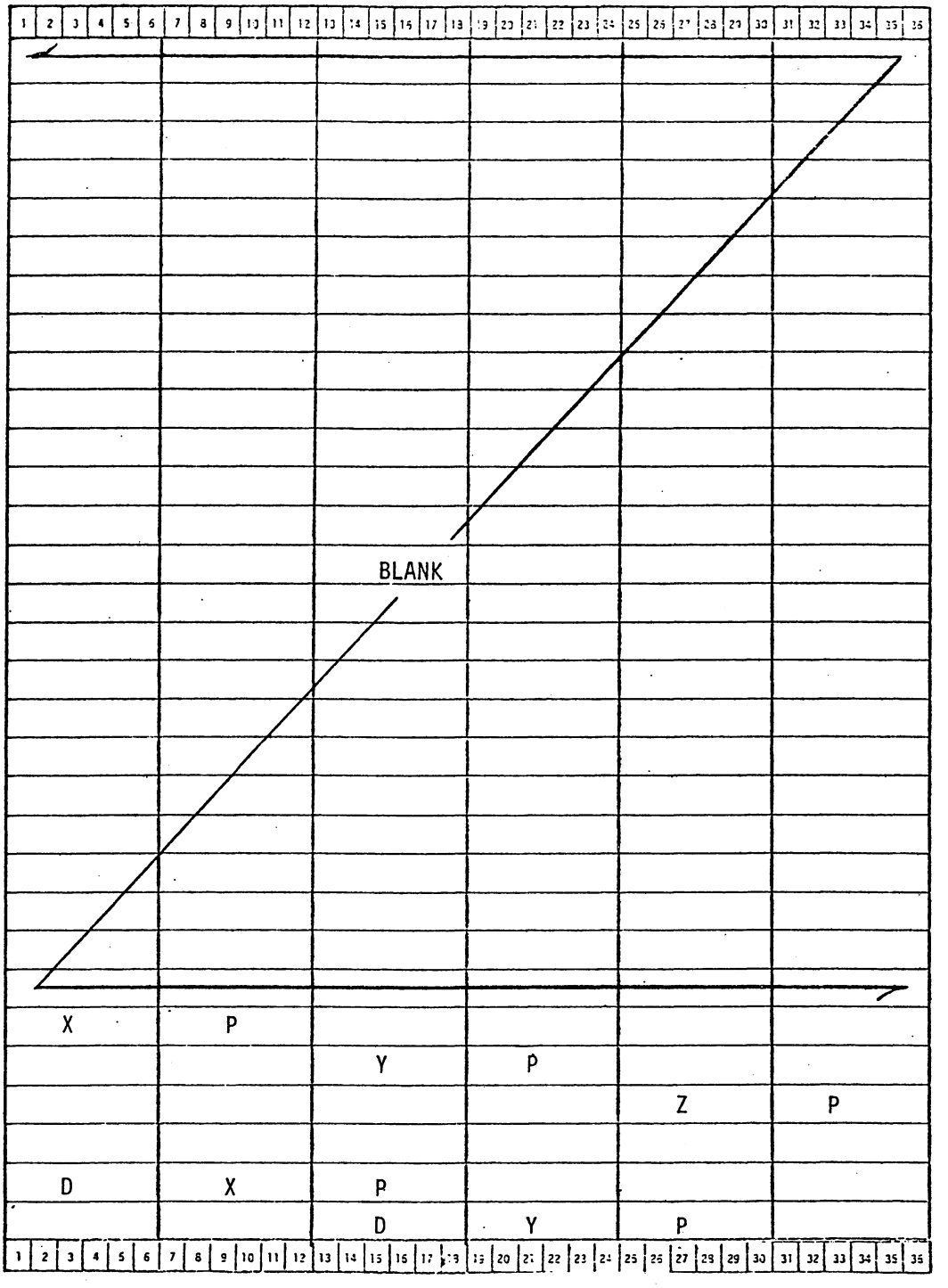
		B	2	L	0
N	P			B	2
V	E	L	P		
B	2	P	T	H	P
		B	2	A	Z
I	P			E	P
B	1	A	N		
E	P	B	2	A	N
		E	P	S	U
A	N			E	P
M	O	A	N		
C	P	E	A	N	G
		C	P	S	A
N	G			M	O
P	S	A	N		
B	1	P	B	2	A
		M	O	E	P
A	N			S	E
P	A	N	G		
E	S	P	A	N	G
		S	P	B	1
A	N			S	P
B	2	A	N		
B	1	E	P	A	N
		B	2	E	P
A	N			C	O
N	E	C	E		
C	L	C	K	C	E
		C	O	N	E
C	1			C	L
C	K	C	1		

REPRODUCED FROM	TITLE 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 7 OF 13

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	2		
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: 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 8 OF 13	



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 9 OF 13

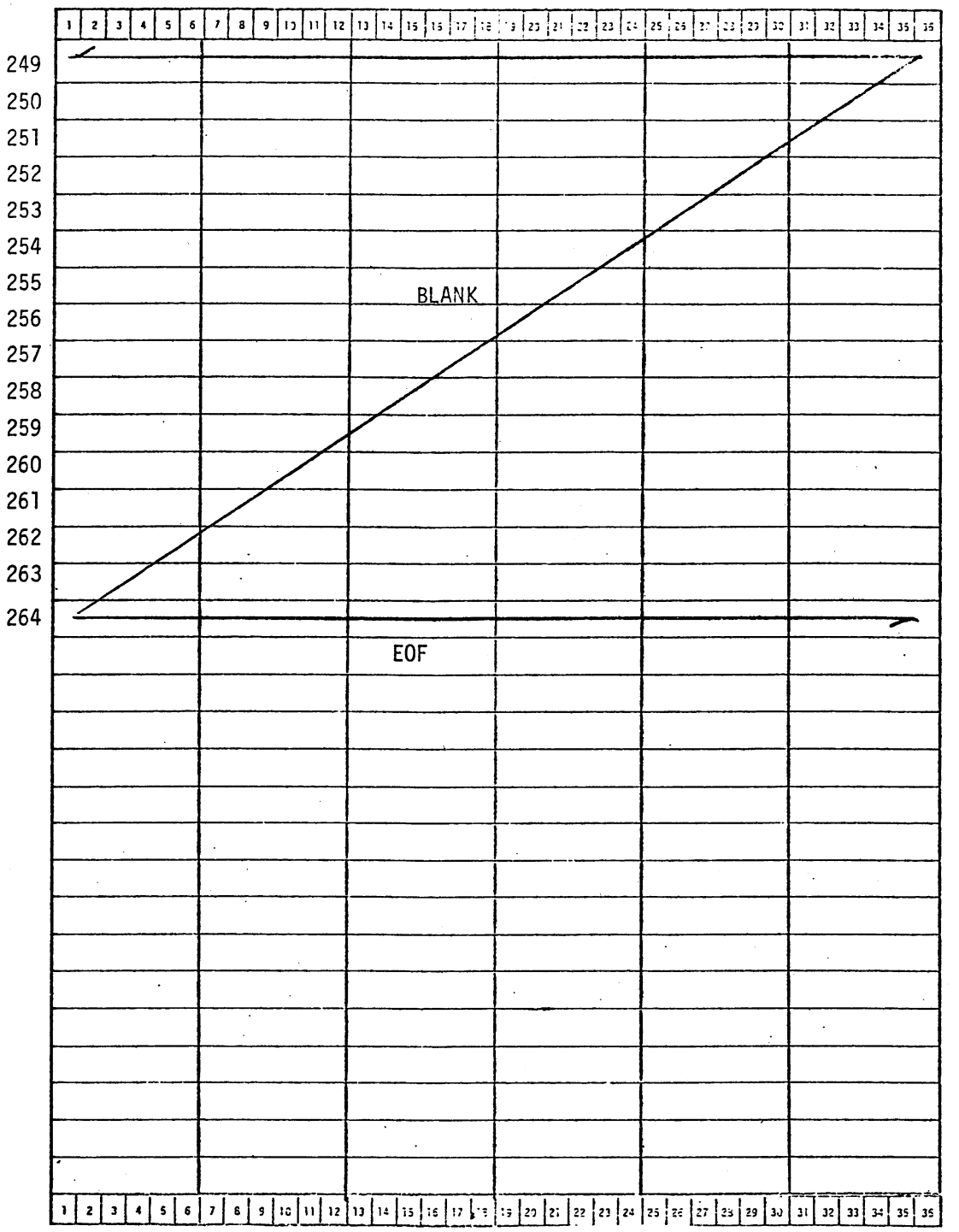
				D	Z
P					
X	M				
		Y	M		
				Z	M
X	S				
		Y	S		
				Z	S
X	5				
		Y	5		
				Z	5
R	A	5			
		D	E	C	5
				R	5
V	I	5			
		X	E		
				Y	E
Z	E				
		H	X	M	
				H	Y
M					
H	Z	M			
		H	X	5	
				H	Y
5					
H	Z	5			

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

		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					
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
	PARAMETER MNEMONICS FILE 2 (36-BIT MACHINE)	DOC. NO. PC-262.04
		FIG. 3.2.3
	REV. NO. 1 DATE 12-20-71	SHEET 11 OF 13



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 12 OF 13

1	(SIGN) +					
2			ENTRY	1		
3						
4				BLANK	BLANK	BLANK
625	(SIGN) +					
626			ENTRY	157		
627						
628				BLANK	BLANK	BLANK
			EOR			

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

REPRODUCED FROM	TITLE PARAMETER VALUES FILE 3 (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 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: FORMAT DESCRIPTION FOR 48-BIT MACHINES	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 1 OF 12

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
7	n	n		U	C	S	D	/
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
13		M	M	/	D	D	/	y
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
20	H	/	M	M	/	S	S	
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

HEADER
FILE 1
(48-BIT MACHINE)

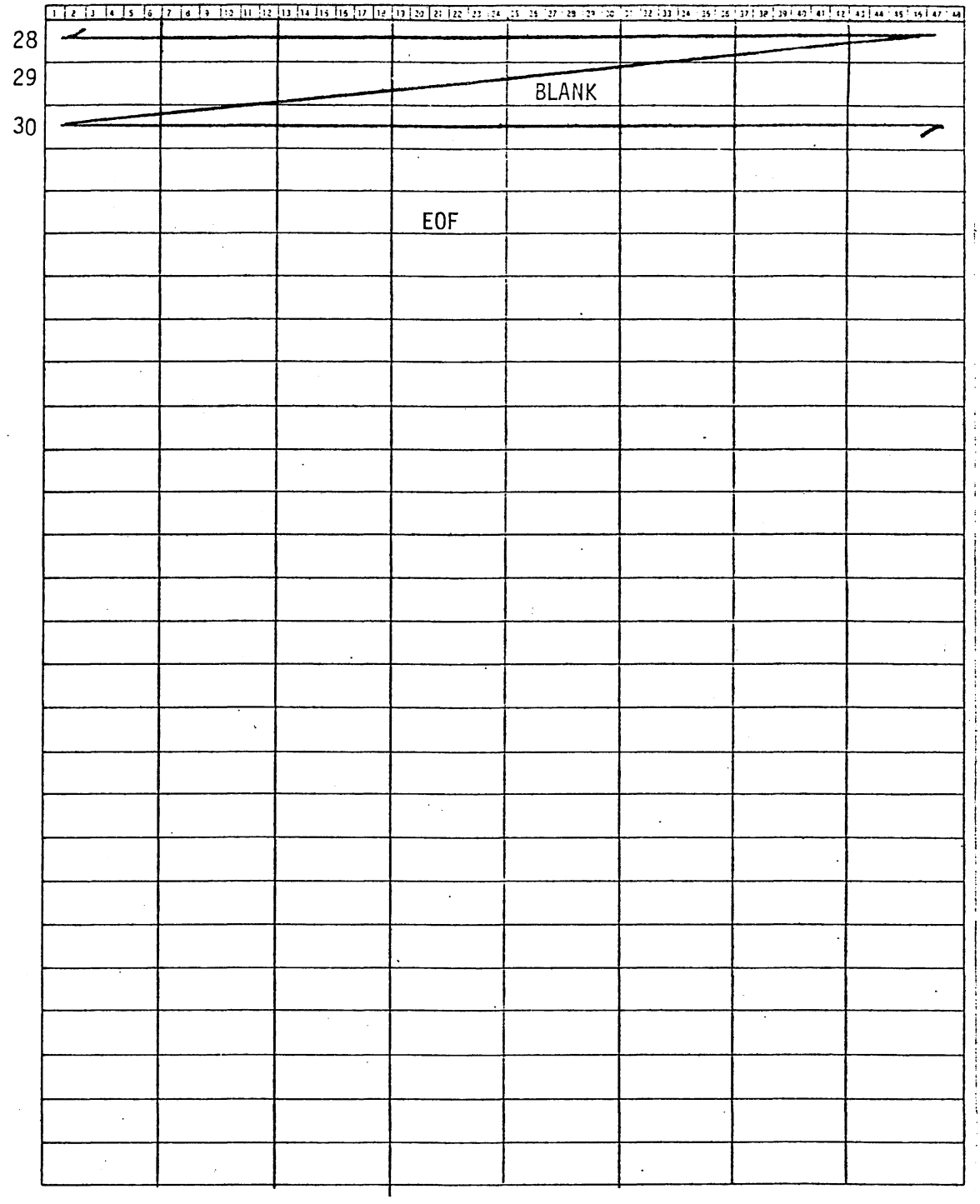
PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.4

REV. NO. 1 | DATE 12-20-71

SHEET 2 OF 12



REPRODUCED FROM	TITLE HEADER FILE 1 (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 2-20-71	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				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				L				L				N				P																											
C				E				L				L				T				E																											
C				E				L				L				N				E																											
X				S				C				S				E				L																											

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

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 4 OF 12

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		

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)

REV. NO. 1

DATE 12-20-71

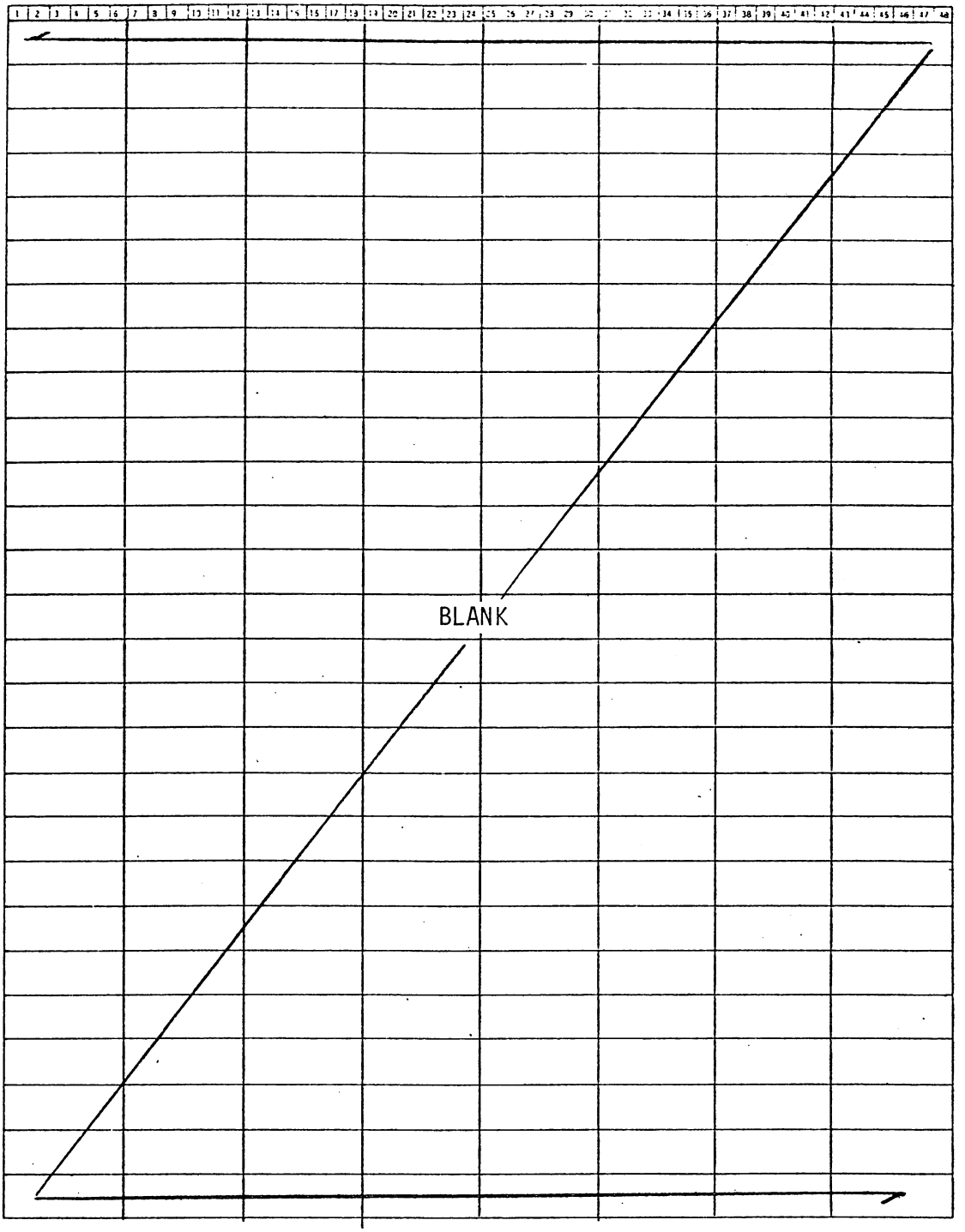
PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.4

SHEET 6 OF 12

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	2		
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

PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

REV. NO. 1

DATE 12-20-71

PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.4

SHEET 8 OF 12

X	P						
Y	P						
Z	P						
D	X	P					
D	Y	P					
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						
Y	E						
Z	E						
H	X	M					
H	Y	M					
H	Z	M					
H	X	5					
H	Y	5					

REPRODUCED FROM

TITLE

PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

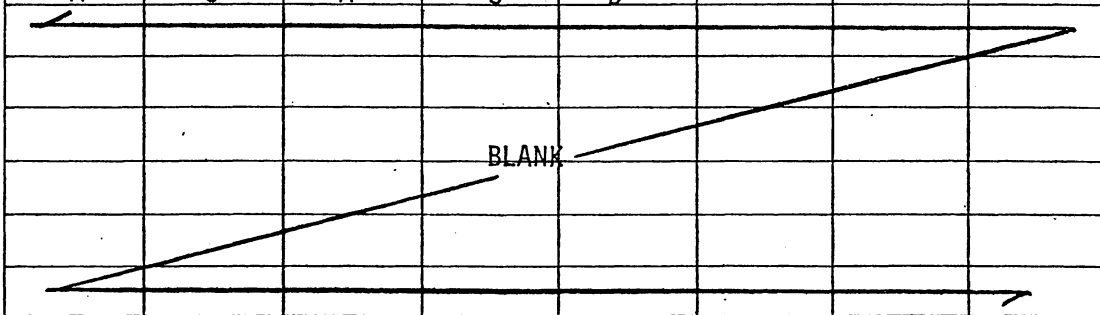
PIONEER PROGRAM
NASA
AMES RESEARCH CENTER
MOFFETT FIELD, CALIFORNIA

DOC. NO. PC-262.04

FIG. 3.2.4

REV. NO. 1 | DATE 12-20-71 | SHEET 9 OF 12

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					
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			



REPRODUCED FROM

TITLE

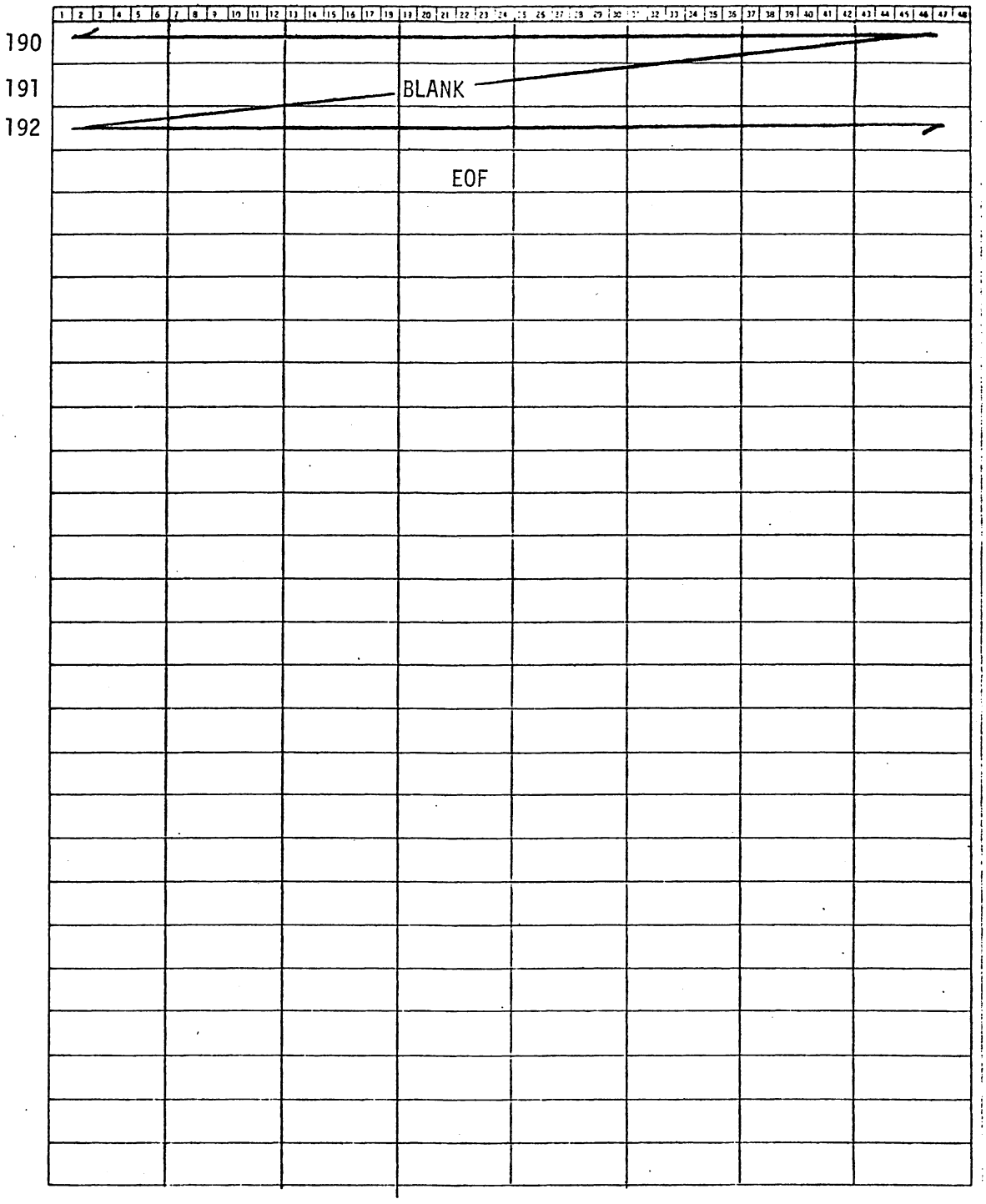
PARAMETER MNEMONICS
FILE 2
(48-BIT MACHINE)

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 10 OF 12



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 11 OF 12

1	(SIGN) +							
2			ENTRY	1				
3						BLANK	BLANK	BLANK
•								
•								
•								
•								
469	(SIGN) +							
470			ENTRY	157				
471						BLANK	BLANK	BLANK
				EOR				

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

REPRODUCED FROM	TITLE PARAMETER VALUES FILE 3 (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 12 OF 12