#384

PIONEER 10 & 11
72-012A-10C
72-012A-10D
72-012A-10E
72-012A-10F
73-019A-10B
73-019A-10C

PIONEER 10

IO OCCULT. - - INTERMED. DATA, TAPE

72-012A-10C

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY IT CONTAINED ONE 7-TRACK, 800 BPI TAPE WRITTEN IN BINARY. THERE IS ONE RESTORED TAPE. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE ORIGINAL TAPE WAS CREATED ON AN UNIVAC 1108 COMPUTER AND WAS RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPAN IS AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR005047	DS005047	D029358	1-11	12/04/73 - 12/04/73

PIONEER 10

IO OCCULATION REDUCED TELEMETRY SIGNALS, TAPE

72-012A-10D

This data set has been restored. There were originally two 9-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The tapes were created on an IBM 1100 computer. The DR and DS numbers along with the corresponding D numbers and the time spans are as follows:

DR#	DS#	DD#	FILES	TIME SPAN
DR03735	DS03735	D29239	1	12/04/73 - 12/04/73
		D29240	2	12/04/73 - 12/04/73

PIONEER 10 & 11

JUP. OCCULT - - INTERMED. DATA, TAPE

72-012A-10E

73-019A-10B

THESE DATA SETS HAVE BEEN RESTORED. ORIGINALLY THEY CONTAINED ONE 7-TRACK, 800 BPI TAPE WRITTEN IN BINARY. THERE IS ONE RESTORED TAPE. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE ORIGINAL TAPE WAS CREATED ON AN UNIVAC 1108 COMPUTER AND WAS RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPAN IS AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN	
DR005048	DS005048	D029357	1-11	12/04/73	PIO 10
			12-22	12/03/74	PIO 11

PIONEER 11

JUP.OCCULT -- RED.TM SIGNALS,TAPE

73-019A-10C

This data set has been restored. There were originally three 9-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on a 1108 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005051	DS005051	D029243	1	12/03/73 - 12/03/73
		D029244	2	12/03/73 - 12/03/73
		D029245	3	12/03/73 - 12/03/73

PIONEER 10

JUPITER OCCULATION REDUCED TELEMETRY SIGNALS, TAPE

72-012A-10F

This data set has been restored. There were originally two 9-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The tapes were created on an IBM 1108 computer. The DR and DS numbers along with the corresponding D numbers and the time spans are as follows:

DR#	DS#	DD#	FILES	TIME SPAN
DR03736	DS03736	D29241	1	12/04/73 - 12/04/73
		D29242	2	12/04/73 - 12/04/73

REQ. AGENT	RAND NO.	ACQ. AGENT
VJP	RC7556	CDW

PIONEER 10 & 11

JUPITER OCCULTATION

REDUCED TELEMETRY SIGNAL DATA

72-012A-10F & 73-019A-10C

AND

JUPITER OCCULTATION INTERMEDIATE DATA FILE

72-019A-10E/73-019A-10B

This data set catalog consists of 2 Pioneer 10 and 3 Pioneer 11 Reduced Telemetry signal data tapes and 1 Pioneer 10/11 Jupiter Occultation Intermediate data tape.

The Reduced Telemetry data are 800 BPI, Binary, 9 track and contains 1 file each. The Jupiter Occultation Intermediate data is 800 BPI, Binary, 7 track and contains 12 files, the first file is an E. O. F. the second is a header and files 3-12 are the data files. The tapes were created on a UNIVAC 1108 computer and contain BCD and binary data.

Pioneer 10 72-012A-10F RESTORED, SEE NEW pg

D#	C#	DATE	TIMES
D-29241	C-18922	12/04/73	04:27:30-04:31:30
D-29242	C-18923	12/04/73	05:28:00-05:32:00

PIONEER 11 73-019A-10C

D#	C#	DATE	TIMES
D-29243	C-18924	12/03/74	05:39:00-05:43:39
D-29244	C-18925	12/03/74	06:22:30-06:26:30
D-29245	C-18926	12/03/74	06:22:30-06:26:39

PIONEER 10/11 72-012A-10E/73-019A-10B

D#	C#	FILES	TIMES
D-29357	C-18977	1 Pioneer 10	12/4/73
		1 Pioneer 11	12/3/74

REQ. AGENT	RAND NO.	ACQ. AGENT
VJP	RC7556	CDW

PIONEER 10

Io OCCULTATION

REDUCED TELEMETRY SIGNAL DATA

72-012A-10D RESTORED, SEE NEW RC.

AND

Io OCCULTATION INTERMEDIATE DATA FILES

72-012A-10C

This data set catalog consists of 2 Pioneer 10 Reduced Telemetry Signal data tapes and 1 IO Occultation data tape.

The Reduced Telemetry data are 800 BPI, Binary, 9 track and contains 1 file each. The Io Occultation Intermediate data is 800 BPI, Binary, 7 track and contains 12 files, the first file is an E.O.F., the second a Header and files 3-12 are the data files. The tapes were created on an UNIVAC 1108 computer.

PIONEER 10 72-012A-10D

D#	C#	DATE	TIMES
D-29239	C-18920	12/04/73	03:25:07-03:28:28
D-29240	C-18921	12/04/73	03:28:29-03:31:29

PIONEER 10 72-012A-10C

D#	C#	FILES	TIMES
D-29358	C-18978	12	12/4/73

TO FIND THE TIME SPAN

Write down the first 12 bytes.

ex:

0A3320110E30

Broken down as:

0000 1010 0011 | 0011 | 0010 0000 0001 0001 0000 1110 0011 0000

Then cross out the first two bits, and then every two bits after every 6 bits.

~~00~~ 1010 ~~11~~ 0011 ~~10~~ 0000 ~~01~~ 0001 ~~00~~ 1110 ~~11~~ 0000

6 bits	10 bits	6 bits	7 bits	7 bits
001010	1100111000	000100	0100111	0110000
	3 3 8	0 4	2 7	3 0

First 6 bits = type of data

next 10 bits = Day — Day = 338

next 6 bits = Hour — HR = 04

next 7 bits = Minute — Mn. = 27

next 7 bits = Seconds — Sec = 30

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

March 11, 1977

Dr. Charles Wende, Code 601
National Space Science Data Center
NASA - Goddard Space Flight Center
Greenbelt, Maryland 20771

Dear Sir:

I am enclosing herewith the following Pioneer 10/11 material.

1. A copy of 'Pioneer 10/11 S-Band Occultation Experiment Reduced Data explanatory document'. The document describes tape numbers, I/O formates and the occultation software.

2. Five volumes of hard copy computer listings including plots of Pioneer 10/11 (Jupiter, Io) data files.

3. Two sets of microfilm one microfilm is for Pioneer 10/11 (Jupiter)data files and the other is for Pioneer 10 (IO)data files.

You will also receive Magnetic Tapes directly from JPL tape library. The tape numbers are as follows.

Tape No.		Tape No.		Tape No.	
N052	1*	N447	1*	N889	1*
N053	1*	N449	1*	N966	1*
N054	1*	N453	1*	N986	1*
N055	1*	N525	1*	X435	3*
N125	1*	N561	1*	X455	3*
N199	1*	N584	1*	X573	3*
N234	1*	N585	1*	X574	3*
N245	1*	N587	1*	X755	4*
N336	1*	N758	1*	X681	4*
N337	1*	N796	1*	X793	5*
N370	1*	N797	1*	X658	5*
N413	1*	N884	1*	X641	5*
				X899	7*
				X944	7*
				N936	6*
				H144	2*
				W758	8*

Telephone 354-4321 *Twx 910-588-3269* *Twx 910-588-3294*

JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

Dr. Charles Wende

March 11, 1977

where,

1* Mariner -10 Venus Digitized tapes
2* Mariner -10 (Venus) data files
3* Mariner -10 Mercury Digitized tapes
4* Pioneer -10 (Jupiter) Digitized tapes — 10F
5* Pioneer -11 (Jupiter) Digitized tapes — 10C
6* Pioneer -10 and 11 (Jupiter) Data files P11 10B P10 - 10E
7* Pioneer -10 (IO) Digitized tapes ← 10D
8* Pioneer -10 (IO) Data files ← 10E

Thank you very much.

Sincerely,

Indu R. Patel

Indu R. Patel

IRP:dq

Enclosures

Telephone 354-4321 *Twx 910-588-3269* *Twx 910-588-3294*

B28987-000A

72-012A-10
73-019A-10

PIONEER 10/11 PROJECT

S-BAND OCCULTATION EXPERIMENT

REDUCED DATA

Explanatory Document

Submitted to the

National Space Science Data Center
NASA/Goddard Space Flight Center
Greenbelt, MD 20771

by

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Principal Investigator
[illegible]

and

[illegible]
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Pioneer 10/11 Radio Occultation Experiment Data

Table of Contents

	Pg. No.
1. Introduction	1
2. Digital Data Tape	1
2.1 Format	1
2.2 List of Digital Data Tapes	1
3. Data Files	3
3.1 Occultation Data Tapes	4
3.1.1 Pioneer 10/11 (Jupiter) Data Files	4
3.1.2 Pioneer 10 (Io) Data Files	5
3.2 Description of Data Files	5
3.2.1 Residual Processing Program (RPP)	6
3.2.1.1 Input File	6
3.2.1.2 Output File	7
3.2.2 Data Inversion Program No. 1 (DIP1)	8
3.2.2.1 Input File	8
3.2.2.2 Trajectory File	8
3.2.2.3 Output File	10
3.2.3 Data Inversion Program No. 2 (DIP2)	11
3.2.3.1 Input File	11
3.2.3.2 Output File	11
3.2.4 Atmospheric Parameter Program (ATMOS)	12
3.2.4.1 Input File	12
3.2.4.2 Output	12
3.3 Format	13
4. Bibliography	14

1. Introduction

The material submitted herewith consists of raw, intermediate, and reduced data from the Pioneer 10/11 S-Band Radio Occultation Experiment, covering data on Jupiter and Io. The following data are provided:

a) Digital raw data	Digital tapes only
b) Data Files	
RPP, DIP1, DIP2, ATMOS (input)	Tapes, listings, and microfilm
ATMOS(output)	Listings and microfilm only

This material is described in detail in subsequent section.

2. Digital Data Tapes

Digital occultation data tapes are prepared by sampling analog spacecraft signal and time from analog recorded tapes. The sample rates are 80,000 samples/sec for Pioneer 10 and Io and 40,000 samples/sec for Pioneer 11. These tapes contain a digital representation of recorded signals received from the spacecraft, the time of reception (UTC) and header information. They are 9-track, 800 BPI tapes with odd parity.

2.1 Pioneer

Digital data tapes for Pioneer 10 and Pioneer 11 are in BCD mode. (odd-parity). Each record on the magnetic tape contains 4096 six-bit binary data words [illegible] six bit BCD words used to identify the time and one header word. The [illegible] of information in each record is shown in Table 1.

2.2 [illegible] Digital Data Tapes

[illegible] and Pioneer 11 digital data tapes are listed in Table 1. [illegible] are 9-[illegible] 800 BPI tapes. The tape number is in the second column and [illegible] the tape is given in the [illegible] column. Pioneer 10 [illegible] separately.

[illegible]

[illegible]	[illegible]
P*	[illegible] EVEN [illegible]ITY BIT
M	[illegible] BIT
S	[illegible] TYPE [illegible] = DSS 14 [illegible] = DSS 6X 11 = DSS 6X
CD	[illegible] [illegible] ? = DIGITAL
[illegible]	[illegible] BITS
[illegible]	[illegible] BITS
[illegible]	[illegible] BITS
[illegible]	[illegible] BITS
[illegible]	[illegible]MILLISECOND
[illegible]	[illegible]MICROSECOND
P	[illegible]ITY BIT

P	0	0	0	0	S	S	T	CD	HEADER
P	0	0	D_1	D_2	D_3	D_4	D_5	D_6	
P	0	0	D_7	D_8	D_9	D_{10}	H_1	H_2	
[illegible]									[illegible]

NOTE:
A_1 - A_{12} [illegible]

[illegible] Record Format - Pioneer 10/11 Digital Occultation Data

Table: 2 Tapes (DSS 43)

PIONEER 10 EVENT	DIGITAL DATA TAPE NO.	TIME, UTC, Dec. 4, 1973
P10N (Entry)	X755	4:27:30 - 4:31:30 (Entry)
P10X (Exit)	X681	5:26:00 - 5:32:00 (Exit)

PIONEER 11	DIGITAL DATA TAPE NO.	TIME, UTC, Dec. 3, 1974
P11NF (Entry FM)	X793	05:39:00 - 05:43:00 (Entry)
P11XF (Exit FM)	X658	06:22:30 - 06:26:30 (Exit)
P11XD (Exit Direct)	X641	06:22:30 - 06:26:30 (Exit)

PIONEER 10 (Io)	DIGITAL DATA TAPE NO.	TIME, UTC, Dec. 4, 1973
I01 (Entry)	X899	03:25:07 - 03:28:28
I02 (Exit)	X944	03:28:30 - 03:31:29

3. Data Files

Pioneer 10 and Pioneer 11 data files are created by Processing Pioneer 10 and Pioneer 11 radio occultation data using the subset of occultation software. A brief description of the software and the files is given below.

Occultation Software: consists of the Computer Programs RPP, DIP1, DIP2 and [illegible]. The functions of these programs are:

[illegible] removes drift and bias from frequency residuals supplied from open loop data

[illegible] computes refractive bending angle as a function of ray-asymptote distance

[illegible] computes refractivity as a function of radius from center of [illegible]

[illegible] computes atmospheric information (temperature, pressure, etc.) [illegible] a function of radius to center of planet

The Data Files described in Section 3.1 are Input/Output files obtained by executing the computer programs RPP, DIP1, DIP2, and ATMOS on the UNIVAC 1108.

The files are written using standard formatted FORTRAN I/O on the UNIVAC 1108 Exec-8 system. The format statements used are given in Section 3.3 according to the identifying number which is used as a label for each record in the detailed descriptions below.

Definitions and types of each variable are also given in Section 3.2. The type of a variable is either Integer, Real or Double Precision.

These files are written on tapes N936 and W058 (both 7-track, 800 BPI) using the tape processor of the 591*LIB, sub-routine library at JPL.

3.1 Occultation Data Tapes

Pioneer 10 and Pioneer 11 (Jupiter and Io) data files, obtained by executing the computer programs RPP, DIP1, DIP2, and ATMOS are discussed below.

3.1.1 Pioneer 10 and 11 (Jupiter) Data Files

The following data files are on tape N936 (7-track, 800 BPI) and are written using the TAPE processor. The sequence in which files are written is as follows:

File Sequence on N936	Description
1	P10 Entry OCCP
[illegible]	P10 Exit OCCP
[illegible]	P10 Exit OCCP
[illegible]	P11 Entry OCCP
[illegible]	P11 Exit OCCP
6	P10 Entry [illegible]
[illegible]	P10 Exit [illegible]
[illegible]	P11 Entry [illegible]
[illegible]	P11 Exit [illegible]
[illegible]	P10 Entry [illegible] Output File

11	P10 Entry DIP1 Output File
12	P10 Entry DIP2 Output File
13	P10 Exit RPP Output File
14	P10 Exit DIP1 Output File
15	P10 Exit DIP2 Output File
16	P11 Exit RPP Output File -B1-
17	P11 Exit DIP1 Output File -B1-
18	P11 Exit DIP2 Output File -B1-
19	P11 Exit RPP Output File -B2-
20	P11 Exit DIP1 Output File -B2-
21	P11 Exit DIP2 Output File -B2-

3.1.2 Pioneer IO (Io) Data Files

The following are IO - Entry and Exit data files. These files are on tape W758 (7-trk, 800 BPI) and are written using TAPE processor. The first file on the tape is Trajectory file which is in a Type 66 format. All other files are in formatted FORTRAN I/O. The sequence in which files are written on tape is as follows:

File Sequence on W758	Description
1	TRAJ IO-entry and IO-exit T/66 Format
2	OCEP IO-entry
3	OCEP IO-exit
4	RPP output file IO-exit
[illegible]	DIP1 output file IO-exit
[illegible]	DIP2 output file IO-exit
[illegible]	File-13 RPP IO-entry
[illegible]	File-14 DIP1 IO-entry
[illegible]	File-15 DIP2 IO entry for AEROS old F898 TRAJ
[illegible]	TRAJ IO-entry and IO-exit (FORTRAN Format)

3.2 [illegible] Data Files

[illegible] software consists of the computer programs RPP, DIP1, [illegible] These programs and the description of input/output files [illegible] given in the following sections.

3.2.1 Residual Processing Program (RPP)

The function of the Residual Processing Program (RPP) is to remove drift and bias from frequency residuals. The RPP program reads the RADIO DATA file produced by the OCEP (Occultation Editing Program) program which consists of time points and corresponding frequency residuals. RPP then computes a polynomial drift function for a user-specified time interval and subtracts this function from the data. RPP then computes the phase differences in cycles and writes an output file consisting of doppler residuals (from which bias and drift has been removed) and amplitude to be used by the DIP1 program.

3.2.1.1 Input File

The input file to be used by RPP is the Radio Occultation data file produced by the OCEP Program. It consists of frequency residuals and power for each time points. This file is in standard formatted FORTRAN I/O and is described as follows. Each line corresponds to one record and the format statement for that record corresponds to the label (e.g. 5*) in section 3.3, definition and type of each variable in the file is also given.

[illegible]	SCID	PASS	MODE		(Record 1)	1*
[illegible]	DSS	IW	FBAND		(Record 2)	1*
[illegible]	F2				(Record 3)	2*
[illegible]	[illegible]				(Record 4)	3*
[illegible]	IDAY	TIME	SFREQ	SRES	(Record 5)	3*
[illegible]	XPWR	XFREQ	XRES		(Record 6)	4*
.	.	.	.			
:	:	:	:			
[illegible]	IDAY	TIME	SFREQ	SRES	(Record n-1)	
[illegible]	XPWR	XFREQ	XRES		(Record n)	

[illegible]

[illegible] type of file. 1 for closed loop, 2 for open loop, and 3 for both (integer)

[illegible] spacecraft identification number (integer)

PASS	orbit or revolution number	(integer)
MODE	1 for entry, 2 for exit	(integer)
XTR	transmitting station number	(integer)
DSS	receiving station number	(integer)
IW	1-way, 2-way or 3-way data	(integer)
FBAND	always 3	(integer)
F1	uplink frequency in hertz	(d. p.)
F2	downlink frequency in hertz	(d. p.)
SYNFRQ	closed loop synthesizer frequency	(d. p.)
SYNLO	open loop synthesizer frequency	(d. p.)
IYR	year of the sample	(integer)
IDAY	day of the sample	(integer)
TIME	time of sample in seconds past midnight	(real)
SFREQ	S-Band frequency in hertz	(d. p.)
SRES	S-Band frequency residuals in hertz	(d. p.)
SPWR	S-Band power in db.	(real)
XPWR	X-Band power in db.	(real)
XFREQ	X-Band frequency in hertz	(d. p.)
XRES	X-Band frequency residuals in hertz	(d. p.)

3.2.1.2 <u>Output File:</u>

RPP output file consists of doppler residuals (from which bias and drift has been removed) and phase for corresponding time points. The file is written with formatted NORTRAN I/O, and is described as follows:

FLTYPE	SCID	PASS	MODE	(Record 1)	1
XTR	DSS	IW	FBAND	(Record 2)	1
F1	F2			(Record 3)	2
TIME	RESIDUAL	PHASE		(Record 4)	3
.	.	.		.	
:	:	:		:	
TIME	RESIDUAL	PHASE		(Record n)	3n

Where,

FLTYPE — type of file. 1 for closed loop, 2 for open loop, and 3 for both (integer)

SCID	spacecraft identification number	(integer)
PASS	orbit or revolution number	(integer)
MODE	1 for entry, 2 for exit	(integer)
XTR	transmitting station number	(integer)
DSS	receiving station number	(integer)
IW	1-way, 2-way, or 3-way data	(integer)
FBAND	always 3	(integer)
F1	uplink frequency in hertz	(d. p.)
F2	downlink frequency in hertz	(d. p.)
TIME	time of sample in seconds past midnight	(d. p.)
RESIDUAL	frequency sample in hertz	(d. p.)
PHASE	phase difference in cycles	(d. p.)

3.2.2 Data Inversion Program No. 1 (DIP1)

The function of DIP1 Program is to compute refractive bending angle, ray asymptote distance, and range from S/C to the center of the planet for each time point. Computation of the above variables are based on the assumptions of the oblateness in the Planet Jupiter. The exact shape of the planet Jupiter is computed by making use of a spherical harmonic representation of the gravity field of Jupiter and radius of curvature at point of ray tangency.

The input and output for DIP1 are described as follows:

3.2.2.1 Input Files

Input files to DIP1 are the trajectory file and KPP output file. The KPP output file is described in Section 3.2.1.2 on Page 7. The trajectory file is described as follows:

3.2.2.1.1 Trajectory file:

This file is a Trajectory file produced by the Trajectory link on the [illegible] and based on the DPTRAJ save and plot tape. The file is dynamically allocated and assigned to the run. The file is written using [illegible] 3/6, [illegible] which is described as follows:

FLTYPE	SCID	PASS	I			(Record 1)	1*
ETSCA	ETMC	LITTM				(Record 2)	5*
S1	S2	S3				(Record 3)	5*
$TIME_{(1)}$	$YR_{(1)}$	$DAY_{(1)}$	$HR_{(1)}$	$MIN_{(1)}$	$SEC_{(1)}$	(Record 4)	6*
$DPREC_{(1,1)}$	$DPREC_{(1,2)}$	$DPREC_{(1,3)}$				(Record 5)	5*
$DPREC_{(1,4)}$	$DPREC_{(1,5)}$	$DPREC_{(1,6)}$				(Record 6)	5*
$DPREC_{(1,7)}$	$DPREC_{(1,7)}$	$DPREC_{(1,8)}$				(Record 7)	5*
$DPREC_{(1,10)}$	$DPREC_{(1,11)}$	$DPREC_{(1,12)}$				(Record 8)	5*
.	.	.				.	
.	.	.				.	
.	.	.				.	
$TIME_{(N)}$	$YR_{(N)}$	$DAY_{(N)}$	$HR_{(N)}$	$MIN_{(N)}$	$SEC_{(N)}$	(Record M-4)	6*
$DPREC_{(N,1)}$	$DPREC_{(N,2)}$	$DPREC_{(N,3)}$				(Record M-3)	5*
$DPREC_{(N,4)}$	$DPREC_{(N,5)}$	$DPREC_{(N,6)}$				(Record M-2)	5*
$DPREC_{(N,7)}$	$DPREC_{(N,8)}$	$DPREC_{(N,9)}$				(Record M-1)	5*
$DPREC_{(N,10)}$	$DPREC_{(N,11)}$	$DPREC_{(N,12)}$				(Record M)	5*

Where,

FLTYPE	Type of file, 1 for closed loop, 2 for open loop and 3 for both (INTEGER)
SCID	Spacecraft Identification Number (INTEGER)
PASS	Orbit or Revolution Number (INTEGER)
I	1 for Entry, 2 for Exit (INTEGER)
LITTM	Time of closest approach - NT (sec/past Midnite 1950) (D.P.)
ETMC	Difference between Ephemeris time and Universal time/sec. (D.P.)
TIME (N)	Time in Seconds (ET) from Jan. 1, 1950.0 for N^{th} Point (D.P.)
YR (N)	Year for the Nth Point (Real)
DAY (N)	Day number for N^{th} Point (Real)
MIN (N)	Time at MIN Minutes for N^{th} Point (Real)
SEC (N)	Time at SEC - Seconds for N^{th} Point (Real)
S1	1-way light time (D.P.)
S2, S3	X, Y, Z Coordinates of Sun Position vector relative to Jupiter (D.P.)

DPREC (N,I)	I = 1, 2, 3 X, Y, Z Coordinates of S/C Position vector relative to Jupiter for N^{th} point (D.P.)
DPREC (N,I)	I = 4, 5, 6 X, Y, Z Components of S/C Velocity vector realtive to Jupiter (D.P.) for N^{th} Point
DPREC (N,I)	I = 7, 8, 9 X, Y, Z Coordinates of Earth Position vector for N^{th} Point (D.P.)
DPREC (N,I)	I = 10, 11, 12 X, Y, Z Coordinates of Earth Velocity vector for N^{th} Point (D.P.) N = 1, 2 - - M Points
NOTE:	All above vectors are body centered and referenced to the Earth Equator of 1950.0 coordinate system

3.2.2.3 Output file:

DUPL output file consists of ray-asymptote, bending angle, gravity and S/C range corresponding to each time point. The file is written with formatted FORTRAN I/O, and is described below.

FLTYPE	SCID	PASS	MODE	(Record 1)	1*
MTR	DSS	IW	FBAND	(Record 2)	1*
F1	F2			(Record 3)	2*
TIME	RD			(Record 4)	2*
[illegible]	R			(Record 5)	2*
[illegible]	LAT			(Record 6)	2*
.	.			.	
.	.			.	
.	.			.	
TIME	RD			(Record (n-2))	2*
[illegible]	R			(Record (n-1))	2*
[illegible]	LAT			(Record n)	2*

FLTYPE	Type of file. 1 for closed loop, 2 for open loop and 3 for both	(integer)
[illegible]	Spacecraft identification number	(integer)

PASS	Orbit or revolution number	(integer)
MODE	1 for entry, 2 for exit	(integer)
NTR	Transmitting station number	(integer)
DSS	Receiving station number	(integer)
IW	1-way, 2-way or 3-way data	(integer)
FBAND	Always 3	(integer)
F1	Uplink frequency in hertz	(d. p.)
F2	Downlink frequency in hertz	(d. p.)
TIME	Time of sample in seconds past midnight	(d. p.)
G	Gravity Value	(d. p.)
LAT	Latitude of ray tangent in degrees	(d. p.)
RD	Asymptotic ray distance in Km	(d. p.)
BA	Refractive bending angle in radians	(d. p.)
R	Range from spacecraft to the center of the planet	(d. p.)

3.2.3 Data Inversion Program No. 2 (DIP2)

The function of the DIP2 program is to compute refractivity as a function of the radial distance to the center of the planet.

DIP2 reads a file of ray distance and corresponding bending angle (among other parameters) produced by the DIP1 program and inverts this data using the Abel Integral Transform to obtain refractivity versus radius.

3.2.3.1 Input file:

DIP2 input file is same as DIP1 output file. This file is in formatted FORTRAN I/O, and is described on Page 10, Section 3.2.2.3.

3.2.3.2 Output file:

The DIP2 output file is written with formatted FORTRAN I/O. It consists of radius, refractivity, gravity and latitude and is described as follows:

[illegible]	LCID	PASS	MODE	(Record 1)
[illegible]	NTR	IW	[illegible]	(Record 2)
[illegible]	F2			(Record 3)
[illegible]	[illegible]			(Record 4)

GR	LATT	(Record 5)	2*
.	.	.	
.	.	.	
.	.	.	
RADIUS	REF	(Record (n-1))	2*
GR	LATT	(Record n)	2*

Where,

FLTYPE	type of file. 1 for closed loop, 2 for open loop and 3 for both	(integer)
SCID	spacecraft identification number	(integer)
PASS	orbit or revolution number	(integer)
MODE	1 for entry, 2 for exit	(integer)
XTR	transmitting station number	(integer)
DSS	receiving station number	(integer)
[illegible]	1-way, 2-way or 3-way data	(integer)
[illegible]AND	always 3	(integer)
[illegible]	uplink frequency in hertz	(d. p.)
[illegible]	donwlink frequency in hertz	(d. p.)
RADIUS	radial distance to the center of the planet in Km	(d. p.)
REF	refractivity in N-units	(d. p.)
GR	gravity value obtained from NALPHA	(d. p.)
LATT	latitude of ray tangent in degrees	(d. p.)

3.2.4 Atmospheric Parameter Program (AMOS)

The function of the AMTOS program is to compute atmospheric information from the refractivity data produced by the DIP2 Program.

A detailed description of ATMOS can be found in the Mariner Mars 1971 occultation Atmospheric Parameter Program - Program document.

3.2.4.1 Input File

ATMOS input file is the same as DIP2 output file. This file is in formatted FORTRAN I/O and is described on Page 11, Section 3.2.3.2.

3.2.4.2 Output

The output of the ATMOS Program consists of hard-copy computer listings [illegible] containing the following information:

For all points:

RADIUS (km) REFRACTIVITY (N-units)

with bias removed

For negative refractivity points:

RADIUS (km) REFRACTIVITY (n-units) ELECTRON DENSITY (cm^{-3})

(these data are not reliable below main peak)

For all positive refractivity points:

RADIUS (km) REFRACTIVITY (n-units) TEMPERATURE (^{o}K) PRESSURE (mb)

NUMBER DENSITY (cm^{-3}) MASS DENSITY (gcm^{-3})

3.3 Formats

The following formats are referred to in the preceding:

1* FORMAT (4I10)

2* FORMAT (2D26.18)

3* FORMAT (I2,I5,F12.4,2D26.18)

4* FORMAT (F9.4,F10.4,2D26.18)

5* FORMAT (3D26.18)

6* FORMAT (3D26.14,4X,4F7.1,F14.8)

7* FORMAT (4D26.18)

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What tape?
DSC # 384

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05053407	02003C3E	0530063C	08003A11	36000000	39010707	3735063A	08003A01	063E3637	0C000539
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08080A03	3811043A	3D080E00	04030200	3D053C06	3E363E02	02370A02	37380600	35020002	2E3F0204
3E350A39	0906030C	03000539	0038383C	0037023D	06023B00	08000107	3E3E3C04	3D040A35	2431083A
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073E0500	3B313C09	3539010D	00000C3E	3903083A	08000202	2E3A3C0C	053A0839	010A0B3D	37003C00
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12/4/77
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C-18922

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( 1640) 0B0D0500 3F3E3C38 3C050B0A 043F3D00 013C383D 05043B35 3A04053A 2339080C 033C3E06 09050305
( 1680) 043F3A3D 02003735 39000000 003D3938 3D060C06 2C383D01 0101003C 35363E03 3E36353D 0506013D
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( 1920) 01393637 3A3A3B02 08043C37 3C01023E 3E010401 2E3E0002 0504003C 393A3D00 003E3D3C 39380008
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( 2120) 35373B3B 3D0C0D0D 043C3D01 0305080B 0A04003D 3F010200 2A37393A 37353904 0901383C 07073D34
( 2160) 34373C04 0A053932 38030500 2C3E0100 04080600 3C393430 31380004 04010000 01000002 03013E3D
( 2200) 3C3D3E00 3F3D3E04 05003B3D 02050509 0D063935 393A3635 3A020606 080A0C09 3D343604 0C053A37
( 2240) 3C3F3D3A 3D040908 05040501 37313238 01080902 3A3A0106 0200040A 0A020006 0C053834 37393431
```

```
( 3400)  00000003  02000106  07023E3F  04080601  3D3C3D3C  3C000405  02000207  06000002  3E342E31  383D3F03
( 3440)  05003736  3E05033C  393D0102  3E373800  06040408  0C050001  02000004  0036353D  023E3C00  08073D36
( 3480)  373D0102  003C3C3E  00030709  0806080A  09033A36  3A3E3D39  383A3B39  3B3E0000  0104003D  00060600
( 3520)  3D00003B  3900043F  26353D05  053D3737  3E023F3C  0209053A  363D0507  05040304  07053A31  3500043E
( 3560)  2A3E0200  3D383C04  0A060001  05023730  343D003D  3B000100  01060700  3D3C3734  37020701  3D00013C
( 3600)  26363837  373C0408  023A3C01  02003E01  05043E3D  02070508  10120830  393A3937  393D3F02  0606003E
( 3640)  0104003C  3D003D3D  02060505  0A0D0A02  0002013F  3E3E3C39  3D020300  3E000039  38020802  293E3C39
( 3680)  34323435  363E0C10  09000003  05023F3A  393A3D00  003D3A38  373A0002  003D003E  393A050A  043D0008
( 3720)  08003A3B  01050505  04020204  07060038  373A3E3C  37380005  003A3C02  00383439  02050100  04043D36
( 3760)  353C0102  0202080D  0D080400  3E3D3E00  003D3C3D  3C373739  3C3A3D00  003A3234  3D05023E  2E3E3A37
( 3800)  3A00003D  00080901  3B3E080D  0704070A  053D383A  3E3C3A3D  01003C3A  3B3D3F00  3D393C02  0600393B
( 3840)  040A0601  040A0C05  00010200  3D3C3C3B  3C040D09  2C353C06  0438363D  033E3A3D  03060504  03003A38
( 3880)  3A000408  05040300  3C3C3F00  3D3E040A  08023E3E  3E3D3E00  3D37373D  02040405  033D3C02  043C3432
( 3920)  37393735  363E080C  03393900  02000108  0D090039  3A3C3735  373E0204  02003B3A  3E040706  04000000
( 3960)  003F0005  09080038  383D0001  0202003D  3D000508  00353239  3E3E3E01  003C393D  02060704  00000405
( 4000)  013A3538  3E003E00  003C3635  3C040A08  02000405  00353439  3C353239  05080400  01003937  3D040239
( 4040)  253A0406  01000102  00000002  04020000  0205013D  3C020501  2D3E0201  3C3C0002  003C3E04  07070300
( 4080)  3C3A3A3A  3A3D0206  04000002  0504003E  3D3E0002  02003937  3D050000  00
```

FILE 1 # OF DATA RECORDS 4693 # SUCCESSFUL READS 4694

PERMANENT READ ERRORS 0 # ZERO BYTE ERRORS 0 # SHORT RECORDS 0 # UNDEFINED ERRORS 0

OF RECORDS RETRIED 0 TOTAL # OF RETRIES 0

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