[redacted]

73-085A-02B, 02C, 02D #389

MARINER 10

VENUS OCCULTATION REDUCED TELEMETRY SIGNAL DATA

VENUS OCCULTATION INTERMEDIATE DATA FILE

AND

REDUCED MERCURY OCCULTATION DATA

[redacted]

Table of Contents

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1. INTRODUCTION:

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 This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system.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

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

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

2. ERRATA/CHANGE LOG:

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

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

Version	Date	Person	Page	Description of Change
01				
02				

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

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

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

4. CATALOG MATERIALS:

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

b. Core Catalog Materials

MARINER 10

VENUS OCCULTATION

REDUCED TELEMETRY SIGNAL DATA

73-085A-02B PSPA-00316

AND

VENUS OCCULATION INTERMEDIATE DATA FILE

73-085A-02C PSPA-00200

THESE DATA SETS HAVE BEEN RESTORED. ORIGINALLY THERE WERE 27 9-TRACK, 800 BPI MARINER 10 REDUCED TELEMETRY SIGNAL DATA TAPES AND ONE 7-TRACK, 800 BPI MARINER 10 VENUS OCCULATION INTERMEDIATE DATA TAPE. THERE ARE NOW 5 RESTORED TAPES AT 9-TRACK, 6250 BPI CONTAINING MULTPLE FILES OF DATA FOR 73-085A-02B AND ONE TAPE AT 9-TRACK, 6250 BPI, CONTAINING 20 FILES, THE FIRST FILE IS AN E.O.F., THE SECOND FILE IS A HEADER AND THE FILES 3 - 20 ARE DATA FILES, FOR 73-085A-02C. THE TAPES WERE CREATED ON AN UNIVAC 1108 COMPUTER. THE VENUS OCCULATION INTERMEDIATE DATA TAPE SHOULD BE SENT WITH THE MARINER 10 DATA TAPES SINCE IT CONTAINS THE PROGRAMS TO RUN AGAINST THOSE TAPES. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND THE TIME SPANS ARE AS FOLLOWS:

73-085A-02B

DR#	DS#	D#	FILES	TIME SPAN
DR02698	DS02698	D29598	1	02/05/74
		D29599	2	02/05/74
		D29600	3	02/05/74
		D29601	4	02/05/74
		D29602	5	02/05/74
		D29603	6	02/05/74
DR02699	DS02699	D29604	1	02/05/74
		D29605	2	02/05/74
		D29606	3	02/05/74
		D29607	4	02/05/74
		D29626	5	02/05/74
		D29627	6	02/05/74

73-085A-02B

DR#	DS#	D#	FILES	TIME SPAN
DR02700	DS02700	D29628	1	02/05/74
		D29629	2	02/05/74
		D29630	3	02/05/74
		D29631	4	02/05/74
		D29632	5	02/05/74
		D29633	6	02/05/74
DR02701	DS02701	D29634	1	02/05/74
		D29635	2	02/05/74
		D29651	3	02/05/74
		D29652	4	02/05/74
		D29653	5	02/05/74
		D29654	6	02/05/74
DR02702	DS02702	D29655	1	02/05/74
		D29656	2	02/05/74
		D29657	3	02/05/74

73-085A-02C

DR02786	DS02786	D29359	1-20	

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

MARINER 10

VENUS OCCULTATION

REDUCED TELEMETRY SIGNAL DATA

73-085A-02B

AND

VENUS OCCULTATION INTERMEDIATE DATA FILE

73-085A-02C

This data set catalog consists of 27 Mariner 10 Reduced Telemetry Signal data tapes and 1 Mariner 10 Venus Occultation Intermediate data tapes.

The reduced Telemetry data are 800 BPI Bin, 9 track and contains 1 file each. The Venus Occultation Intermediate data are 800 BPI, Bin, 7 track and contains 20 files, the first file is an E.O.F., the second a header and files 3-20 are the data files. The tapes were created on a UNIVAC 1108 computer.

The Venus Occultation Intermediate data tape should be sent with the Mariner 10 data tapes since it contains programs to run against those tapes.

MARINER 10 73-085A-02C

D#	C#	FILES
D-29359	C-18979	20

MARINER 10 73-085A-02B

D#	C#	DATE	TIMES
D-29598	C-18997	02/05/74	17:11:15 - 17:12:12
D-29599	C-18998	02/05/74	17:08:29 - 17:09:30
D-29600	C-18999	02/05/74	17:20:24 - 17:21:25
D-29601	C-19000	02/05/74	17:14:55 - 17:15:55
D-29602	C-19001	02/05/74	17:17:39 - 17:18:40
D-29603	C-19002	02/05/74	17:16:45 - 17:17:45
D-29604	C-19003	02/05/74	17:13:04 - 17:14:05
D-29605	C-19004	02/05/74	17:13:59 - 17:15:00
D-29606	C-19005	02/05/74	17:12:09 - 17:13:10
D-29607	C-19006	02/05/74	17:34:09 - 17:35:10
D-29626	C-19061	02/05/74	17:24:59 - 17:26:00
D-29627	C-19062	02/05/74	17:10:19 - 17:11:20
D-29628	C-19063	02/05/74	17:09:24 - 17:10:25
D-29629	C-19064	02/05/74	17:19:29 - 17:20:30
D-29630	C-19065	02/05/74	17:18:34 - 17:19:35
D-29631	C-19066	02/05/74	17:24:04 - 17:25:05
D-29632	C-19067	02/05/74	17:33:15 - 17:34:15
D-29633	C-19068	02/05/74	17:32:26 - 17:33:20
D-29634	C-19069	02/05/74	17:31:34 - 17:32:25
D-29635	C-19070	02/05/74	17:26:49 - 17:27:48
D-29651	C-19128	02/05/74	17:23:09 - 17:24:10
D-29652	C-19129	02/05/74	17:28:39 - 17:29:40
D-29653	C-19130	02/05/74	17:27:44 - 17:28:45
D-29654	C-19131	02/05/74	17:30:29 - 17:31:30
D-29655	C-19132	02/05/74	17:29:34 - 17:30:35
D-29656	C-19133	02/05/74	17:25:55 - 17:26:55
D-29657	C-19134	02/05/74	17:22:14 - 17:23:15

MARINER 10

REDUCED MERCURY OCCULTATION DATA

73-085A-02D PSPA-00311

This data set have been restored. Originally there were four 9-track, 800 BPI tapes, written in Binary. There is one restored tape. The original tapes were created on a UNIVAC 1108 computer. The restored tape was created on the IBM 9021 computer. The DR tape is 3480 cartridge and the DS tape is 9-track, 6250 BPI. The DR and DS numbers along with their corresponding D numbers and time span is as follows:

DR#	DS#	DD#	FILES	TIME SPAN	
DR-004919	DS-004919	DD-029593	1	20:55:20 - 20:56:20	03/29/74
		DD-029594	2	21:07:15 - 21:08:15	03/29/74
		DD-029595	3	21:08:10 - 21:09:10	03/29/74
		DD-029596	4	21:09:05 - 21:10:05	03/29/74

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

MARINER 10

REDUCED MERCURY OCCULTATION DATA

73-085A-02D

This data set catalog consists of 4 Mariner 10 data tapes. The tapes are 9 track, 800 BPI, Bin and contains 1 file each. The tapes were created on a UNIVAC 1108 computer.

D#	C#	DATE	TIME
D-29593	C-18993	3/29/74	20:55:20 - 20:56:20
D-29594	C-18994	3/29/74	21:07:15 - 21:08:15
D-29595	C-18995	3/29/74	21:08:10 - 21:09:10
D-29596	C-18996	3/29/74	21:09:05 - 21:10:05

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	0102111	0110000
	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

E78154-CCCA

MARINER VENUS-MERCURY PROJECT

RADIO SCIENCE TEAM
VENUS OCCULTATION EXPERIMENT

REDUCED DATA

Explanatory Document

Submitted to the

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February 14, 1977

Mariner 10 Occultation Data

Table of Contents

1. Introduction

The material submitted contains raw, intermediate, and reduced data from the Occultation portion of the Mariner 10 Radio Science Experiment (H. T. Howard, Team Leader). The following data are included:

a)	Raw Digital Data	DIGITAL TAPES ONLY
b)	Data Files	
	RPP, DIP1, DIP2, ATMOS (input) (Venus Only)	TAPES LISTINGS & MICROFILM
c)	ATMOS (output) (Venus Entry Only)	LISTINGS & MICRO-FILM ONLY

The material is described in greater detail in following sections.

2. Digital Data Tapes

Digital occultation data tapes are prepared by sampling analog spacecraft signal and time from analog recorded tapes. The sample rate time is 160,000 samples/sec for S-band and X-band signals, respectively. 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 Format

Each record on the magnetic tape contains 4096 six bit binary data words (with S-band and X-band alternating) plus 9 six bit BCD words used to identify the time and one header word. The description of information in each bit in each record is shown in Figure 1.

2.2 List of Digital Data Tapes

MA 10 digitized tapes are listed as follows. All the tapes are 9-track 800 BPI tapes. The tape number is in the second column and the start and stop

LEGEND

CODE	MEANING
p'	LONGITUDINAL EVEN PARITY BIT
S	STATION CODE 10 - DSS 14 01 - DSS 4X 11 - DSS 6X
DS	DATA SOURCE 0 - ANALOG 1 - DIGITAL
$D_1 - D_{10}$	BCD DAY BITS
$H_1 - H_6$	BCD HOUR BITS
$M_1 - M_7$	BCD MINUTE BITS
$S_1 - S_7$	BCD SECOND BITS
$M_1 - M_{12}$	BCD MILLISECOND BITS
$\mu_1 - \mu_{12}$	BCD MICROSECOND BITS
p	BCD PARITY BIT
$\overline{S}$	S-Band Data Sample Bit
X	X-Band Data Sample Bit

START OF RECORD

p	0	0	0	0	S	S	1	DS	HEADER
p	0	0	D_1	D_2	D_3	D_4	D_5	D_6	TIME OF DAY FOR FIRST DATA WORD IN RECORD
p	0	0	D_7	D_8	D_9	D_{10}	H_1	H_2	
p	0	0	H_3	H_4	H_5	H_6	M_1	M_2	
p	0	0	M_3	M_4	M_5	M_6	M_7	S_1	
p	0	0	S_2	S_3	S_4	S_5	S_6	S_7	
p	0	0	M_1	M_2	M_3	M_4	M_5	M_6	
p	0	0	M_7	M_8	M_9	M_{10}	M_{11}	M_{12}	
p	0	0	μ_1	μ_2	μ_3	μ_4	μ_5	μ_6	
p	0	0	μ_7	μ_8	μ_9	μ_{10}	μ_{11}	μ_{12}	
p	0	[illegible]	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	1ST DATA WORD
p	0	0	X	X	X	X	X	X	2ND DATA WORD
p	0	[illegible]	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	. . .
p	0	[illegible]	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	$\overline{S}$	4095TH DATA WORD
p	0	0	X	X	X	X	X	X	4096TH DATA WORD
p'	p'	p'	p'	p'	p'	p'	p'	p'	
									INTERRECORD GAP

NOTE:

$\mu_1 - \mu_{12}$ NOT USED IN ORA-2 CTA 21

Figure 1: Data Record Format on Digital Magnetic Tape, S-X Band

times for the tape are in the last column. Venus and Mercury tapes are listed seperately.

2.2.1 Mariner 10 Venus Digitized Tapes

ORIGINAL DIGITIZED TAPE		DUPLICATE TAPE NO.	TIME UTC, FEB 5, 1974
VEN001		N052	17:08:30 → 17:09:30
VEN002		N053	17:09:25 → 17:10:25
VEN003		N054	17:10:20 → 17:11:20
VEN004		N055	17:11:15 → 17:12:12
VEN005		N125	17:12:10 → 17:13:10
VEN006	ENTRY	N199	17:13:05 → 17:14:05
VEN007		N234	17:14:00 → 17:15:00
VEN008		N245	17:14:55 → 17:15:55
VEN009		N246	
VEN010		N336	17:16:45 → 17:17:45
VEN011		N337	17:17:40 → 17:18:40
VEN012		N370	17:18:35 → 17:19:35
VEN013		N413	17:19:30 → 17:20:30
VEN014		N447	17:20:25 → 17:21:25
VEN016		N449	17:22:15 → 17:23:15
VEN017		N453	17:23:10 → 17:24:10
VEN018		N525	17:24:05 → 17:25:05
VEN019		N561	17:25:00 → 17:26:00
VEN020		N584	17:25:55 → 17:26:55
VEN021	EXIT	N585	17:26:50 → 17:27:48
VEN022		N587	17:27:45 → 17:28:45
VEN023		N758	17:28:40 → 17:29:40
VEN024		N796	17:29:35 → 17:30:35
VEN025		N797	17:30:30 → 17:31:30
VEN026		N884	17:31:25 → 17:32:25
VEN027		N889	17:32:26 → 17:33:20
VEN028		N966	17:33:15 → 17:34:15
VEN029		N986	17:34:10 → 17:35:10

2.2.2 Mariner 10 Mercury Digitized Tapes

DIGITIZED TAPE	DUPLICATE TAPE NO.	TIME, UTC, 29 March, 1974
MERC05	X435	20:55:20 - 20:56:20 (entry)
MERC06	X455	21:07:15 - 21:08:15 (exit)
MERC07	X573	21:08:10 - 21:09:10 (exit)
MERC08	X574	21:09:05 - 21:10:05 (exit)

3. Data Files

Mariner 10 (Venus) data files are created by Processing Mariner 10 radio occultation data using the subset of occultation software. A brief description of software and the files is given below.

The occultation software consists of the Computer Programs RPP, DIP1/PCP, DIP2 and ATMOS. The functions of these programs are:

RPP: removes drift and bias from frequency residuals.

DIP1/PCP: computes bending angle, ray-asymptote distance and power correction.

DIP2: computes refractivity as a function of radius to center of planet

ATMOS: computes atmospheric information (temperature, pressure, etc.) as a function of radius to center of planet

Detail description of these programs are given in section 3.2.

The data files are input/output files obtained by executing programs RPP, DIP1/PCP, DIP2 and ATMOS on the UNIVAC 1108 computer.

The files are written using standard formatted FORTRAN I/O on the UNIVAC 1108 system. The format statement for each record is given in Section 3.3 and corresponds to the label for that record.

The definitions and types of each variable are also given in section 3.2. The type of each variable is either Integer, Real or Double precision.

These files are written on tape H144 (7-track, 600 BPI) using TAPE processor

of the 91*LIB. sub-routine library at JPL.

3.1 List of Data Files

The following is a list of Mariner 10 data files obtained by executing computer programs RPP, DIP1/PCP, DIP2 and ATMOS. These are on tape H144 and are written using tape processor of the 391*LIB computer sub-routine library at JPL. The format is a standard formatted Fortran I/O and the detailed format statements are given in section 3.4.

File Sequence No. on H144	Content
1	OCEP S-X band V.entry old file
2	Traj V.entry old file for above
3	OCEP S-X band V.Exit old file
4	Traj V.exit old
5	OCEP V.entry only S-band (big-8-min)
6	Traj V.entry for big OCEP
7	OCEP V.entry (new) for power 4-min (BW-10) S-band
8	OCEP V.entry X-band (new) for power 2-min (BW-10)
9	V.entry S-band (BW-10) RPP output file (-13SN10)
10	V.entry S-band (BW-10) DIP1/PCP output file (-14)
11	V.entry S-band (BW-10) DIP2 output file (-15)
12	OCEP V.entry X-band (BW-10) (2-min) for power
13	V.entry X-band (BW-10) RPP output
14	V.entry X-band (BW-10) DIP1/PCP output (-14)
15	V.entry X-band (BW-10) DIP2/AVRG AVRG=1 output file
16	OCEP V.exit both S-X band (BW-10) 3-min
17	RPP (-13) V.exit S-band output
18	RPP (-13) V.exit X-band output

3.2 Occultation Software and I/O Data Files

The occultation software consists of the computer programs RPP, DIP1/PCP, DIP2, and ATMOS. These programs and the description of input/output files for them are given in the following secitons.

3.2.1 Residual Processing Program

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 Occultation Editing Program (OCEP) 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 write 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 data file produced by 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 3.4. The definition and type of each variable in the file is also given.

FLTYPE	SCID	PASS	MODE		(Record 1)	1*
XTR	DSS	IW	FBAND		(Record 2)	1*
F1	F2				(Record 3)	2*
SYNFRQ	SYNLO				(Record 4)	2*
IYR	IDAY	TIME	SFEQ	SRES	(Record 5)	3*
SPWR	XPWR	XFREQ	XRES		(Record 6)	4*
.	.	.	.	.		
.	.	.	.	.		
.	.	.	.	.		
IYR	IDAY	TIME	SFREQ	SRES	(Record(n-1))	3*
SPWR	XPWR	XFREQ	XRES		(Record n)	4*

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.)
SYNFREQ	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 dbm	(real)
XPWR	X-band power in dbm	(real)
XFREQ	X-band frequency in hertz	(d. p.)
XRES	X-band frequency residuals in hertz	(d. p.)

3.2.1.2 Output File:

RPP output file consists of doppler residuals (from which bias and drift has been removed) phase and power for corresponding to time points. The file is written with formatted FORTRAN 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	PWRPTS	(Record 4)	7*
.	.	.	.	.	
.	.	.	.	.	
.	.	.	.	.	
TIME	RESIDUAL	PHASE	PWRPTS	(Record n)	7*

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.)
PWRPTS	strength of the signal in DBM	(d. p.)

3.2.2 Data Inversion Program No.1 (DIP1/PCP)

DIP1/PCP computes refractive bending angle, ray asymptote distance, range from S/C to the center of the planet and corrected power for each time point.

The input and output files for DIP1/PCP are described as follows:

3.2.2.1 Input files

The input files to DIP1/PCP are the Trajectory file and the RPP output file. The RPP output file is described in Section 3.2.1.2 on Page 6. The Trajectory file is described as follows:

3.2.2.2 Trajectory file

This file is a Trajectory file produced by the Trajectory link of the OCEP program which is based on the DPTRAJ Save and Plot Tape. The file is dynamically catalogued and assigned to the run. The file is written using formatted FORTRAN I/O, and the format 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*
$DPREC_{(1,4)}$	$DPREC_{(1,5)}$	$DPREC_{(1,5)}$				(Record 6)	5*
$DPREC_{(1,7)}$	$DPREC_{(1,8)}$	$DPREC_{(1,9)}$				(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)
ETSCA	Time of closest approach - ET (sec/past Midnite 1950.0) (D.P.)
ETMC	Difference between Ephermis 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 N^{th} Point (Real)
DAY (N)	Day number for N^{th} Point (Real)
MIN (N)	Time at MIN minutes for N^{th} Point (Real)
LITTM	1-Way light time (D.P.)

S1, S2, S3	X, Y, Z Coordinates of Sun Position vector, relative to Venus (D.P.)
DPREC (N,I)	I = 1, 2, 3 X, Y, Z Coordinates of S/C Position vector relative to Venus for N^{th} point (D.P.)
DPREC (N,I)	I = 4, 5, 6 X, Y, Z Components of S/C Velocity vector relative to Venus (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.)
NOTE:	All above vectors are space centered and in the Earth Equator of 1950.0 coordinate system.

3.2.2.3 Output File

DIPI/PCP output file consists of ray-distance, bending angle, corrected power and range from S/C to center of the planet. The file is written with formatted FORTRAN 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	RD	CORPWR		(Record 4)	5*
BA	R			(Record 5)	2*
.	.			.	
.	.			.	
.	.			.	
TIME	RD	CORPWR		(Record n-1)	5*
BA	R			(Record n)	2*

Where,

FLTYPE	type of file. 1 for closed loop, 2 for open loop and 3 for both

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.)
RD	asymptotic ray distance in km	(d. p.)
CORPWR	corrected power in DBM	(d. p.)
BA	refractive bending angle in radians	(d. p.)
R	range from spacecraft to the center of 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/PCP program and inverts this data using the Abel Integral Transform to obtain refractivity versus radius.

3.2.3.1 Input File

The input file to the DIP2 Program is the same as the output file of DIP1/PCP and is described on Page 9 of Section 3.2.2.3.

3.2.3.2 Output File

The DIP2 output file consists of radius, refractivity, bending angle and corrected power. The file is written with formatted FORTRAN I/O and described

as follows:

FLTYPE	SCID	PASS	MODE	(Record 1)	1*
XTR	DSS	IW	FBAND	(Record 2)	1*
F1	F2			(Record 3)	2*
RD	CORPWR	BA	BA	(Record 4)	5*
RAD	REF	R	R	(Record 5)	5*
.	.			.	
.	.			.	
RD	CORPWR	BA	BA	(Record N-1))	5*
RAD	REF	R	R	(Record N)	5*

Where,

FLTYPE	type of file. 1 for closed loop, 2 for open loop 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.)
RD	asymptote ray distance in Km	(d. p.)
CORPWR	corrected Power in DBM	(d. p.)
BA	refractive bending in radians	(d. p.)
REF	refractivity in N-units	(d. p.)
RAD	radial distance to the center of the planet in Km	(d. p.)
R	range from spacecraft to the center of the planet	(d. p.)

3.2.4 Atmospheric Parameter Program (ATMOS)

The function of the ATMOS 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

The ATMOS input file is the same as the DIP2 output file. This file is in formatted FORTRAN I/O and is described on Page 10, Section 3.2.3.2.

3.2.4.2 Output

The output of the ATMOS Program consists of hard-copy computer listings and plots 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})

For all positive refractivty points:

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

RADIUS (km) SCALE HEIGHT (km) LAPSE RATE ($^{o}K/km$) NUMBER DENSITY (cm^{-3})

MASS DENSITY (gcm^{-3})

3.3 Formats

The following formats are referred to in the preceding sections:

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 (D26.14,4X,4F7.1,F14.8)
7* FORMAT (4D26.18)

4. Bibliography

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MARINER 10
Feb 5. 197X
17:11:15 - 17:12:12
M-29598

```
$JOB   9:27:07
$ASS IN MS3
$NOP ******************** HEX DUMP OF J2OUT-1B ********************
$EXEC DPHEX,BS
 INPUT TAPE ON MS5
 DATA INPUT     1 1 1
  FILE  1       RECORD    1       LENGTH    4106 BYTES
(     0)  3A331910  22141917  00000202  00030108  00083F3F  3C053D01  2E3A3F06  013C0400  053E0405  03010237
(    40)  37060206  04000630  3D3C0931  0838063C  033C0001  3F3F3F3F  00000200  04050603  073C0609  050E0301
(    80)  01040000  000C0003  00000002  3F3F3F3D  3D343D32  3D3A3E00  3E353E3E  000C0000  000F0009  3E3C3F3F
(   120)  3E023E02  3F3A003F  3F010136  02020200  03080406  053E3E2E  05380400  02000039  39393D3D  1C0B3B0A
(   160)  3C043C38  2E3E3F01  000C0207  040B0508  06080504  05000506  04020405  03313333  023F0203  02000339
(   200)  393F3F08  0101003D  3D013F3F  3F01003F  003E3E3C  003D0039  3E0F3C07  3B093A05  2B3E3D38  3F050200
(   240)  0330043B  333E0102  3F093F00  0003023F  3F3E0700  0831073D  3D09013E  3E3C3D35  3E3D3F3F  003F003F
(   280)  00003F3F  3F163F04  3F013F3E  003F3F00  3F3D3F3F  3F013F3B  3F063F3A  3F023F38  2E3C3F3E  0000013A
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(   360)  3F0B3E06  3E083E06  2E3F3E02  3E003F3B  00070000  00010035  35353D03  3B09393C  3A3C3D09  003F0300
(   400)  0605070C  07060607  050C0405  0408053B  3B370701  08040806  07000705  08353539  08370805  0601043C
(   440)  3C353D09  3B0C3A09  3B0B3E05  023D063F  06040703  0505023E  3E023C00  2C393D39  3F030038  01000000
(   480)  00020203  3C3C393F  3902370A  273D3701  39003C39  3F000208  0500060C  05040337  3F063E01  2E383E07
(   520)  003E0203  04010639  3900063D  043F3F3D  3F343D35  3B023A3C  3A013C03  2E3F003F  04000502  05010400
(   560)  023F3F3F  3F3C003B  003E0008  0005003D  3D3D3F38  3E043D00  2D3F3D2B  3D343E3F  3E3E3F37  3F3A3E08
(   600)  3F3D3F01  000B0001  023D3D3D  0301030A  033B0100  013C003E  3E3F3E03  3E083E02  2E3E3F34  0039013D
(   640)  0237023E  01080037  00070007  0004010E  0309033E  030F0209  003D3E09  3E083E01  000A0137  3739043E
(   680)  0400030D  013F3F3E  3F3A3F3B  3F033E38  3E383C3C  3B023A02  2A3A3B08  3C083E04  00020137  37350107
(   720)  00103F3F  3E323E37  3E063F38  01310335  043F0400  043C0202  00040005  3F3F0109  020D0408  05000608
(   760)  0606060A  05010402  03040208  00093F3F  3D063F00  3F010136  2636053C  063D0402  0201003D  3D3D0008
(   800)  02080509  07030900  0A04090C  0803070Z  06390602  05010302  01080005  3F3F3F3F  023D043E  0536053A
(   840)  0408033E  003C3E3F  3C003B3A  2B3A3B0E  3D083F3F  023F0439  063D0501  03030037  37003E3D  3F000008
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(   920)  053C063F  040A013D  3F3D3C2F  3B303B3D  3B3B3C3F  3D3D3D3B  3E023D3F  3D053C07  3B003916  380C3716
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(  1080)  3F3E0508  063D073C  073D0802  08000707  04373701  3F053D00  3C063D3F  3D000006  0001000A  000E0E05
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(  1160)  0301003E  3D3A393F  37093810  3A0A3E3B  010D0403  0406040C  023D3F3F  013C0308  04080600  063F3F3A
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(  1240)  0A0D0B04  080D0606  04350337  043D0531  063E0703  063E043F  00350000  3E3E3E3F  1E0E3F06  00000101
(  1280)  01020100  01393B3B  010C0204  030E0302  0306040C  03000230  3D020001  3E003E3E  2C3E3D3C  3E010006
(  1320)  010C0239  3905010F  00013E3E  3C043B03  3C023E04  003C3E36  06000705  07060606  04380225  013E0135
(  1360)  023D033D  0438053E  05040505  04370130  02040009  00113F3F  3F003F39  01060302  063C073B  063E060E
(  1400)  0534033A  00003F3D  3F01003F  00340201  02030204  0200003F  3F3F3E3C  3E053E0B  3E073E0A  3E053E39
(  1440)  00020100  0301043C  3C0A0405  03040300  033D0338  033E043B  032C0239  01300000  3F3E3E07  3D0C3C02
(  1480)  3B3E3C3C  3D003F06  030C0700  0B020D0B  0B040902  063F0203  0000003F  3F3F013D  043C043D  02070000
(  1520)  3F3D3E3E  3E333E08  00190100  013E0111  3F053D05  3B003A00  2B3B3C3B  3E043E04  00070007  00010000
(  1560)  003E3E3E  0001013E  00060038  3F3D3E08  3E0C3F0D  01130304  05050601  0501043F  3F393F02  3D063D03
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(  1640)  3C043D02  3F050105  0307043F  3F390502  053B043F  3F390238  013C0036  3F393F39  3E303E38  3E013E3F
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(  1880)  3F383F08  3F003F37  0000000C  023E3E3E  04040503  063A0400  0439023C  3C0E3F06  3E043D03  3D063E00
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(  1960)  023E3E07  003C3F3A  3F0A3F07  00000006  02090303  0431042F  03040306  03060337  023C023D  0105000E
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(  2200)  02000037  37393E36  3D3A3C03  3C043B2D  2B3E3B3F  1C0C3D12  3F050100  04080636  363E080F  0804083F
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(2320)	05010638	383F033F	01003F3B	3C3E3B09	3B013D3E	003F0308	07000A00	0B3A3A07	06090104	3E353C30
(2360)	3C003E03	3FC10000	013F3F3F	3D3D3D00	3C393C37	3C033E38	3E003E0E	2D3E3C01	3B093B03	3D013F38
(2400)	0006020E	033D0307	033C0434	04380953	06000637	053D033B	01320030	3F000030	0039023A	0206023E
(2440)	00013F3F	3E043D3C	3D0D3E09	003F0235	03010702	08000806	07080609	04010301	02080207	01030333
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(2560)	003B3B3B	0009020F	04000508	05020404	03383A3A	02030204	013D3D3D	01040030	003B3E3C	3E353F3A
(2600)	00370037	010C0005	00040000	3F3F3F3F	01040305	05030607	060E0607	060D073A	07350737	07000603
(2640)	05010303	023F3F3F	00313F31	3E003D02	2D3E3D3D	3E3C3E06	3E073F02	3E043E04	3F080009	02060302
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(2920)	04060437	37080406	04060439	3938033F	023E0204	02000200	01080102	00030000	3F3D3F3F	1E0A3E03
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(3040)	3C3C3C3D	3C003D39	2F3E0039	013C0201	0203020F	0F010201	03020401	053C3E3F	040E0305	0200010D
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(3160)	3F003E0E	3D073D37	3D013D3E	3E123E06	3F070003	0135023B	03030400	04050309	013E3F3B	3E0B3C3D
(3200)	2B3D3A39	333E3C00	3D2D3D30	3C393B33	3A363905	380C3814	39113B0A	3C113E0B	00070208	05050606
(3240)	0602053F	3F09003F	3F3C3F3D	3F3C0106	03010405	05050406	0434033E	033A0204	00083F3F	3B003905
(3280)	273B3603	36063808	3B013E33	3F370100	0309043C	3C080604	0600043B	3B020002	2F393D3D	3E3E3F39
(3320)	0030013C	02170106	00203E3E	3D013D04	3E073E02	3F013F3B	2F3E3F35	0000003E	013E3E05	043C0531
(3360)	05080402	033A0137	37000301	03060400	0E0B0300	01343639	3E0A3E0C	3F053F3D	00390206	030A033C
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(3440)	3E0C3E05	3F020006	00390003C	3C000339	033B003A	01040038	00313F3F	3F3B3F3E	3F020000	00010006
(3480)	060E010E	02090307	04040508	06030601	07040603	04060009	3E3C3C08	3B3D3B00	3C003D02	2D3A3D05
(3520)	3E003E00	3E0C3E00	3F0A003E	3E0C0004	00060039	393C0005	003E003D	00000138	00040005	003F3F3F
(3560)	00010100	01000138	38030007	003D3D3D	3F04000A	003C0000	013E0102	000D003F	3F3E0002	00000106
(3600)	023D3D05	053E060A	0700073D	3D040300	00003D3D	3D073A04	2B3C3C3E	3E063E06	3E093E0C	2D3F3D06
(3640)	3E053F06	000D023F	3F000306	02020103	0001013A	3A000401	0539033E	3E360037	3E353E3C	3E3C003D
(3680)	01370201	02080000	3E3E3E08	3B013B06	3C093E0F	3F0A003F	02010237	0200023E	02373706	01000002
(3720)	00003F3F	3F003E05	2F3E3F02	00340037	373D0009	000C010A	03050403	053E0435	05040307	01073F38
(3760)	3D043D13	3D313E3B	3E033E00	3E053D0F	3B043A01	3A043A02	3C033D07	2E353F05	00070200	04050500
(3800)	063D0605	053F043B	013C0003	3E3E3D3F	3D143400	2C3D3C3B	3C043C3A	2C3E3C0A	3C043D39	3E033F00
(3840)	003D020E	030B060E	060C073F	08060802	0935083A	07050605	040A0207	00043F3D	3F3D3F39	003E0201
(3880)	04000500	063C3C02	05390301	0138003F	3F3E3E3A	3E3B3F04	0005010E	0305063F	07370802	08000707
(3920)	05000406	020A0204	02050023A	3A3F003D	3F343E36	3C073B06	3A023A3D	3A103A05	2A0D3A0D	3C3A3E3E
(3960)	010C053F	09000B3F	0A3A063D	02393E05	3A033801	283C3804	3C3F3E37	3F043F3F	3F3B3E3E	3E013D04
(4000)	3D0C3C2F	3C3E3D0D	3E153F0A	0000010A	02080304	03070406	043C040E	0504053B	053D0502	04010402
(4040)	033E3E34	023C013E	00083F3F	3F363F3C	00340102	03100404	053B0537	05000609	050F040C	03000107
(4080)	003E3E3E	3C393B01	3B053B08	3B033C3D	2B383B3E	3B393B32	3C02			
FILE 1	RECORD	4497	LENGTH	4106 BYTES						
(0)	0A03191C	24120805	00000000	3F3F3F3F	3F000008	00070707	0034003C	0000013C	033C040E	06030707
(40)	07000637	0336003F	3F003E3C	3E013F3C	003D0000	013E0202	0205033D	3D3E0400	04040506	04040504
(80)	043F0304	043D0336	003D3F00	3C393B38	3A033B00	3E000002	023A3A3A	043D0435	02053F3F	3E043D0E
(120)	3D0D3E07	3F3F0035	023C0308	0302040C	040D0311	0404043E	3E3A0306	01393F36	3D003A00	2939393D
(160)	3A003C39	3E01003C	02040206	023E003E	00080000	3F3F3E0B	3F003E3E	3E0D3E3D	3E063E3C	3E003E02
(200)	3D023D3D	2C343C38	3C013C3F	3D283E38	3F363E08	3E053D04	3C063D06	3E010000	0205043F	3F3E043F
(240)	0234003B	3E013C05	3B073B3F	3D013F3D	0105033F	043A043E	0438020C	0104003B	3B380103	02060200
(280)	023D3F3F	02000306	040A040F	04050305	030F020C	0200033F	02350401	05000506	0508033E	003D0033
(320)	3F363E02	3E043F00	00000104	0208023F	3F3E0103	0035003F	3F070108	0401063A	063F0703	06030439
(360)	39040039	003C3F3F	003F003F	003D0002	010A013F	3F0D050C	0704093F	090C0A0C	0900073E	3E000100
(400)	2F3E3E02	3E0B3E00	3F05003F	3F353E36	3B3E3802	363D3507	36023804	2B3C3D03	C0010204	02060105
(440)	003C3F3F	3E3E3D02	3D003D15	3E073F02	00000030	3005020D	023C0302	0304033C	3C3E003E	3E393C08
(480)	3B073A3F	3A0E3B04	3C013C00	2E3C3F0A	00370206	0408070E	090C0902	093E0737	04000404	0306020A
(520)	023C0236	003A0134	00303F3F	2F2E3E32	3D393D0B	3C3D3C3A	3E060010	03040530	0405060B	0500043B
(560)	043E3E03	07060A00	0C3C0B3C	07020407	3F093C00	2B343B3C	3D3B3F3F	00390004	3F3F3E02	3E0B3E3D
(600)	3E003F05	000B0006	003D003E	3F030007	01090100	003C3E3E	3D0E3D04	3C343C37	3C003C3F	2D363D3E
(640)	3E3C3E01	3F12000C	00050100	020A0117	17040104	0105020F	010B0200	02040100	013F3F3F	00380100
(680)	000B003D	3D3C3D04	3C023D3B	2E3D003E	03DE0503	060C060B	053B0411	04080400	04040433	333C040C
(720)	0302013F	3F393E00	3E3A3E00	000C0204	033D043D	023F0337	013C0031	003F0007	0200033C	3C00063C

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(  3400)  05330434  043C043A  03000306  04060611  093D0B0D  0F3C103C  0F080C08  08000500  0306030A  06080836
(  3440)  073B0808  0500003C  3C343B00  3C003D3C  3F030005  00043F3D  3D3B3B04  3A3C3B3D  3E03010D  053C3E39
(  3480)  08040610  00073B3C  36353405  350C3703  39043A05  3A03373E  363A343C  34383439  06003906  3A073902
(  3520)  3601330A  2F022D3A  2C012E06  310B3403  37083A06  2B363B38  3B093B01  3B3D3B3D  3C383D01  3E053F00
(  3560)  3F033F34  2F3D3E33  2E2D3D35  3C3A3C07  1C083C04  3D063D04  3E040000  020C040A  06040709  08030802
(  3600)  0738043B  0234023A  033C0635  08390B3D  0C360C39  093C0637  04280337  0502083E  0B390D3E  0E370C05
(  3640)  08050439  0003013C  030D060C  0A0C0D06  0E130C07  0A01083E  06070808  0C010F3B  123A133F  02060E39
(  3680)  0A3D0500  01043F3F  3E07003C  03000502  07070B0D  0801083F  070C0803  083E0900  08010704  043D0004
(  3720)  3D003A05  270D3736  38373A3D  3C003D39  2E373E38  3D3D3D06  3C053C00  3C073B08  3A393833  373C363C
(  3760)  36313600  36313638  363E3504  353C353C  26083834  3B3D3D38  3E353E38  3D3B3B34  3A343934  1B163E0C
(  3800)  3F180016  00093E3C  3B053904  3805390E  3B0B3E05  0105043B  3B020404  023D3F3D  3D3F3C3D  3B303C2A
(  3840)  3E3F3F02  0038003B  3B363E39  3C013B37  2B3E3C00  3E3D0000  000A0008  00103E3E  00050212  04130706
(  3880)  093D0A04  0A060039  05300637  073D093B  0B3E0D3C  0E3D0D31  0B250734  0503033D  00010006  003E3E3C
(  3920)  0101030A  040F0604  063C0702  09010A3B  0A020E0C  0F353700  10030A07  0C3C3E01  0A0F0A09  0A000A3A
(  3960)  0705063F  0336013C  00390005  00060239  02010405  023F3F3E  3E363C3D  1C013E3D  013C043B  063B060D
(  4000)  0504013D  3F3A3C00  3901383E  3802393F  39053913  39363830  17013607  3600353A  263F3705  3814390B
(  4040)  39053800  273D3609  370A3A39  3D3C3E08  3E043C0E  38063400  3200323D  34003936  3C003C3C  2B3C3737
(  4080)  3538 3436  3504 3908  3E07000B  02050200  00053F3D  1C0A3C04  3C00
FILE    1       # OF DATA RECORDS    4774     # SUCCESSFUL READS    4775
        # PERMANENT READ ERRORS    0        # ZERO BYTE ERRORS    0        # SHORT RECORDS    0        # UNDEFINED ERRORS    0
           # OF RECORDS RETRIED    0        TOTAL # OF RETRIES    0


$$
$REW LO
```