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Volume II - Appendixes

JET PROPULSION LABORATORY
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Contract JPL 953058

OUTER PLANET DATA PRESENTATION COMPUTER PROGRAM

Model Description Report

July 1971

Volume II - Appendixes

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FOREWORD

This report has been prepared in accordance with requirements of Contract JPL 953058 to present a description of a computer program resulting from a four-month development effort performed for the Jet Propulsion Laboratory by the Martin Marietta Corporation, Denver Division. The report is submitted in two volumes. Volume I is a description of the program and its operation, Volume II contains the appendixes, which include sample data cases to aid initial input setup and program checkout.

This work was performed for the Jet Propulsion Laboratory, California Institute of Technology, sponsored by the National Aeronautics and Space Administration under Contract NAS7-100.

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INTRODUCTION

This volume consists of the following appendixes:

- Appendix A, which contains three validation missions, representing partial fulfillment of the contract. Tabular and plotted data are presented as samples to confirm program operation by showing that numerous mission and experiment options have been used;
- Appendix B, which is a card listing of the Univac 1108 version of the subroutines developed during the contract period;
- Appendix C, which is a partial reproduction of the documentation provided by JPL. This documentation is included to aid the user in determining the proper input for card numbers 2, 3, 4, and 6 through 12. Because this documentation is for subroutines maintained by JPL, the user is advised to determine if the documentation has been updated before attempting to run the program.

APPENDIX A

COMPUTER PROGRAM VALIDATION MISSIONS

Validation missions provide the user with sample data to confirm program operation by exercising numerous mission and experiment options. Table A-1 shows the variations for nine computer cases. The Mission 1 objective is to check out geometry associated with imaging at Jupiter. The Mission 2 objective extends checkout to Saturn, and exercises considerable more pointing, experiment characteristics, and satellite modes. Mission 3 is an orbiting mission at Jupiter adding spinning spacecraft comparison, and particle and field measurements. Discussion of the options listed in Table A-1 are given in each validation mission that follows.

The order of presentation for Mission 1, 2, and 3 is shown in the appendix contents. A discussion of input and output listings is provided for each mission. Following the discussion, tabular input, tabular output, and graphic output are presented for each case.

Table A-1

Validation Missions Index

	CASE	PLANET	SATELLITE OPTION	CAMERA CHARACTERISTICS		POINTING
MISSION 1	1	Jupiter	NA	Canned	Wide Angle	Radius Vector
	2-1, 2-2 & 2-3	Jupiter	NA	Input	Wide Angle	Cone and Clock
MISSION 2	5	Jupiter	NA	Canned	Narrow Angle	Radius Vector
	4	Jupiter	One Satellite	Canned	Narrow Angle	Radius Vector
	6	Saturn	NA	Canned	Wide Angle	Radius Vector
	7	Saturn	NA	Canned	Narrow Angle	Radius Vector
MISSION 3	8	Jupiter-Orbiter	NA	Pioneer		Radius Vector
	9	Jupiter-Orbiter	NA	Input	Narrow Angle	Radius Vector
	10	Jupiter-Orbiter	NA	NA (Particle & Field)		NA

A. MISSION 1

The specific objective of Mission 1 is to provide the data required to check out the geometry associated with the imaging science evaluation capability. Thus, the mission description herein is limited to that required to fulfill this objective. As an example, the trajectory data used are the Jupiter encounter conditions from a total Earth-Jupiter-Saturn-Pluto outer planet mission.

The mission description and results are contained in the following sections. The spacecraft is considered to be a TOPS configuration, with Earth/Canopus attitude control.

1. Science Mode

To check out the imaging-associated geometry subroutines, the target is the planet disk of Jupiter with terminator; i.e., no local geography, such as the red spot, is shown. The following measurement modes are used:

- Align Camera to Radius Vector -

Timing Encounter	Frame Sequence	Data Display
-1.5 to +1.5 days	1 @ 5 minutes	Plot at 30 minute intervals

- Input Discrete Cone and Clock (Table A-2) -

Timing Encounter	Frame Sequence	Data Display
$-5^h\ 20^m$ to $+5^h\ 20^m$	1 @ 5 minutes	Plot at $1^h\ 0^m$ intervals

The first clock position at each time point is a limb pointing direction; the second clock position is an intermediate direction; the third clock position is a radius vector (or planet center) direction. These pointings are referred to as case 2-1, 2-2, and 2-3 respectively. The input and output with the above measurement mode variations are shown on Missions 1 and 2 for the radial alignment and discrete cone/clock, respectively.

Table A-2 Cone and Clock Angles for Mission 1

TIME	CONE	CLOCK	TIME	CONE	CLOCK
$-5^h\ 20^m$	151.65	247.70	$+1^h\ 19^m$	30.44	233.18
	151.65	254.70		30.44	247.18
	151.65	261.70		30.44	261.18
$-4^h\ 0^m$	141.34	247.62	$+2^h\ 39^m$	5.71	189.92
	141.34	254.62		5.71	224.92
	141.34	261.62		5.71	259.92
$-2^h\ 40^m$	125.66	247.54	$+3^h\ 59^m$	9.96	14.30
	125.66	254.54		9.96	38.30
	125.66	261.54		9.96	82.30
$-1^h\ 20^m$	100.92	247.46	$+5^h\ 19^m$	20.27	59.05
	100.92	254.46		20.27	70.05
	100.92	261.46		20.27	81.05
$0^h\ 0^m$	65.68	247.37			
	65.68	254.37	$0^h\ 0^m$ = time at radius of closest approach		
	65.68	261.37			

2. Instrument Characteristics

The TV characteristics for Mission 1 are as follows:

	FIELD OF VIEW (deg)	
DIRECTION	NARROW-ANGLE LENS	WIDE-ANGLE LENS
Vertical	1.0	10.0
Horizontal	1.0	10.0

The input and output of the above wide-angle lens are shown on cases 1 and 2. The narrow-angle lens is used in Missions 2 and 3.

3. Trajectory Data

The Jupiter encounter data were taken from a 1977 Jupiter-Saturn-Pluto mission, which has a total flight time to Pluto of approximately eight years. The data are as follows:

JUPITER ENCOUNTER

Calendar Date/Hr/Min/Sec	14 JAN 79/10/48/3.27
Julian Date	2443887.950038
Periapse State (km) (Earth Ecliptic Ref)	1.2706446432E+05 (x) 2.1321885366E+05 (y) 1.3387051602E+04 (z)
(km/sec)	2.9431552532E+01 (x) 1.7610963316E+01 (y) 1.1418359371E+00 (z)

4. Case 1

a. Input Data - The tabular input listing is shown in Table A-3. Tabular listings of TV instrument characteristics, planetary and satellite albedos, and other values used in the imaging subroutine are shown in Table A-4. For the TV characteristics, the user inputs are labeled to distinguish them from canned values. The pointing mode is planet-centered (radius vector).

Table A-3 Case 1 Input Listing

```
JUPITER CHECK OUT CASE 1

 2       5.0000000    PLANET
 3       2.0000000    SATEL
 4       790114.69    DATE  JD AT ENCOUNTER
 6       15.000000
 7       127064.46    STATE1
 8       213218.85    STATE2     PERIAPSIS VECTOR FROM LEADBETTERS
 9      -13387.052    STATE3     79 JSP RUN TO MAXIMIZE SATELLITE
10      -29.431552    STATE4     ENCOUNTER
11       17.610963    STATE5
12       1.1418359    STATE6
22       120.00000    INSTID
61      -1.5000000    TSTAR TIME FROM PERIAPSIS
62       1.5000000    TSTOP TIME FROM PERIAPSIS
63       5.0000000    DTINSTPICTURE TAKING INTERVAL (MIN)
69       6.0000000    CALCSTPICTURES PER CALC STEP       30 MIN PER CALC STEP
81       3.0000000    DPLOT
82       3.0000000    DPRNT
90       1111111.0
98
```

```
      JUPITER CHECK OUT CASE 1

   XZ(I) VALUES IN STORAGE

    1   0   0.                          2   1   5.0000000000E+00
    3   1   2.0000000000E+00            4   1   7.9011469200E+05
    5   0   0.                          6   1   1.5000000000E+01
    7   1   1.2706446400E+05            8   1   2.1321885300E+05
    9   1  -1.3387051600E+04           10   1  -2.9431552500E+01
   11   1   1.7610963100E+01           12   1   1.1418359000E+00
   13   0   0.                         14   0   0.
   15   0   3.0000000000E+00           16   0   0.
   17   0   0.                         18   0   0.
   19   0   0.                         20   0   0.
   21   0   0.                         22   1   1.2000000000E+02
   23   0   0.                         24   0  -7.1738305547E+57
   25   0  -7.1738305547E+57          26   0   0.
   27   0   0.                         28   0   0.
   29   0   0.                         30   0   0.
   31   0   0.                         32   0   0.
   33   0   0.                         34   0   0.
   35   0   0.                         36   0   0.
   37   0   0.                         38   0   0.
   39   0   0.                         40   0   0.
   41   0   0.                         42   0   0.
   43   0   0.                         44   0   0.
   45   0   0.                         46   0   0.
   47   0   0.                         48   0   0.
   49   0   0.                         50   0   0.
   51   0   0.                         52   0   0.
   53   0   0.                         54   0   0.
   55   0   0.                         56   0   0.
   57   0   0.                         58   0   0.
   59   0   0.                         60   0   0.
   61   1  -1.5000000000E+00          62   1   1.5000000000E+00
   63   1   5.0000000000E+00           64   0   0.
   65   0   0.                         66   0   0.
   67   0   0.                         68   0   0.
   69   1   6.0000000000E+00           70   0   0.
   71   0   0.                         72   0   0.
   73   0   0.                         74   0   0.
   75   0   0.                         76   0   0.
   77   0   0.                         78   0   0.
   79   0   0.                         80   0   0.
   81   1   3.0000000000E+00           82   1   3.0000000000E+00
   83   0   0.                         84   0   0.
   85   0   0.                         86   0   0.
   87   0   0.                         88   0   0.
   89   0   0.                         90   1   1.1111110000E+06
   91   0   0.                         92   0   0.
   93   0   0.                         94   0   0.
   95   0   0.                         96   0   0.
```

Table A-4 Case 1 TV Characteristics, Albedos, and Imaging Values

JUPITER CHECK OUT CASE 1

TV CHARACTERISTICS FOR SIT WIDE ANGLE CAMERA (CAND)

6	FOC LN=	2.000000E+01	
7	DIAM =	5.000000E+00	
8	OBSCUR=	0.	
9	TRANS =	8.500000E-01	
10	SIZE-V=	1.600000E+00	
11	SIZE-H=	1.600000E+00	
12	LINES =	8.000000E+02	
13	PIXELS=	8.000000E+02	
14	BIT/PX=	8.000000E+00	
15	MINEXP=	8.000000E-06	
16	MAXEXP=	2.000000E-03	
17	RESO-1=	3.000000E+02	
18	RESO-2=	1.000000E+02	
19	RESO-3=	5.000000E+01	
20	RESO-4=	1.000000E+01	
21	SENSOR=	1.000000E+00	
22	B FILT=	1.000000E+00	
23	G FILT=	1.000000E+00	
24	R FILT=	1.000000E+00	
25	P FILT=	-1.000000E+00	
26	DT EXP=	1.000000E-04	
27	OPEN =	1.000000E-03	
28	OPEN =	1.000000E-02	
29	T READ=	4.000000E+01	
30	ERASET=	1.000000E-01	
31	TSTART=	-1.500000E+00	USER INPUT
32	TSTOP =	1.500000E+00	USER INPUT
33	DEL T =	5.000000E+00	USER INPUT
34	BULK =	1.000000E+09	
35	BULK-0=	0.	
36	BITRAT=	4.740000E+04	
37	SCIBPS=	1.000000E+02	
38	BUFFER=	5.120000E+06	
39	PIC/ST=	6.000000E+00	USER INPUT
40	DEL TF=	5.000000E+00	
41	F/STOP=	4.000000E+00	COMPUTED VALUES
42	A BLOC=	0.	COMPUTED VALUES
43	DIF LM=	1.342000E-05	COMPUTED VALUES
44	FOV-V =	4.581223955E+00	COMPUTED VALUES
45	FOV-H =	4.581223955E+00	COMPUTED VALUES
46	RES-C =	1.000000E-04	COMPUTED VALUES
47	RES-V =	1.710542777E-06	COMPUTED VALUES
48	RES-H =	1.710542777E-06	COMPUTED VALUES
49	BIT/PC=	5.120000E+06	COMPUTED VALUES
50	RR-BPS=	1.280000E+05	COMPUTED VALUES
51	T/NUM =	4.338609116E+00	COMPUTED VALUES
52	T/NUMF=	4.338609116E+00	COMPUTED VALUES
53	OPEN =	0.	COMPUTED VALUES
54	OPEN =	0.	COMPUTED VALUES
55	OPEN =	0.	COMPUTED VALUES
56	OPEN =	0.	COMPUTED VALUES
57	OPEN =	0.	COMPUTED VALUES
58	OPEN =	0.	COMPUTED VALUES
59	OPEN =	0.	COMPUTED VALUES
60	OPEN =	0.	COMPUTED VALUES

JUPITER CHECK OUT CASE 1

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

PLANET 5 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.3000	0	1.0000	5.250000E-05	0.
.2750	.0204	.2820	.0020	1.0000	1.438200E-04	2.876400E-07
.3000	.0514	.2700	.0950	1.0000	3.469500E-04	3.295025E-05
.3250	.0971	.2650	.4760	1.0000	5.432975E-04	3.062043E-04
.3500	.1093	.2630	.7620	1.0000	7.350425E-04	5.601324E-04
.3750	.1157	.2720	.9530	1.0000	7.867650E-04	7.497823E-04
.4000	.1429	.2650	.9840	1.0000	1.019162E-03	1.001872E-03
.4250	.1693	.3150	1.0000	1.0000	1.333237E-03	1.333237E-03
.4500	.2006	.3540	.9840	1.0000	1.825460E-03	1.795253E-03
.4750	.2044	.3850	.9530	1.0000	1.967350E-03	1.874685E-03
.5000	.1942	.4060	.7940	1.0000	1.971130E-03	1.565077E-03
.5250	.1852	.4310	.7620	1.0000	1.930900E-03	1.517066E-03
.5500	.1725	.4500	.6820	1.0000	1.940625E-03	1.323506E-03
.5750	.1719	.4600	.5550	1.0000	1.976850E-03	1.097152E-03
.6000	.1666	.4650	.4760	1.0000	1.936725E-03	9.213611E-04
.6250	.1586	.4690	.4450	1.0000	1.859565E-03	8.275153E-04
.6500	.1511	.4700	.3600	1.0000	1.775425E-03	6.391530E-04
.6750	.1442	.4690	.2540	1.0000	1.690745E-03	4.294492E-04
.7000	.1369	.4580	.2060	1.0000	1.567505E-03	3.229060E-04
.7250	.1302	.4400	.1530	1.0000	1.432200E-03	2.277138E-04
.7500	.1235	.4100	.0950	1.0000	1.265875E-03	1.202581E-04
.7750	.1171	.3800	.0400	1.0000	1.112450E-03	4.449800E-05
.8000	.1167	.3550	.0240	1.0000	9.824625E-04	2.357910E-05
.8250	.1048	.3330	.0100	1.0000	8.646000E-04	8.646000E-06
.8500	.0988	.3150	.0030	1.0000	7.780500E-04	2.334150E-06
.8750	.0939	.3000	.0220	1.0000	7.042500E-04	1.549350E-05
.9000	.0889	.2820	0	1.0000	6.267450E-04	0.
.9250	.0862	.2640	0	1.0000	5.683200E-04	0.
.9500	.0835	.2460	0	1.0000	5.135250E-04	0.
.9750	.0791	.2320	0	1.0000	4.587900E-04	0.
1.0000	.0746	.2220	0	1.0000	4.140300E-04	0.

Table A-4 (cont)

JUPITER CHECK OUT CASE 1

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 1 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

JUPITER CHECK OUT CASE 1

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 2 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

Table A-4 (concl)

JUPITER CHECK OUT CASE 1

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 3 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.567125E-05	0.
.2750	.0204	.0500	.0020	1.0000	5.074500E-05	1.014900E-07
.3000	.0514	.0550	.0950	1.0000	1.406432E-04	1.336111E-05
.3250	.0971	.0600	.4760	1.0000	2.898435E-04	1.379655E-04
.3500	.1093	.0650	.7620	1.0000	3.534489E-04	2.693280E-04
.3750	.1157	.0700	.9530	1.0000	4.029252E-04	3.839378E-04
.4000	.1429	.0750	.9840	1.0000	5.331956E-04	5.246645E-04
.4250	.1693	.0800	1.0000	1.0000	6.738140E-04	6.738140E-04
.4500	.2006	.0850	.9840	1.0000	8.482872E-04	8.347147E-04
.4750	.2044	.1000	.9530	1.0000	1.016990E-03	9.690962E-04
.5000	.1942	.1050	.7940	1.0000	1.014452E-03	8.054751E-04
.5250	.1852	.1130	.7620	1.0000	1.041148E-03	7.933549E-04
.5500	.1725	.1200	.6820	1.0000	1.029825E-03	7.023406E-04
.5750	.1719	.1250	.5550	1.0000	1.069003E-03	5.932967E-04
.6000	.1666	.1300	.4760	1.0000	1.077485E-03	5.128831E-04
.6250	.1586	.1350	.4450	1.0000	1.065197E-03	4.740128E-04
.6500	.1511	.1450	.3600	1.0000	1.089998E-03	3.923991E-04
.6750	.1442	.1550	.2540	1.0000	1.111962E-03	2.824384E-04
.7000	.1369	.1650	.2060	1.0000	1.123778E-03	2.314982E-04
.7250	.1302	.1700	.1590	1.0000	1.101166E-03	1.750855E-04
.7500	.1235	.1750	.0950	1.0000	1.075222E-03	1.021461E-04
.7750	.1171	.1800	.0400	1.0000	1.048630E-03	4.194522E-05
.8000	.1107	.1850	.0240	1.0000	1.018855E-03	2.445252E-05
.8250	.1048	.2000	.0100	1.0000	1.512002E-03	1.512002E-05
.8500	.0988	.2050	.0030	1.0000	1.450013E-03	4.350040E-06
.8750	.0939	.2000	.0220	1.0000	9.343050E-04	2.055471E-05
.9000	.0889	.2000	0	1.0000	8.845550E-04	0.
.9250	.0862	.2000	0	1.0000	8.576900E-04	0.
.9500	.0835	.2050	0	1.0000	8.515956E-04	0.
.9750	.0791	.2080	0	1.0000	8.185268E-04	0.
1.0000	.0746	.2100	0	1.0000	7.793835E-04	0.

JUPITER CHECK OUT CASE 1

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 4 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.779750E-05	0.
.2750	.0204	.0500	.0020	1.0000	5.763000E-05	1.152600E-07
.3000	.0514	.0550	.0950	1.0000	1.597255E-04	1.517392E-05
.3250	.0971	.0600	.4760	1.0000	3.291690E-04	1.566844E-04
.3500	.1093	.0650	.7620	1.0000	4.014042E-04	3.058700E-04
.3750	.1157	.0700	.9530	1.0000	4.575935E-04	4.360866E-04
.4000	.1429	.0750	.9840	1.0000	6.055387E-04	5.958501E-04
.4250	.1693	.0800	1.0000	1.0000	7.652360E-04	7.652360E-04
.4500	.2006	.0850	.9840	1.0000	9.633815E-04	9.479674E-04
.4750	.2044	.1000	.9530	1.0000	1.154860E-03	1.100582E-03
.5000	.1942	.1050	.7940	1.0000	1.152091E-03	9.147607E-04
.5250	.1852	.1130	.7620	1.0000	1.182409E-03	9.009960E-04
.5500	.1725	.1200	.6820	1.0000	1.169550E-03	7.976331E-04
.5750	.1719	.1250	.5550	1.0000	1.214044E-03	6.737943E-04
.6000	.1666	.1300	.4760	1.0000	1.223677E-03	5.824703E-04
.6250	.1586	.1350	.4450	1.0000	1.209721E-03	5.383261E-04
.6500	.1511	.1450	.3600	1.0000	1.237887E-03	4.456392E-04
.6750	.1442	.1550	.2540	1.0000	1.262831E-03	3.207592E-04
.7000	.1369	.1650	.2060	1.0000	1.276250E-03	2.628076E-04
.7250	.1302	.1700	.1590	1.0000	1.250571E-03	1.988408E-04
.7500	.1235	.1750	.0950	1.0000	1.221106E-03	1.160051E-04
.7750	.1171	.1800	.0400	1.0000	1.190907E-03	4.763628E-05
.8000	.1107	.1850	.0240	1.0000	1.157092E-03	2.777020E-05
.8250	.1048	.2000	.0100	1.0000	1.717148E-03	1.717148E-05
.8500	.0988	.2950	.0030	1.0000	1.646749E-03	4.940247E-06
.8750	.0939	.2000	.0220	1.0000	1.061070E-03	2.334354E-05
.9000	.0889	.2000	0	1.0000	1.004570E-03	0.
.9250	.0862	.2000	0	1.0000	9.740600E-04	0.
.9500	.0835	.2050	0	1.0000	9.671387E-04	0.
.9750	.0791	.2080	0	1.0000	9.295832E-04	0.
1.0000	.0746	.2100	0	1.0000	8.851290E-04	

b. Output Data - For any imaging case run there is a set of general calculations made and the results printed. These data are "computations for minimum picture taking interval," "picture numbering and associated times," and "exposure/exposure-time check and adjustments" (Table A-5). The remaining tab print (Table A-6) is associated directly with the graphic output discussed below. Each requested print set consists of two pages.

The first graphic output (Fig. A-1) shows overall flyby encounter geometry with planet and satellite positions, and trajectory with hourly time markings. Figure A-2 shows scenes both before and after closest approach. (When the planet fills the field of view, the field of view is shown by a rectangular area on the planet.) Figure A-3 shows summary cone and clock plots. The circles represent the main planet; the plus signs indicate that the distance from the satellite to the spacecraft is greater than the distance from the planet to the spacecraft; the asterisks indicate that the distance from the satellite to the spacecraft is less than the distance from the planet to the spacecraft.

Table A-5 Results of General Calculations

JUPITER CHECK OUT CASE 1

COMPUTATIONS FOR MINIMUM PICTURE TAKING INTERVAL

PICTURE START TIME	(DAYS)	=	-1.5000000E+00
PICTURE STOP TIME	(DAYS)	=	1.5000000E+00
DELTA T REQUESTED	(SEC)	=	3.0000000E+02
FRAME READ TIME	(SEC)	=	4.0000000E+01
FRAME READ RATE	(BPS)	=	1.2800000E+05
BULK DATA STORAGE CAPACITY	(BITS)	=	1.0000000E+09
PICTURE SIZE	(BITS)	=	5.1200000E+06
BULK DATA STORAGE CAPACITY	(PICS)	=	1.9531250E+02
BULK CONTENTS IN USE	(BITS)	=	0.
BUFFER STORAGE CAPACITY	(BITS)	=	5.1200000E+06
DATA TRANSMISSION RATE	(BPS)	=	4.7400000E+04
RATE FROM OTHER INSTRUMENTS	(BPS)	=	1.0000000E+02
REAL TIME PICTURE RATE	(BPS)	=	4.7300000E+04
MINIMUM PICTURE INTERVAL	(SEC)	=	1.0824524E+02
MAXIMUM PICTURE RATE	(PICS/HR)	=	3.3259125E+01
MAXIMUM PICTURE RATE	(PIC/DAY)	=	7.9818750E+02
MAXIMUM NUMBER OF PICTURES		=	2394
ACTUAL PICTURE RATE	(PIC/DAY)	=	2.8800000E+02
ACTUAL NUMBER OF PICTURES		=	864

PERIAPSIS STATE VECTOR

1.27064424E+05	2.13214877E+05	-1.33870500E+04
-2.94315539E+01	1.76103607E+01	1.14183605E+00

VIEW FROM INPUT VIEWPOINT

JUPITER CHECK OUT CASE 1

PLOT INTERVAL = 3 CALC STEPS = 90.00MINUTES
PRNT INTERVAL = 3CALC STEPS = 90.00 MINUTES

TIME INTERVAL FOR CALCULATIONS = 30.00 MINUTES

PICTURE	CALC	TIME (DAYS)	TIME (HRS)	TIME (MIN)
1	1	-1.5000000E+00	-3.6000000E+01	-2.1600000E+03
7	2	-1.4791667E+00	-3.5500000E+01	-2.1300000E+03
13	3	-1.4583333E+00	-3.5000000E+01	-2.1000000E+03
19	4	-1.4375000E+00	-3.4500000E+01	-2.0700000E+03
25	5	-1.4166667E+00	-3.4000000E+01	-2.0400000E+03
31	6	-1.3958333E+00	-3.3500000E+01	-2.0100000E+03
37	7	-1.3750000E+00	-3.3000000E+01	-1.9800000E+03
43	8	-1.3541667 +00	-3.2500000E+01	-1.9500000E+03
49	9	-1.3333333E+00	-3.2000000E+01	-1.9200000E+03
55	10	-1.3125000E+00	-3.1500000E+01	-1.8900000E+03
61	11	-1.2916667E+00	-3.1000000E+01	-1.8600000E+03
67	12	-1.2708333E+00	-3.0500000E+01	-1.8300000E+03
73	13	-1.2500000E+00	-3.0000000E+01	-1.8000000E+03
79	14	-1.2291667E+00	-2.9500000E+01	-1.7700000E+03
85	15	-1.2083333E+00	-2.9000000E+01	-1.7400000E+03
91	16	-1.1875000E+00	-2.8500000E+01	-1.7100000E+03
97	17	-1.1666667E+00	-2.8000000E+01	-1.6800000E+03
103	18	-1.1458333E+00	-2.7500000E+01	-1.6500000E+03
109	19	-1.1250000E+00	-2.7000000E+01	-1.6200000E+03
115	20	-1.1041667E+00	-2.6500000E+01	-1.5900000E+03
121	21	-1.0833333E+00	-2.6000000E+01	-1.5600000E+03
127	22	-1.0625000E+00	-2.5500000E+01	-1.5300000E+03
133	23	-1.0416667E+00	-2.5000000E+01	-1.5000000E+03
139	24	-1.0208333E+00	-2.4500000E+01	-1.4700000E+03
145	25	-1.0000000E+00	-2.4000000E+01	-1.4400000E+03
151	26	-9.7916667E-01	-2.3500000E+01	-1.4100000E+03
157	27	-9.5833333E-01	-2.3000000E+01	-1.3800000E+03
163	28	-9.3750000E-01	-2.2500000E+01	-1.3500000E+03
169	29	-9.1666667E-01	-2.2000000E+01	-1.3200000E+03
175	30	-8.9583333E-01	-2.1500000E+01	-1.2900000E+03
181	31	-8.7500000E-01	-2.1000000E+01	-1.2600000E+03
187	32	-8.5416667E-01	-2.0500000E+01	-1.2300000E+03
193	33	-8.3333333E-01	-2.0000000E+01	-1.2000000E+03
199	34	-8.1250000E-01	-1.9500000E+01	-1.1700000E+03
205	35	-7.9166667E-01	-1.9000000E+01	-1.1400000E+03
211	36	-7.7083333E-01	-1.8500000E+01	-1.1100000E+03
217	37	-7.5000000E-01	-1.8000000E+01	-1.0800000E+03
223	38	-7.2916667E-01	-1.7500000E+01	-1.0500000E+03
229	39	-7.0833333E-01	-1.7000000E+01	-1.0200000E+03
235	40	-6.8750000E-01	-1.6500000E+01	-9.9000000E+02
241	41	-6.6666667E-01	-1.6000000E+01	-9.6000000E+02
247	42	-6.4583333E-01	-1.5500000E+01	-9.3000000E+02
253	43	-6.2500000E-01	-1.5000000E+01	-9.0000000E+02
259	44	-6.0416667E-01	-1.4500000E+01	-8.7000000E+02
265	45	-5.8333333E-01	-1.4000000E+01	-8.4000000E+02
271	46	-5.6250000E-01	-1.3500000E+01	-8.1000000E+02
277	47	-5.4166667E-01	-1.3000000E+01	-7.8000000E+02
283	48	-5.2083333E-01	-1.2500000E+01	-7.5000000E+02
289	49	-5.0000000E-01	-1.2000000E+01	-7.2000000E+02
295	50	-4.7916667E-01	-1.1500000E+01	-6.9000000E+02
301	51	-4.5833333E-01	-1.1000000E+01	-6.6000000E+02
307	52	-4.3750000E-01	-1.0500000E+01	-6.3000000E+02
313	53	-4.1666667E-01	-1.0000000E+01	-6.0000000E+02
319	54	-3.9583333E-01	-9.5000000E+00	-5.7000000E+02
325	55	-3.7500000E-01	-9.0000000E+00	-5.4000000E+02
331	56	-3.5416667E-01	-8.5000000E+00	-5.1000000E+02
337	57	-3.3333333E-01	-8.0000000E+00	-4.8000000E+02
343	58	-3.1250000E-01	-7.5000000E+00	-4.5000000E+02
349	59	-2.9166667E-01	-7.0000000E+00	-4.2000000E+02
355	60	-2.7083333E-01	-6.5000000E+00	-3.9000000E+02
361	61	-2.5000000E-01	-6.0000000E+00	-3.6000000E+02
367	62	-2.2916667E-01	-5.5000000E+00	-3.3000000E+02
373	63	-2.0833333E-01	-5.0000000E+00	-3.0000000E+02
379	64	-1.8750000E-01	-4.5000000E+00	-2.7000000E+02
385	65	-1.6666667E-01	-4.0000000E+00	-2.4000000E+02
391	66	-1.4583333E-01	-3.5000000E+00	-2.1000000E+02
397	67	-1.2500000E-01	-3.0000000E+00	-1.8000000E+02
403	68	-1.0416667E-01	-2.5000000E+00	-1.5000000E+02
409	69	-8.3333333E-02	-2.0000000E+00	-1.2000000E+02
415	70	-6.2500000E-02	-1.5000000E+00	-9.0000000E+01
421	71	-4.1666667E-02	-1.0000000E+00	-6.0000000E+01
427	72	-2.0833333E-02	-5.0000000E-01	-3.0000000E+01
433	73	-7.1054274E-15	-1.7053026E-13	-1.0231815E-11
439	74	2.0833333E-02	5.0000000E-01	3.0000000E+01
445	75	4.1666667E-02	1.0000000E+00	6.0000000E+01
451	76	6.2500000E-02	1.5000000E+00	9.0000000E+01
457	77	8.3333333E-02	2.0000000E+00	1.2000000E+02
463	78	1.0416667E-01	2.5000000E+00	1.5000000E+02
469	79	1.2500000E-01	3.0000000E+00	1.8000000E+02
475	80	1.4583333E-01	3.5000000E+00	2.1000000E+02
481	81	1.6666667E-01	4.0000000E+00	2.4000000E+02
487	82	1.8750000E-01	4.5000000E+00	2.7000000E+02
493	83	2.0833333E-01	5.0000000E+00	3.0000000E+02
499	84	2.2916667E-01	5.5000000E+00	3.3000000E+02
505	85	2.5000000E-01	6.0000000E+00	3.6000000E+02
511	86	2.7083333E-01	6.5000000E+00	3.9000000E+02
517	87	2.9166667E-01	7.0000000E+00	4.2000000E+02
523	88	3.1250000E-01	7.5000000E+00	4.5000000E+02
529	89	3.3333333E-01	8.0000000E+00	4.8000000E+02
535	90	3.5416667E-01	8.5000000E+00	5.1000000E+02
541	91	3.7500000E-01	9.0000000E+00	5.4000000E+02
547	92	3.9583333E-01	9.5000000E+00	5.7000000E+02
553	93	4.1666667E-01	1.0000000E+01	6.0000000E+02
559	94	4.3750000E-01	1.0500000E+01	6.3000000E+02
565	95	4.5833333E-01	1.1000000E+01	6.6000000E+02
571	96	4.7916667E-01	1.1500000E+01	6.9000000E+02
577	97	5.0000000E-01	1.2000000E+01	7.2000000E+02
583	98	5.2083333E-01	1.2500000E+01	7.5000000E+02
589	99	5.4166667E-01	1.3000000E+01	7.8000000E+02
595	100	5.6250000E-01	1.3500000E+01	8.1000000E+02
601	101	5.8333333E-01	1.4000000E+01	8.4000000E+02
607	102	6.0416667E-01	1.4500000E+01	8.7000000E+02
613	103	6.2500000E-01	1.5000000E+01	9.0000000E+02
619	104	6.4583333E-01	1.5500000E+01	9.3000000E+02
625	105	6.6666667E-01	1.6000000E+01	9.6000000E+02
631	106	6.8750000E-01	1.6500000E+01	9.9000000E+02
637	107	7.0833333E-01	1.7000000E+01	1.0200000E+03
643	108	7.2916667E-01	1.7500000E+01	1.0500000E+03
649	109	7.5000000E-01	1.8000000E+01	1.0800000E+03
655	110	7.7083333E-01	1.8500000E+01	1.1100000E+03
661	111	7.9166667E-01	1.9000000E+01	1.1400000E+03
667	112	8.1250000E-01	1.9500000E+01	1.1700000E+03
673	113	8.3333333E-01	2.0000000E+01	1.2000000E+03
679	114	8.5416667E-01	2.0500000E+01	1.2300000E+03
685	115	8.7500000E-01	2.1000000E+01	1.2600000E+03
691	116	8.9583333E-01	2.1500000E+01	1.2900000E+03
697	117	9.1666667E-01	2.2000000E+01	1.3200000E+03
703	118	9.3750000E-01	2.2500000E+01	1.3500000E+03
709	119	9.5833333E-01	2.3000000E+01	1.3800000E+03
715	120	9.7916667E-01	2.3500000E+01	1.4100000E+03
721	121	1.0000000E+00	2.4000000E+01	1.4400000E+03
727	122	1.0208333E+00	2.4500000E+01	1.4700000E+03
733	123	1.0416667E+00	2.5000000E+01	1.5000000E+03
739	124	1.0625000E+00	2.5500000E+01	1.5300000E+03
745	125	1.0833333E+00	2.6000000E+01	1.5600000E+03
751	126	1.1041667E+00	2.6500000E+01	1.5900000E+03
757	127	1.1250000E+00	2.7000000E+01	1.6200000E+03
763	128	1.1458333E+00	2.7500000E+01	1.6500000E+03
769	129	1.1666667E+00	2.8000000E+01	1.6800000E+03
775	130	1.1875000E+00	2.8500000E+01	1.7100000E+03
781	131	1.2083333E+00	2.9000000E+01	1.7400000E+03
787	132	1.2291667E+00	2.9500000E+01	1.7700000E+03
793	133	1.2500000E+00	3.0000000E+01	1.8000000E+03
799	134	1.2708333E+00	3.0500000E+01	1.8300000E+03
805	135	1.2916667E+00	3.1000000E+01	1.8600000E+03
811	136	1.3125000E+00	3.1500000E+01	1.8900000E+03
817	137	1.3333333E+00	3.2000000E+01	1.9200000E+03
823	138	1.3541667E+00	3.2500000E+01	1.9500000E+03
829	139	1.3750000E+00	3.3000000E+01	1.9800000E+03
835	140	1.3958333E+00	3.3500000E+01	2.0100000E+03
841	141	1.4166667E+00	3.4000000E+01	2.0400000E+03
847	142	1.4375000E+00	3.4500000E+01	2.0700000E+03
853	143	1.4583333E+00	3.5000000E+01	2.1000000E+03
859	144	1.4791667E+00	3.5500000E+01	2.1300000E+03
865	145	1.5000000E+00	3.6000000E+01	2.1600000E+03

JUPITER CHECK OUT CASE 1
SIT WIDE ANGLE CAMERA (CAND)

EXPOSURE TOO HIGH 8.860E-03 (ERGS/CM**2)
EXPOSURE TIME REDUCED TO 1.920E-05 SEC
EXPOSURE IS 1.701E-03 (ERG/CM**2)
CHG 1
EXPOSURE TIME SET TO 0.1 MILLISEC
REQUIRED FILTER FACTOR IS 5.208E+00
CHG 1
VIEW FROM SPACECRAFT

Table A-6 Printout Associated with Graphic Output

```
JUPITER CHECK OUT CASE 1

 PICTURE NUMBER     1                    -1 DAYS 12 HRS  0 MIN TO ENCOUNTER          JD  2443886.692


 PLANET JUPITE                           SATELLITE  EUROP
 RANGE (KM)  =  2.44010834E+06           RANGE (KM)  =  2.40077098E+06
 CONE  (DEG) = 168.45                    CONE  (DEG) = 152.48
 CLOCK (DEG) =  80.70                    CLOCK (DEG) =  83.76
 PHASE (DEG) =   9.11                    PHASE (DEG) =  25.08
 DIAM  (DEG) =   3.35                    DIAM  (DEG) =    .07


 RESOLUTION OF PLANET
 CENTER =   236.87 KM/PIXEL
 LIMB   =   243.91 KM/PIXEL
 INSTRUMENT DATA FOR PLANET JUPITE          (PICTURE CENTERED AT   1.74 DEG LAT   97.42 DEG LONG )


 RESOLUTION AT SPECIFIED LOCATION =   235.87 KM/PIXEL
 SMEAR DUE TO RELATIVE VELOCITIES      9.18 KM/SEC
 SMEAR DUE TO S/C ATTITUDE RATES     645.53 KM/SEC
 OBJECT MOTION FROM ALL SOURCES        .07 KM
 NUMBER OF PIXELS SMEARED           .00028 PIXELS


EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR  181.812 MILLISEC


EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION      236.9 KM/PIXEL
 AT SUBSPACECRAFT POINT     236.9 KM/PIXEL
 AT LIMB OF TARGET BODY     244.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA   (CAND) =     .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 8.8599E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.7012E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 85.000
 DIGITAL NUMBER OF EXPOS  = 217 (OF 256 LEVELS)
 ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM


NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0        100.0        50.0         10.0          KM/PIXEL

 PLANET                1.0          0.           0.           0.
 SATELLITE 1           1.0000       0.           0.           0.
 SATELLITE 2           1.0000       0.           0.           0.
 SATELLITE 3           0.           0.           0.           0.
 SATELLITE 4           0.           0.           0.           0.



          SATELLITE DATA

            NUM     RANGE (KM)          PHASE (DEG)    CONE (DEG)     CLOCK (DEG)

             1    2.78976597E+06          14.29         163.27          83.30
             2    2.40077098E+06          25.08         152.48          83.76
             3    3.31513930E+06          21.54         156.03          84.75
             4    4.32575521E+06           5.95         171.61          83.64

            NUM       EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

             1         1.42930608E+01                   6.85964046E-02
             2         2.50775989E+01                   6.96874829E-02
             3         2.15370295E+01                   8.81436580E-02
             4         5.95468279E+00                   6.25176598E-02

          RESOLUTION (KM/PIX) DATA FOR SATELLITES
            NUM   RES ALONG RADIUS VECTOR          RES AT SATELLITE LIMB

             1         2.78809601E+02                   2.78976551E+02
             2         2.39331102E+02                   2.40077057E+02
             3         3.31258935E+02                   3.31513837E+02
             4         4.32339529E+02                   4.32575464E+02

          SMEAR DATA FOR SATELLITES
          SMEAR DUE TO       SMEAR DUE TO        NUMBER OF          TIME TO SMEAR
          VEL (KM/SEC)       S/C (KM/SEC)       PIXELS SMEARED      1/2 PIXEL (SEC)

           1.67361634E+01     7.34089228E+02     2.84626911E-04      1.75668562E-01
           8.20284742E-01     7.38367738E+02     2.85019473E-04      1.69480338E-01
           9.47394473E+00     9.64335622E+02     2.92595717E-04      1.70884251E-01
           1.25685210E+01     1.14862876E+03     2.67398834E-04      1.86986604E-01
      VIEW FROM SPACECRAFT
```

Table A-6 (cont)

JUPITER CHECK OUT CASE 1

PICTURE NUMBER 361 0 DAYS 0 HRS 0 MIN TO ENCOUNTER JD 2443887.942

PLANET JUPITE
RANGE (KM) = 5.72306335E+05
CONE (DEG) = 155.47
CLOCK (DEG) = 261.79
PHASE (DEG) = 26.65
DIAM (DEG) = 14.33

SATELLITE EUROP
RANGE (KM) = 1.23328999E+06
CONE (DEG) = 160.43
CLOCK (DEG) = 262.33
PHASE (DEG) = 21.68
DIAM (DEG) = .14

RESOLUTION OF PLANET
CENTER = 50.09 KM/PIXEL
LIMB = 56.78 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -1.62 DEG LAT 115.74 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 50.09 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 2.58 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 91.46 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00018 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 277.321 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 50.1 KM/PIXEL
AT SUBSPACECRAFT POINT 50.1 KM/PIXEL
AT LIMB OF TARGET BODY 56.8 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.7775E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7775E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 88.830
DIGITAL NUMBER OF EXPOS = 227 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	361.0	85.0	0.	0.	
SATELLITE 1	361.0000	109.0000	49.0000	0.	
SATELLITE 2	361.0000	0.	0.	0.	
SATELLITE 3	271.0000	0.	0.	0.	
SATELLITE 4	97.0000	0.	0.	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	1.53315945E+05	23.13	158.96	248.68
2	1.23328999E+06	21.68	160.43	262.33
3	1.63058411E+06	16.93	165.18	262.46
4	2.46899823E+06	25.28	156.83	264.60

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	2.30976143E+01	1.24821778E+00
2	2.16837591E+01	1.35656429E-01
3	1.69308482E+01	1.79204858E-01
4	2.52815548E+01	1.09532732E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	1.51645947E+01	1.53306852E+01
2	1.23183001E+02	1.23328914E+02
3	1.62803414E+02	1.63058214E+02
4	2.46663827E+02	2.46899714E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
4.85481854E+00	2.73420799E+01	1.48417411E-04	3.36887699E-01
2.69766284E+01	2.41557681E+02	2.13702817E-04	2.33963775E-01
2.22241117E+01	3.39973567E+02	2.19099598E-04	2.28206718E-01
2.26730036E+01	4.68356606E+02	1.97543887E-04	2.53108314E-01

SATELLITE OBSCURED BY PLANET -.23DAYS FROM ENCOUNTE
SATELLITE OBSCURED BY PLANET -.21DAYS FROM ENCOUNTE
SATELLITE OBSCURED BY PLANET -.19DAYS FROM ENCOUNTE

Table A-6 (cont)

JUPITER CHECK OUT CASE 1

PICTURE NUMBER 487 0 DAYS 4 HRS 29 MIN TO ENCOUNTER JD 2443888.379

PLANET JUPITE
RANGE (KM) = 4.67695251E+05
CONE (DEG) = 14.39
CLOCK (DEG) = 82.08
PHASE (DEG) = 163.55
DIAM (DEG) = 17.56

SATELLITE EUROP
RANGE (KM) = 4.80329228E+05
CONE (DEG) = 75.19
CLOCK (DEG) = 267.08
PHASE (DEG) = 106.86
DIAM (DEG) = .35

RESOLUTION OF PLANET
CENTER = 39.63 KM/PIXEL
LIMB = 46.22 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT 4.84 DEG LAT 338.94 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 45.74 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 20.10 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 106.42 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00021 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 240.474 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 45.8 KM/PIXEL
AT SUBSPACECRAFT POINT 39.6 KM/PIXEL
AT LIMB OF TARGET BODY 46.2 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 3.6933E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 3.6933E-04 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 18.139
DIGITAL NUMBER OF EXPOS = 46 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	487.0	211.0	121.0	0.	
SATELLITE 1	487.0000	235.0000	157.0000	31.0000	
SATELLITE 2	487.0000	85.0000	7.0000	0.	
SATELLITE 3	397.0000	43.0000	0.	0.	
SATELLITE 4	223.0000	0.	0.	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	5.67248438E+05	116.63	61.32	85.96
2	4.80329228E+05	106.86	75.19	267.08
3	6.39428596E+05	46.30	135.75	266.73
4	1.45924482E+06	39.90	142.15	266.45

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.16628695E+02	3.37362198E-01
2	1.06857516E+02	3.48310958E-01
3	4.63008073E+01	4.56984958E-01
4	3.98987635E+01	1.85326131E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	5.65578448E+01	5.67245990E+01
2	4.78869236E+01	4.80327018E+01
3	6.36878606E+01	6.39423522E+01
4	1.45688485E+02	1.45924294E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
8.80260434E+00	9.84695527E+01	1.89429984E-04	2.63943766E-01
2.91506135E+01	1.30456644E+02	3.09742452E-04	1.61424434E-01
4.88299530E+00	1.35093345E+02	1.72168134E-04	2.90413789E-01
2.15891863E+00	2.44780461E+02	1.67791364E-04	2.97983115E-01

VIEW FROM SPACECRAFT

Table A-6 (concl)

JUPITER CHECK OUT CASE 1

PICTURE NUMBER 865 1 DAYS 11 HRS 59 MIN TO ENCOUNTER JD 2443889.692

PLANET JUPITE
RANGE (KM) = 2.44016854E+06
CONE (DEG) = 60.16
CLOCK (DEG) = 81.55
PHASE (DEG) = 117.94
DIAM (DEG) = 3.35

SATELLITE EUROP
RANGE (KM) = 2.93926958E+06
CONE (DEG) = 50.27
CLOCK (DEG) = 81.60
PHASE (DEG) = 127.77
DIAM (DEG) = .06

RESOLUTION OF PLANET
CENTER = 236.87 KM/PIXEL
LIMB = 243.91 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT 4.94 DEG LAT 293.26 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 240.32 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 2.53 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 369.36 KM/SEC
OBJECT MOTION FROM ALL SOURCES .04 KM
NUMBER OF PIXELS SMEARED .00015 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 323.125 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 240.4 KM/PIXEL
AT SUBSPACECRAFT POINT 236.9 KM/PIXEL
AT LIMB OF TARGET BODY 243.9 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.3955E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.3955E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 69.654
DIGITAL NUMBER OF EXPOS = 178 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	865.0	313.0	133.0	0.	
SATELLITE 1	865.0000	403.0000	157.0000	31.0000	
SATELLITE 2	865.0000	211.0000	43.0000	0.	
SATELLITE 3	775.0000	307.0000	157.0000	0.	
SATELLITE 4	601.0000	301.0000	181.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	2.78313516E+06	123.28	54.77	81.83
2	2.93926958E+06	127.77	50.27	81.60
3	1.72829623E+06	140.04	38.02	76.37
4	5.67946095E+05	117.88	60.24	64.81

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.23275797E+02	6.87598352E-02
2	1.27772228E+02	5.69201560E-02
3	1.40036566E+02	1.69073204E-01
4	1.17881802E+02	4.76166418E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	2.78146521E+02	2.78313471E+02
2	2.93780963E+02	2.93926926E+02
3	1.72574626E+02	1.72829438E+02
4	5.65586104E+01	5.67941201E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.96056250E+01	4.18503561E+02	1.57280779E-04	3.17902800E-01
1.69056770E+01	4.32232616E+02	1.52841459E-04	3.27136369E-01
3.96769902E+00	2.43645019E+02	1.43480593E-04	3.48473185E-01
5.72318634E+00	5.15943588E+01	8.11782522E-05	6.15928511E-01

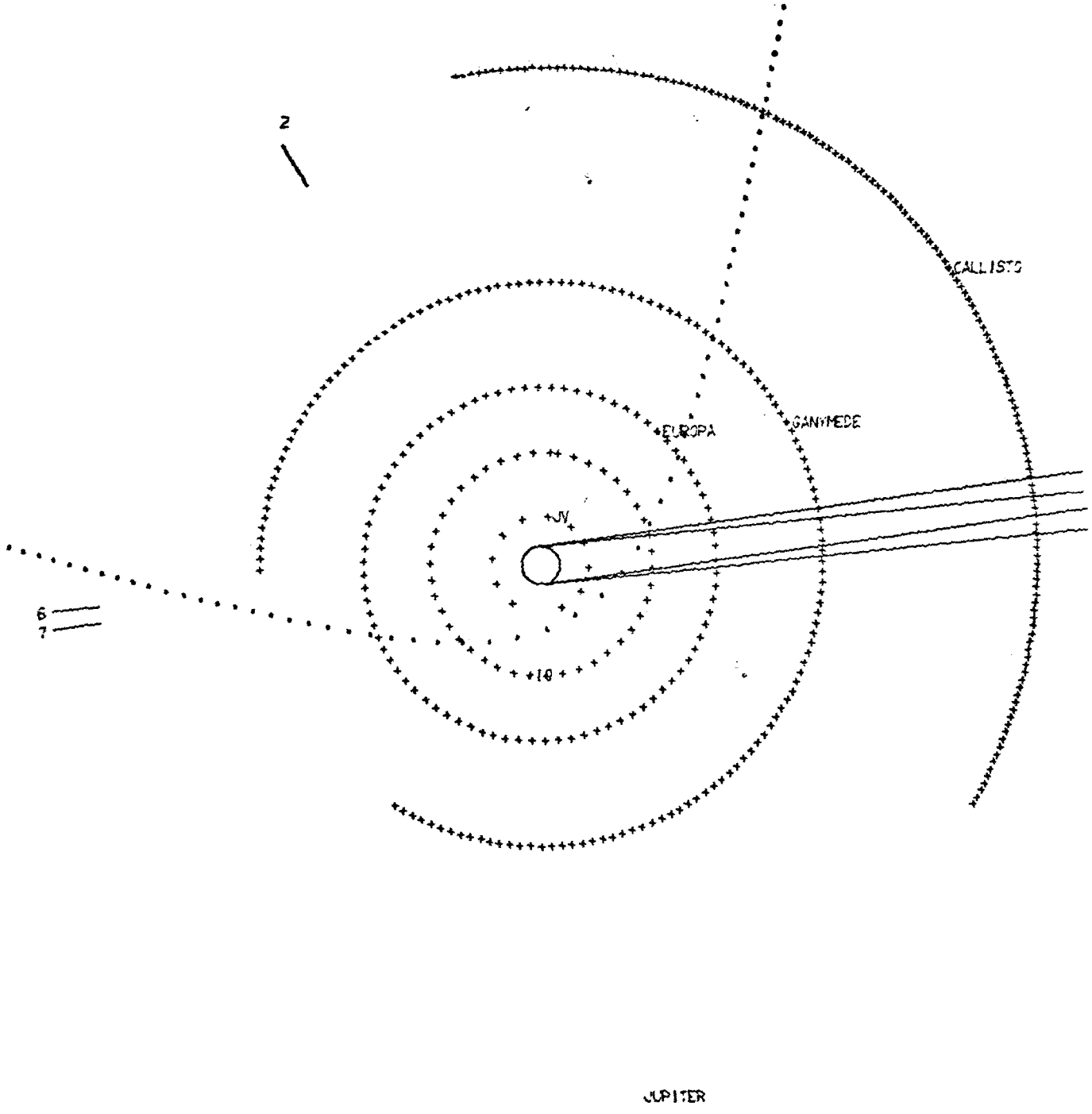


Fig. A-1 Flyby Encounter Geometry

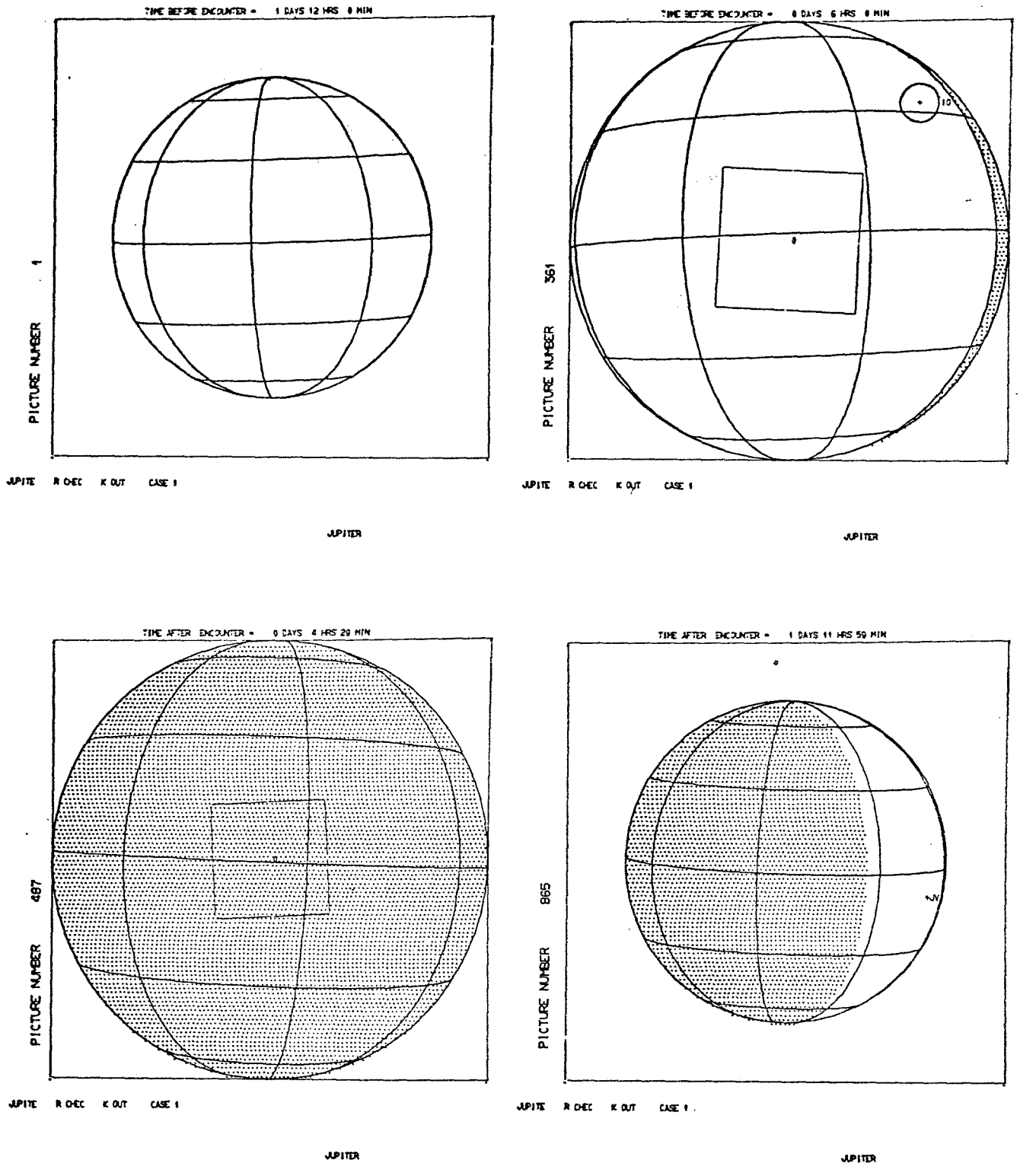
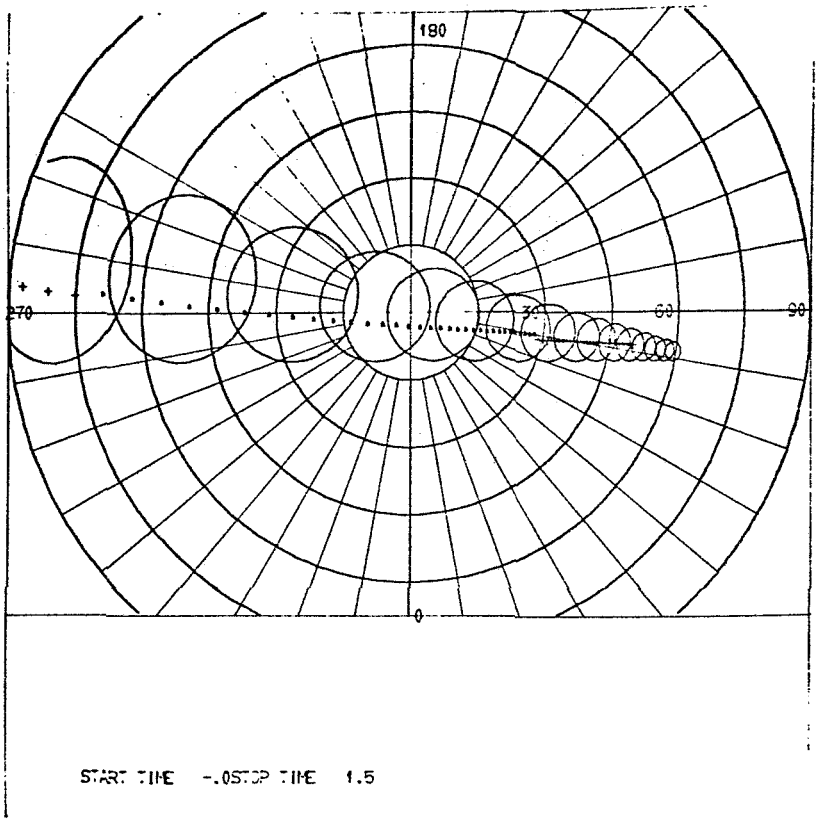


Fig. A-2 Scenes Before and After Closest Approach



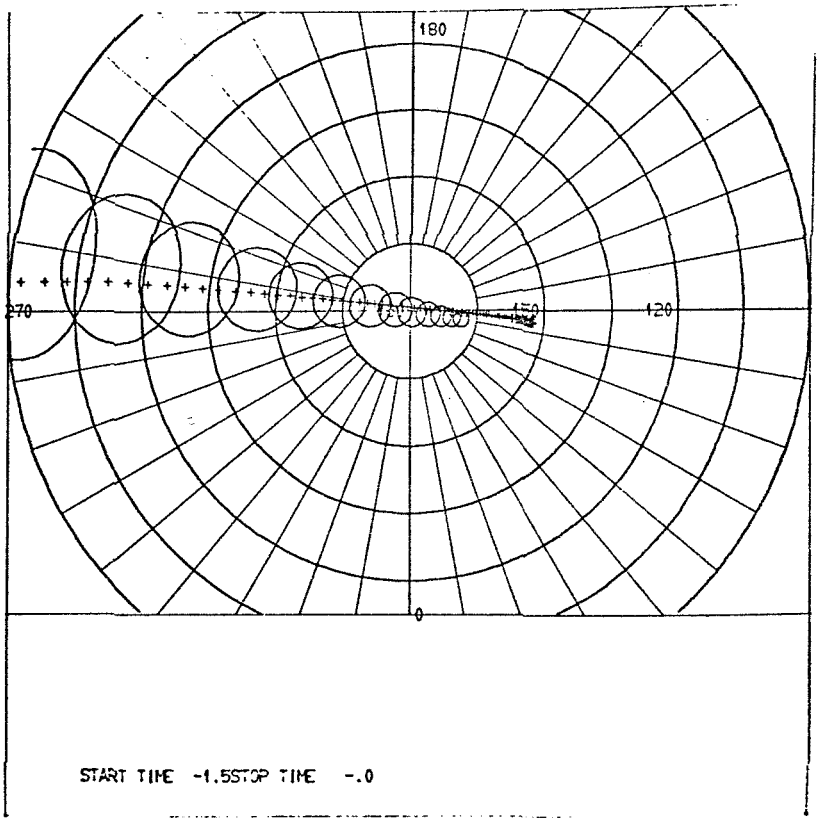


Fig. A-3 Summary Cone and Clock Plots

5. Case 2

a. Input Data - The tabular input data are shown on Table A-7 with input control 23 equal to 1.0, signifying cone and clock user option. There are three sets of discrete cone and clock positions corresponding to pointing modes of nonlimb, intermediate, and radius vector (planet center). These are designated cases 2-1, 2-2, and 2-3, respectively.

Table A-7 Case 2 Input Listing

```
JUPITER CHECK OUT CASE 2
 2       5.0000000    PLANET JUPITER (J-S-P)      WIDE ANGLE SIT (10 DEG) TOPS
 3       2.0000000    SATEL  EUROPA (J-II)
 4       730114.69    DATE  JD AT ENCOUNTER                                    D  2443867.970
 6       15.000000
 7       127364.46    STATE1
 8       213215.45    STATE2     PERIAPSIS VECTOR FROM LEADMETTERS
 9      -13387.652    STATE3     79 JSP RUN TO MAXIMIZE SATELLITE
10      -29.431552    STATE4     ENCOUNTER
11       17.613963    STATE5
12       1.1410359    STATE6
22       120.30000    INSTID,INSTRUMENT ID (TV,  WIDE ANGLE SIT)
23       1.0000000
26      -.22266000
24       151.65000
25       247.70000
26      -.16700000
24       141.34000
25       247.62000
26      -.11100000
24       125.66000
25       247.54000                                                            11 DEG LONG )
26    -55.00000000E-03
24       100.92000
25       247.46000
26       0.
24       65.680000
25       247.37000
26     55.00000000E-03
24       30.440000
25       233.19000
26       .11100000
24       5.7100000
25       189.92000
26       .16700000
24       9.9600000              (CASE 2-1)
25       14.300000                  ▲
26       .22200000                  ¦
24       26.270000                  ¦
25       53.050000_____________     ¦
26      -.22200000             ¦    ¦
24       151.65000              ¦    ¦
25       254.70000              ¦    ¦
26      -.16700000              ¦    ▼
24       141.34000              ¦  (CASE 2-2)
25       254.62000              ¦
26      -.11100000              ¦
24       125.66000              ¦
25       254.54000              ¦
26    -55.00000000E-03          ¦
24       100.92000              ¦
25       254.46000              ¦
26       0.                     ¦
24       65.680000              ¦
25       254.37000              ¦
26     55.00000000E-03          ¦                                             IXEL
24       30.440000              ¦
25       247.19000              ¦
26       .11100000              ¦
24       5.7100000              ¦
25       224.92000              ¦
26       .16700000              ¦
24       9.9600000              ¦
25       14.300000         (CASE 2-2)
26       .22200000              ¦
24       26.270000              ¦
25       53.050000              ¦
26      -.22200000              ¦
24       151.65000              ¦
25       261.70000              ¦
26      -.16700000         (CASE 2-3)
24       141.34000              ¦
25       261.62000              ¦
26      -.11100000              ¦
24       125.66000              ¦
25       261.54000              ¦
26    -55.00000000E-03          ¦
24       100.92000              ¦
25       261.46000              ¦
26       0.                     ¦
24       65.680000              ¦
25       261.37000              ¦
26     55.00000000E-03          ¦
24       30.440000              ¦
25       261.19000              ¦
26       .11100000              ¦
24       5.7100000              ¦
25       259.92000              ¦
26       .16700000              ¦
24       9.9600000              ¦
25       12.300000         (CASE 2-3)
26       .22200000                  ▲
24       26.270000                  ¦
25       81.050000_____________     ¦
45     80.000000000E-07CHAR10SIT MIN DETECTABLE EXP
46     20.000000000E-04CHAR11SIT HIGHLIGHT EXP
51       1.0000000          NO
61      -1.5000000     TSTAR TIME FROM PERIAPSIS
62       1.5000000     TSTOP TIME FROM PERIAPSIS
63       5.0000000     DTINSIPICTURE TAKING INTERVAL (MIN)
64       100000000E+01       TORAGE CAPACITY
65       0.                  BULK STORAGE ZERO STATE
66       47400.000     BITRATTRANSMIT BIT RATE  HALF FOR EACH CAMERA
67       640.00000           DATA RATE FROM OTHER INSTRUMENTS
68       2000000.0           BUFFER STORAGE CAPACITY
69       6.0000000     CALCSTPICTURES PER CALC STEP       30 MIN PER CALC STEP
81       1.0000000     OPLOT
82       1.0000000     OPRNT
90       1111111.0
98
```

b. Output Data - Tabular output (Table A-8) is in three parts: near limb, intermediate, and radius vector cone and clock pointing. Two tabular picture frame summaries, given for each pointing case, correspond to the first and last time points for the cone and clock runs. By comparing the resolution numbers between cases, it can be seen that the cone and clock input is exercised.

Graphic output was selected for the radius vector case 2-3 showing start and stop times of 5^h 19^m from closest approach (Fig. A-4). Summary cone and clock plots before and after closest approach are shown in Fig. A-5.

Table A-8 (cont)

JUPITER CHECK OUT CASE 2-1; NEAR LIMB CONE & CLOCK POINTING

PICTURE NUMBER 49 0 DAYS 5 HRS 19 MIN TO ENCOUNTER JD 2443888.414

PLANET JUPITE
RANGE (KM) = 5.25260368E+05
CONE (DEG) = 20.32
CLOCK (DEG) = 81.89
PHASE (DEG) = 157.63
DIAM (DEG) = 15.62

SATELLITE EUROP
RANGE (KM) = 4.62866579E+05
CONE (DEG) = 64.60
CLOCK (DEG) = 268.01
PHASE (DEG) = 117.44
DIAM (DEG) = .36

RESOLUTION OF PLANET
CENTER = 45.39 KM/PIXEL
LIMB = 52.04 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -71.71 DEG LAT 297.16 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 52.03 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 15.10 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 90.93 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00015 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 327.102 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 52.0 KM/PIXEL
AT SUBSPACECRAFT POINT 45.4 KM/PIXEL
AT LIMB OF TARGET BODY 52.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 3.7531E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 3.7531E-04 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 18.439
DIGITAL NUMBER OF EXPOS = 47 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	49.0	49.0	49.0	0.	
SATELLITE 1	49.0000	49.0000	37.0000	7.0000	
SATELLITE 2	49.0000	37.0000	7.0000	0.	
SATELLITE 3	49.0000	19.0000	0.	0.	
SATELLITE 4	49.0000	0.	0.	0.	

SATELLITE DATA (CASE 2-1; NEAR LIMB CONE & CLOCK POINTING)

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	6.01258871E+05	114.26	63.69	85.43
2	4.62866579E+05	117.44	64.60	268.01
3	5.71829026E+05	47.52	134.52	267.60
4	1.38983254E+06	39.76	142.29	266.84

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.14263260E+02	3.18279129E-01
2	1.17444529E+02	3.61451791E-01
3	4.75178101E+01	5.11008414E-01
4	3.97587436E+01	1.94581867E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	5.99588881E+01	6.01256562E+01
2	4.61406585E+01	4.62864284E+01
3	5.69279036E+01	5.71823350E+01
4	1.38747256E+02	1.38983056E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
7.66707959E+00	1.05641013E+02	1.88681975E-04	2.64996166E-01
2.93291698E+01	1.33810723E+02	3.26972393E-04	1.52918109E-01
4.83290033E+00	9.53904715E+01	1.75208383E-04	2.85374473E-01
2.49213573E+00	2.34774236E+02	1.68580207E-04	2.96594725E-01

SATELLITE OBSCURED BY PLANET -.220AYS FROM ENCOUNTE
VIEW FROM SPACECRAFT

Table A-8 (cont)

JUPITER CHECK OUT CASE 2-2 INTERMEDIATE CONE & CLOCK POINTING

PICTURE NUMBER 55 0 DAYS 5 HRS 19 MIN TO ENCOUNTER JD 2443887.370

PLANET JUPITE
RANGE (KM) = 5.25260868E+05
CONE (DEG) = 151.53
CLOCK (DEG) = 261.74
PHASE (DEG) = 30.58
DIAM (DEG) = 15.62

SATELLITE EUROP
RANGE (KM) = 1.18556282E+06
CONE (DEG) = 157.28
CLOCK (DEG) = 262.61
PHASE (DEG) = 24.83
DIAM (DEG) = .14

RESOLUTION OF PLANET
CENTER = 45.39 KM/PIXEL
LIMB = 52.04 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT 13.51 DEG LAT 98.97 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 45.98 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 4.78 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 74.35 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00016 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 318.551 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 46.0 KM/PIXEL
AT SUBSPACECRAFT POINT 45.4 KM/PIXEL
AT LIMB OF TARGET BODY 52.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.2637E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.2637E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 63.036
DIGITAL NUMBER OF EXPOS = 161 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	55.0	55.0	55.0	0.	
SATELLITE 1	55.0000	55.0000	43.0000	7.0000	
SATELLITE 2	55.0000	37.0000	7.0000	0.	
SATELLITE 3	55.0000	19.0000	0.	0.	
SATELLITE 4	55.0000	0.	0.	0.	

SATELLITE DATA CASE 2-2 (CONTINUED)

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	1.09803488E+05	19.77	162.10	233.15
2	1.18556282E+06	24.83	157.28	262.61
3	1.57983912E+06	18.87	163.24	262.66
4	2.42053945E+06	26.58	155.53	264.60

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.97743957E+01	1.74288891E+00
2	2.48314665E+01	1.41117549E-01
3	1.88707342E+01	1.84960986E-01
4	2.65764770E+01	1.11725559E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	1.08133490E+01	1.09790790E+01
2	1.18410284E+02	1.18556194E+02
3	1.57728915E+02	1.57983709E+02
4	2.41817949E+02	2.42053834E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
6.52377351E+00	2.00079108E+01	1.26869103E-04	3.94106987E-01
2.80201480E+01	2.23070245E+02	2.08156334E-04	2.40204076E-01
2.27720538E+01	3.21505867E+02	2.14970246E-04	2.32593328E-01
2.30808932E+01	4.51932016E+02	1.35000773E-04	2.56403241E-01

SATELLITE OBSCURED BY PLANET -.170AYS FROM ENCOUNTE
VIEW FROM SPACECRAFT

SUBROUTINE FIND HAD TROUBLE

Table A-8 (cont)

JUPITER CHECK OUT CASE 2-2 (CONTINUED)

PICTURE NUMBER 103 0 DAYS 5 HRS 19 MIN TO ENCOUNTER JD 2443888.414

PLANET JUPITE
RANGE (KM) = 5.25260368E+05
CONE (DEG) = 20.32
CLOCK (DEG) = 81.89
PHASE (DEG) = 157.63
DIAM (DEG) = 15.62

SATELLITE EUROP
RANGE (KM) = 4.62866579E+05
CONE (DEG) = 64.60
CLOCK (DEG) = 268.01
PHASE (DEG) = 117.44
DIAM (DEG) = .36

RESOLUTION OF PLANET
CENTER = 45.39 KM/PIXEL
LIMB = 52.04 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -25.64 DEG LAT 242.81 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 45.31 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 5.10 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 84.39 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00017 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 287.493 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 46.3 KM/PIXEL
AT SUBSPACECRAFT POINT 45.4 KM/PIXEL
AT LIMB OF TARGET BODY 52.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.5694E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.5694E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 78.381
DIGITAL NUMBER OF EXPOS = 200 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	103.0	103.0	103.0	0.	
SATELLITE 1	103.0000	103.0000	79.0000	19.0000	
SATELLITE 2	103.0000	79.0000	19.0000	0.	
SATELLITE 3	103.0000	43.0000	0.	0.	
SATELLITE 4	103.0000	0.	0.	0.	

SATELLITE DATA CASE 2-2 (CONTINUED)

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	6.01258871E+05	114.26	63.69	85.43
2	4.62866579E+05	117.44	64.60	268.01
3	5.71829026E+05	47.52	134.52	267.60
4	1.38983254E+06	39.76	142.29	266.84

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.14263260E+02	3.18279129E-01
2	1.17444529E+02	3.61451791E-01
3	4.75178101E+01	5.11008414E-01
4	3.97587436E+01	1.94581867E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	5.99588881E+01	6.01256562E+01
2	4.61406586E+01	4.62864284E+01
3	5.69279036E+01	5.71823350E+01
4	1.38747256E+02	1.38983056E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
7.66707959E+00	1.05641013E+02	1.88681975E-04	2.64996166E-01
2.93291698E+01	1.33810723E+02	3.26972393E-04	1.52918109E-01
4.83290033E+00	9.53904715E+01	1.75208383E-04	2.85374473E-01
2.49213573E+00	2.34774236E+02	1.68580207E-04	2.96594725E-01

SATELLITE OBSCURED BY PLANET -.220AYS FROM ENCOUNTE
VIEW FROM SPACECRAFT

Table A-8 (cont)

JUPITER CHECK OUT CASE 2-3 RADIUS VECTOR CONE & CLOCK POINTING

PICTURE NUMBER 109 0 DAYS 5 HRS 19 MIN TO ENCOUNTER JD 2443887.970

PLANET JUPITE
RANGE (KM) = 5.25260868E+05
CONE (DEG) = 151.53
CLOCK (DEG) = 261.74
PHASE (DEG) = 30.58
DIAM (DEG) = 15.62

SATELLITE EUROP
RANGE (KM) = 1.18556282E+06
CONE (DEG) = 157.28
CLOCK (DEG) = 262.61
PHASE (DEG) = 24.83
DIAM (DEG) = .14

RESOLUTION OF PLANET
CENTER = 45.39 KM/PIXEL
LIMB = 52.04 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -2.18 DEG LAT 95.83 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 45.39 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 3.77 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 78.74 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00017 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 297.319 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 45.4 KM/PIXEL
AT SUBSPACECRAFT POINT 45.4 KM/PIXEL
AT LIMB OF TARGET BODY 52.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.1114E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.1114E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 55.391
DIGITAL NUMBER OF EXPOS = 141 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	109.0	109.0	109.0	0.	
SATELLITE 1	109.0000	109.0000	85.0000	19.0000	
SATELLITE 2	109.0000	73.0000	19.0000	0.	
SATELLITE 3	109.0000	43.0000	0.	0.	
SATELLITE 4	109.0000	0.	0.	0.	

SATELLITE DATA CASE 2-3 (CONTINUED)

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	1.09803488E+05	19.77	162.10	233.15
2	1.18556282E+06	24.83	157.28	262.61
3	1.57983912E+06	18.87	163.24	262.66
4	2.42053945E+06	26.58	155.53	264.60

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.97743957E+01	1.74288891E+00
2	2.48314665E+01	1.41117549E-01
3	1.88707342E+01	1.84960986E-01
4	2.65764770E+01	1.11725559E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	1.08133490E+01	1.09790790E+01
2	1.18410284E+02	1.18556194E+02
3	1.57728915E+02	1.57983709E+02
4	2.41817949E+02	2.42053834E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
6.52377351E+00	2.00079108E+01	1.26869103E-04	3.94106987E-01
2.80201480E+01	2.23070245E+02	2.08156334E-04	2.40204076E-01
2.27720538E+01	3.21505867E+02	2.14970246E-04	2.32590328E-01
2.30808932E+01	4.51982016E+02	1.95000773E-04	2.56409241E-01

SATELLITE OBSCURED BY PLANET -.17DAYS FROM ENCOUNTE
VIEW FROM SPACECRAFT

SUBROUTINE FIND HAD TROUBLE

Table A-8 (concl)

JUPITER CHECK OUT CASE 2-3 (CONTINUED)

PICTURE NUMBER - 157 0 DAYS 5 HRS 19 MIN TO ENCOUNTER JD 2443888.414

PLANET JUPITE
RANGE (KM) = 5.25260868E+05
CONE (DEG) = 20.32
CLOCK (DEG) = 81.89
PHASE (DEG) = 157.63
DIAM (DEG) = 15.62

SATELLITE EUROP
RANGE (KM) = 4.62866579E+05
CONE (DEG) = 64.60
CLOCK (DEG) = 268.01
PHASE (DEG) = 117.44
DIAM (DEG) = .36

RESOLUTION OF PLANET
CENTER = 45.39 KM/PIXEL
LIMB = 52.04 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -.39 DEG LAT 237.64 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 45.39 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 3.81 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 87.50 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00019 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 265.426 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 45.4 KM/PIXEL
AT SUBSPACECRAFT POINT 45.4 KM/PIXEL
AT LIMB OF TARGET BODY 52.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.7860E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7860E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 89.255
DIGITAL NUMBER OF EXPOS = 228 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	157.0	157.0	157.0	0.	
SATELLITE 1	157.0000	157.0000	121.0000	31.0000	
SATELLITE 2	157.0000	121.0000	31.0000	0.	
SATELLITE 3	157.0000	67.0000	0.	0.	
SATELLITE 4	157.0000	0.	0.	0.	

SATELLITE DATA (CASE 2-3 CONTINUED)

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	6.01258871E+05	114.26	63.69	85.43
2	4.62866579E+05	117.44	64.60	268.01
3	5.71829026E+05	47.52	134.52	267.60
4	1.38983254E+06	39.76	142.29	266.84

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.14263260E+02	3.18279129E-01
2	1.17444529E+02	3.61451791E-01
3	4.75178101E+01	5.11008414E-01
4	3.97587436E+01	1.94581867E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	5.99586881E+01	6.01256562E+01
2	4.61406586E+01	4.62864284E+01
3	5.69279036E+01	5.71823350E+01
4	1.38747256E+02	1.38983056E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
7.66707959E+00	1.05641013E+02	1.88681975E-04	2.64996166E-01
2.93291698E+01	1.33810723E+02	3.26972393E-04	1.52914109E-01
4.83290033E+00	9.53904715E+01	1.75208333E-04	2.85374473E-01
2.49213573E+00	2.34774236E+02	1.68580207E-04	2.96594725E-01

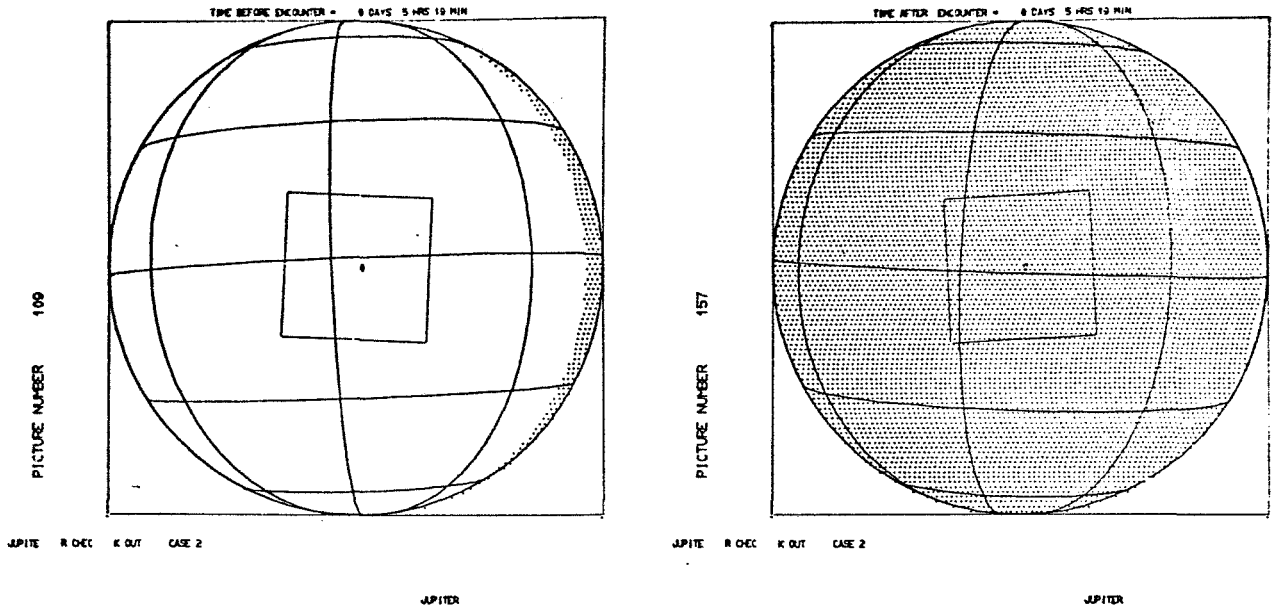


Fig. A-4 Scenes Before and After Closest Approach (Case 2-3)

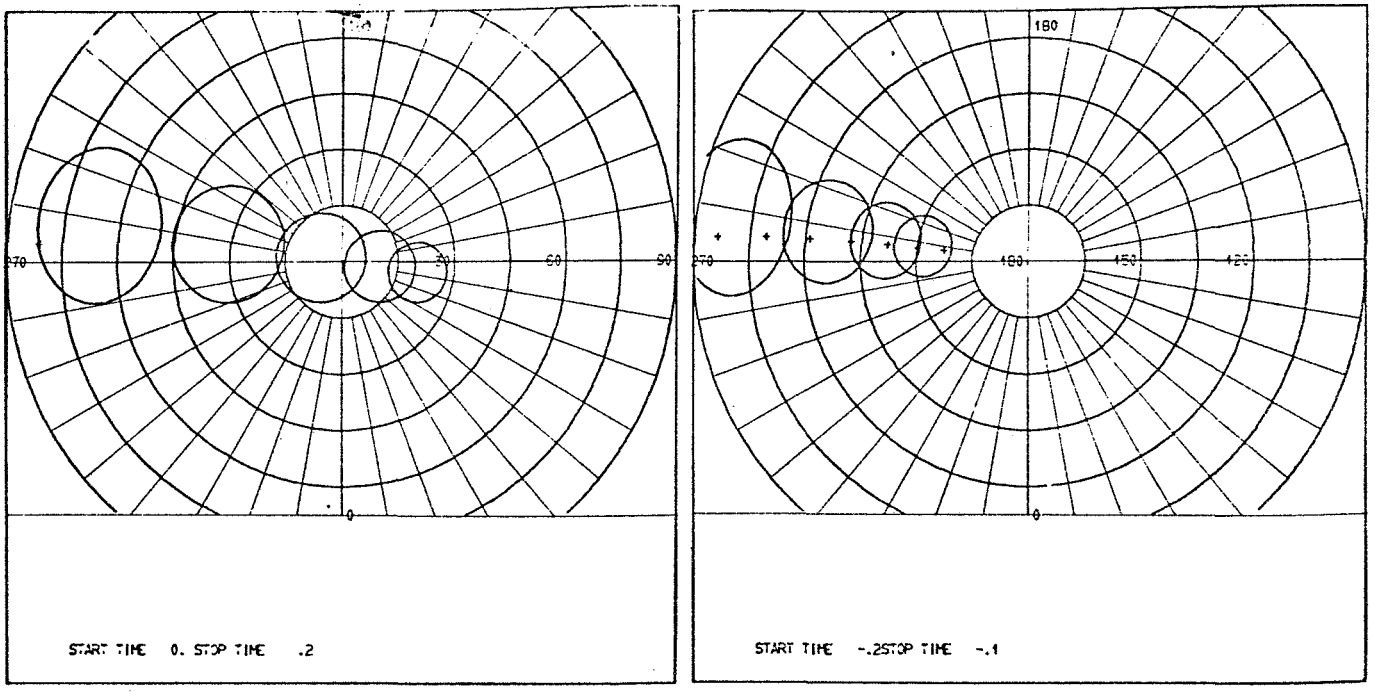


Fig. A-5 Summary Cone and Clock Plots

B. MISSION 2

The specific objective of Mission 2 is to provide the data required to validate the "imaging" analysis capability. This mission includes the cases shown in Table A-1. Mission 2 exercises two cameras, two planet flybys, and natural satellite encounters.

The spacecraft is a TOPS configuration, with Earth/Canopus attitude control.

1. Science Mode

Data are provided to check out the imaging mission analysis capability, (i.e., the interface between instrument module, trajectory geometry, summary calculations, and data display) with targets of Jupiter, Jupiter-natural satellites, and Saturn. The complete set of measurement mode capabilities is used via combinations of instrument pointing and frame timing modes. The total number of runs is four, with variations as follows:

POINTING

Align to Radius Vector

Input Discrete Cone/Clock

CAMERA FOR	SATELLITE
Wide-angle Field of View	None
Narrow-angle Field of View	One
	Multinumber
CAMERA CHARACTERISTICS	PLANETS
Command Instrument Values	Jupiter
User Input Values	Saturn

2. Instrument Characteristics

The imaging system characteristics for Mission 2 are shown in Table A-9. The majority of logic flow through the equations is validated by switching from the narrow- to the wide-angle camera, and by switching between command instrument values and user instrument values. The matrix of runs and associated values that exercise the two cameras and other variations are presented in the "Input Data" paragraphs for each case.

Table A-9 Imaging System Characteristics

PARAMETER	SYMBOL	UNITS	NARROW-ANGLE CAMERA	WIDE-ANGLE CAMERA
Focal Length	F	cm	200	20
Aperture (diam)	D	cm	23	5
Obscuration	OBSC	%	0.0	0.0
Optics Transmission	Trans	%	85.0	85.0
Horizontal		cm	1.6x1.6	1.6x1.6
No. of Scan Lines	NLINES		800	800
No. of Pixels per Scan Line	NPIXEL		800	800
No. of Bits per Pixel	BPPIX	bits	8	8
Minimum Detectable Exposure		ft-ca-sec	0.003	0.003
Maximum or High Light Exposure		ft-ca-sec	0.3	0.3
Sensor Response Curve			S-20	S-20
Filter Transmission	ft	%		
Blue			47.0	47.0
Green			58.0	58.0
Red			25.0	25.0
Exposure Times				
		sec	0.05	0.1
			0.1	0.5
			0.5	1.0
Frame Read Time	TREAD	sec	40.0	40.0
Frame Erase Time	TERASE	sec	0.5	0.5

3. Trajectory Data

The encounter data were obtained from a 1977 Jupiter-Saturn-Pluto mission. The Jupiter encounter time was specified such that multiple encounters would occur; the data are as follows:

PARAMETER		PLANET ENCOUNTER JUPITER	SATURN
Calendar Date/Hr/Min/Sec		14 JAN 79/10/48/3.27	1 AUG 80/20/19/56.54
Julian Date		2443887.950038	2444453.347182
Periapse State (km),	(X)	1.2706446432E+05	-1.4122713896E+05
	(Y)	2.1321885366E+05	9.7650652979E+04
		-1.3387051602E+04	-4.2083846991E+05
(Earth Ecliptic Ref). (km/sec),	(Ẋ)	-2.9431552532E+01	-2.0131197330E+01
	(Ẏ)	1.7610963316E+01	-6.1481658560E+00
	(Ż)	1.1418359371E+00	5.3291218577E+00

4. Case 4

a. Input Data - The ability of the program to switch from planet to satellite and back to planet is demonstrated. (See Table A-10 for input listing.)

Table A-10 Case 4 Input Listing

```
JUPITER CHECK OUT CASE 4

 2       5.0000000    PLANET
 3       2.0000000    SATEL  EUROPA (J-II)
 4       790114.69    DATE  JD AT ENCOUNTER
 6       15.000000
 7       127064.46    STATE1
 8       213218.85    STATE2      PERIAPSIS VECTOR FROM LEADBETTERS
 9      -13387.052    STATE3      79 JSP RUN TO MAXIMIZE SATELLITE
10      -29.431552    STATE4      ENCOUNTER
11       17.610963    STATE5
12       1.1418359    STATE6
22       110.00000    INSTIO
61      -1.5000000    TSTAR TIME FROM PERIAPSIS
62       1.5000000    TSTOP TIME FROM PERIAPSIS
63       5.0000000    DTINSTPICTURE TAKING INTERVAL (MIN)
69       6.0000000    CALCSTPICTURES PER CALC STEP       30 MIN PER CALC STEP
81       3.0000000    DPLOT
82       3.0000000    DPRNT
86       100000.00E+01SATRNG
90       1111111.0
98
```

b. Output Data - The objective in case 4 was to show the geometry and analysis capability associated with switching from planet to satellite and return. The tabular output (Table A-11) gives several frames of Europa before, at, and after closest approach. Frames are also given to indicate a completely dark disk (occultation) of Europa, and the next printout frame switches back to Jupiter and its associated field of view compared with Europa.

The graphic output (Fig. A-6) shows the overall view of encounter. Figure A-7 presents geometry frames of Europa and Jupiter, as discussed in Table A-11. Figure A-8 presents resolution and smear summaries that show the effect of switching from Jupiter to Europa and back to Jupiter.

Table A-11 Case 4 Tabular Ouptut

```
JUPITER CHECK OUT CASE 4

 PICTURE NUMBER  415                    0 DAYS  1 HRS 30 MIN TO ENCOUNTER          JD  2443888.129

 PLANET JUPITE                          SATELLITE  EUROP
 RANGE (KM)  =  2.84442318E+05          RANGE (KM)  =  9.00197697E+05
 CONE  (DEG) = 104.55                   CONE  (DEG) = 133.44
 CLOCK (DEG) = 261.50                   CLOCK (DEG) = 263.65
 PHASE (DEG) =  77.52                   PHASE (DEG) =  48.63
 DIAM  (DEG) =  29.06                   DIAM  (DEG) =    .19


 RESOLUTION OF PLANET
 CENTER =     8.29 KM/PIXEL
 LIMB   =     8.97 KM/PIXEL
 INSTRUMENT DATA FOR SATELLITE  EUROP


 RESOLUTION AT SPECIFIED LOCATION =     8.99 KM/PIXEL
 SMEAR DUE TO RELATIVE VELOCITIES     33.89 KM/SEC
 SMEAR DUE TO S/C ATTITUDE RATES     138.63 KM/SEC
 OBJECT MOTION FROM ALL SOURCES        .02 KM
 NUMBER OF PIXELS SMEARED            .00192 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR   26.050 MILLISEC


EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION        9.0 KM/PIXEL
 AT SUBSPACECRAFT POINT       8.3 KM/PIXEL
 AT LIMB OF TARGET BODY       9.0 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CAND) =     .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 1.7421E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.7421E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 87.055
 DIGITAL NUMBER OF EXPOS  = 222 (OF 256 LEVELS)
 ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET              415.0          415.0          415.0         139.0
 SATELLITE 1         415.0000       415.0000       415.0000      163.0000
 SATELLITE 2         415.0000       415.0000       415.0000       13.0000
 SATELLITE 3         415.0000       415.0000       415.0000        0.
 SATELLITE 4         415.0000       415.0000       415.0000        0.



          SATELLITE DATA

            NUM      RANGE (KM)          PHASE (DEG)     CONE (DEG)      CLOCK (DEG)

             1     1.54475603E+05          133.50          44.53           99.63
             2     9.00197697E+05           48.63         133.44          263.65
             3     1.25077004E+06           32.07         150.00          263.49
             4     2.09581488E+06           34.73         147.34          264.70

            NUM        EARTH-SAT-S/C ANG                 SATELLITE ANG DIAM

             1          1.33498385E+02                    1.23884696E+00
             2          4.86296758E+01                    1.85852230E-01
             3          3.20692822E+01                    2.33623022E-01
             4          3.47332730E+01                    1.29036271E-01

          RESOLUTION (KM/PIX) DATA FOR SATELLITES
            NUM   RES ALONG RADIUS VECTOR            RES AT SATELLITE LIMB

             1          1.52805603E+00                    1.54466576E+00
             2          8.98737697E+00                    9.00196513E+00
             3          1.24822004E+01                    1.25076744E+01
             4          2.09345488E+01                    2.09581355E+01

          SMEAR DATA FOR SATELLITES
          SMEAR DUE TO        SMEAR DUE TO          NUMBER OF          TIME TO SMEAR
          VEL (KM/SEC)        S/C (KM/SEC)        PIXELS SMEARED       1/2 PIXEL (SEC)

           4.32332668E+00      3.12179724E+01      1.85585280E-03       2.69417919E-02
           3.38863834E+01      1.38626344E+02      1.91946592E-03       2.60489125E-02
           2.29996789E+01      2.16450517E+02      1.90146472E-03       2.62955181E-02
           2.19048678E+01      3.57582797E+02      1.80585517E-03       2.76877132E-02
      VIEW FROM SPACECRAFT
```

Table A-11 (cont)

JUPITER CHECK OUT CASE 4

PICTURE NUMBER 433 0 DAYS 0 HRS 0 MIN TO ENCOUNTER JD 2443888.192

PLANET JUPITE
RANGE (KM) = 2.48569649E+05
CONE (DEG) = 65.59
CLOCK (DEG) = 261.38
PHASE (DEG) = 116.47
DIAM (DEG) = 33.37

SATELLITE EUROP
RANGE (KM) = 7.74639729E+05
CONE (DEG) = 121.02
CLOCK (DEG) = 264.11
PHASE (DEG) = 61.04
DIAM (DEG) = .22

RESOLUTION OF PLANET
CENTER = 7.03 KM/PIXEL
LIMB = 7.71 KM/PIXEL
INSTRUMENT DATA FOR SATELLITE EUROP

RESOLUTION AT SPECIFIED LOCATION = 7.73 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 32.65 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 126.64 KM/SEC
OBJECT MOTION FROM ALL SOURCES .02 KM
NUMBER OF PIXELS SMEARED .00204 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 24.519 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 7.7 KM/PIXEL
AT SUBSPACECRAFT POINT 7.0 KM/PIXEL
AT LIMB OF TARGET BODY 7.7 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.8958E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.8958E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 94.769
DIGITAL NUMBER OF EXPOS = 242 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	433.0	433.0	433.0	157.0	
SATELLITE 1	433.0000	433.0000	433.0000	181.0000	
SATELLITE 2	433.0000	433.0000	433.0000	31.0000	
SATELLITE 3	433.0000	433.0000	433.0000	0.	
SATELLITE 4	433.0000	433.0000	433.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	2.70681833E+05	134.37	43.60	93.23
2	7.74638729E+05	61.04	121.02	264.11
3	1.08974550E+06	37.47	144.59	263.90
4	1.92926939E+06	37.61	144.44	264.90

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.34373429E+02	7.06989145E-01
2	6.10436294E+01	2.15976518E-01
3	3.74669818E+01	2.68144023E-01
4	3.76148093E+01	1.40175376E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	2.69011833E+00	2.70676681E+00
2	7.73178729E+00	7.74637354E+00
3	1.08719559E+01	1.08974251E+01
4	1.92690999E+01	1.92926855E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
4.29772763E+00	4.37668602E+01	1.96567815E-03	2.54365142E-02
3.26490980E+01	1.26642547E+02	2.03952547E-03	2.45153065E-02
1.71740645E+01	1.79163869E+02	1.80312426E-03	2.77753604E-02
1.48631350E+01	3.21471898E+02	1.74313508E-03	2.86839503E-02

Table A-11 (cont)

UPITER CHECK OUT CASE 4

PICTURE NUMBER 451 0 DAYS 1 HRS 29 MIN TO ENCOUNTER JD 2443888.254

PLANET JUPITE
RANGE (KM) = 2.84442918E+05
CONE (DEG) = 26.63
CLOCK (DEG) = 261.14
PHASE (DEG) = 155.43
DIAM (DEG) = 29.06

SATELLITE EUROP
RANGE (KM) = 6.49097659E+05
CONE (DEG) = 107.55
CLOCK (DEG) = 264.79
PHASE (DEG) = 74.50
DIAM (DEG) = .26

RESOLUTION OF PLANET
CENTER = 5.78 KM/PIXEL
LIMB = 6.45 KM/PIXEL
INSTRUMENT DATA FOR SATELLITE EUROP

RESOLUTION AT SPECIFIED LOCATION = 6.48 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 29.38 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 124.48 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00230 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 21.776 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 6.5 KM/PIXEL
AT SUBSPACECRAFT POINT 5.8 KM/PIXEL
AT LIMB OF TARGET BODY 6.5 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.7956E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7956E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 89.740
DIGITAL NUMBER OF EXPOS = 229 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	451.0	451.0	451.0	175.0	
SATELLITE 1	451.0000	451.0000	451.0000	199.0000	
SATELLITE 2	451.0000	451.0000	451.0000	49.0000	
SATELLITE 3	451.0000	451.0000	451.0000	7.0000	
SATELLITE 4	451.0000	451.0000	451.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	3.89778905E+05	128.76	49.20	89.34
2	6.49097659E+05	74.50	107.55	264.79
3	9.23034406E+05	41.49	140.57	264.55
4	1.75460228E+06	39.31	142.74	265.28

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.28755630E+02	4.90966768E-01
2	7.45017513E+01	2.57746299E-01
3	4.14895022E+01	3.16574166E-01
4	3.93095393E+01	1.54129608E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	3.88108905E+00	3.89775327E+00
2	6.47637659E+00	6.49096017E+00
3	9.20484407E+00	9.23030884E+00
4	1.75224228E+01	1.75460069E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
8.94909572E+00	6.74534833E+01	1.96416674E-03	2.54560872E-02
2.93837799E+01	1.24478042E+02	2.29701177E-03	2.17674113E-02
9.71221427E+00	1.48635430E+02	1.72000164E-03	2.90697397E-02
6.20061016E+00	2.90182266E+02	1.69144587E-03	2.95605084E-02

Table A-11 (cont)

JUPITER CHECK OUT CASE 4

PICTURE NUMBER 613 0 DAYS 14 HRS 59 MIN TO ENCOUNTER JD 2443888.317

PLANET JUPITE
RANGE (KM) = 1.17972717E+06
CONE (DEG) = 47.46
CLOCK (DEG) = 81.60
PHASE (DEG) = 130.52
DIAM (DEG) = 6.94

SATELLITE EUROP
RANGE (KM) = 9.97374490E+05
CONE (DEG) = 13.33
CLOCK (DEG) = 66.52
PHASE (DEG) = 164.71
DIAM (DEG) = .17

RESOLUTION OF PLANET
CENTER = 9.26 KM/PIXEL
LIMB = 9.95 KM/PIXEL
INSTRUMENT DATA FOR SATELLITE EUROP

RESOLUTION AT SPECIFIED LOCATION = 3.98 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 16.53 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 203.73 KM/SEC
OBJECT MOTION FROM ALL SOURCES .02 KM
NUMBER OF PIXELS SMEARED .00216 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 23.117 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 10.0 KM/PIXEL
AT SUBSPACECRAFT POINT 9.3 KM/PIXEL
AT LIMB OF TARGET BODY 10.0 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.6514E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.6514E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 82.502
DIGITAL NUMBER OF EXPOS = 211 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	613.0	613.0	613.0	337.0	
SATELLITE 1	613.0000	613.0000	613.0000	361.0000	
SATELLITE 2	613.0000	613.0000	613.0000	211.0000	
SATELLITE 3	613.0000	613.0000	613.0000	169.0000	
SATELLITE 4	613.0000	613.0000	613.0000	49.0000	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	8.10471148E+05	118.38	59.59	80.64
2	9.97074490E+05	164.71	13.33	66.52
3	1.78837773E+05	156.30	23.35	359.34
4	7.38139742E+05	54.76	147.21	276.21

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.16378018E+02	2.36119496E-01
2	1.64706911E+02	1.67794621E-01
3	1.56301948E+02	1.63398578E+00
4	3.47617541E+01	3.66375802E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	8.08801148E+00	8.10469428E+00
2	9.95614490E+00	9.97073421E+00
3	1.76287773E+00	1.78813592E+00
4	7.35779742E+00	7.38135969E+00

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.07718452E+01	1.22883396E+02	1.40179956E-03	3.56684375E-02
1.65340491E+01	2.33723163E+02	2.16902567E-03	2.30513249E-02
1.21883579E+01	3.53941617E+01	2.55328316E-03	1.95825302E-02
4.66945377E+00	1.44270280E+02	1.93131031E-03	2.58891592E-02

VIEW FROM SPACECRAFT

Table A-11 (concl)

JUPITER CHECK OUT CASE 4

PICTURE NUMBER 631 0 DAYS 16 HRS 29 MIN TO ENCOUNTER JD 2443888.379

PLANET JUPITE		SATELLITE EUROP	
RANGE (KM)	= 1.27576863E+06	RANGE (KM)	= 1.13084785E+06
CONE (DEG)	= 49.21	CONE (DEG)	= 17.81
CLOCK (DEG)	= 81.60	CLOCK (DEG)	= 71.75
PHASE (DEG)	= 128.77	PHASE (DEG)	= 160.19
DIAM (DEG)	= 6.41	DIAM (DEG)	= .15

RESOLUTION OF PLANET
CENTER = 12.04 KM/PIXEL
LIMB = 12.74 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT 5.09 DEG LAT 280.29 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	12.45 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	2.41 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	183.30 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.02 KM
NUMBER OF PIXELS SMEARED	.00145 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 34.406 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 12.5 KM/PIXEL
AT SUBSPACECRAFT POINT 12.1 KM/PIXEL
AT LIMB OF TARGET BODY 12.8 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 9.8751E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 9.8751E-04 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 49.172
DIGITAL NUMBER OF EXPOS = 125 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	631.0	631.0	631.0	337.0	
SATELLITE 1	631.0000	631.0000	631.0000	379.0000	
SATELLITE 2	631.0000	631.0000	631.0000	211.0000	
SATELLITE 3	631.0000	631.0000	631.0000	187.0000	
SATELLITE 4	631.0000	631.0000	631.0000	67.0000	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	8.69015744E+05	122.52	55.45	80.02
2	1.13084785E+06	160.19	17.81	71.75
3	2.69154279E+05	155.86	22.68	36.27
4	6.50250387E+05	33.33	148.54	279.49

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.22522642E+02	2.20212376E-01
2	1.60189686E+02	1.47945387E-01
3	1.55856419E+02	1.08567045E+00
4	3.33887894E+01	4.15896212E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	8.67345744E+00	8.69014140E+00
2	1.12938785E+01	1.13084691E+01
3	2.66604279E+00	2.69142199E+00
4	6.47890387E+00	6.50246104E+00

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.16323071E+01	1.25393992E+02	1.31881809E-03	3.79127344E-02
1.57660618E+01	2.16923602E+02	2.02981951E-03	2.46327320E-02
8.22446291E+00	4.36613153E+01	1.91532614E-03	2.61052146E-02
5.18908762E+00	1.32110254E+02	2.00393843E-03	2.49508663E-02

VIEW FROM SPACECRAFT

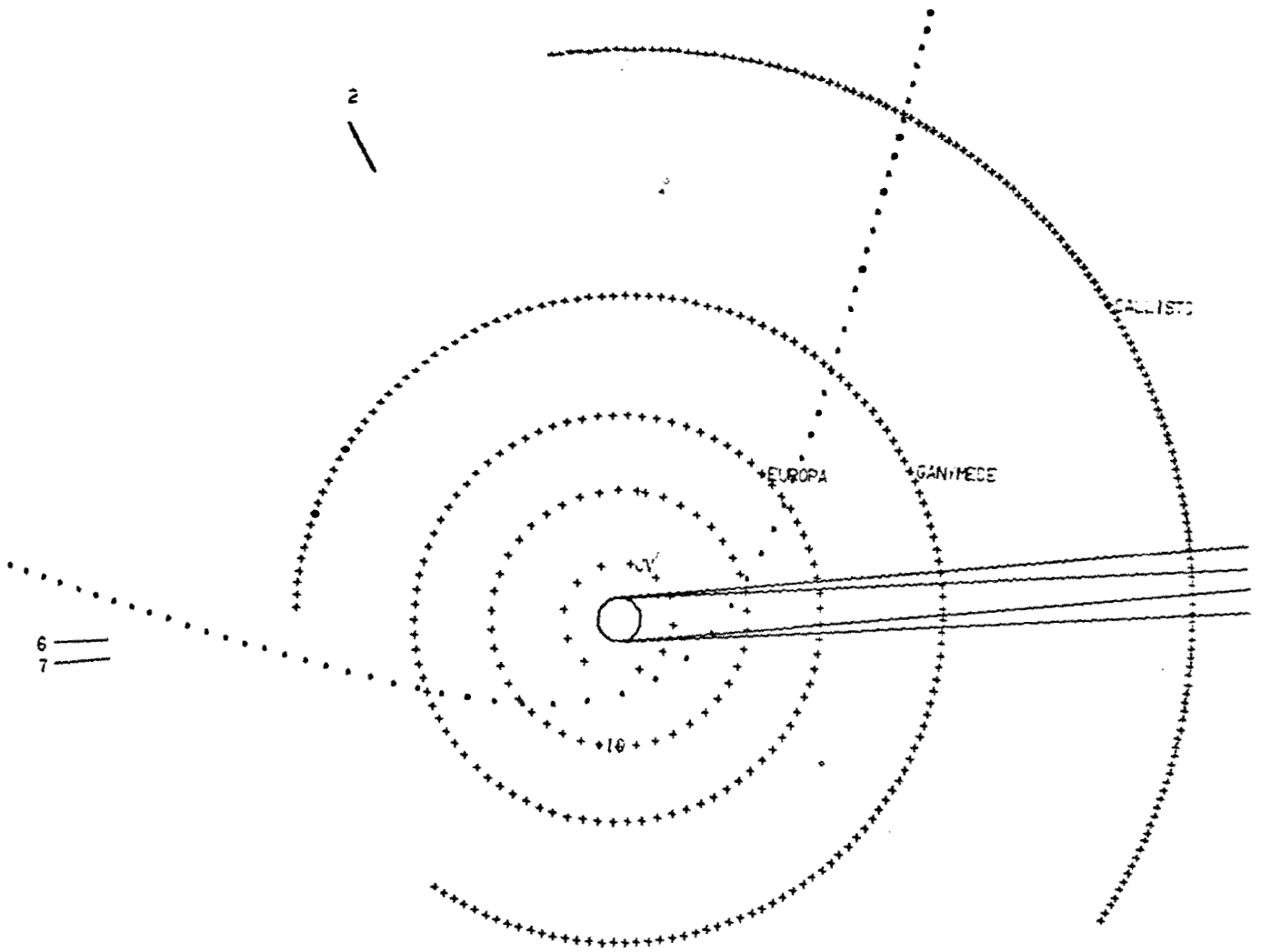


Fig. A-6 Overall View of Encounter

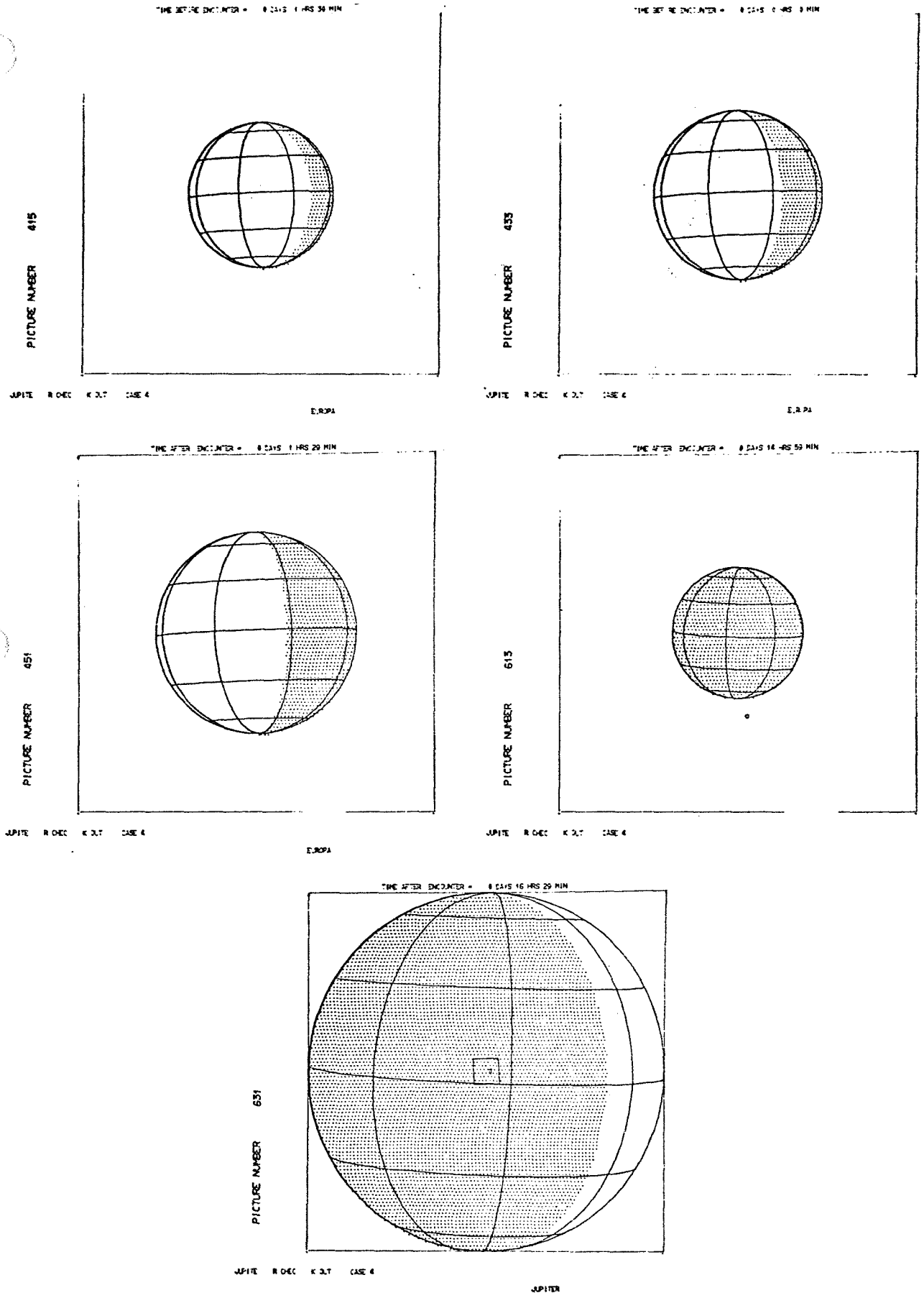


Fig. A-7 Geometry Frames - Europa and Jupiter

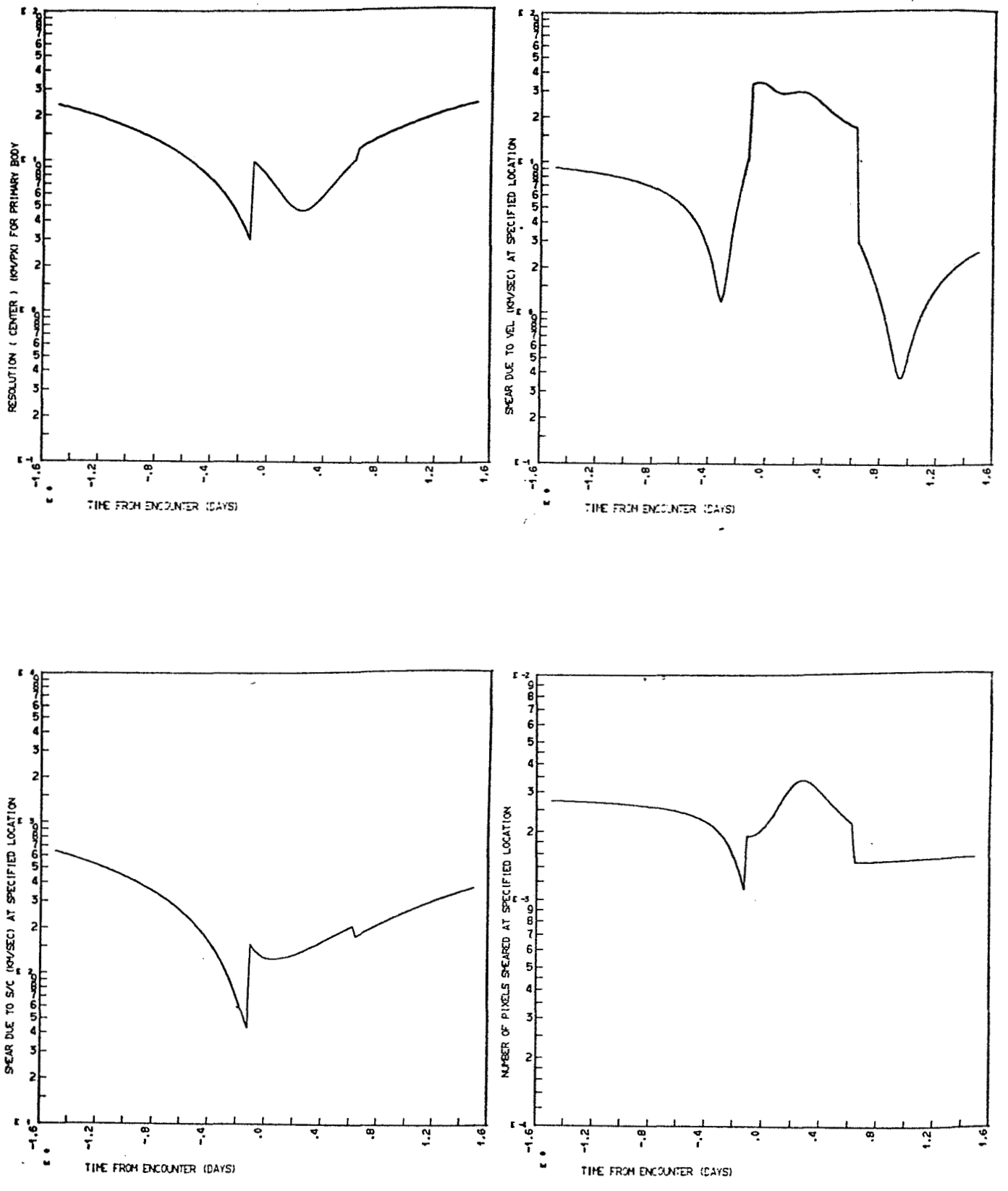


Fig. A-8 TV Summaries

5. Case 5

a. Input Data - The TOPS, SIT narrow-angle camera is demonstrated in this case. See Table A-12 for input listing.

Table A-12 Case 5 Input Listing

```
JUPITER CHECK OUT CASE 5

 2        5.0000000     PLANET
 3       0.             SATEL
 4        790114.69     DATE  JD AT ENCOUNTER
 6        15.000000
 7        127064.46     STATE1
 8        213218.85     STATE2      PERIAPSIS VECTOR FROM LEADBETTERS
 9       -13387.052     STATE3      79 JSP RUN TO MAXIMIZE SATELLITE
10       -29.431552     STATE4      ENCOUNTER
11        17.610963     STATE5
12        1.1418359     STATE6
22        110.00000     INSTID
61       -1.5000000     TSTAR TIME FROM PERIAPSIS
62        1.5000000     TSTOP TIME FROM PERIAPSIS
63        5.0000000     DTINSTPICTURE TAKING INTERVAL (MIN)
69        6.0000000     CALCSTPICTURES PER CALC STEP       30 MIN PER CALC STEP
81        3.0000000     DPLOT
82        3.0000000     DPRNT
86        100000.00E+01SATRNG
90        1111111.0
98
```

b. Output Data - Output for the narrow-angle camera consists of the same frame timing for geometry as was used for case 1, with the wide-angle camera for comparison. Tabular output of the selected frames is given in Table A-13.

The graphic output (Fig. A-9 through A-11) shows the frames mentioned above for the narrow-angle camera, and provides a complete set of analysis frames to check the variety of summary data available for the imaging system.

Table A-13 Case 5 Tabular Output

JUPITER CHECK OUT CASE 5

PICTURE NUMBER 1 -1 DAYS 12 HRS 0 MIN TO ENCOUNTER JD 2443886.632

PLANET JUPITE
RANGE (KM) = 2.44010854E+06
CONE (DEG) = 168.45
CLOCK (DEG) = 80.70
PHASE (DEG) = 9.11
DIAM (DEG) = 3.35

SATELLITE JUPITE
RANGE (KM) = 2.40077098E+06
CONE (DEG) = 152.48
CLOCK (DEG) = 83.76
PHASE (DEG) = 0.
DIAM (DEG) = 0.

RESOLUTION OF PLANET
CENTER = 23.69 KM/PIXEL
LIMB = 24.39 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT 1.74 DEG LAT 97.42 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 23.69 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 9.18 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 645.53 KM/SEC
OBJECT MOTION FROM ALL SOURCES .07 KM
NUMBER OF PIXELS SMEARED .00275 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 18.181 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 23.8 KM/PIXEL
AT SUBSPACECRAFT POINT 23.8 KM/PIXEL
AT LIMB OF TARGET BODY 24.5 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.8748E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7012E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 85.000
DIGITAL NUMBER OF EXPOS = 217 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	1.0	1.0	1.0	0.	
SATELLITE 1	1.0000	1.0000	1.0000	0.	
SATELLITE 2	1.0000	1.0000	1.0000	0.	
SATELLITE 3	1.0000	1.0000	1.0000	0.	
SATELLITE 4	1.0000	1.0000	1.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	2.78976597E+06	14.29	163.27	83.30
2	2.40077098E+06	25.08	152.48	83.76
3	3.31513930E+06	21.54	156.03	84.75
4	4.32575521E+06	5.95	171.61	83.64

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.42930608E+01	6.85964046E-02
2	2.50775989E+01	6.96874829E-02
3	2.15370295E+01	8.81436580E-02
4	5.95468279E+00	6.25176598E-02

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	2.78809597E+01	2.78976547E+01
2	2.39931098E+01	2.40077053E+01
3	3.31258930E+01	3.31513832E+01
4	4.32339522E+01	4.32575457E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.67361694E+01	7.84089228E+02	2.84626915E-03	1.75668559E-02
8.20284742E-01	7.08367738E+02	2.95019478E-03	1.69480335E-02
9.47094473E+00	9.64335622E+02	2.92595721E-03	1.70884249E-02
1.25685210E+01	1.14862876E+03	2.67398839E-03	1.86986601E-02

VIEW FROM SPACECRAFT
LAT 2 , LONG 137 NOT VISIBLE

Table A-13 (cont)

JUPITER CHECK OUT CASE 5

PICTURE NUMBER 487 0 DAYS 4 HRS 29 MIN TO ENCOUNTER JD 2443888.379

PLANET JUPITE		SATELLITE JUPITE	
RANGE (KM)	= 4.67695251E+05	RANGE (KM)	= 4.80329228E+05
CONE (DEG)	= 14.39	CONE (DEG)	= 75.19
CLOCK (DEG)	= 82.08	CLOCK (DEG)	= 267.08
PHASE (DEG)	= 163.55	PHASE (DEG)	= 0.
DIAM (DEG)	= 17.56	DIAM (DEG)	= 0.

RESOLUTION OF PLANET
CENTER = 3.96 KM/PIXEL
LIMB = 4.62 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT 4.84 DEG LAT 338.94 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	4.57 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	20.10 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	106.42 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.01 KM
NUMBER OF PIXELS SMEARED	.00208 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 24.047 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 4.6 KM/PIXEL
AT SUBSPACECRAFT POINT 4.0 KM/PIXEL
AT LIMB OF TARGET BODY 4.6 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 3.6933E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 3.6933E-04 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 18.139
DIGITAL NUMBER OF EXPOS = 46 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	487.0	487.0	487.0	211.0	
SATELLITE 1	487.0000	487.0000	487.0000	235.0000	
SATELLITE 2	487.0000	487.0000	487.0000	85.0000	
SATELLITE 3	487.0000	487.0000	487.0000	43.0000	
SATELLITE 4	487.0000	487.0000	487.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	5.67248438E+05	116.63	61.32	85.96
2	4.80329228E+05	106.86	75.19	267.08
3	6.39428596E+05	46.30	135.75	266.73
4	1.45924482E+06	39.90	142.15	266.45

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	1.16628695E+02	3.37362198E-01
2	1.06857516E+02	3.48310958E-01
3	4.63008073E+01	4.56984958E-01
4	3.98987635E+01	1.85326131E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	5.65578439E+00	5.67245980E+00
2	4.78869228E+00	4.80327010E+00
3	6.36878596E+00	6.39423511E+00
4	1.45688482E+01	1.45924291E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
8.80260494E+00	9.84695527E+01	1.89429988E-03	2.63949761E-02
2.91506135E+01	1.30456644E+02	3.09742457E-03	1.61424431E-02
4.88299590E+00	1.05093345E+02	1.72168136E-03	2.90413784E-02
2.15891863E+00	2.44780461E+02	1.67791366E-03	2.97989110E-02

VIEW FROM SPACECRAFT

Table A-13 (concl)

JUPITER CHECK OUT CASE 5

PICTURE NUMBER 361 — 0 DAYS 6 HRS 0 MIN TO ENCOUNTER — JD 2443937.942

PLANET JUPITE		SATELLITE JUPITE	
RANGE (KM)	= 5.72306385E+05	RANGE (KM)	= 1.53315945E+05
CONE (DEG)	= 155.47	CONE (DEG)	= 158.96
CLOCK (DEG)	= 261.79	CLOCK (DEG)	= 248.68
PHASE (DEG)	= 26.65	PHASE (DEG)	= 0.
DIAM (DEG)	= 14.33	DIAM (DEG)	= 0.

RESOLUTION OF PLANET
CENTER = 5.01 KM/PIXEL
LIMB = 5.68 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -1.62 DEG LAT 115.74 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	5.01 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	2.58 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	91.46 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.01 KM
NUMBER OF PIXELS SMEARED	.00180 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 27.732 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR

AT SPECIFIED LOCATION	5.0 KM/PIXEL
AT SUBSPACECRAFT POINT	5.0 KM/PIXEL
AT LIMB OF TARGET BODY	5.7 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.7775E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7775E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 88.830
DIGITAL NUMBER OF EXPOS = 227 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	361.0	361.0	361.0	95.0	
SATELLITE 1	361.0000	361.0000	361.0000	109.0000	
SATELLITE 2	361.0000	361.0000	361.0000	0.	
SATELLITE 3	361.0000	361.0000	361.0000	0.	
SATELLITE 4	361.0000	361.0000	361.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	1.53315945E+05	23.10	158.96	248.68
2	1.23328999E+06	21.68	160.43	262.33
3	1.63058411E+06	16.93	165.18	262.46
4	2.46899823E+06	25.28	156.83	264.60

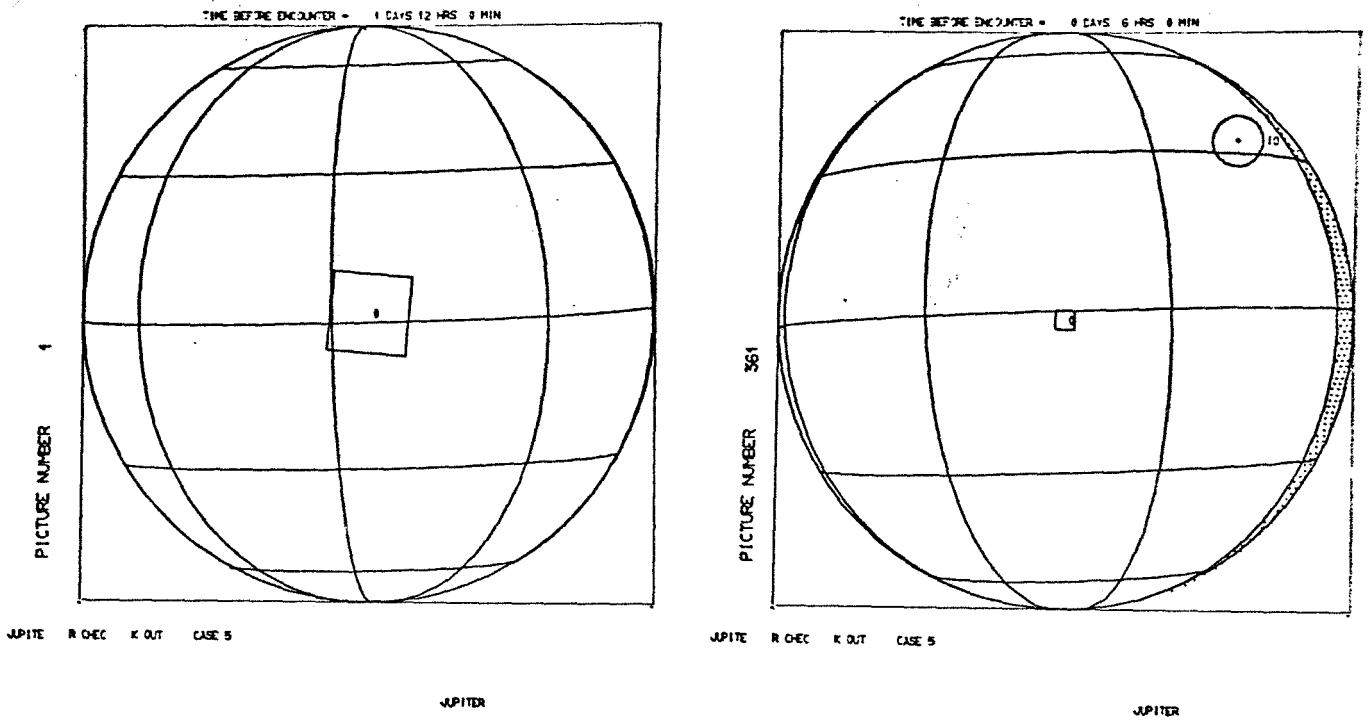
NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	2.30976149E+01	1.24821778E+00
2	2.16837591E+01	1.35656429E-01
3	1.69308482E+01	1.79204858E-01
4	2.52815548E+01	1.09532732E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	1.51645945E+00	1.53306849E+00
2	1.23182999E+01	1.23328912E+01
3	1.62803411E+01	1.63058212E+01
4	2.46663823E+01	2.46899710E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
4.65481454E+00	2.73420799E+01	1.48417413E-03	3.36887694E-02
2.69766284E+01	2.41557691E+02	2.13702820E-03	2.33969772E-02
2.22241117E+01	3.39973567E+02	2.19099601E-03	2.28206714E-02
2.26739036E+01	4.68356606E+02	1.97543990E-03	2.53108309E-02



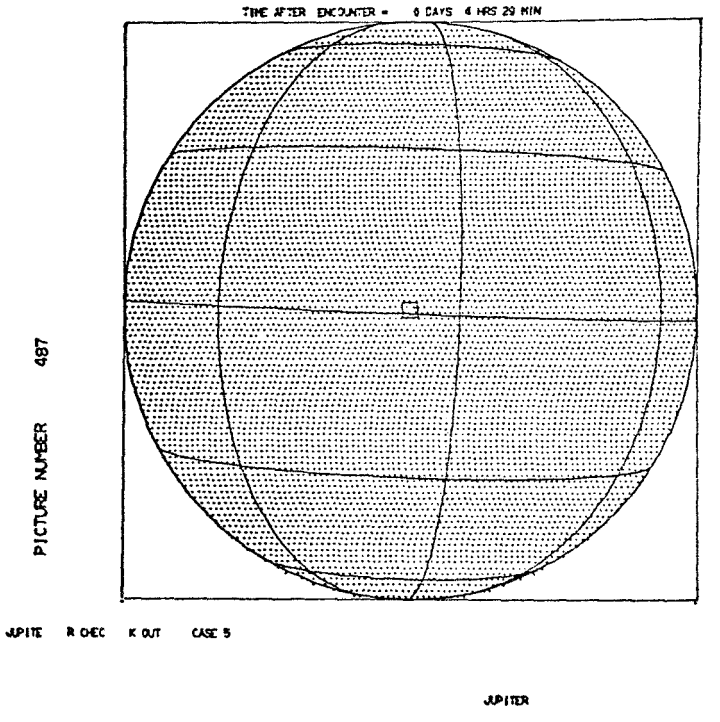
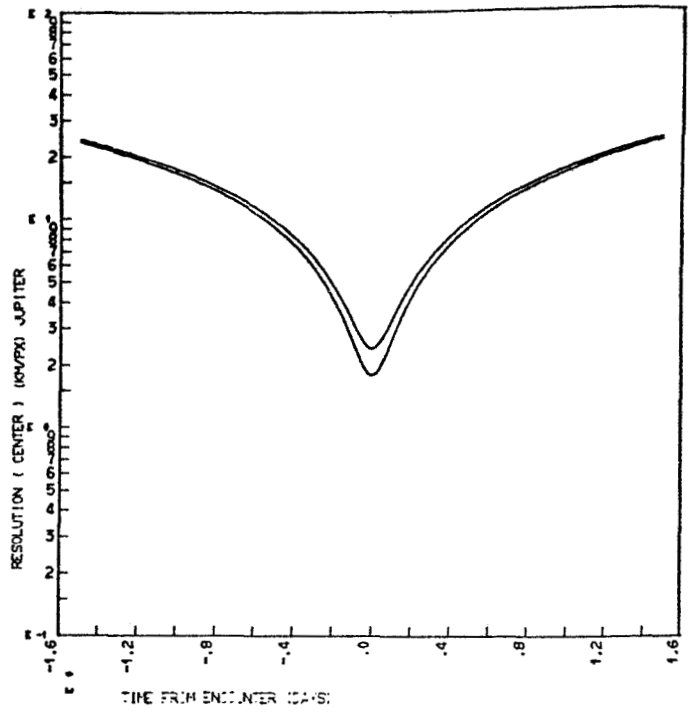
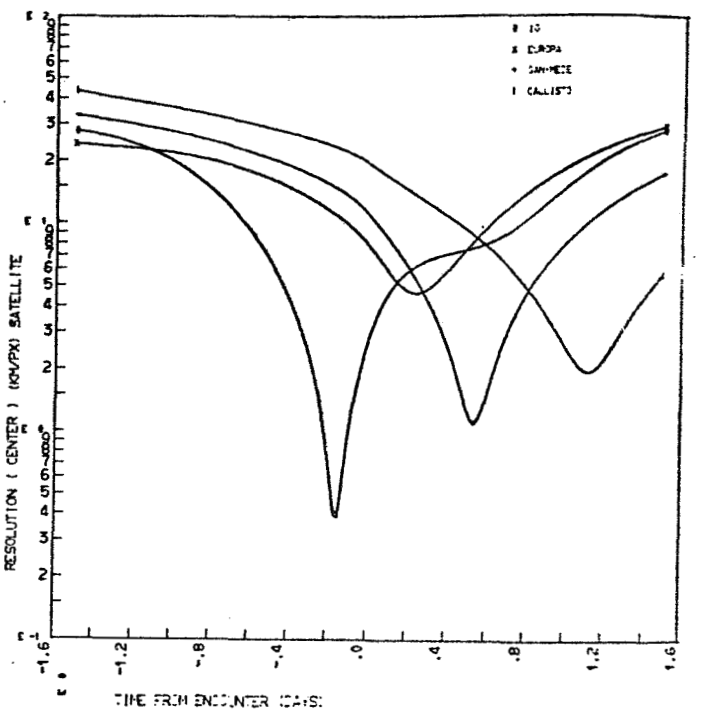
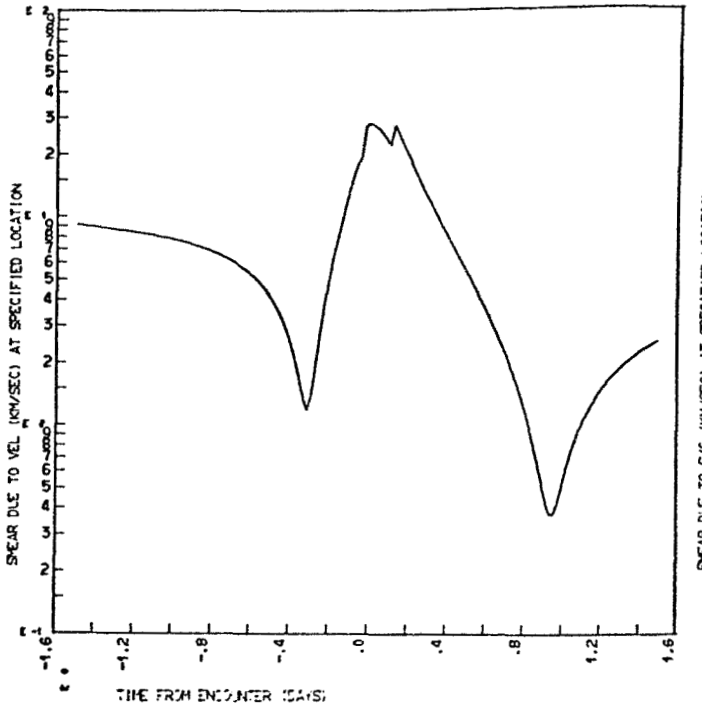


Fig. A-9 Scenes Before and After Closest Approach







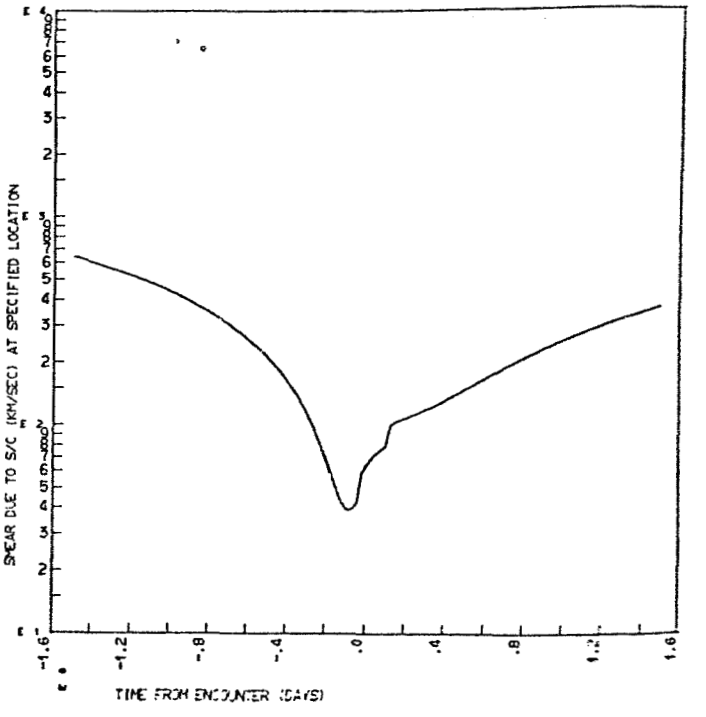
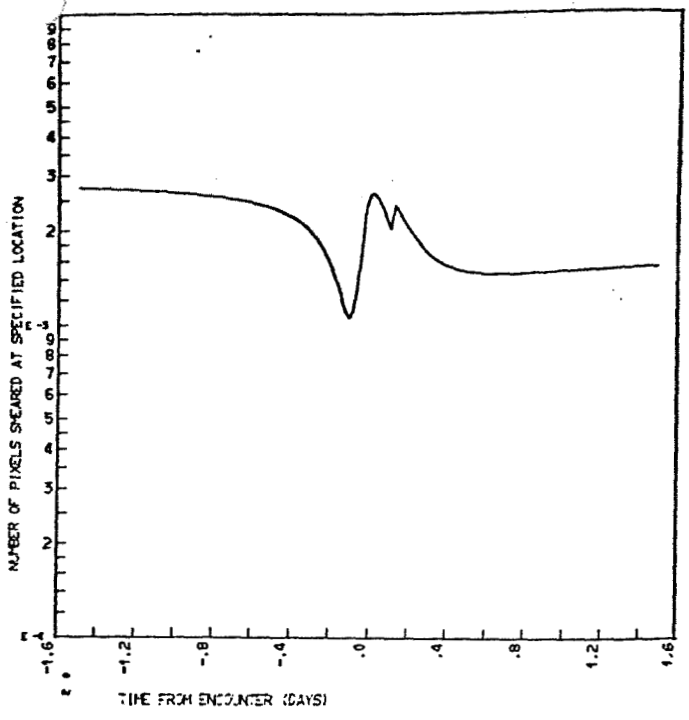
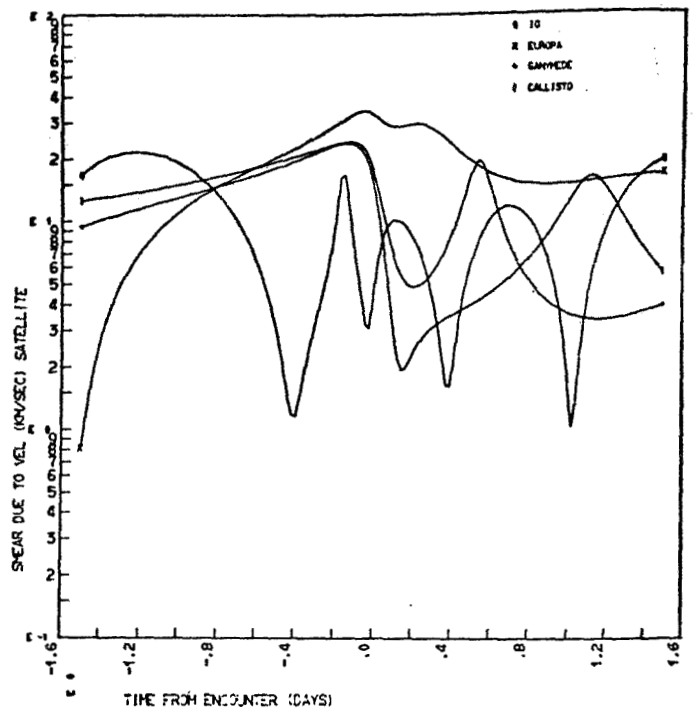
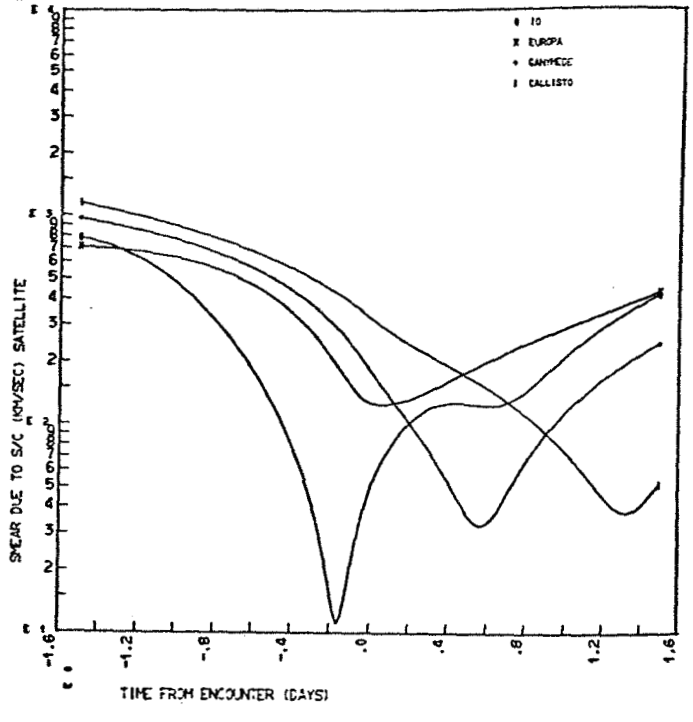


Fig. A-10 TV Summaries


NUMBER OF PIXELS SHEARED AT SPECIFIED LOCATION
TIME FROM ENCOUNTER (DAYS)


IO
EUROPA
GANYMEDE
CALLISTO
SHEAR DUE TO VEL (KM/SEC) SATELLITE
TIME FROM ENCOUNTER (DAYS)


IO
EUROPA
GANYMEDE
CALLISTO
SHEAR DUE TO S/C (KM/SEC) SATELLITE
TIME FROM ENCOUNTER (DAYS)

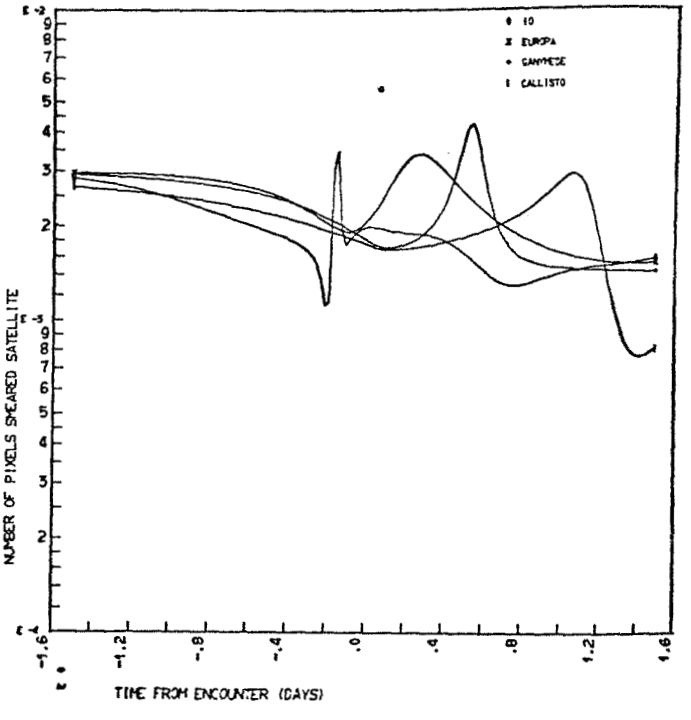
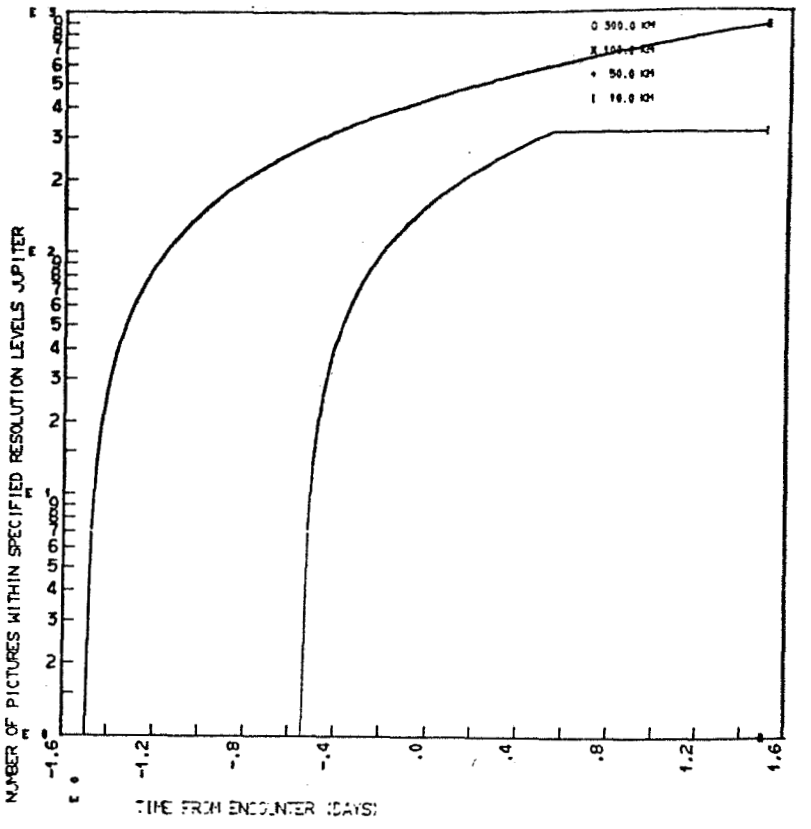

IO
EUROPA
GANYMEDE
CALLISTO
NUMBER OF PIXELS SHEARED SATELLITE
TIME FROM ENCOUNTER (DAYS)

Fig. A-10 (cont)



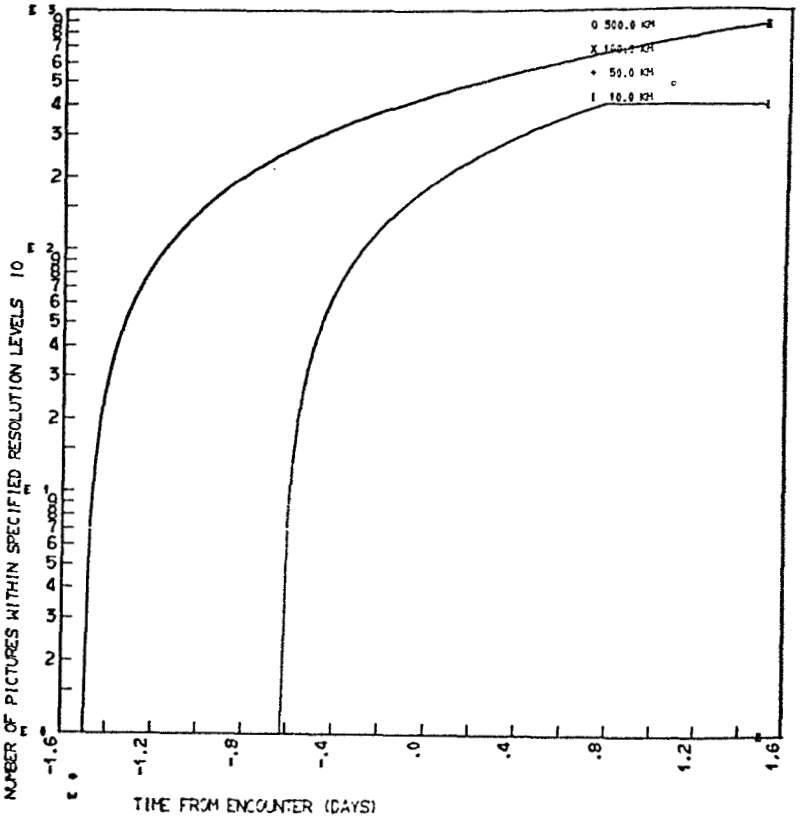


Fig. A-10 (concl)

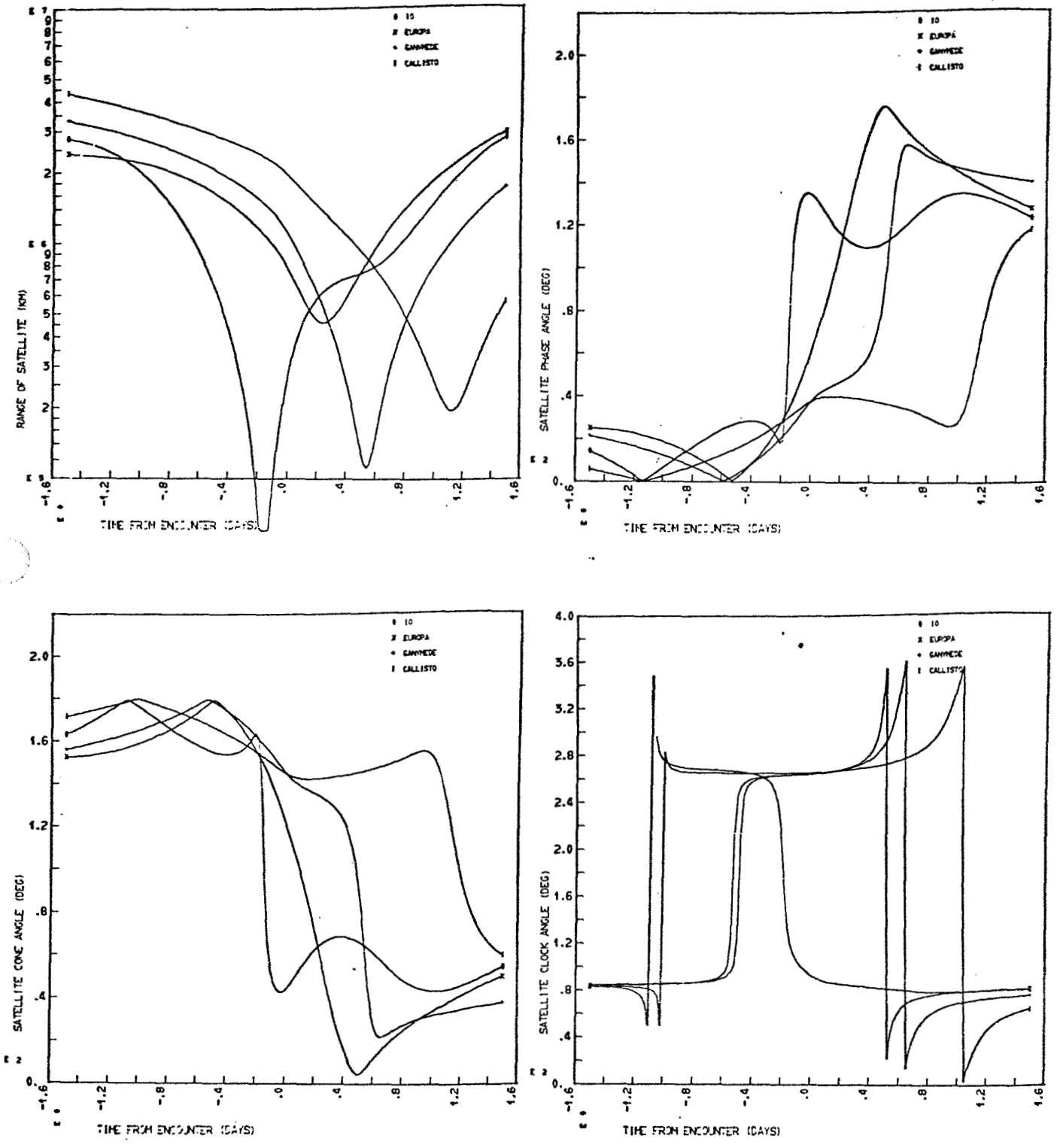
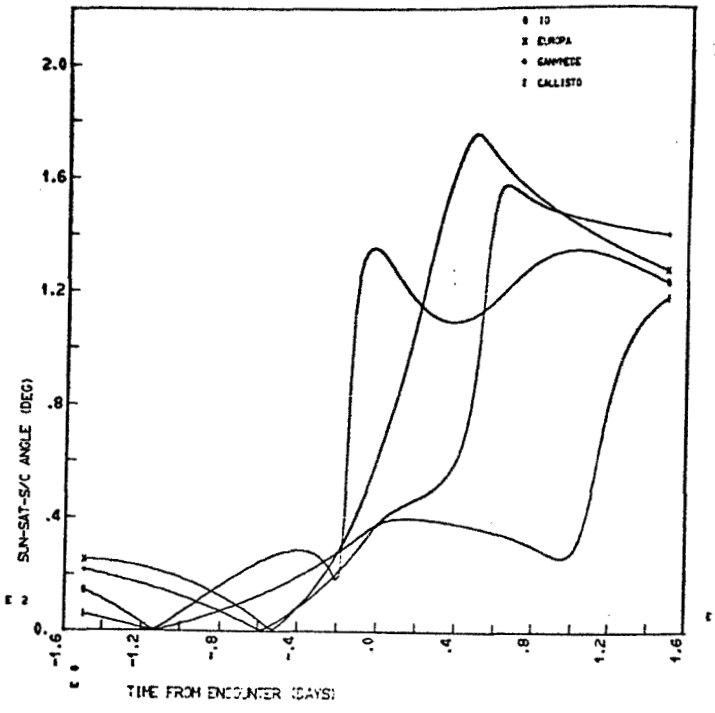
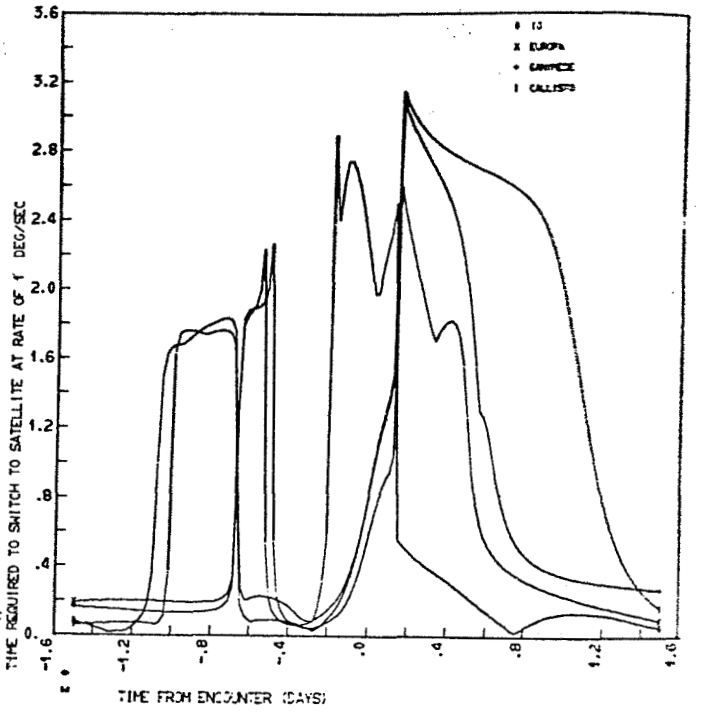


Fig. A-11 Satellite Geometry Summaries





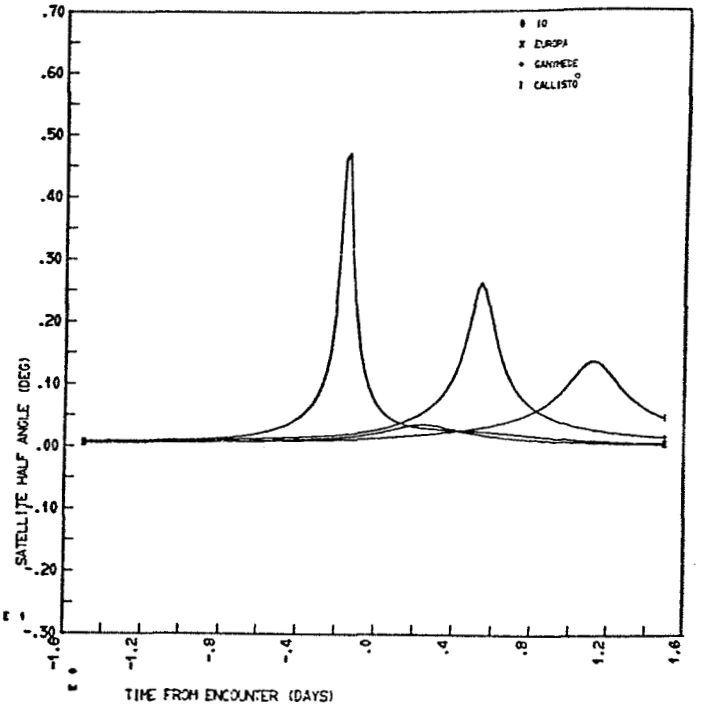


Fig. A-11 (concl)

6. Case 6

a. Input Data - The Saturn tabular input listing, for a wide-angle camera is shown in Table A-14. Table A-15 provides tabular listings of TV characteristics, planet and satellite albedos, and other values used in the imaging subroutine.

Table A-14 Case 6 Input Listing

```
SATURN CHECK OUT CASE NO 6

 2       6.0000000    PLANET
 3       6.0000000    SATEL  TITAN (VI)
 4       800801.81    DATE
 6       15.000000
 7      -141227.14    STATE1
 8       97650.653    STATE2
 9      -420838.47    STATE3
10      -20.131197    STATE4
11      -6.1481659    STATE5
12       5.3291219    STATE6
22       120.00000    INSTIDINSTRUMENT ID (TV,  WIDE ANGLE SIT)
61      -1.5000000    TSTAR TIME FROM PERIAPSIS
62       1.5000000    TSTOP TIME FROM PERIAPSIS
63       5.0000000    DTINSTPICTURE TAKING INTERVAL (MIN)
69       6.0000000    CALCSTPICTURES PER CALC STEP      30 MIN PER CALC STEP
81       3.0000000    DPLOT
82       3.0000000    DPRNT
90       1111111.0
98
```

```
SATURN CHECK OUT CASE NO 6

XZ(I) VALUES IN STORAGE

  1   0   0.                          2   1   6.0000000000E+00
  3   1   6.0000000000E+00            4   1   8.0080181250E+05
  5   0   0.                          6   1   1.5000000000E+01
  7   1  -1.4122713896E+05            8   1   9.7650652972E+04
  9   1  -4.2083846991E+05           10   1  -2.0131197330E+01
 11   1  -6.1481658560E+00           12   1   5.3291218577E+00
 13   0   0.                         14   0   0.
 15   0   3.0000000000E+00           16   0   0.
 17   0   0.                         18   0   0.
 19   0   0.                         20   0   0.
 21   0   0.                         22   1   1.2000000000E+02
 23   0   0.                         24   0  -7.1738305547E+57
 25   0  -7.1738305547E+57          26   0   0.
 27   0   0.                         28   0   0.
 29   0   0.                         30   0   0.
 31   0   0.                         32   0   0.
 33   0   0.                         34   0   0.
 35   0   0.                         36   0   0.
 37   0   0.                         38   0   0.
 39   0   0.                         40   0   0.
 41   0   0.                         42   0   0.
 43   0   0.                         44   0   0.
 45   0   0.                         46   0   0.
 47   0   0.                         48   0   0.
 49   0   0.                         50   0   0.
 51   0   0.                         52   0   0.
 53   0   0.                         54   0   0.
 55   0   0.                         56   0   0.
 57   0   0.                         58   0   0.
 59   0   0.                         60   0   0.
 61   1  -1.5000000000E+00           62   1   1.5000000000E+00
 63   1   5.0000000000E+00           64   0   0.
 65   0   0.                         66   0   0.
 67   0   0.                         68   0   0.
 69   1   6.0000000000E+00           70   0   0.
 71   0   0.                         72   0   0.
 73   0   0.                         74   0   0.
 75   0   0.                         76   0   0.
 77   0   0.                         78   0   0.
 79   0   0.                         80   0   0.
 81   1   3.0000000000E+00           82   1   3.0000000000E+00
 83   0   0.                         84   0   0.
 85   0   0.                         86   0   0.
 87   0   0.                         88   0   0.
 89   0   0.                         90   1   1.1111110000E+06
 91   0   0.                         92   0   0.
 93   0   0.                         94   0   0.
 95   0   0.                         96   0   0.
```

Table A-15 TV Characteristics, Albedos, and Imaging Values

SATURN CHECK OUT CASE NO 6

TV CHARACTERISTICS FOR SIT WIDE ANGLE CAMERA (CANO)

6	FOC LN=	2.00000000E+01	
7	DIAM =	5.00000000E+00	
8	OBSCUR=	0.	
9	TRANS =	8.50000000E-01	
10	SIZE-V=	1.60000000E+00	
11	SIZE-H=	1.60000000E+00	
12	LINES =	8.00000000E+02	
13	PIXELS=	8.00000000E+02	
14	BIT/PX=	8.00000000E+00	
15	MINEXP=	8.00000000E-06	
16	MAXEXP=	2.00000000E-03	
17	RESO-1=	3.00000000E+02	
18	RESO-2=	1.00000000E+02	
19	RESO-3=	5.00000000E+01	
20	RESO-4=	1.00000000E+01	
21	SENSOR=	1.00000000E+00	
22	B FILT=	1.00000000E+00	
23	G FILT=	1.00000000E+00	
24	R FILT=	1.00000000E+00	
25	P FILT=	-1.00000000E+00	
26	OT EXP=	1.00000000E-04	
27	OPEN =	1.00000000E-03	
28	OPEN =	1.00000000E-02	
29	T READ=	4.00000000E+01	
30	ERASET=	1.00000000E-01	
31	TSTART=	-1.50000000E+00	USER INPUT
32	TSTOP =	1.50000000E+00	USER INPUT
33	DEL T =	5.00000000E+00	USER INPUT
34	BULK =	1.00000000E+09	
35	BULK-0=	0.	
36	BITRAT=	4.74000000E+04	
37	SCI9PS=	1.00000000E+02	
38	BUFFER=	5.12000000E+06	
39	PIC/ST=	6.00000000E+00	USER INPUT
40	DEL TF=	5.00000000E+00	
41	F/STOP=	4.00000000E+00	COMPUTED VALUES
42	A BLOC=	0.	COMPUTED VALUES
43	DIF LM=	1.34200000E-05	COMPUTED VALUES
44	FOV-V =	4.58122395E+00	COMPUTED VALUES
45	FOV-H =	4.58122395E+00	COMPUTED VALUES
46	RES-C =	1.00000002E-04	COMPUTED VALUES
47	RES-V =	1.71058277E-06	COMPUTED VALUES
48	RES-H =	1.71058277E-06	COMPUTED VALUES
49	BIT/PC=	5.12000000E+06	COMPUTED VALUES
50	RR-BPS=	1.28000000E+05	COMPUTED VALUES
51	T/NUM =	4.33860916E+00	COMPUTED VALUES
52	T/NUMF=	4.33860916E+00	COMPUTED VALUES
53	OPEN =	0.	COMPUTED VALUES
54	OPEN =	0.	COMPUTED VALUES
55	OPEN =	0.	COMPUTED VALUES
56	OPEN =	0.	COMPUTED VALUES
57	OPEN =	0.	COMPUTED VALUES
58	OPEN =	0.	COMPUTED VALUES
59	OPEN =	0.	COMPUTED VALUES
60	OPEN =	0.	COMPUTED VALUES

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CANO)

PLANET 6 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	B0(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.3000	0	1.0000	5.460000E-05	0.
.2750	.0204	.2820	.0020	1.0000	1.495728E-04	2.991456E-07
.3000	.0514	.2700	.0950	1.0000	3.608280E-04	3.427866E-05
.3250	.0971	.2650	.4760	1.0000	6.690190E-04	3.184590E-04
.3500	.1093	.2690	.7620	1.0000	7.644442E-04	5.825065E-04
.3750	.1157	.2720	.9530	1.0000	8.182314E-04	7.797736E-04
.4000	.1429	.2850	.9940	1.0000	1.058339E-03	1.041947E-03
.4250	.1693	.3150	1.0000	1.0000	1.386567E-03	1.386567E-03
.4500	.2006	.3640	.9840	1.0000	1.898478E-03	1.868103E-03
.4750	.2044	.3850	.9530	1.0000	2.046044E-03	1.949880E-03
.5000	.1942	.4060	.7940	1.0000	2.049975E-03	1.627680E-03
.5250	.1852	.4300	.7620	1.0000	2.070536E-03	1.577748E-03
.5500	.1725	.4500	.6820	1.0000	2.018250E-03	1.376446E-03
.5750	.1719	.4600	.5550	1.0000	2.055924E-03	1.141039E-03
.6000	.1666	.4650	.4760	1.0000	2.014194E-03	9.587563E-04
.6250	.1586	.4690	.4450	1.0000	1.933968E-03	8.606159E-04
.6500	.1511	.4700	.3600	1.0000	1.846442E-03	6.647191E-04
.6750	.1442	.4690	.2540	1.0000	1.758375E-03	4.466272E-04
.7000	.1369	.4580	.2060	1.0000	1.630205E-03	3.358223E-04
.7250	.1302	.4400	.1590	1.0000	1.489438E-03	2.368286E-04
.7500	.1235	.4100	.0950	1.0000	1.316510E-03	1.250644E-04
.7750	.1171	.3800	.0400	1.0000	1.156948E-03	4.627792E-05
.8000	.1107	.3550	.0240	1.0000	1.021761E-03	2.452226E-05
.8250	.1048	.3300	.0100	1.0000	8.991640E-04	8.991640E-06
.8500	.0988	.3150	.0030	1.0000	8.091720E-04	2.427516E-06
.8750	.0939	.3000	.0220	1.0000	7.324200E-04	1.611324E-05
.9000	.0869	.2820	0	1.0000	6.518148E-04	0.
.9250	.0862	.2640	0	1.0000	5.916768E-04	0.
.9500	.0835	.2460	0	1.0000	5.340660E-04	0.
.9750	.0791	.2320	0	1.0000	4.771312E-04	0.
1.0000	.0746	.2220	0	1.0000	4.305912E-04	0.

Table A-15 (cont)

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 1 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 2 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

Table A-15 (cont)

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 3 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914500E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 4 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

Table A-15 (cont)

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 5 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.409625E-05	0.
.2750	.0204	.0500	.0020	1.0000	4.564500E-05	9.129000E-08
.3000	.0514	.0550	.0950	1.0000	1.265082E-04	1.201828E-05
.3250	.0971	.0600	.4760	1.0000	2.607135E-04	1.240996E-04
.3500	.1093	.0650	.7620	1.0000	3.179264E-04	2.422599E-04
.3750	.1157	.0700	.9530	1.0000	3.624302E-04	3.453960E-04
.4000	.1429	.0750	.9840	1.0000	4.796081E-04	4.719344E-04
.4250	.1693	.0800	1.0000	1.0000	6.060940E-04	6.060940E-04
.4500	.2006	.0850	.9840	1.0000	7.630322E-04	7.508237E-04
.4750	.2044	.1000	.9530	1.0000	9.146900E-04	8.716996E-04
.5000	.1942	.1050	.7940	1.0000	9.124972E-04	7.245228E-04
.5250	.1852	.1130	.7620	1.0000	9.365101E-04	7.136207E-04
.5500	.1725	.1200	.6820	1.0000	9.263250E-04	6.317536E-04
.5750	.1719	.1250	.5550	1.0000	9.615656E-04	5.336689E-04
.6000	.1666	.1300	.4760	1.0000	9.691955E-04	4.613371E-04
.6250	.1586	.1350	.4450	1.0000	9.581422E-04	4.263733E-04
.6500	.1511	.1450	.3600	1.0000	9.504501E-04	3.529620E-04
.6750	.1442	.1550	.2540	1.0000	1.000207E-03	2.540526E-04
.7000	.1369	.1650	.2060	1.0000	1.010835E-03	2.082321E-04
.7250	.1302	.1700	.1590	1.0000	9.904965E-04	1.574889E-04
.7500	.1235	.1750	.0950	1.0000	9.671594E-04	9.188014E-05
.7750	.1171	.1800	.0400	1.0000	9.432405E-04	3.772962E-05
.8000	.1107	.1850	.0240	1.0000	9.164576E-04	2.199498E-05
.8250	.1048	.2900	.0100	1.0000	1.360042E-03	1.360042E-05
.8500	.0988	.2950	.0030	1.0000	1.304283E-03	3.912850E-06
.8750	.0939	.2000	.0220	1.0000	8.404050E-04	1.848891E-05
.9000	.0889	.2000	0	1.0000	7.956550E-04	0.
.9250	.0862	.2000	0	1.0000	7.714900E-04	0.
.9500	.0835	.2050	0	1.0000	7.660081E-04	0.
.9750	.0791	.2080	0	1.0000	7.362628E-04	0.
1.0000	.0746	.2100	0	1.0000	7.010535E-04	0.

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 6 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.031525E-05	0.
.2750	.0204	.0500	.0020	1.0000	3.340500E-05	6.681000E-08
.3000	.0514	.0550	.0950	1.0000	9.258425E-05	8.795504E-06
.3250	.0971	.0600	.4760	1.0000	1.908015E-04	9.082151E-05
.3500	.1093	.0650	.7620	1.0000	2.326724E-04	1.772963E-04
.3750	.1157	.0700	.9530	1.0000	2.652422E-04	2.527759E-04
.4000	.1429	.0750	.9840	1.0000	3.509981E-04	3.453822E-04
.4250	.1693	.0800	1.0000	1.0000	4.435660E-04	4.435660E-04
.4500	.2006	.0850	.9840	1.0000	5.584202E-04	5.494855E-04
.4750	.2044	.1000	.9530	1.0000	6.694100E-04	6.379477E-04
.5000	.1942	.1050	.7940	1.0000	6.678052E-04	5.302374E-04
.5250	.1852	.1130	.7620	1.0000	6.853789E-04	5.222587E-04
.5500	.1725	.1200	.6820	1.0000	6.779250E-04	4.623449E-04
.5750	.1719	.1250	.5550	1.0000	7.037156E-04	3.905522E-04
.6000	.1666	.1300	.4760	1.0000	7.092995E-04	3.376266E-04
.6250	.1586	.1350	.4450	1.0000	7.012102E-04	3.120386E-04
.6500	.1511	.1450	.3600	1.0000	7.175361E-04	2.583130E-04
.6750	.1442	.1550	.2540	1.0000	7.319952E-04	1.859268E-04
.7000	.1369	.1650	.2060	1.0000	7.397734E-04	1.523933E-04
.7250	.1302	.1700	.1590	1.0000	7.248885E-04	1.152573E-04
.7500	.1235	.1750	.0950	1.0000	7.078094E-04	6.724189E-05
.7750	.1171	.1800	.0400	1.0000	6.903045E-04	2.761218E-05
.8000	.1107	.1850	.0240	1.0000	6.707036E-04	1.609689E-05
.8250	.1048	.2900	.0100	1.0000	9.953380E-04	9.953380E-06
.8500	.0988	.2950	.0030	1.0000	9.545315E-04	2.863594E-06
.8750	.0939	.2000	.0220	1.0000	6.150450E-04	1.353099E-05
.9000	.0889	.2000	0	1.0000	5.822950E-04	0.
.9250	.0862	.2000	0	1.0000	5.646100E-04	0.
.9500	.0835	.2050	0	1.0000	5.605981E-04	0.
.9750	.0791	.2080	0	1.0000	5.388232E-04	0.
1.0000	.0746	.2100	0	1.0000	5.130615E-04	0.

Table A-15 (cont)

SATURN CHECK OUT CASE NO 6

TV ENERGY DATA FOR SIT WIDE ANGLE CAMERA (CAND)

SATELLITE 7 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	2.953125E-05	0.
.2750	.0204	.0500	.0020	1.0000	9.562500E-05	1.912500E-07
.3000	.0514	.0550	.0950	1.0000	2.650312E-04	2.517797E-05
.3250	.0971	.0600	.4760	1.0000	5.461875E-04	2.599852E-04
.3500	.1093	.0650	.7620	1.0000	6.660469E-04	5.075277E-04
.3750	.1157	.0700	.9530	1.0000	7.592812E-04	7.235950E-04
.4000	.1429	.0750	.9840	1.0000	1.004766E-03	9.886894E-04
.4250	.1693	.0800	1.0000	1.0000	1.269750E-03	1.269750E-03
.4500	.2006	.0850	.9840	1.0000	1.598531E-03	1.572955E-03
.4750	.2044	.1000	.9530	1.0000	1.916250E-03	1.826186E-03
.5000	.1942	.1050	.7940	1.0000	1.911656E-03	1.517855E-03
.5250	.1852	.1130	.7620	1.0000	1.961962E-03	1.495015E-03
.5500	.1725	.1200	.6820	1.0000	1.940625E-03	1.323506E-03
.5750	.1719	.1250	.5550	1.0000	2.014453E-03	1.118021E-03
.6000	.1666	.1300	.4760	1.0000	2.030437E-03	9.664882E-04
.6250	.1586	.1350	.4450	1.0000	2.007281E-03	8.932402E-04
.6500	.1511	.1450	.3600	1.0000	2.054016E-03	7.394456E-04
.6750	.1442	.1550	.2540	1.0000	2.095406E-03	5.322332E-04
.7000	.1369	.1650	.2060	1.0000	2.117672E-03	4.362404E-04
.7250	.1302	.1700	.1590	1.0000	2.075062E-03	3.299349E-04
.7500	.1235	.1750	.0950	1.0000	2.026172E-03	1.924863E-04
.7750	.1171	.1800	.0400	1.0000	1.976062E-03	7.904250E-05
.8000	.1107	.1850	.0240	1.0000	1.919953E-03	4.607887E-05
.8250	.1048	.2900	.0100	1.0000	2.849250E-03	2.849250E-05
.8500	.0988	.2950	.0030	1.0000	2.732437E-03	8.197312E-06
.8750	.0939	.2000	.0220	1.0000	1.760625E-03	3.873375E-05
.9000	.0889	.2000	0	1.0000	1.666875E-03	0.
.9250	.0862	.2000	0	1.0000	1.616250E-03	0.
.9500	.0635	.2050	0	1.0000	1.604766E-03	0.
.9750	.0791	.2080	0	1.0000	1.542450E-03	0.
1.0000	.0746	.2100	0	1.0000	1.468687E-03	0.

SATURN CHECK OUT CASE NO 6

COMPUTATIONS FOR MINIMUM PICTURE TAKING INTERVAL

PICTURE START TIME (DAYS) = -1.50000000E+00
PICTURE STOP TIME (DAYS) = 1.50000000E+00
DELTA T REQUESTED (SEC) = 3.00000000E+02
FRAME READ TIME (SEC) = 4.00000000E+01
FRAME READ RATE (BPS) = 1.28000000E+05

BULK DATA STORAGE CAPACITY (BITS) = 1.00000000E+09
PICTURE SIZE (BITS) = 5.12000000E+06
BULK DATA STORAGE CAPACITY (PICS) = 1.95312500E+02
BULK CONTENTS IN USE (BITS) = 0.
BUFFER STORAGE CAPACITY (BITS) = 5.12000000E+06

DATA TRANSMISSION RATE (BPS) = 4.74000000E+04
RATE FROM OTHER INSTRUMENTS (BPS) = 1.00000000E+02
REAL TIME PICTURE RATE (BPS) = 4.73000000E+04

MINIMUM PICTURE INTERVAL (SEC) = 1.08245243E+02
MAXIMUM PICTURE RATE (PICS/HR) = 3.32578125E+01
MAXIMUM PICTURE RATE (PIC/DAY) = 7.98187500E+02
MAXIMUM NUMBER OF PICTURES = 2394
ACTUAL PICTURE RATE (PIC/DAY) = 2.88000000E+02
ACTUAL NUMBER OF PICTURES = 864

PERIAPSIS STATE VECTOR
-1.41227165E+05 9.76506451E+04 -4.20838463E+05
-2.01311973E+01 -6.14816591E+00 5.32912208E+00
VIEW FROM INPUT VIEWPOINT

Table A-15 (cont)

SATURN CHECK OUT CASE NO 6

PLOT INTERVAL = 3 CALC STEPS = 90.00MINUTES
PRNT INTERVAL = 3CALC STEPS = 90.00 MINUTES

TIME INTERVAL FOR CALCULATIONS = 30.00 MINUTES

PICTURE	CALC	TIME (DAYS)	TIME (HRS)	TIME (MIN)
1	1	-1.5000000E+00	-3.6000000E+01	-2.1600000E+03
7	2	-1.4791667E+00	-3.5500000E+01	-2.1300000E+03
13	3	-1.4583333E+00	-3.5000000E+01	-2.1000000E+03
19	4	-1.4375000E+00	-3.4500000E+01	-2.0700000E+03
25	5	-1.4166667E+00	-3.4000000E+01	-2.0400000E+03
31	6	-1.3958333E+00	-3.3500000E+01	-2.0100000E+03
37	7	-1.3750000E+00	-3.3000000E+01	-1.9800000E+03
43	8	-1.3541667E+00	-3.2500000E+01	-1.9500000E+03
49	9	-1.3333333E+00	-3.2000000E+01	-1.9200000E+03
55	10	-1.3125000E+00	-3.1500000E+01	-1.8900000E+03
61	11	-1.2916667E+00	-3.1000000E+01	-1.8600000E+03
67	12	-1.2708333E+00	-3.0500000E+01	-1.8300000E+03
73	13	-1.2500000E+00	-3.0000000E+01	-1.8000000E+03
79	14	-1.2291667E+00	-2.9500000E+01	-1.7700000E+03
85	15	-1.2083333E+00	-2.9000000E+01	-1.7400000E+03
91	16	-1.1875000E+00	-2.8500000E+01	-1.7100000E+03
97	17	-1.1666667E+00	-2.8000000E+01	-1.6800000E+03
103	18	-1.1458333E+00	-2.7500000E+01	-1.6500000E+03
109	19	-1.1250000E+00	-2.7000000E+01	-1.6200000E+03
115	20	-1.1041667E+00	-2.6500000E+01	-1.5900000E+03
121	21	-1.0833333E+00	-2.6000000E+01	-1.5600000E+03
127	22	-1.0625000E+00	-2.5500000E+01	-1.5300000E+03
133	23	-1.0416667E+00	-2.5000000E+01	-1.5000000E+03
139	24	-1.0208333E+00	-2.4500000E+01	-1.4700000E+03
145	25	-1.0000000E+00	-2.4000000E+01	-1.4400000E+03
151	26	-9.7916667E-01	-2.3500000E+01	-1.4100000E+03
157	27	-9.5833333E-01	-2.3000000E+01	-1.3800000E+03
163	28	-9.3750000E-01	-2.2500000E+01	-1.3500000E+03
169	29	-9.1666667E-01	-2.2000000E+01	-1.3200000E+03
175	30	-8.9583333E-01	-2.1500000E+01	-1.2900000E+03
181	31	-8.7500000E-01	-2.1000000E+01	-1.2600000E+03
187	32	-8.5416667E-01	-2.0500000E+01	-1.2300000E+03
193	33	-8.3333333E-01	-2.0000000E+01	-1.2000000E+03
199	34	-8.1250000E-01	-1.9500000E+01	-1.1700000E+03
205	35	-7.9166667E-01	-1.9000000E+01	-1.1400000E+03
211	36	-7.7083333E-01	-1.8500000E+01	-1.1100000E+03
217	37	-7.5000000E-01	-1.8000000E+01	-1.0800000E+03
223	38	-7.2916667E-01	-1.7500000E+01	-1.0500000E+03
229	39	-7.0833333E-01	-1.7000000E+01	-1.0200000E+03
235	40	-6.8750000E-01	-1.6500000E+01	-9.9000000E+02
241	41	-6.6666667E-01	-1.6000000E+01	-9.6000000E+02
247	42	-6.4583333E-01	-1.5500000E+01	-9.3000000E+02
253	43	-6.2500000E-01	-1.5000000E+01	-9.0000000E+02
259	44	-6.0416667E-01	-1.4500000E+01	-8.7000000E+02
265	45	-5.8333333E-01	-1.4000000E+01	-8.4000000E+02
271	46	-5.6250000E-01	-1.3500000E+01	-8.1000000E+02
277	47	-5.4166667E-01	-1.3000000E+01	-7.8000000E+02
283	48	-5.2083333E-01	-1.2500000E+01	-7.5000000E+02
289	49	-5.0000000E-01	-1.2000000E+01	-7.2000000E+02
295	50	-4.7916667E-01	-1.1500000E+01	-6.9000000E+02
301	51	-4.5833333E-01	-1.1000000E+01	-6.6000000E+02
307	52	-4.3750000E-01	-1.0500000E+01	-6.3000000E+02
313	53	-4.1666667E-01	-1.0000000E+01	-6.0000000E+02
319	54	-3.9583333E-01	-9.5000000E+00	-5.7000000E+02
325	55	-3.7500000E-01	-9.0000000E+00	-5.4000000E+02
331	56	-3.5416667E-01	-8.5000000E+00	-5.1000000E+02
337	57	-3.3333333E-01	-8.0000000E+00	-4.8000000E+02
343	58	-3.1250000E-01	-7.5000000E+00	-4.5000000E+02
349	59	-2.9166667E-01	-7.0000000E+00	-4.2000000E+02
355	60	-2.7083333E-01	-6.5000000E+00	-3.9000000E+02
361	61	-2.5000000E-01	-6.0000000E+00	-3.6000000E+02
367	62	-2.2916667E-01	-5.5000000E+00	-3.3000000E+02
373	63	-2.0833333E-01	-5.0000000E+00	-3.0000000E+02
379	64	-1.8750000E-01	-4.5000000E+00	-2.7000000E+02
385	65	-1.6666667E-01	-4.0000000E+00	-2.4000000E+02
391	66	-1.4583333E-01	-3.5000000E+00	-2.1000000E+02
397	67	-1.2500000E-01	-3.0000000E+00	-1.8000000E+02
403	68	-1.0416667E-01	-2.5000000E+00	-1.5000000E+02
409	69	-8.3333333E-02	-2.0000000E+00	-1.2000000E+02
415	70	-6.2500000E-02	-1.5000000E+00	-9.0000000E+01
421	71	-4.1666667E-02	-1.0000000E+00	-6.0000000E+01
427	72	-2.0833333E-02	-5.0000000E-01	-3.0000000E+01
433	73	-7.1054274E-15	-1.7053026E-13	-1.0231815E-11
439	74	2.0833333E-02	5.0000000E-01	3.0000000E+01
445	75	4.1666667E-02	1.0000000E+00	6.0000000E+01
451	76	6.2500000E-02	1.5000000E+00	9.0000000E+01
457	77	8.3333333E-02	2.0000000E+00	1.2000000E+02
463	78	1.0416667E-01	2.5000000E+00	1.5000000E+02
469	79	1.2500000E-01	3.0000000E+00	1.8000000E+02
475	80	1.4583333E-01	3.5000000E+00	2.1000000E+02
481	81	1.6666667E-01	4.0000000E+00	2.4000000E+02
487	82	1.8750000E-01	4.5000000E+00	2.7000000E+02
493	83	2.0833333E-01	5.0000000E+00	3.0000000E+02
499	84	2.2916667E-01	5.5000000E+00	3.3000000E+02

Table A-15 (concl)

505	85	2.5000000E-01	6.0000000E+00	3.6000000E+02
511	86	2.7083333E-01	6.5000000E+00	3.9000000E+02
517	87	2.9166667E-01	7.0000000E+00	4.2000000E+02
523	88	3.1250000E-01	7.5000000E+00	4.5000000E+02
529	89	3.3333333E-01	8.0000000E+00	4.8000000E+02
535	90	3.5416667E-01	8.5000000E+00	5.1000000E+02
541	91	3.7500000E-01	9.0000000E+00	5.4000000E+02
547	92	3.9583333E-01	9.5000000E+00	5.7000000E+02
553	93	4.1666667E-01	1.0000000E+01	6.0000000E+02
559	94	4.3750000E-01	1.0500000E+01	6.3000000E+02
565	95	4.5833333E-01	1.1000000E+01	6.6000000E+02
571	96	4.7916667E-01	1.1500000E+01	6.9000000E+02
577	97	5.0000000E-01	1.2000000E+01	7.2000000E+02
583	98	5.2083333E-01	1.2500000E+01	7.5000000E+02
589	99	5.4166667E-01	1.3000000E+01	7.8000000E+02
595	100	5.6250000E-01	1.3500000E+01	8.1000000E+02
601	101	5.8333333E-01	1.4000000E+01	8.4000000E+02
607	102	6.0416667E-01	1.4500000E+01	8.7000000E+02
613	103	6.2500000E-01	1.5000000E+01	9.0000000E+02
619	104	6.4583333E-01	1.5500000E+01	9.3000000E+02
625	105	6.6666667E-01	1.6000000E+01	9.6000000E+02
631	106	6.8750000E-01	1.6500000E+01	9.9000000E+02
637	107	7.0833333E-01	1.7000000E+01	1.0200000E+03
643	108	7.2916667E-01	1.7500000E+01	1.0500000E+03
649	109	7.5000000E-01	1.8000000E+01	1.0800000E+03
655	110	7.7083333E-01	1.8500000E+01	1.1100000E+03
661	111	7.9166667E-01	1.9000000E+01	1.1400000E+03
667	112	8.1250000E-01	1.9500000E+01	1.1700000E+03
673	113	8.3333333E-01	2.0000000E+01	1.2000000E+03
679	114	8.5416667E-01	2.0500000E+01	1.2300000E+03
685	115	8.7500000E-01	2.1000000E+01	1.2600000E+03
691	116	8.9583333E-01	2.1500000E+01	1.2900000E+03
697	117	9.1666667E-01	2.2000000E+01	1.3200000E+03
703	118	9.3750000E-01	2.2500000E+01	1.3500000E+03
709	119	9.5833333E-01	2.3000000E+01	1.3800000E+03
715	120	9.7916667E-01	2.3500000E+01	1.4100000E+03
721	121	1.0000000E+00	2.4000000E+01	1.4400000E+03
727	122	1.0208333E+00	2.4500000E+01	1.4700000E+03
733	123	1.0416667E+00	2.5000000E+01	1.5000000E+03
739	124	1.0625000E+00	2.5500000E+01	1.5300000E+03
745	125	1.0833333E+00	2.6000000E+01	1.5600000E+03
751	126	1.1041667E+00	2.6500000E+01	1.5900000E+03
757	127	1.1250000E+00	2.7000000E+01	1.6200000E+03
763	128	1.1458333E+00	2.7500000E+01	1.6500000E+03
769	129	1.1666667E+00	2.8000000E+01	1.6800000E+03
775	130	1.1875000E+00	2.8500000E+01	1.7100000E+03
781	131	1.2083333E+00	2.9000000E+01	1.7400000E+03
787	132	1.2291667E+00	2.9500000E+01	1.7700000E+03
793	133	1.2500000E+00	3.0000000E+01	1.8000000E+03
799	134	1.2708333E+00	3.0500000E+01	1.8300000E+03
805	135	1.2916667E+00	3.1000000E+01	1.8600000E+03
811	136	1.3125000E+00	3.1500000E+01	1.8900000E+03
817	137	1.3333333E+00	3.2000000E+01	1.9200000E+03
823	138	1.3541667E+00	3.2500000E+01	1.9500000E+03
829	139	1.3750000E+00	3.3000000E+01	1.9800000E+03
835	140	1.3958333E+00	3.3500000E+01	2.0100000E+03
841	141	1.4166667E+00	3.4000000E+01	2.0400000E+03
847	142	1.4375000E+00	3.4500000E+01	2.0700000E+03
853	143	1.4583333E+00	3.5000000E+01	2.1000000E+03
859	144	1.4791667E+00	3.5500000E+01	2.1300000E+03
865	145	1.5000000E+00	3.6000000E+01	2.1600000E+03

```
     SATURN CHECK OUT CASE NO 6
SIT WIDE ANGLE CAMERA    (CAND)

 EXPOSURE TOO HIGH   3.258E-03 (ERGS/CM**2)
 EXPOSURE TIME REDUCED TO  5.221E-05 SEC
 EXPOSURE IS  1.701E-03 (ERG/CM**2)
     CHG    1
 EXPOSURE TIME SET TO 0.1 MILLISEC
 REQUIRED FILTER FACTOR IS  1.915E+00
     CHG    1
 VIEW FROM SPACECRAFT
```

b. Output Data - The tabular output is given in Table A-16 for select frames before, and after, closest approach.

The graphic output consists of the geometry of the frames mentioned above (Fig. A-12), an overview of closest approach (Fig. A-13), summary cone and clock plots (Fig. A-14), and a complete set of analysis frames (Fig. A-15 and A-16).

Table A-16 Case 6 Tabular Output

```
SATURN CHECK OUT CASE NO 6


PICTURE NUMBER    37                    -1 DAYS  9 HRS  8 MIN TO ENCOUNTER          JD  2444451.937


PLANET SATURN                           SATELLITE  RHEA
RANGE (KM)   = 2.28133755E+06           RANGE (KM)  = 2.53819693E+06
CONE  (DEG) = 153.10                    CONE  (DEG) = 164.07
CLOCK (DEG) = 225.00                    CLOCK (DEG) = 222.89
PHASE (DEG) =  23.11                    PHASE (DEG) =  12.35
DIAM  (DEG) =   3.03                    DIAM  (DEG) =    .03


RESOLUTION OF PLANET
CENTER =   222.09 KM/PIXEL
LIMB   =   228.05 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN          (PICTURE CENTERED AT  -1.23 DEG LAT  231.64 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =   222.09 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES      8.09 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES     313.52 KM/SEC
OBJECT MOTION FROM ALL SOURCES        .03 KM
NUMBER OF PIXELS SMEARED           .00014 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR  349.985 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION      222.1 KM/PIXEL
 AT SUBSPACECRAFT POINT     222.1 KM/PIXEL
 AT LIMB OF TARGET BODY     228.1 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA   (CANO) =     .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 1.7143E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.7143E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 85.660
 DIGITAL NUMBER OF EXPOS  = 219 (OF 256 LEVELS)
 ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0           10.0          KM/PIXEL

 PLANET               37.0            0.             0.             0.
 SATELLITE 1          37.0000         37.0000        37.0000        37.0000
 SATELLITE 2          37.0000          0.             0.             0.
 SATELLITE 3          37.0000          0.             0.             0.
 SATELLITE 4          37.0000          0.             0.             0.
 SATELLITE 5          37.0000          0.             0.             0.
 SATELLITE 6          37.0000          0.             0.             0.
 SATELLITE 7           0.              0.             0.             0.


      SATELLITE DATA

        NUM     RANGE (KM)          PHASE (DEG)    CONE (DEG)     CLOCK (DEG)

         1      0.                   0.             0.             0.
         2      2.43905148E+06      20.61          155.63         224.86
         3      2.23830930E+06      17.30          159.00         223.88
         4      2.57570823E+06      23.36          152.83         225.49
         5      2.11313188E+06      14.52          161.87         222.86
         6      2.53819693E+06      12.35          164.07         222.89
         7      3.51807200E+06      20.54          155.66         225.71

        NUM       EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

         1        0.                                0.
         2        2.06100867E+01                    1.19804144E-02
         3        1.73015552E+01                    1.63325580E-02
         4        2.33643558E+01                    2.26895635E-02
         5        1.45153547E+01                    2.41315956E-02
         6        1.23509508E+01                    3.16027851E-02
         7        2.05350039E+01                    7.94763230E-02

      RESOLUTION (KM/PIX) DATA FOR SATELLITES
        NUM   RES ALONG RADIUS VECTOR            RES AT SATELLITE LIMB

         1        0.                                0.
         2        2.43879652E+02                    2.43905151E+02
         3        2.23798933E+02                    2.23830931E+02
         4        2.57519825E+02                    2.57570823E+02
         5        2.11268692E+02                    2.11313187E+02
         6        2.53749698E+02                    2.53819688E+02
         7        3.51563206E+02                    3.51807121E+02

      SMEAR DATA FOR SATELLITES
      SMEAR DUE TO        SMEAR DUE TO          NUMBER OF          TIME TO SMEAR
      VEL (KM/SEC)        S/C (KM/SEC)        PIXELS SMEARED       1/2 PIXEL (SEC)

       0.                  0.                  0.                  0.
       1.43468796E+01      3.72675942E+02      1.51878327E-04      3.29210895E-01
       3.04159664E+00      3.75876440E+02      1.56612523E-04      3.00097490E-01
       1.46226746E+01      3.60324727E+02      1.39256303E-04      3.59024393E-01
       4.76103655E+00      3.81034637E+02      1.78861974E-04      2.79545163E-01
       5.17315803E+00      4.80976805E+02      1.88461648E-04      2.65305963E-01
       8.14138711E+00      5.38191636E+02      1.52390088E-04      3.28105328E-01
  VIEW FROM SPACECRAFT
```

Table A-16 (cont)

SATURN CHECK OUT CASE NO 6

PICTURE NUMBER 289 8 DAYS 12 HRS 0 MIN TO ENCOUNTER JD 2444452.812

PLANET SATURN		SATELLITE RHEA	
RANGE (KM)	= 9.51764992E+05	RANGE (KM)	= 1.45998684E+06
CONE (DEG)	= 136.89	CONE (DEG)	= 142.10
CLOCK (DEG)	= 204.49	CLOCK (DEG)	= 211.32
PHASE (DEG)	= 40.40	PHASE (DEG)	= 34.81
DIAM (DEG)	= 7.28	DIAM (DEG)	= .05

RESOLUTION OF PLANET
CENTER = 89.14 KM/PIXEL
LIMB = 94.98 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN (PICTURE CENTERED AT -15.35 DEG LAT 226.49 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	89.14 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	7.97 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	88.90 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.01 KM
NUMBER OF PIXELS SMEARED	.00010 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 479.515 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 93.1 KM/PIXEL
AT SUBSPACECRAFT POINT 89.1 KM/PIXEL
AT LIMB OF TARGET BODY 95.0 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CANO) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.7736E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7736E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 88.633
DIGITAL NUMBER OF EXPOS = 226 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	289.0	19.0	0.	0.	
SATELLITE 1	289.0000	289.0000	289.0000	289.0000	
SATELLITE 2	289.3000	0.	0.	0.	
SATELLITE 3	289.0000	13.0000	0.	0.	
SATELLITE 4	289.0000	43.0000	0.	0.	
SATELLITE 5	289.0000	0.	0.	0.	
SATELLITE 6	289.0000	0.	0.	0.	
SATELLITE 7	151.0000	0.	0.	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	0.	0.	0.	0.
2	1.01925018E+06	30.85	146.76	200.31
3	8.93709732E+05	54.27	122.77	208.10
4	7.08269117E+05	51.92	125.54	201.23
5	1.30456977E+06	33.74	143.34	208.41
6	1.45998684E+06	34.81	142.10	211.32
7	2.16328630E+06	36.63	139.95	217.43

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	0.	0.
2	3.08470508E+01	2.86689651E-02
3	5.42654803E+01	4.10304357E-02
4	5.19178741E+01	8.25134101E-02
5	3.37445551E+01	3.90831699E-02
6	3.48135716E+01	5.49416557E-02
7	3.66294122E+01	1.29249403E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	0.	0.
2	1.01693520E+02	1.01925017E+02
3	8.93389747E+01	8.93709589E+01
4	7.07759129E+01	7.08269345E+01
5	1.30412479E+02	1.30456972E+02
6	1.45926867E+02	1.45998670E+02
7	2.16094633E+02	2.16328496E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
0.	0.	0.	0.
1.09968979E+01	1.40843424E+02	1.30461567E-04	3.83254632E-01
1.46365769E+01	6.64237343E+01	6.49859141E-05	7.69397502E-01
1.11803183E+01	7.09397433E+01	9.69033415E-05	5.15978079E-01
1.62424327E+01	1.44651572E+02	1.02710704E-04	4.86304198E-01
1.54669222E+01	1.47027174E+02	9.38831830E-05	5.32576711E-01
1.32932331E+01	1.76877103E+02	7.84514470E-05	6.37336550E-01

VIEW FROM SPACECRAFT

Table A-16 (cont)

SATURN CHECK OUT CASE NO 6

PICTURE NUMBER 415 8 DAYS 1 HRS 30 MIN TO ENCOUNTER JD 2444453.250

PLANET SATURN		SATELLITE RHEA	
RANGE (KM)	= 4.66786399E+05	RANGE (KM)	= 8.88154877E+05
CONE (DEG)	= 86.46	CONE (DEG)	= 102.77
CLOCK (DEG)	= 182.45	CLOCK (DEG)	= 205.93
PHASE (DEG)	= 92.19	PHASE (DEG)	= 74.37
DIAM (DEG)	= 14.87	DIAM (DEG)	= .09

RESOLUTION OF PLANET
CENTER = 40.64 KM/PIXEL
LIMB = 46.29 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN (PICTURE CENTERED AT -31.54 DEG LAT 219.03 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 42.41 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 19.10 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 111.09 KM/SEC
OBJECT MOTION FROM ALL SOURCES .01 KM
NUMBER OF PIXELS SMEARED .00027 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 186.521 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 42.4 KM/PIXEL
AT SUBSPACECRAFT POINT 40.6 KM/PIXEL
AT LIMB OF TARGET BODY 46.3 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.5957E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.5957E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 79.706
DIGITAL NUMBER OF EXPOS = 204 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	415.0	145.0	37.0	0.	
SATELLITE 1	415.0000	415.0000	415.0000	415.0000	
SATELLITE 2	415.0000	115.0000	0.	0.	
SATELLITE 3	415.0000	139.0000	67.0000	0.	
SATELLITE 4	415.0000	169.0000	85.0000	0.	
SATELLITE 5	415.0000	61.0000	0.	0.	
SATELLITE 6	415.0000	31.0000	0.	0.	
SATELLITE 7	277.0000	0.	0.	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	0.	0.	0.	0.
2	5.92551824E+05	102.36	75.56	192.50
3	3.49321210E+05	96.94	83.91	152.90
4	3.45013617E+05	88.24	93.28	143.95
5	7.71910084E+05	83.95	93.36	202.78
6	8.88154877E+05	74.37	102.77	205.93
7	1.50660531E+06	55.38	121.39	213.40

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	0.	0.
2	1.02364226E+02	4.93135744E-02
3	9.69368172E+01	1.04973025E-01
4	8.82411614E+01	1.69389594E-01
5	8.39524234E+01	6.60611224E-02
6	7.43731142E+01	9.03154413E-02
7	5.53807945E+01	1.85585119E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	0.	0.
2	5.92296834E+01	5.92551779E+01
3	3.49001216E+01	3.49321070E+01
4	3.44503623E+01	3.45013246E+01
5	7.71465097E+01	7.71903969E+01
6	8.87454892E+01	8.88154616E+01
7	1.50416534E+02	1.50660336E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
0.	0.	0.	0.
3.50135632E+01	1.52714930E+02	2.51407481E-04	1.98880319E-01
1.16053585E+01	1.03718754E+02	2.38671511E-04	1.67497999E-01
1.09529378E+01	1.02962245E+02	2.91540635E-04	1.71326382E-01
2.93489399E+01	1.43590292E+02	1.74381507E-04	2.86727651E-01
2.58409203E+01	1.27477559E+02	1.32037345E-04	3.78680743E-01
1.80131014E+01	8.26309939E+01	4.50349365E-05	1.11024915E+00

VIEW FROM SPACECRAFT

Table A-16 (concl)

SATURN CHECK OUT CASE NO 6

PICTURE NUMBER 829 1 DAYS 8 HRS 59 MIN TO ENCOUNTER JD 2444454.687

PLANET SATURN		SATELLITE RHEA	
RANGE (KM)	= 2.28133755E+06	RANGE (KM)	= 2.76709249E+06
CONE (DEG)	= 24.46	CONE (DEG)	= 19.81
CLOCK (DEG)	= 49.91	CLOCK (DEG)	= 49.69
PHASE (DEG)	= 159.29	PHASE (DEG)	= 163.91
DIAM (DEG)	= 3.03	DIAM (DEG)	= .03

RESOLUTION OF PLANET
CENTER = 222.09 KM/PIXEL
LIMB = 228.05 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN (PICTURE CENTERED AT 3.96 DEG LAT 326.54 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	227.05 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	3.83 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	362.75 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.04 KM
NUMBER OF PIXELS SMEARED	.00016 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 310.167 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 227.1 KM/PIXEL
AT SUBSPACECRAFT POINT 222.1 KM/PIXEL
AT LIMB OF TARGET BODY 223.1 KM/PIXEL

EXPOSURE TIME FOR SIT WIDE ANGLE CAMERA (CAND) = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 6.2487E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 6.2487E-04 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 30.967
DIGITAL NUMBER OF EXPOS = 79 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	829.0	325.0	109.0	0.	
SATELLITE 1	829.0000	829.0000	829.0000	829.0000	
SATELLITE 2	829.0000	313.0000	0.	0.	
SATELLITE 3	829.0000	325.0000	175.0000	0.	
SATELLITE 4	829.0000	373.0000	205.0000	0.	
SATELLITE 5	829.0000	175.0000	0.	0.	
SATELLITE 6	829.0000	163.0000	0.	0.	
SATELLITE 7	691.0000	61.0000	0.	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	0.	0.	0.	0.
2	2.19703894E+06	155.01	28.75	49.72
3	2.32949463E+06	153.52	30.24	49.72
4	2.57125912E+06	160.53	23.21	49.74
5	2.47550034E+06	151.51	32.25	49.58
6	2.76709249E+06	163.91	19.81	49.69
7	1.90345946E+06	168.65	7.49	225.49

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	0.	0.
2	1.55010551E+02	1.33001046E-02
3	1.53521652E+02	1.57413108E-02
4	1.60530761E+02	2.27283238E-02
5	1.51509316E+02	2.05991666E-02
6	1.63910498E+02	2.89885836E-02
7	1.68647793E+02	1.46892270E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	0.	0.
2	2.19678397E+02	2.19703896E+02
3	2.32917467E+02	2.32949465E+02
4	2.57074917E+02	2.57125912E+02
5	2.47505539E+02	2.47550035F+02
6	2.76639254E+02	2.76709245E+02
7	1.90101949E+02	1.90345793E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
0.	0.	0.	0.
4.93179575E+00	2.92819503E+02	1.31824704E-04	3.79291578E-01
5.22722331E+00	2.94107435E+02	1.25296714E-04	3.99052764E-01
1.47740469E+01	4.07820928E+02	1.58232501E-04	3.15990549E-01
6.88065591E+00	2.88657181E+02	1.15839986E-04	4.31630259E-01
1.26824039E+01	4.80005935E+02	1.72899367E-04	2.89201281E-01
1.23639126E+01	5.09128730E+02	2.66573146E-04	1.87565780E-01

VIEW FROM SPACECRAFT

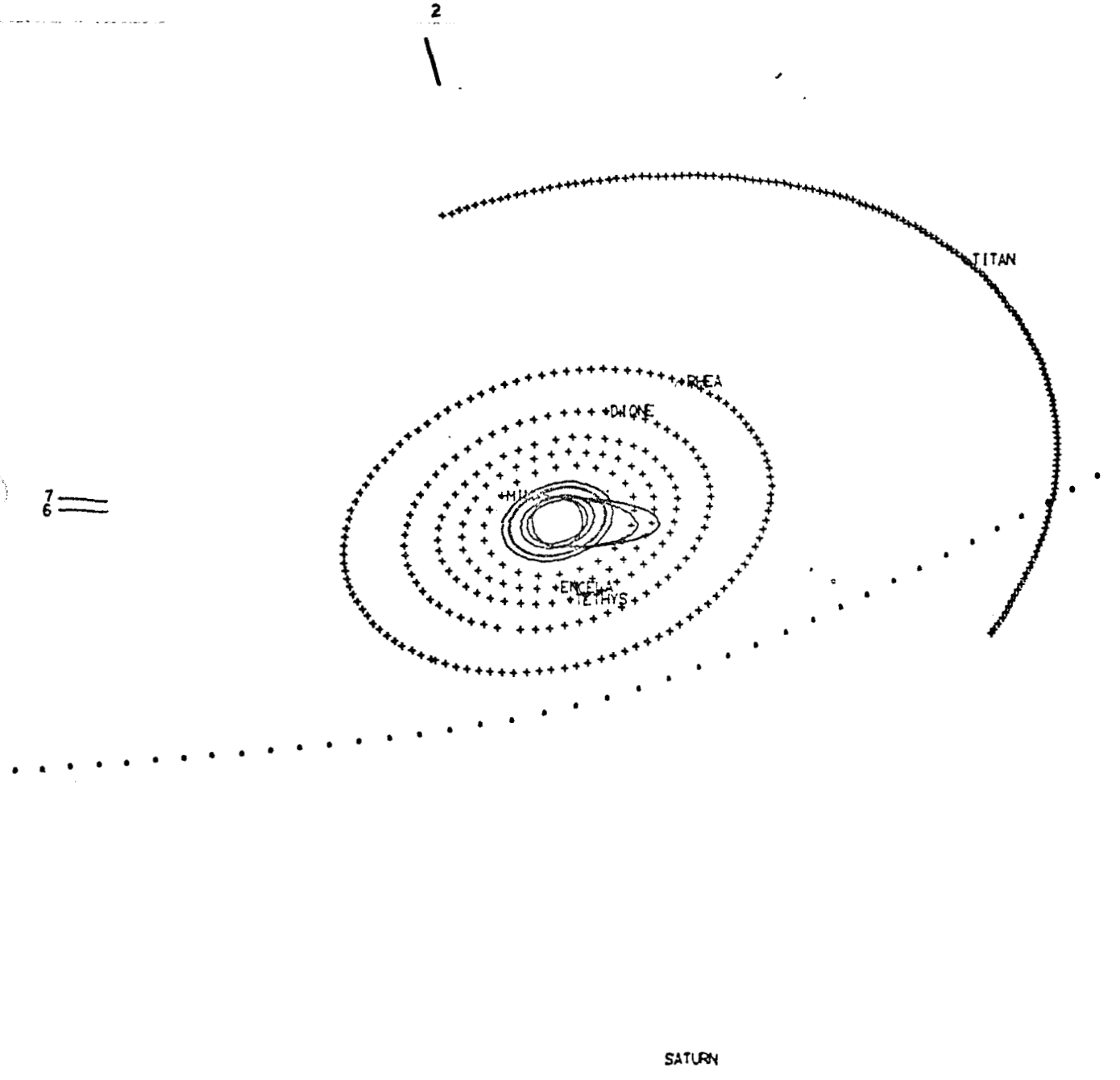


Fig. A-12 Flyby Encounter Geometry

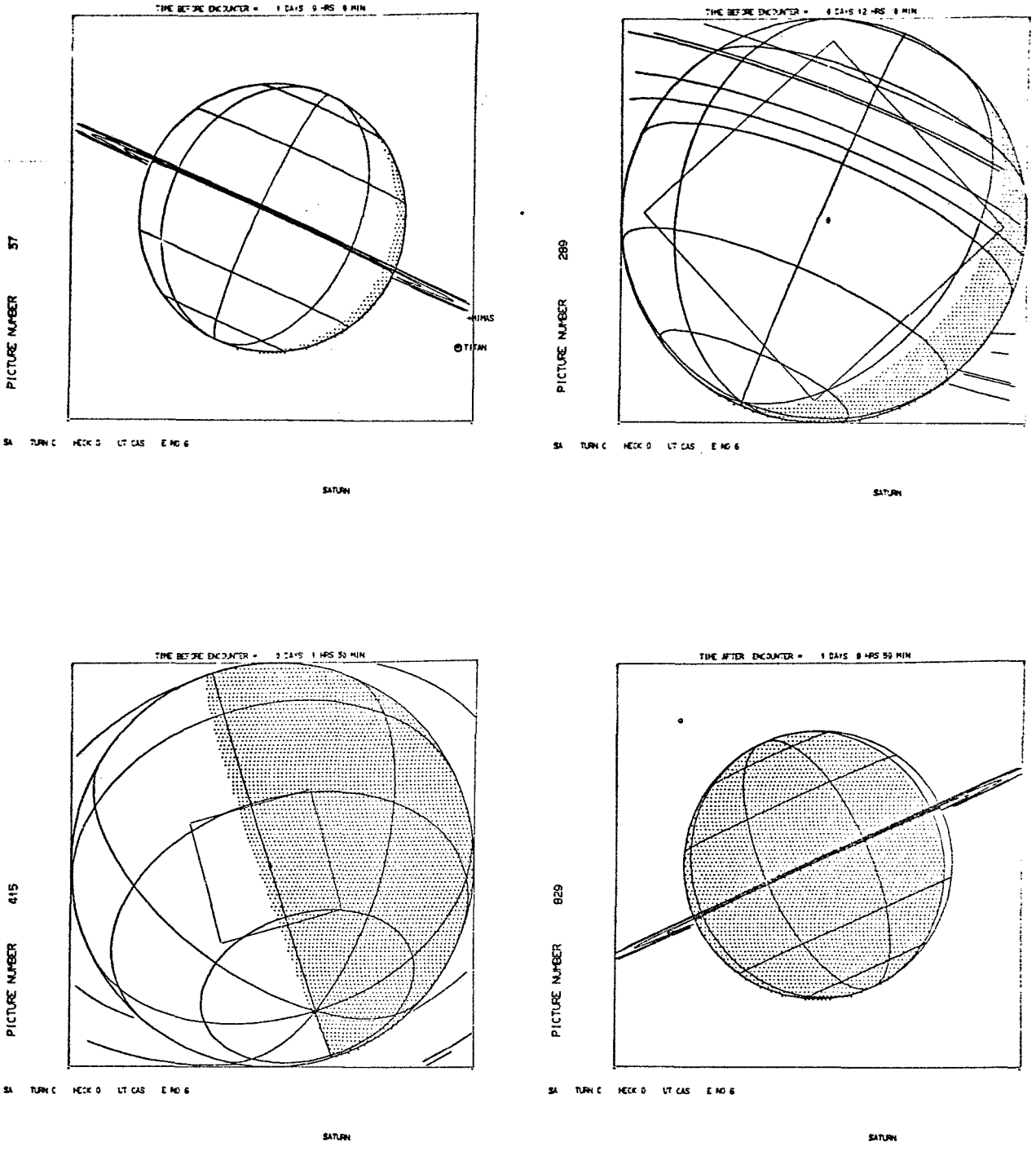
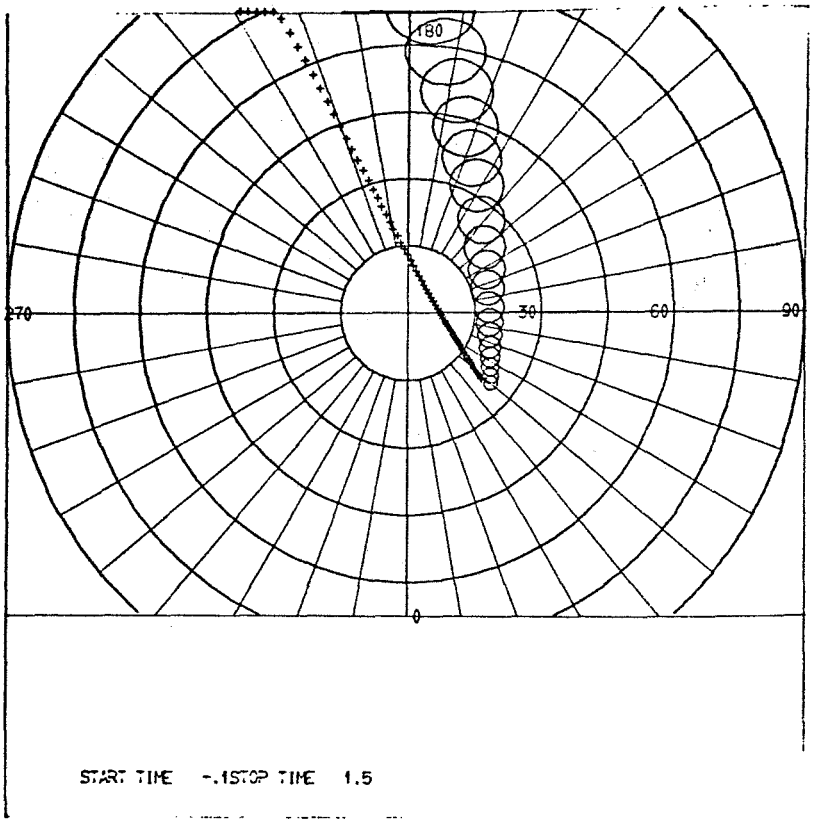


Fig. A-13 Scenes Before and After Closest Approach



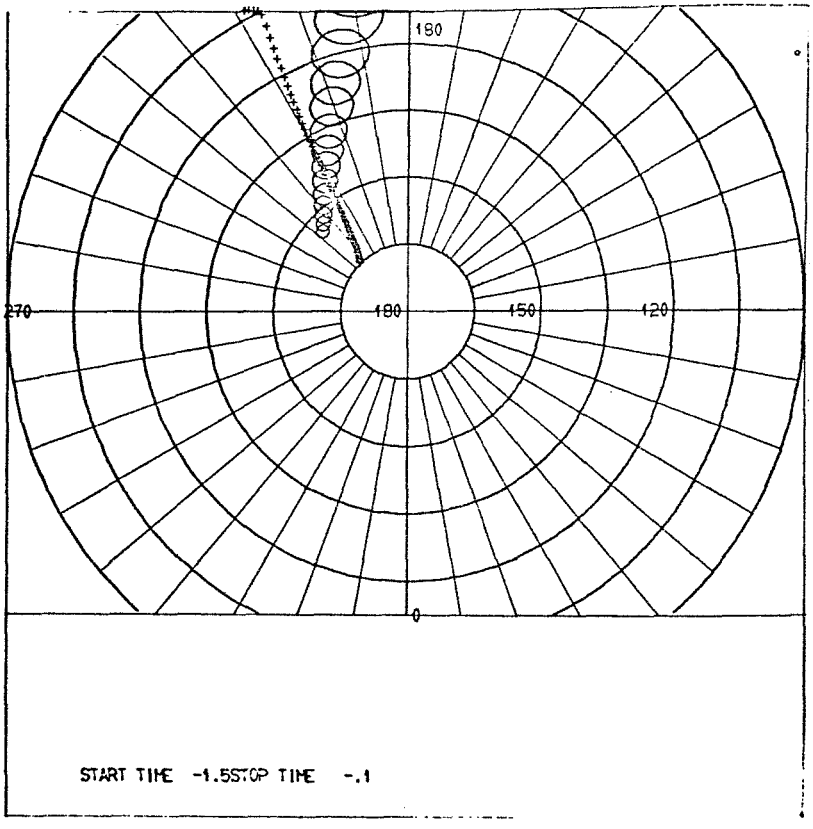
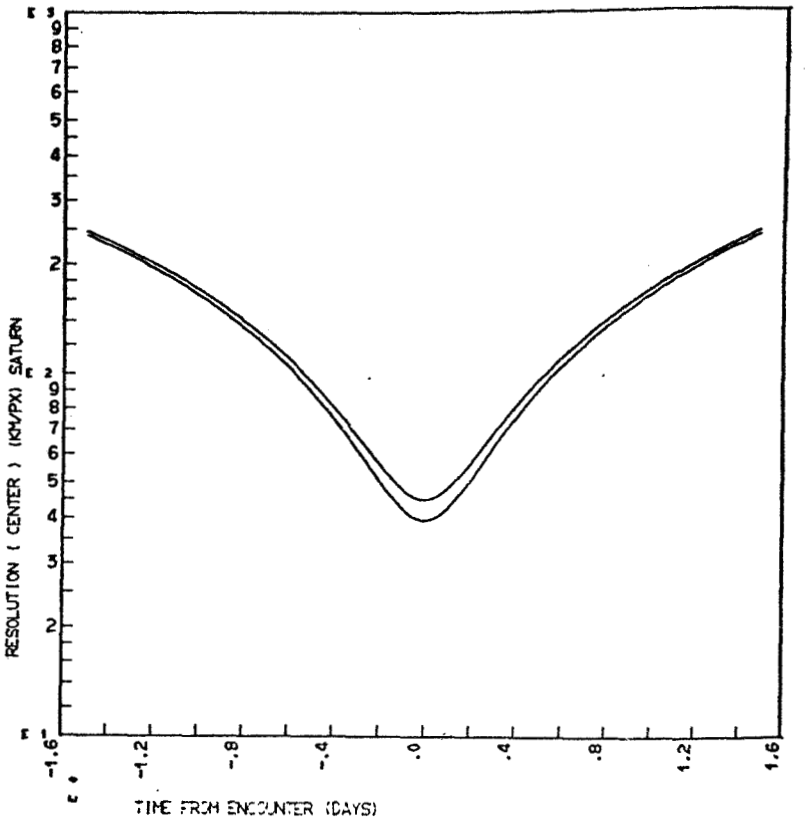


Fig. A-14 Summary Cone and Clock Plots



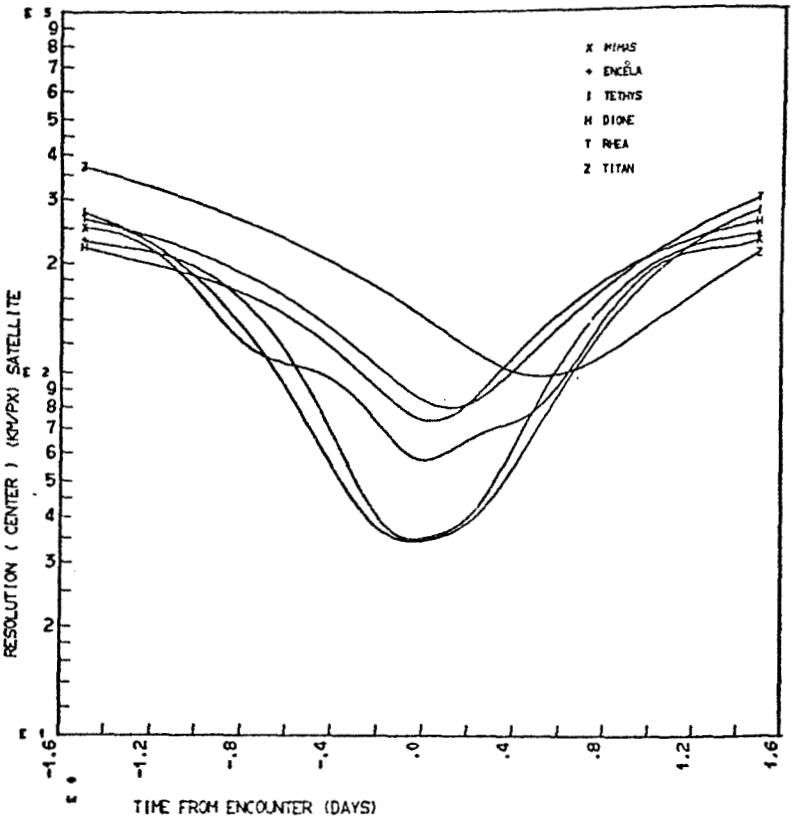
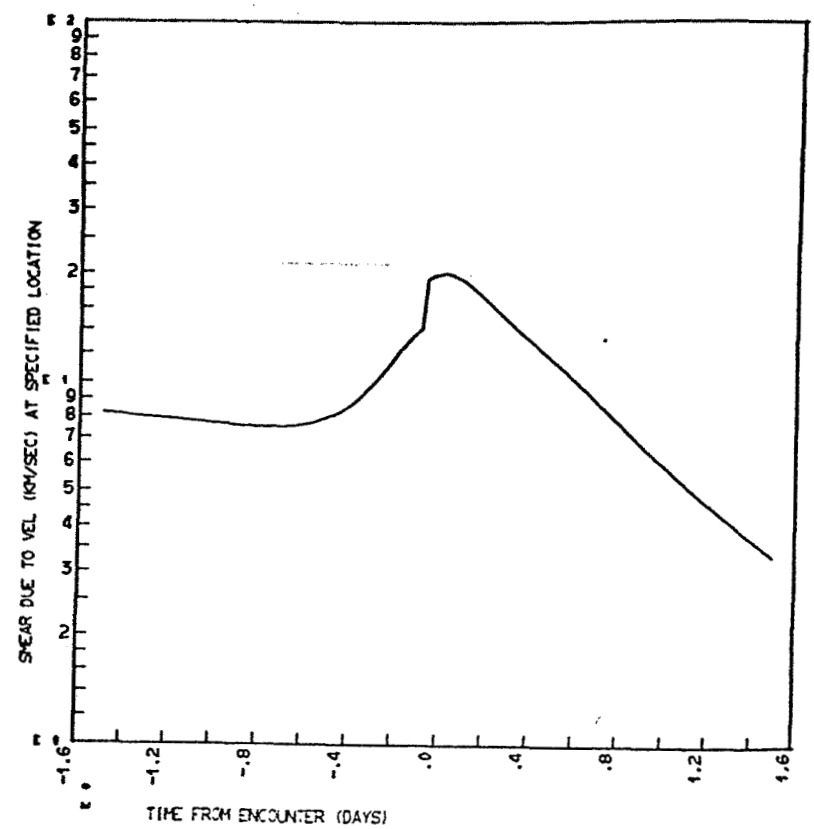


Fig. A-15 TV Summaries


SHEAR DUE TO VEL (KM/SEC) AT SPECIFIED LOCATION
TIME FROM ENCOUNTER (DAYS)
-1.6
-1.2
-.8
-.4
.0
.4
.8
1.2
1.6

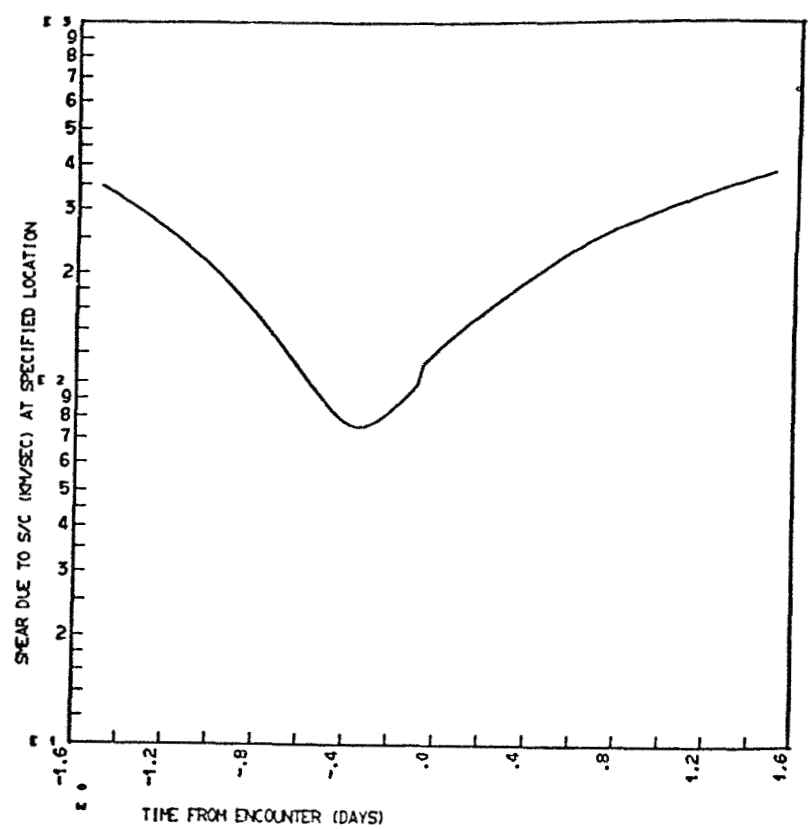
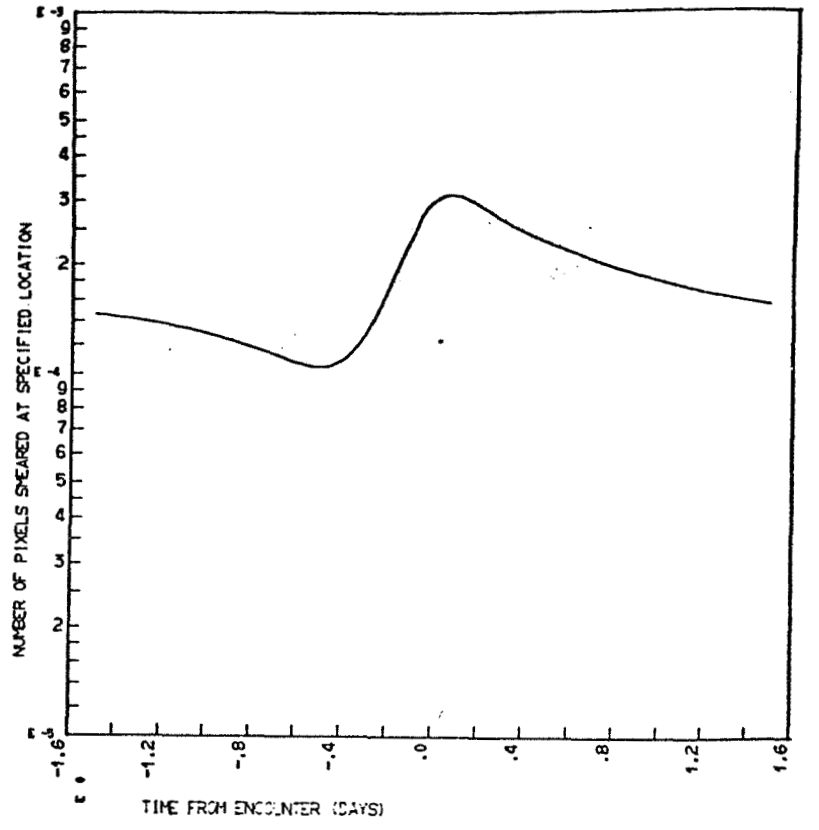

SHEAR DUE TO S/C (KM/SEC) AT SPECIFIED LOCATION
TIME FROM ENCOUNTER (DAYS)
-1.6
-1.2
-.8
-.4
.0
.4
.8
1.2
1.6

Fig. A-15 (cont)


NUMBER OF PIXELS SHEARED AT SPECIFIED LOCATION
TIME FROM ENCOUNTER (DAYS)

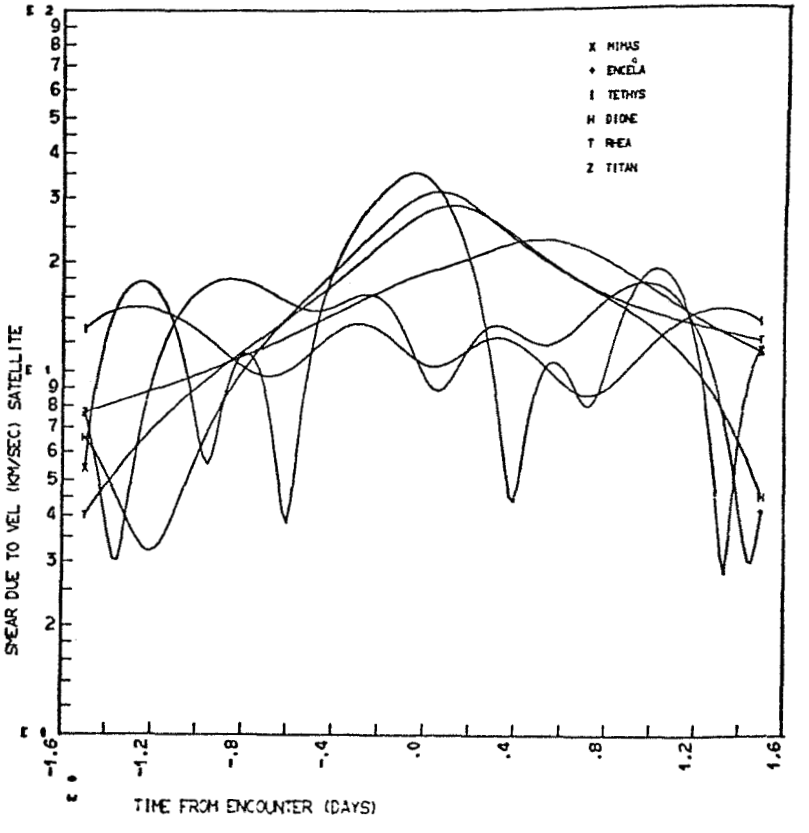
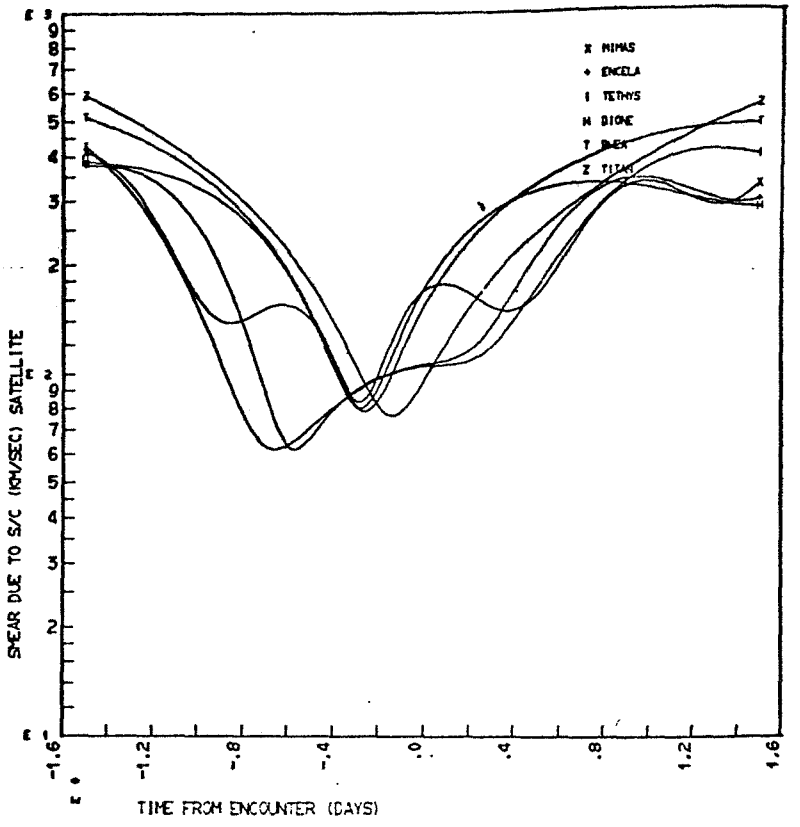

X MIMAS
+ ENCELA
I TETHYS
H DIONE
T RHEA
Z TITAN
SHEAR DUE TO VEL (KM/SEC) SATELLITE
TIME FROM ENCOUNTER (DAYS)

Fig. A-15 (cont)


X MIMAS
+ ENCELA
I TETHYS
H DIONE
T RHEA
Z TITAN
SHEAR DUE TO S/C (KM/SEC) SATELLITE
TIME FROM ENCOUNTER (DAYS)

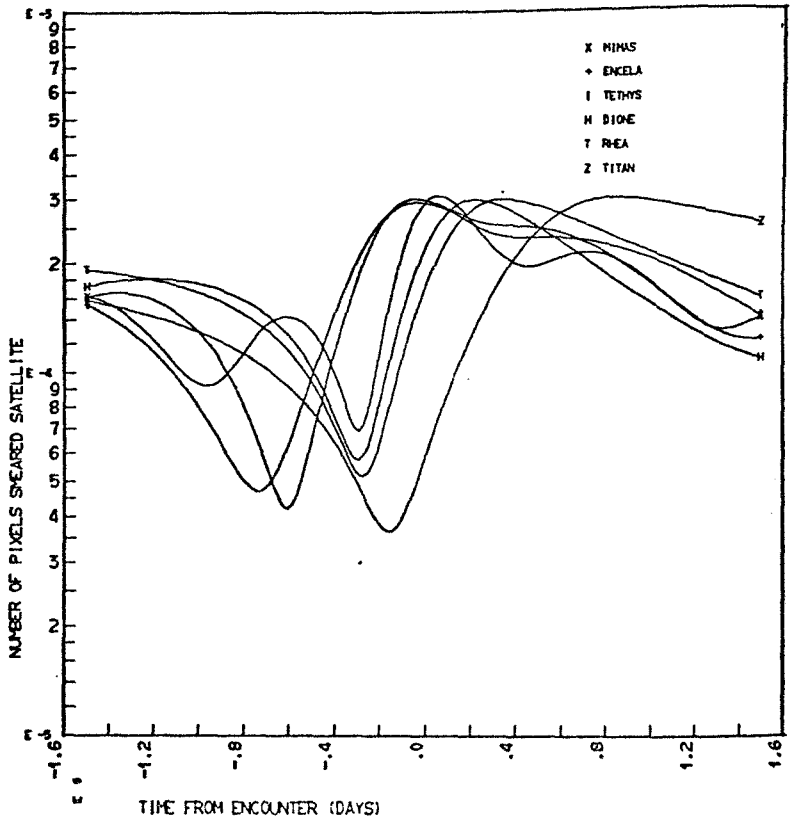

X MIMAS
+ ENCELA
I TETHYS
H DIONE
T RHEA
Z TITAN
NUMBER OF PIXELS SHEARED SATELLITE
TIME FROM ENCOUNTER (DAYS)

Fig. A-15 (cont)

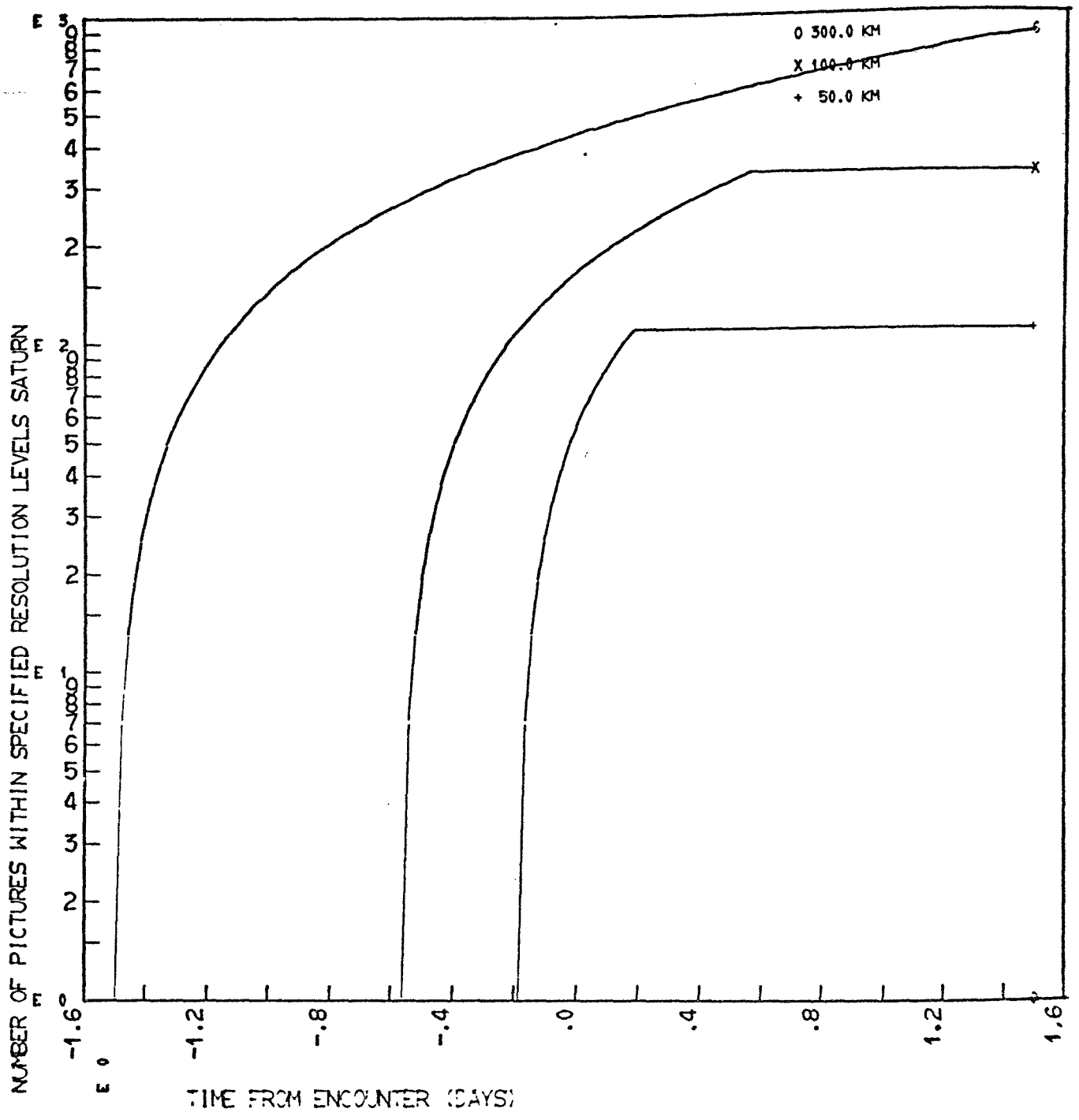


Fig. A-15 (concl)

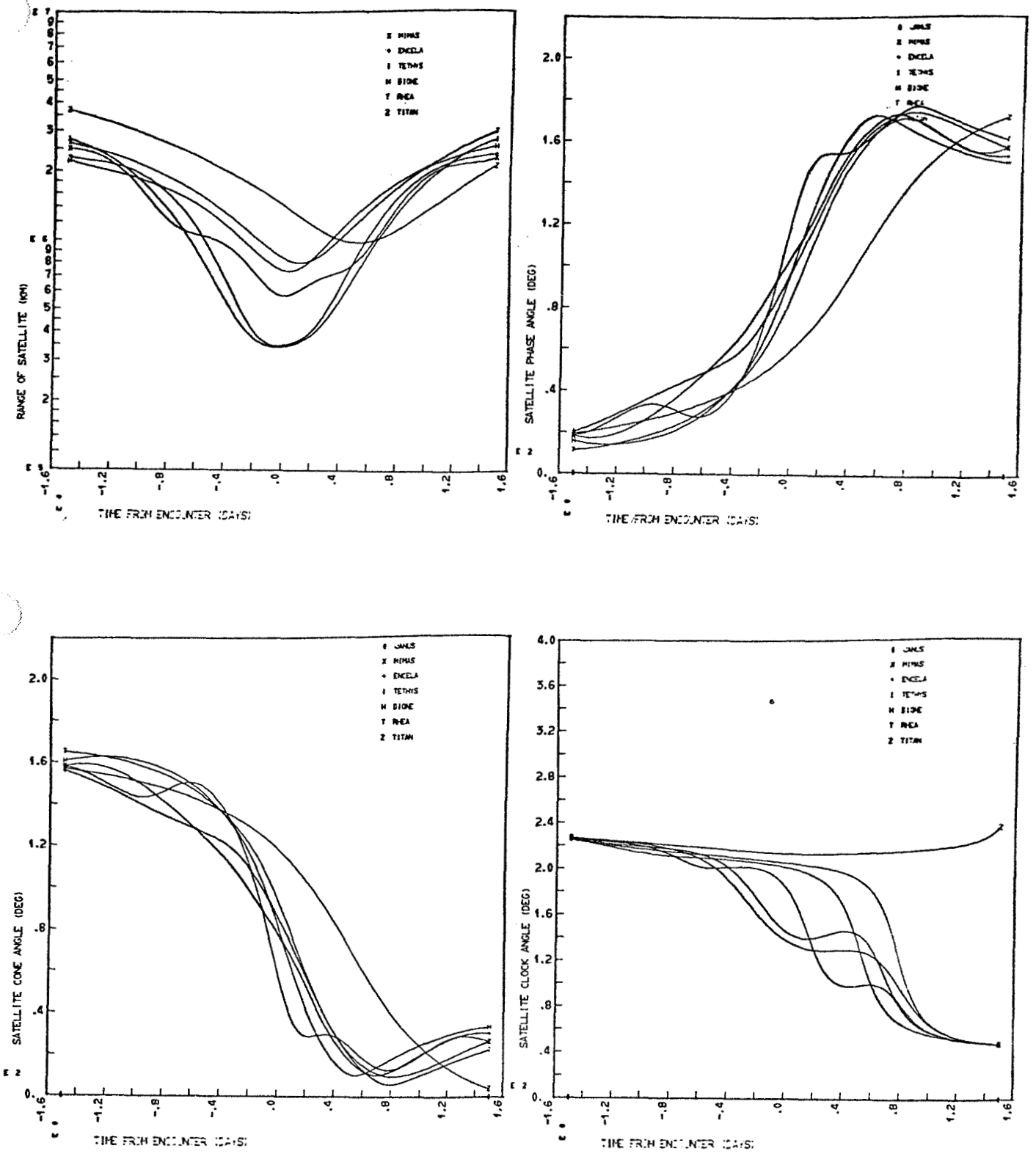
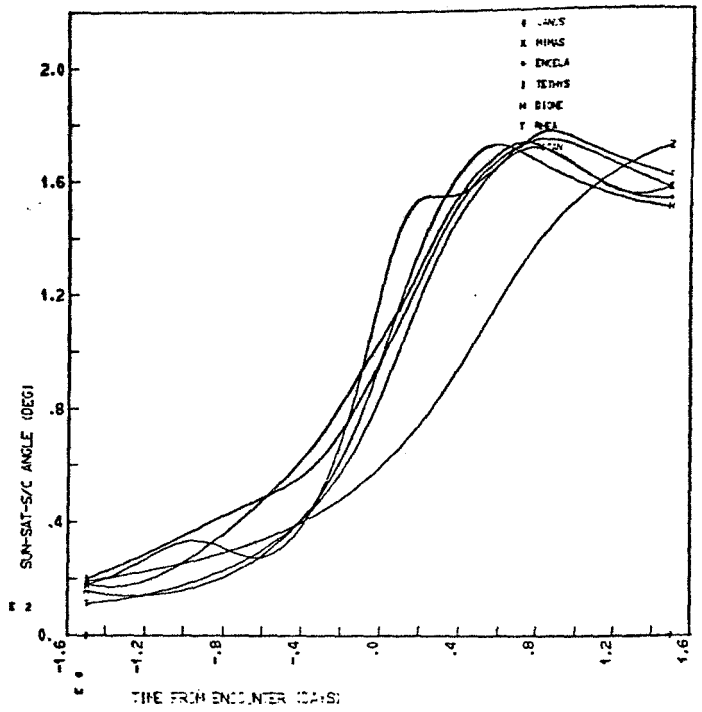
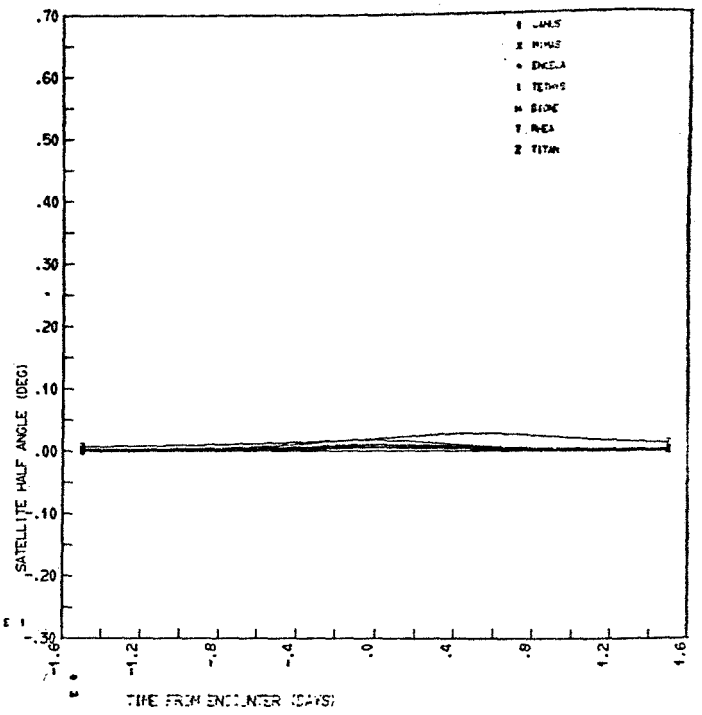


Fig. A-16 Satellite Geometry Summaries





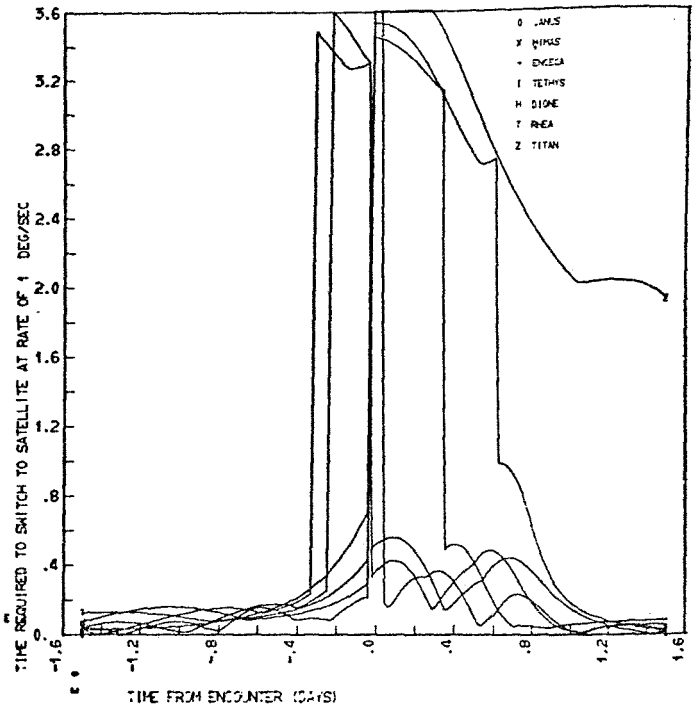


Fig. A-16 (concl)

7. Case 7

a. Input Data - The Saturn input listing, using a narrow-angle camera is given in Table A-17.

Table A-17 Case 7 Input Listing

```
SATURN CHECK OUT CASE NO 7

 2       6.0000000    PLANET SATURN
 3       6.0000000    SATEL  TITAN (VI)
 4       800801.81    DATE
 6       15.000000
 7      -141227.14    STATE1
 8       97650.653    STATE2
 9      -420838.47    STATE3
10      -20.131197    STATE4
11      -5.1481659    STATE5
12       5.3291219    STATE6
22       110.00000    INSTIDINSTRUMENT ID (TV,NARROW ANGLE SIT)
61      -1.5000000    TSTAR
62       1.5000000    TSTOP
63       5.0000000    DTINST
69       6.0000000    CALCSTPICTURES PER CALC STEP       60 MIN PER CALC STEP
81       3.0000000    DPLOT
82       3.0000000    DPRNT
90       1111111.0
98
```

b. Output Data - The tabular output, for a narrow-angle camera, is given in Table A-18. This output is for the same frame times as were used for Case 6, which provides a comparison between the narrow- and wide-angle cameras.

The graphic output consists of the geometry (Fig. A-17) of the selected frames, and resolution and smear summaries (Fig. A-18).

Table A-18 Case 7 Tabular Output

```
SATURN CHECK OUT CASE NO 7

PICTURE NUMBER    37                    -1 DAYS  3 HRS  0 MIN TO ENCOUNTER          JD  2444451.937

PLANET SATURN                           SATELLITE  RHEA
RANGE (KM)  =  2.28136755E+06           RANGE (KM)  =  2.53819693E+06
CONE  (DEG) = 153.10                    CONE  (DEG) = 164.07
CLOCK (DEG) = 225.00                    CLOCK (DEG) = 222.89
PHASE (DEG) =  23.11                    PHASE (DEG) =  12.35
DIAM  (DEG) =  3.03                     DIAM  (DEG) =   .03


RESOLUTION OF PLANET
CENTER =    22.21 KM/PIXEL
LIMB   =    22.81 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN          (PICTURE CENTERED AT  -1.23 DEG LAT  231.64 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =    22.21 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES      8.09 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES     13.52 KM/SEC
OBJECT MOTION FROM ALL SOURCES        .09 KM
NUMBER OF PIXELS SMEARED            .00352 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR   34.939 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION       22.3 KM/PIXEL
 AT SUBSPACECRAFT POINT      22.3 KM/PIXEL
 AT LIMB OF TARGET BODY      22.9 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) =     .247 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 6.9480E+00 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.7142E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 85.660
 DIGITAL NUMBER OF EXPOS  = 219 (OF 256 LEVELS)
 ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET              37.0           37.0           37.0           0.
 SATELLITE 1         37.0000        37.0000        37.0000       37.0000
 SATELLITE 2         37.0000        37.0000        37.0000        0.
 SATELLITE 3         37.0000        37.0000        37.0000        0.
 SATELLITE 4         37.0000        37.0000        37.0000        0.
 SATELLITE 5         37.0000        37.0000        37.0000        0.
 SATELLITE 6         37.0000        37.0000        37.0000        0.
 SATELLITE 7         37.0000        37.0000        37.0000        0.


SATELLITE DATA

  NUM     RANGE (KM)          PHASE (DEG)    CONE (DEG)     CLOCK (DEG)

    1     0.                    0.             0.             0.
    2     2.43905148E+06       20.61          155.63         224.86
    3     2.23830930E+06       17.30          159.00         223.88
    4     2.57570823E+06       23.36          152.83         225.49
    5     2.11313138E+06       14.52          161.87         222.86
    6     2.53819693E+06       12.35          164.07         222.89
    7     3.51807200E+06       20.54          155.66         225.71

  NUM       EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

    1       0.                               0.
    2       2.06100867E+01                   1.19804144E-02
    3       1.73015552E+01                   1.63825880E-02
    4       2.33643558E+01                   2.26835635E-02
    5       1.45153547E+01                   2.41315956E-02
    6       1.23509508E+01                   3.16027851E-02
    7       2.05350033E+01                   7.94763234E-02

RESOLUTION (KM/PIX) DATA FOR SATELLITES
  NUM   RES ALONG RADIUS VECTOR          RES AT SATELLITE LIMB

    1       0.                               0.
    2       2.42879648E+01                   2.43905147E+01
    3       2.2379893UE+01                   2.23830927E+01
    4       2.5751982JE+01                   2.57570818E+01
    5       2.11268689E+01                   2.11313184E+01
    6       2.53749694E+01                   2.53819684E+01
    7       3.5156320JE+01                   3.51807115E+01

SMEAR DATA FOR SATELLITES
SMEAR DUE TO      SMEAR DUE TO        NUMBER OF          TIME TO SMEAR
VEL (KM/SEC)      S/C (KM/SEC)        PIXELS SMEARED     1/2 PIXEL (SEC)

 0.                0.                  0.                 0.
 1.43463736E+01    3.72675942E+02      3.74741517E-03     3.29210589E-02
 3.04159684E+00    3.75873480E+02      4.11096374E-03     3.00897485E-02
 1.46226746E+01    3.00324727E+02      3.43622864E-03     3.59024387E-02
 4.76103655E+00    3.41084637E+02      4.41320421E-03     2.79545161E-02
 5.17315803E+00    4.80976805E+02      4.65306463E-03     2.65305964E-02
 8.14138711E+00    5.38191636E+02      3.76004226E-03     3.28105323E-02
VIEW FROM SPACECRAFT
```

Table A-18 (cont)

SATURN CHECK OUT CASE NO 7

PICTURE NUMBER 289 0 DAYS 12 HRS 0 MIN TO ENCOUNTER JD 2444452.812

PLANET SATURN		SATELLITE RHEA	
RANGE (KM)	= 9.51764932E+05	RANGE (KM)	= 1.45998684E+06
CONE (DEG)	= 136.89	CONE (DEG)	= 142.10
CLOCK (DEG)	= 204.49	CLOCK (DEG)	= 211.32
PHASE (DEG)	= 40.40	PHASE (DEG)	= 34.81
DIAM (DEG)	= 7.28	DIAM (DEG)	= .05

RESOLUTION OF PLANET
CENTER = 8.91 KM/PIXEL
LIMB = 9.50 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN (PICTURE CENTERED AT -15.88 DEG LAT 226.49 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	8.91 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	7.97 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	88.90 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.02 KM
NUMBER OF PIXELS SMEARED	.00230 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 47.952 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 8.9 KM/PIXEL
AT SUBSPACECRAFT POINT 8.9 KM/PIXEL
AT LIMB OF TARGET BODY 9.5 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CAND) = .220 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 8.0530E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7736E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 88.633
DIGITAL NUMBER OF EXPOS = 226 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	289.0	289.0	289.0	19.0	
SATELLITE 1	289.0000	289.0000	289.0000	289.0000	
SATELLITE 2	289.0000	289.0000	289.0000	0.	
SATELLITE 3	289.0000	289.0000	289.0000	13.0000	
SATELLITE 4	289.0000	289.0000	289.0000	43.0000	
SATELLITE 5	289.0000	289.0000	289.0000	0.	
SATELLITE 6	289.0000	289.0000	289.0000	0.	
SATELLITE 7	289.0000	289.0000	289.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	0.	0.	0.	0.
2	1.01925018E+06	30.85	146.76	200.31
3	8.93709732E+05	54.27	122.77	208.10
4	7.08269117E+05	51.92	125.54	201.23
5	1.30456977E+06	33.74	143.34	208.41
6	1.45998684E+06	34.81	142.10	211.32
7	2.16328630E+06	36.63	139.95	217.43

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	0.	0.
2	3.08470568E+01	2.86689651E-02
3	5.42654863E+01	4.10304357E-02
4	5.19178741E+01	8.25134101E-02
5	3.37445551E+01	3.90881698E-02
6	3.48135716E+01	5.49416557E-02
7	3.66294122E+01	1.23249403E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	0.	0.
2	1.01899518E+01	1.01925015E+01
3	8.93389732E+00	8.93709675E+00
4	7.07759117E+00	7.08268334E+00
5	1.30412477E+01	1.30455370E+01
6	1.45928684E+01	1.45998668E+01
7	2.16084630E+01	2.16328492E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
0.	0.	0.	0.
1.09966979E+01	1.40843424E+02	2.87323255E-03	3.83254626E-02
1.46396756E+01	6.64237340E+01	1.43122137E-03	7.69397489E-02
1.11603163E+01	7.09397433E+01	2.13415982E-03	5.15973870E-02
1.62424327E+01	1.44651572E+02	2.26205881E-03	4.86304172E-02
1.54066222E+01	1.47027174E+02	2.36764526E-03	5.32576702E-02
1.32932331E+01	1.76877103E+02	1.72778367E-03	6.37335539E-02

VIEW FROM SPACECRAFT

Table A-18 (cont)

SATURN CHECK OUT CASE NO 7

PICTURE NUMBER 415 0 DAYS 1 HRS 30 MIN TO ENCOUNTER JD 2444453.250

PLANET SATURN		SATELLITE RHEA	
RANGE (KM)	= 4.66786349E+05	RANGE (KM)	= 5.8515+377E+05
CONE (DEG)	= 86.46	CONE (DEG)	= 102.77
CLOCK (DEG)	= 152.45	CLOCK (DEG)	= 205.93
PHASE (DEG)	= 32.19	PHASE (DEG)	= 74.37
DIAM (DEG)	= 14.87	DIAM (DEG)	= .09

RESOLUTION OF PLANET
CENTER = 4.66 KM/PIXEL
LIMB = 4.63 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN (PICTURE CENTERED AT -31.54 DEG LAT 219.03 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	4.24 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	19.13 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	111.09 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.02 KM
NUMBER OF PIXELS SMEARED	.00466 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 14.052 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 4.3 KM/PIXEL
AT SUBSPACECRAFT POINT 4.1 KM/PIXEL
AT LIMB OF TARGET BODY 4.6 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) = .174 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 9.1746E+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.5957E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 79.706
DIGITAL NUMBER OF EXPOS = 204 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	415.0	415.0	415.0	145.0	
SATELLITE 1	415.0000	415.0000	415.0000	415.0000	
SATELLITE 2	415.0000	415.0000	415.0000	115.0000	
SATELLITE 3	415.0000	415.0000	415.0000	139.0000	
SATELLITE 4	415.0000	415.0000	415.0000	169.0000	
SATELLITE 5	415.0000	415.0000	415.0000	61.0000	
SATELLITE 6	415.0000	415.0000	415.0000	31.0000	
SATELLITE 7	415.0000	415.0000	415.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	0.	0.	0.	0.
2	5.92591824E+05	102.36	75.56	192.56
3	3.49321210E+05	96.94	83.31	152.96
4	3.45013617E+05	88.24	93.28	143.95
5	7.71910064E+05	83.95	93.36	202.78
6	8.88154877E+05	74.37	102.77	205.93
7	1.50660531E+06	55.38	121.39	213.40

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	0.	0.
2	1.02364226E+02	4.93135744E-02
3	9.69368172E+01	1.04973025E-01
4	8.82411614E+01	1.69339594E-01
5	8.39524234E+01	6.60611224E-02
6	7.43731142E+01	9.03154413E-02
7	5.53907945E+01	1.85585119E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	0.	0.
2	5.92296824E+00	5.92551769E+00
3	3.49001211E+00	3.49321064E+00
4	3.44503617E+00	3.45013240E+00
5	7.71465085E+00	7.71909956E+00
6	8.87454877E+00	8.88154601E+00
7	1.50416531E+01	1.50660334E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
0.	0.	0.	0.
3.50135632E+01	1.52714993E+02	4.37275032E-03	1.98480316E-02
1.16398535E+01	1.33719764E+02	5.19481737E-03	1.67407396E-02
1.08829378E+01	1.32962245E+02	5.07600739E-03	1.71326379E-02
2.93486333E+01	1.43593292E+02	3.03303143E-03	2.36727647E-02
2.58409203E+01	1.27477559E+02	2.23653605E-03	3.73640737E-02
1.80131014E+01	8.26309999E+01	7.33296235E-04	1.11024913E-01

VIEW FROM SPACECRAFT

Table A-18 (concl)

SATURN CHECK OUT CASE NO 7

PICTURE NUMBER 829 1 DAYS 8 HRS 59 MIN TO ENCOUNTER JD 2444454.687

PLANET SATURN		SATELLITE RHEA	
RANGE (KM)	= 2.28133755E+06	RANGE (KM)	= 2.76703249E+06
CONE (DEG)	= 24.46	CONE (DEG)	= 19.81
CLOCK (DEG)	= 49.91	CLOCK (DEG)	= 49.69
PHASE (DEG)	= 159.29	PHASE (DEG)	= 163.91
DIAM (DEG)	= 3.03	DIAM (DEG)	= .03

RESOLUTION OF PLANET
CENTER = 22.21 KM/PIXEL
LIMB = 22.81 KM/PIXEL
INSTRUMENT DATA FOR PLANET SATURN (PICTURE CENTERED AT 3.96 DEG LAT 326.54 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	22.70 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	3.83 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	362.75 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.06 KM
NUMBER OF PIXELS SMEARED	.00280 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 31.017 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 22.8 KM/PIXEL
AT SUBSPACECRAFT POINT 22.3 KM/PIXEL
AT LIMB OF TARGET BODY 22.9 KM/PIXEL

EXPOSURE TIME FOR SIT NARROW ANGLE CAMERA (CANO) = .174 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 3.59266+00 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 6.2487E-04 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 30.967
DIGITAL NUMBER OF EXPOS = 79 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	829.0	829.0	829.0	325.0	
SATELLITE 1	829.0000	829.0000	829.0000	329.0000	
SATELLITE 2	829.0000	829.0000	829.0000	313.0000	
SATELLITE 3	829.0000	829.0000	829.0000	325.0000	
SATELLITE 4	829.0000	829.0000	829.0000	373.0000	
SATELLITE 5	829.0000	829.0000	829.0000	175.0000	
SATELLITE 6	829.0000	829.0000	829.0000	163.0000	
SATELLITE 7	829.0000	829.0000	829.0000	61.0000	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	0.	0.	0.	0.
2	2.19703894E+06	155.01	28.75	49.72
3	2.32949463E+06	153.52	30.24	49.72
4	2.57125312E+06	160.53	23.21	49.74
5	2.47550034E+06	151.51	32.25	49.58
6	2.76703249E+06	163.91	19.81	49.69
7	1.90345946E+06	168.65	7.49	225.49

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	0.	0.
2	1.55010551E+02	1.33001046E-02
3	1.53521652E+02	1.57413108E-02
4	1.60530761E+02	2.27288238E-02
5	1.51509316E+02	2.05991666E-02
6	1.63910496E+02	2.89885836E-02
7	1.68647793E+02	1.46832270E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	0.	0.
2	2.19678394E+01	2.19703892E+01
3	2.32917463E+01	2.32949461E+01
4	2.57074912E+01	2.57125907E+01
5	2.47505534E+01	2.47550030E+01
6	2.76639249E+01	2.76703240E+01
7	1.90101946E+01	1.90345790E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
0.	0.	0.	0.
4.93179578E+00	2.92813503E+02	2.29283757E-03	3.79291572E-02
5.22722331E+00	2.34107435E+02	2.17929572E-03	3.99052757E-02
1.47740468E+01	4.37823928E+02	2.79215222E-03	3.15993504E-02
6.88065591E+00	2.58657081E+02	2.01481236E-03	4.31633251E-02
1.26624033E+01	4.30005995E+02	3.00708836E-03	2.89201277E-02
1.23638120E+01	5.09128790E+02	4.63652795E-03	1.87565776E-02

VIEW FROM SPACECRAFT

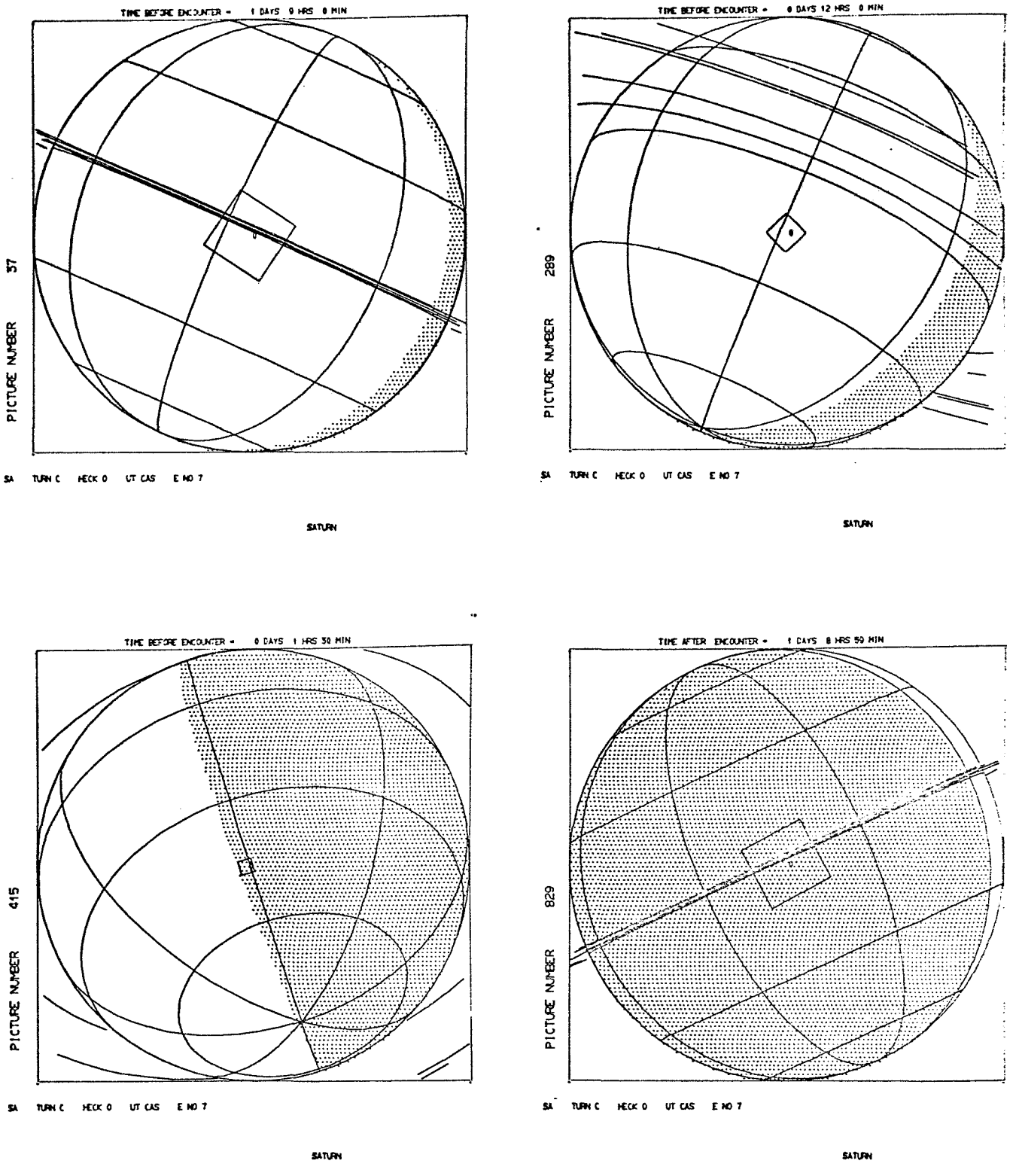
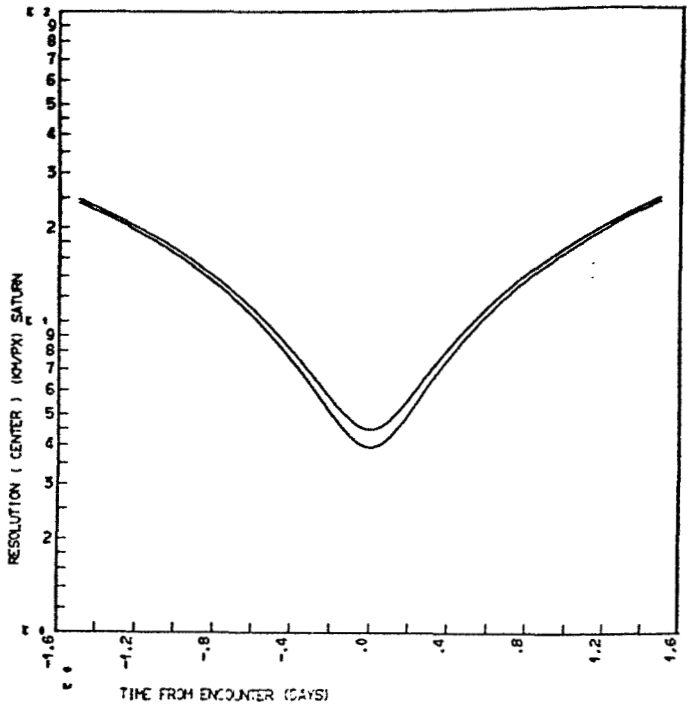
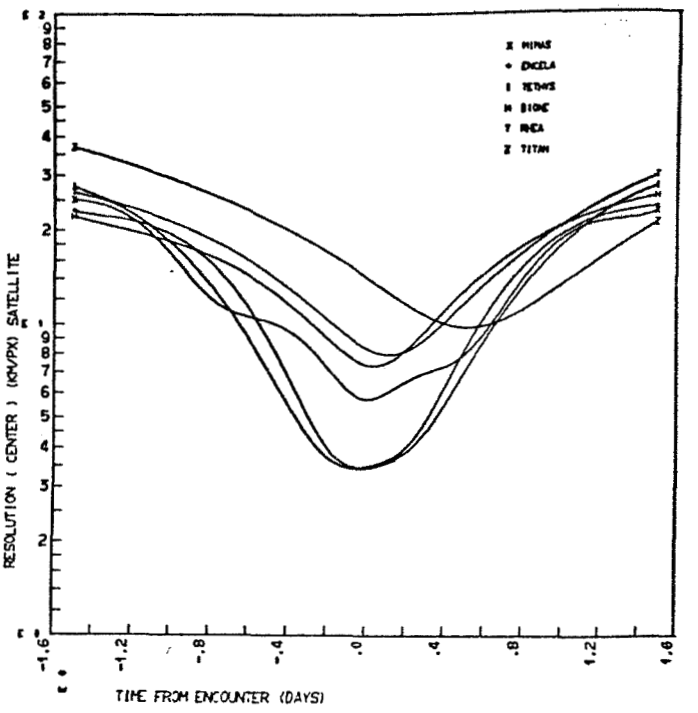


Fig. A-17 Scenes Before and After Closest Approach





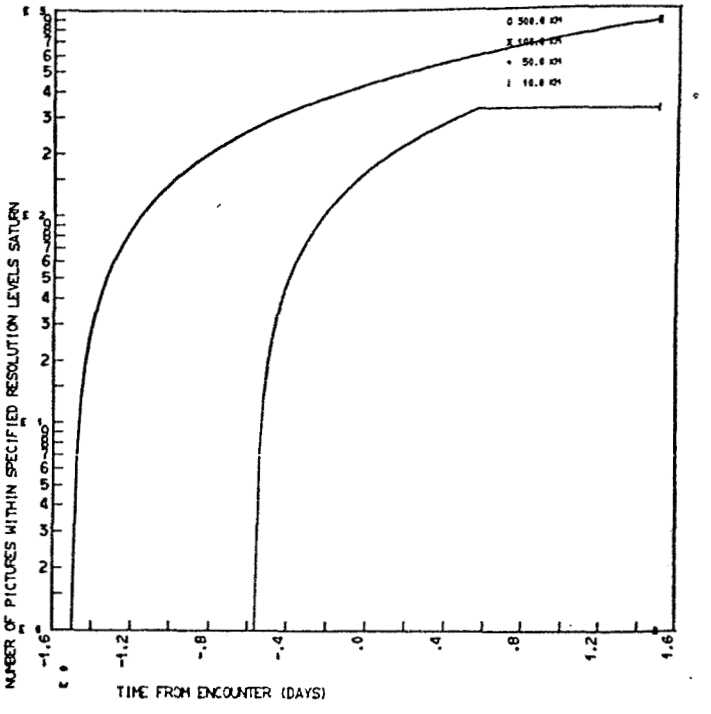


Fig. A-18 TV Summaries

C. MISSION 3

The specific objective of Mission 3 is to provide the data and guidelines to validate spacecraft configuration, orbital trajectory, and to complete the science options. Mission 2 validated the imaging analysis capability in conjunction with a TOPS spacecraft configuration; Mission 3 considers a spinning type spacecraft, includes particle and field capability, and treats the orbiter mission.

1. Science Mode

TV characteristics were discussed in previous missions; therefore, no detail is included here. The particle and field instruments are modeled at a system level--principally, sensitivity limits and data rate modes (Tables A-19 and A-20).

Table A-19 Magnetometer Characteristics

RATE	60 Bits/Sample	High Rate	25 Samples/Sec
	60 Bits/Sample	Low Rate	1 Sample/Sec
SENSITIVITY	High	0.02 Gamma	
	Low	0.2 Gamma	
RANGE	2.5, 10, 10^2, 10^3, 10^4 Gamma		
	1, 10 Gauss		

Table A-20 Radiation Detector Characteristics

RATE	50 Bits/Sample	High	10 Samples/Sec
		Low	1 Sample/Sec
SENSITIVITY	Electrons	50 kev	
	Protons	0.5 Mev	
RANGE	Electrons	0.05, 0.1, 0.5, 1.0, 3, 5, 50, 100 Mev	
	Protons	0.05, 0.1, 0.5, 1.0, 5, 10, 50, 10^2, 10^3 Mev	

2. Trajectory Data

The trajectory represents a 1984 Jupiter encounter with a subsequent maneuver resulting in an orbit injection. The orbit chosen yields satellite encounters. The approach and subsequent inject conditions are as follows:

Arrival Date	1 Feb 84
Approach Asymptote	
VINF (km/sec)	7.26
Approach Asymptote Angle (deg)	129.8
Asymptote Declination (deg)	0.0
Orbit Periapse Angle (deg)	70.68 (0_p)
Orbit Period (days)	21.333
Periapse (R_J)	2.255
Apoapse (R_J)	59.884
Orbit Capture Impulse (km/sec)	1.384

3. Case 8

a. Input Data - This case treats a Jupiter orbital mission with a spinning spacecraft with Pioneer type camera. The input listing is given in Table A-21; additional camera specifications are given in Table A-22.

Table A-21 Case 8 Input Listing

JUPITER CHECK OUT CASE NO 8

2	5.0000000	PLANET
3	+.0000000	SATEL
4	840201.00	DATE
6	1.0000000E+01	
7	2.2550000	STATE1
8	59.884000	STATE2
9	70.680000	STATE3
22	110.00000	INSTID
31	-0.	NAME-1R
32	-0.	NAME-2
33	-0.	NAME-3
34	-0.	NAME-4
35	-0.	NAME-5
36	25.400000	CHAR-1
37	15.120000	CHAR-2
40	2.5000000	CHAR-5
41	2.5000000	CHAR-6
42	500.00000	CHAR-7
43	500.00000	CHAR-8
44	6.0000000	CHAR-9
51	1.0000000	
56	12.700000000E-05	
61	1.0000000	TSTAR
62	22.000000	TSTOP
63	720.00000	DTINST
64	-0.	
65	-0.	
66	2048.0000	BITRAT
67	64.000000	
68	1500000.0	
69	1.0000000	CALCST
81	1.0000000	DPLOT
82	1.0000000	DPRNT
86	15.000000	SATRNG
90	1111111.0	
98		

JUPITER CHECK OUT CASE NO 8

XZ(I) VALUES IN STORAGE

1	0	0.	2	1	5.0000000000E+00
3	1	4.0000000000E+00	4	1	8.4020100000E+05
5	0	0.	6	1	1.0000000000E+01
7	1	2.2550000000E+00	8	1	5.9884000000E+01
9	1	7.0680000000E+01	10	0	0.
11	0	0.	12	0	0.
13	0	0.	14	0	0.
15	0	3.0000000000E+00	16	0	0.
17	0	0.	18	0	0.
19	0	0.	20	0	0.
21	0	0.	22	1	1.1000000000E+02
23	0	0.	24	0	-7.1738305547E+57
25	0	-7.1738305547E+57	26	0	0.
27	0	0.	28	0	0.
29	0	0.	30	0	0.
31	1	-0.	32	1	-0.
33	1	-0.	34	1	-0.
35	1	-0.	36	1	2.5400000000E+01
37	1	1.5120000000E+01	38	0	0.
39	0	0.	40	1	2.5000000000E+00
41	1	2.5000000000E+00	42	1	5.0000000000E+02
43	1	5.0000000000E+02	44	1	6.0000000000E+00
45	0	0.	46	0	0.
47	0	0.	48	0	0.
49	0	0.	50	0	0.
51	1	1.0000000000E+00	52	0	0.
53	0	0.	54	0	0.
55	0	0.	56	1	1.2700000000E-04
57	0	0.	58	0	0.
59	0	0.	60	0	0.
61	1	1.0000000000E+00	62	1	2.2000000000E+01
63	1	7.2000000000E+02	64	1	-0.
65	1	-0.	66	1	2.0480000000E+03
67	1	6.4000000000E+01	68	1	1.5000000000E+06
69	1	1.0000000000E+00	70	0	0.
71	0	0.	72	0	0.
73	0	0.	74	0	0.
75	0	0.	76	0	0.
77	0	0.	78	0	0.
79	0	0.	80	0	0.
81	1	1.0000000000E+00	82	1	1.0000000000E+00
83	0	0.	84	0	0.
85	0	0.	86	1	1.5000000000E+01
87	0	0.	88	0	0.
89	0	0.	90	1	1.1111110000E+06
91	0	0.	92	0	0.
93	0	0.	94	0	0.
95	0	0.	96	0	0.

Table A-22 Additional Camera Specifications

JUPITER CHECK OUT CASE NO 8

TV CHARACTERISTICS FOR PIONEER SIT CAMERA

6	FOC LN=	2.54000000E+01	USER INPUT
7	DIAM =	1.51200000E+01	USER INPUT
8	OBSCUR=	0.	
9	TRANS =	8.50000000E-01	
10	SIZE-V=	2.50000000E+00	USER INPUT
11	SIZE-H=	2.50000000E+00	USER INPUT
12	LINES =	5.00000000E+02	USER INPUT
13	PIXELS=	5.00000000E+02	USER INPUT
14	BIT/PX=	6.00000000E+00	USER INPUT
15	MINEXP=	8.00000000E-06	
16	MAXEXP=	2.00000000E-03	
17	RESO-1=	3.00000000E+02	
18	RESO-2=	1.00000000E+02	
19	RESO-3=	5.00000000E+01	
20	RESO-4=	1.00000000E+01	
21	SENSOR=	1.00000000E+00	USER INPUT
22	B FILT=	1.00000000E+00	
23	G FILT=	1.00000000E+00	
24	R FILT=	1.00000000E+00	
25	P FILT=	-1.00000000E+00	
26	DT EXP=	1.27000000E-04	USER INPUT
27	OPEN =	0.	
28	OPEN =	0.	
29	T READ=	4.00000000E+01	
30	ERASET=	1.00000000E-01	
31	TSTART=	1.00000000E+00	USER INPUT
32	TSTOP =	2.20000000E+01	USER INPUT
33	DEL T =	7.20000000E+02	USER INPUT
34	BULK =	-0.	USER INPUT
35	BULK-0=	-0.	USER INPUT
36	BITRAT=	2.04800000E+03	USER INPUT
37	SCIBPS=	6.40000000E+01	USER INPUT
38	BUFFER=	1.50000000E+06	USER INPUT
39	PIC/ST=	1.00000000E+00	USER INPUT
40	DEL TF=	7.20000000E+02	
41	F/STOP=	1.67989418E+00	COMPUTED VALUES
42	A BLOC=	0.	COMPUTED VALUES
43	DIF LM=	4.43783069E-06	COMPUTED VALUES
44	FOV-V =	5.63480713E+00	COMPUTED VALUES
45	FOV-H =	5.63480713E+00	COMPUTED VALUES
46	RES-C =	1.96850406E-04	COMPUTED VALUES
47	RES-V =	1.25061309E-04	COMPUTED VALUES
48	RES-H =	1.25061309E-04	COMPUTED VALUES
49	BIT/PC=	1.50000000E+06	COMPUTED VALUES
50	RR-BPS=	3.75000000E+04	COMPUTED VALUES
51	T/NUM =	1.82210107E+00	COMPUTED VALUES
52	T/NUMF=	1.82210107E+00	COMPUTED VALUES
53	OPEN =	0.	COMPUTED VALUES
54	OPEN =	0.	COMPUTED VALUES
55	OPEN =	0.	COMPUTED VALUES
56	OPEN =	0.	COMPUTED VALUES
57	OPEN =	0.	COMPUTED VALUES
58	OPEN =	0.	COMPUTED VALUES
59	OPEN =	0.	COMPUTED VALUES
60	OPEN =	0.	COMPUTED VALUES

Table A-22 (cont)

JUPITER CHECK OUT CASE NO 8

TV ENERGY DATA FOR PIONEER SIT CAMERA

PLANET 5 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.3030	0	1.0000	5.250300E-05	0.
.2750	.0204	.2320	.0020	1.0000	1.438200E-04	2.876400E-07
.3000	.0514	.2700	.0950	1.0000	3.469500E-04	3.296025E-05
.3250	.0971	.2350	.4760	1.0000	6.432875E-04	3.062049E-04
.3500	.1093	.2690	.7620	1.0000	7.350425E-04	5.601024E-04
.3750	.1157	.2720	.9530	1.0000	7.867600E-04	7.497823E-04
.4000	.1429	.2850	.9840	1.0000	1.018162E-03	1.001572E-03
.4250	.1693	.3150	1.0000	1.0000	1.333237E-03	1.333237E-03
.4500	.2006	.3640	.9840	1.0000	1.825460E-03	1.796253E-03
.4750	.2044	.3350	.9530	1.0000	1.967350E-03	1.874385E-03
.5000	.1942	.4060	.7940	1.0000	1.971130E-03	1.565077E-03
.5250	.1852	.4300	.7620	1.0000	1.990900E-03	1.517066E-03
.5500	.1725	.4500	.6820	1.0000	1.940625E-03	1.323506E-03
.5750	.1719	.4600	.5550	1.0000	1.976850E-03	1.097152E-03
.6000	.1666	.4650	.4760	1.0000	1.936725E-03	9.218311E-04
.6250	.1586	.4630	.4450	1.0000	1.853585E-03	8.275153E-04
.6500	.1511	.4700	.3600	1.0000	1.775425E-03	6.391530E-04
.6750	.1442	.4630	.2540	1.0000	1.690745E-03	4.294492E-04
.7000	.1369	.4580	.2060	1.0000	1.567505E-03	3.223060E-04
.7250	.1302	.4400	.1590	1.0000	1.432200E-03	2.277198E-04
.7500	.1235	.4100	.0950	1.0000	1.265875E-03	1.202581E-04
.7750	.1171	.3800	.0400	1.0000	1.112450E-03	4.449800E-05
.8000	.1107	.3550	.0240	1.0000	9.824525E-04	2.357910E-05
.8250	.1048	.3300	.0100	1.0000	8.646000E-04	8.646000E-06
.8500	.0988	.3150	.0030	1.0000	7.780500E-04	2.334150E-06
.8750	.0939	.3000	.0220	1.0000	7.042500E-04	1.549350E-05
.9000	.0889	.2820	0	1.0000	6.267450E-04	0.
.9250	.0862	.2640	0	1.0000	5.689200E-04	0.
.9500	.0835	.2430	0	1.0000	5.135250E-04	0.
.9750	.0791	.2320	0	1.0000	4.587800E-04	0.
1.0000	.0746	.2220	0	1.0000	4.140300E-04	0.

JUPITER CHECK OUT CASE NO 8

TV ENERGY DATA FOR PIONEER SIT CAMERA

SATELLITE 1 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.713347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.618045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190350E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.518306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

Table A-22 (cont)

JUPITER CHECK OUT CASE NO 8

TV ENERGY DATA FOR PIONEER SIT CAMERA

SATELLITE 2 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.713347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.619045E-03
.5250	.1852	.1100	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070300E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165300E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527835E-04
.6500	.1511	.1450	.3600	1.0000	2.190950E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

JUPITER CHECK OUT CASE NO 8

TV ENERGY DATA FOR PIONEER SIT CAMERA

SATELLITE 3 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.567125E-05	0.
.2750	.0204	.0500	.0020	1.0000	5.074500E-05	1.014900E-07
.3000	.0514	.0550	.0950	1.0000	1.406432E-04	1.336111E-05
.3250	.0971	.0600	.4760	1.0000	2.898435E-04	1.379655E-04
.3500	.1093	.0650	.7620	1.0000	3.534489E-04	2.693280E-04
.3750	.1157	.0700	.9530	1.0000	4.029252E-04	3.833878E-04
.4000	.1429	.0750	.9840	1.0000	5.331956E-04	5.246645E-04
.4250	.1693	.0800	1.0000	1.0000	6.738140E-04	6.738140E-04
.4500	.2006	.0850	.9840	1.0000	8.482872E-04	8.347147E-04
.4750	.2044	.1000	.9530	1.0000	1.016890E-03	9.690362E-04
.5000	.1942	.1050	.7940	1.0000	1.014452E-03	8.054751E-04
.5250	.1852	.1100	.7620	1.0000	1.041148E-03	7.933549E-04
.5500	.1725	.1200	.6820	1.0000	1.029825E-03	7.023406E-04
.5750	.1719	.1250	.5550	1.0000	1.069003E-03	5.932967E-04
.6000	.1666	.1300	.4760	1.0000	1.077485E-03	5.129331E-04
.6250	.1586	.1350	.4450	1.0000	1.065197E-03	4.740128E-04
.6500	.1511	.1450	.3600	1.0000	1.089998E-03	3.923991E-04
.6750	.1442	.1550	.2540	1.0000	1.111962E-03	2.824384E-04
.7000	.1369	.1650	.2060	1.0000	1.123778E-03	2.314982E-04
.7250	.1302	.1700	.1590	1.0000	1.101166E-03	1.750855E-04
.7500	.1235	.1750	.0950	1.0000	1.075222E-03	1.021461E-04
.7750	.1171	.1800	.0400	1.0000	1.048630E-03	4.194522E-05
.8000	.1107	.1850	.0240	1.0000	1.018855E-03	2.445252E-05
.8250	.1048	.2900	.0100	1.0000	1.512002E-03	1.512002E-05
.8500	.0988	.2950	.0030	1.0000	1.450013E-03	4.350040E-06
.8750	.0939	.2000	.0220	1.0000	9.343050E-04	2.055471E-05
.9000	.0889	.2000	0	1.0000	8.845550E-04	0.
.9250	.0862	.2000	0	1.0000	8.576900E-04	0.
.9500	.0835	.2050	0	1.0000	8.515956E-04	0.
.9750	.0791	.2080	0	1.0000	8.185268E-04	0.
1.0000	.0746	.2100	0	1.0000	7.793835E-04	0.

Table A-22 (cont)

JUPITER CHECK OUT CASE NO 8

TV ENERGY DATA FOR PIONEER SIT CAMERA

SATELLITE 4 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.779750E-05	0.
.2750	.0204	.0510	.0020	1.0000	5.763000E-05	1.152600E-07
.3000	.0514	.0550	.0950	1.0000	1.597255E-04	1.517392E-05
.3250	.0971	.0630	.4760	1.0000	3.291690E-04	1.566844E-04
.3500	.1093	.0650	.7620	1.0000	4.014042E-04	3.059700E-04
.3750	.1157	.0700	.9530	1.0000	4.575935E-04	4.360866E-04
.4000	.1429	.0750	.9840	1.0000	6.055387E-04	5.958501E-04
.4250	.1693	.0800	1.0000	1.0000	7.652360E-04	7.652360E-04
.4500	.2006	.0850	.9840	1.0000	9.633815E-04	9.479674E-04
.4750	.2044	.1000	.9530	1.0000	1.154860E-03	1.100582E-03
.5000	.1942	.1050	.7940	1.0000	1.152091E-03	9.147607E-04
.5250	.1852	.1130	.7620	1.0000	1.182409E-03	9.009960E-04
.5500	.1725	.1200	.6820	1.0000	1.169550E-03	7.976331E-04
.5750	.1719	.1250	.5550	1.0000	1.214044E-03	6.737943E-04
.6000	.1666	.1300	.4760	1.0000	1.223677E-03	5.824703E-04
.6250	.1586	.1350	.4450	1.0000	1.209721E-03	5.383261E-04
.6500	.1511	.1450	.3600	1.0000	1.237687E-03	4.456392E-04
.6750	.1442	.1550	.2540	1.0000	1.262831E-03	3.207592E-04
.7000	.1369	.1650	.2060	1.0000	1.276250E-03	2.628076E-04
.7250	.1302	.1700	.1590	1.0000	1.250571E-03	1.988408E-04
.7500	.1235	.1750	.0950	1.0000	1.221106E-03	1.160051E-04
.7750	.1171	.1800	.0400	1.0000	1.190907E-03	4.763628E-05
.8000	.1107	.1850	.0240	1.0000	1.157092E-03	2.777020E-05
.8250	.1048	.2000	.0100	1.0000	1.717148E-03	1.717148E-05
.8500	.0988	.2950	.0030	1.0000	1.646749E-03	4.940247E-06
.8750	.0939	.2000	.0220	1.0000	1.061070E-03	2.334354E-05
.9000	.0889	.2000	0	1.0000	1.004570E-03	0.
.9250	.0862	.2000	0	1.0000	9.740600E-04	0.
.9500	.0835	.2050	0	1.0000	9.671387E-04	0.
.9750	.0791	.2080	0	1.0000	9.295832E-04	0.
1.0000	.0746	.2100	0	1.0000	8.851290E-04	0.

JUPITER CHECK OUT CASE NO 8

COMPUTATIONS FOR MINIMUM PICTURE TAKING INTERVAL

PICTURE START TIME (DAYS) = 1.00000000E+00
PICTURE STOP TIME (DAYS) = 2.20000000E+01
DELTA T REQUESTED (SEC) = 4.32000000E+04
FRAME READ TIME (SEC) = 4.00000000E+01
FRAME READ RATE (BPS) = 3.75000000E+04

BULK DATA STORAGE CAPACITY (BITS) = -0.
PICTURE SIZE (BITS) = 1.50000000E+06
BULK DATA STORAGE CAPACITY (PICS) = 0.
BULK CONTENTS IN USE (BITS) = -0.
BUFFER STORAGE CAPACITY (BITS) = 1.50000000E+06

DATA TRANSMISSION RATE (BPS) = 2.04800000E+03
RATE FROM OTHER INSTRUMENTS (BPS) = 6.40000000E+01
REAL TIME PICTURE RATE (BPS) = 1.98400000E+03

PICTURE INTERVAL BASED ON ROLL RATE = 3.60000304E+04 SEC, NO OF ROLLS/PIC = 1

MINIMUM PICTURE INTERVAL (SEC) = 3.60000304E+04
MAXIMUM PICTURE RATE (PICS/HR) = 9.99999155E-02
MAXIMUM PICTURE RATE (PIC/DAY) = 2.39999797E+00
MAXIMUM NUMBER OF PICTURES = 50
ACTUAL PICTURE RATE (PIC/DAY) = 2.00000000E+00
ACTUAL NUMBER OF PICTURES = 41

PERIAPSIS STATE VECTOR
-1.55815045E+05 -4.33051226E+04 3.07916842E+02
9.75526852E+00 -3.77127648E+01 0.
VIEW FROM INPUT VIEWPOINT

Table A-22 (concl)

JUPITER CHECK OUT CASE NO 8

PLOT INTERVAL = 1 CALC STEPS = 720.00MINUTES
PRNT INTERVAL = 1CALC STEPS = 720.00 MINUTES

TIME INTERVAL FOR CALCULATIONS = 720.00 MINUTES

PICTURE	CALC	TIME (DAYS)	TIME (HRS)	TIME (MIN)
1	1	1.0000000E+00	2.4000000E+01	1.4400000E+03
2	2	1.5000000E+00	3.6000000E+01	2.1600000E+03
3	3	2.0000000E+00	4.8000000E+01	2.8800000E+03
4	4	2.5000000E+00	6.0000000E+01	3.6000000E+03
5	5	3.0000000E+00	7.2000000E+01	4.3200000E+03
6	6	3.5000000E+00	8.4000000E+01	5.0400000E+03
7	7	4.0000000E+00	9.6000000E+01	5.7600000E+03
8	8	4.5000000E+00	1.0800000E+02	6.4800000E+03
9	9	5.0000000E+00	1.2000000E+02	7.2000000E+03
10	10	5.5000000E+00	1.3200000E+02	7.9200000E+03
11	11	6.0000000E+00	1.4400000E+02	8.6400000E+03
12	12	6.5000000E+00	1.5600000E+02	9.3600000E+03
13	13	7.0000000E+00	1.6800000E+02	1.0080000E+04
14	14	7.5000000E+00	1.8000000E+02	1.0800000E+04
15	15	8.0000000E+00	1.9200000E+02	1.1520000E+04
16	16	8.5000000E+00	2.0400000E+02	1.2240000E+04
17	17	9.0000000E+00	2.1600000E+02	1.2960000E+04
18	18	9.5000000E+00	2.2800000E+02	1.3680000E+04
19	19	1.0000000E+01	2.4000000E+02	1.4400000E+04
20	20	1.0500000E+01	2.5200000E+02	1.5120000E+04
21	21	1.1000000E+01	2.6400000E+02	1.5840000E+04
22	22	1.1500000E+01	2.7600000E+02	1.6560000E+04
23	23	1.2000000E+01	2.8800000E+02	1.7280000E+04
24	24	1.2500000E+01	3.0000000E+02	1.8000000E+04
25	25	1.3000000E+01	3.1200000E+02	1.8720000E+04
26	26	1.3500000E+01	3.2400000E+02	1.9440000E+04
27	27	1.4000000E+01	3.3600000E+02	2.0160000E+04
28	28	1.4500000E+01	3.4800000E+02	2.0880000E+04
29	29	1.5000000E+01	3.6000000E+02	2.1600000E+04
30	30	1.5500000E+01	3.7200000E+02	2.2320000E+04
31	31	1.6000000E+01	3.8400000E+02	2.3040000E+04
32	32	1.6500000E+01	3.9600000E+02	2.3760000E+04
33	33	1.7000000E+01	4.0800000E+02	2.4480000E+04
34	34	1.7500000E+01	4.2000000E+02	2.5200000E+04
35	35	1.8000000E+01	4.3200000E+02	2.5920000E+04
36	36	1.8500000E+01	4.4400000E+02	2.6640000E+04
37	37	1.9000000E+01	4.5600000E+02	2.7360000E+04
38	38	1.9500000E+01	4.6800000E+02	2.8080000E+04
39	39	2.0000000E+01	4.8000000E+02	2.8800000E+04
40	40	2.0500000E+01	4.9200000E+02	2.9520000E+04
41	41	2.1000000E+01	5.0400000E+02	3.0240000E+04
42	42	2.1500000E+01	5.1600000E+02	3.0960000E+04
43	43	2.2000000E+01	5.2800000E+02	3.1680000E+04
44	44	2.2500000E+01	5.4000000E+02	3.2400000E+04
45	45	2.3000000E+01	5.5200000E+02	3.3120000E+04
46	46	2.3500000E+01	5.6400000E+02	3.3840000E+04
47	47	2.4000000E+01	5.7600000E+02	3.4560000E+04

JUPITER CHECK OUT CASE NO 8
PIONEER SIT CAMERA

EXPOSURE TOO HIGH 9.535E-02 (ERGS/CM**2)
EXPOSURE TIME REDUCED TO 2.266E-06 SEC
EXPOSURE IS 1.701E-03 (ERG/CM**2)
CHG 1
EXPOSURE TIME SET TO 0.1 MILLISEC
REQUIRED FILTER FACTOR IS 4.413E+01
CHG 1
VIEW FROM SPACECRAFT

b. Output Data - For this Jupiter orbiter case, several frames were selected to show geometry near periapsis, midway, and near apoapsis. Table A-23 presents the tabular output for the frames selected. Several satellites are shown on the frames along with the main planet.

The graphic output shows the orbit frames selected (Fig. A-19); the case time interval was run for slightly greater than one orbit. The overview plot (Fig. A-20) shows that the start time was at periapsis. In addition to geometry, several analysis plots summarize resolution of Jupiter and satellites, number of pixels smeared, and number of pictures within specified resolution levels for Jupiter and satellites (Fig. A-21).

Table A-23 Case 8 Tabular Output

```
JUPITER CHECK OUT CASE NO 8

PICTURE NUMBER     5                    3 DAYS  0 HRS  0 MIN TO ENCOUNTER          JD  2445734.500

PLANET JUPITE                          SATELLITE  CALLI
RANGE (KM)  =  2.66269379E+06           RANGE (KM)  =  1.19239507E+06
CONE  (DEG) =  84.10                    CONE  (DEG) =  46.28
CLOCK (DEG) =  87.14                    CLOCK (DEG) =  90.60
PHASE (DEG) =  88.63                    PHASE (DEG) = 126.46
DIAM  (DEG) =   3.07                    DIAM  (DEG) =    .23


RESOLUTION OF PLANET
CENTER =   510.10 KM/PIXEL
LIMB   =   523.96 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE          (PICTURE CENTERED AT   -.83 DEG LAT  130.07 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =   510.10 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES     10.30 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES     588.04 KM/SEC
OBJECT MOTION FROM ALL SOURCES        .06 KM
NUMBER OF PIXELS SMEARED            .00012 PIXELS


EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR  427.976 MILLISEC


EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION      510.2 KM/PIXEL
 AT SUBSPACECRAFT POINT     510.2 KM/PIXEL
 AT LIMB OF TARGET BODY     524.0 KM/PIXEL

EXPOSURE TIME FOR PIONEER SIT CAMERA             =      .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 2.0449E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.7012E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 85.000
 DIGITAL NUMBER OF EXPOS  =  54 (OF  64 LEVELS)
 ONE DIGITAL NUMBER EQUALS 3.1125E-05 ERGS/SQ CM


NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET                1.0            0.             0.            0.          *
 SATELLITE 1           1.0000         0.             0.            0.
 SATELLITE 2           2.0000         0.             0.            0.
 SATELLITE 3           0.             0.             0.            0.
 SATELLITE 4           5.0000         2.0000         1.0000        0.



          SATELLITE DATA

            NUM     RANGE (KM)          PHASE (DEG)    CONE (DEG)     CLOCK (DEG)

             1    2.85040788E+06          80.74          91.99          86.76
             2    3.18056131E+06          96.97          75.76          87.45
             3    3.72563611E+06          90.91          81.82          87.05
             4    1.19239507E+06         126.46          46.28          90.60

            NUM       EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

             1         8.07429149E+01                   6.71370283E-02
             2         9.69706902E+01                   5.26019358E-02
             3         9.09100043E+01                   7.84318409E-02
             4         1.26460415E+02                   2.26686818E-01

          RESOLUTION (KM/PIX) DATA FOR SATELLITES
            NUM   RES ALONG RADIUS VECTOR            RES AT SATELLITE LIMB

             1         5.60775210E+02                   5.61103853E+02
             2         6.25807386E+02                   6.26094721E+02
             3         7.32891013E+02                   7.33392810E+02
             4         2.34376997E+02                   2.34841104E+02

          SMEAR DATA FOR SATELLITES
          SMEAR DUE TO       SMEAR DUE TO         NUMBER OF          TIME TO SMEAR
          VEL (KM/SEC)       S/C (KM/SEC)       PIXELS SMEARED       1/2 PIXEL (SEC)

           1.02079370E+01     6.97139128E+02     1.25563682E-04       3.98204314E-01
           1.44858817E+01     6.62074560E+02     1.07724596E-04       4.64146555E-01
           1.34111592E+01     8.24296713E+02     1.13886635E-04       4.39033078E-01
           1.37585854E+00     2.10885749E+02     9.05576683E-05       5.52134357E-01
      VIEW FROM SPACECRAFT
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Table A-23 (cont)

JUPITER CHECK OUT CASE NO 8

PICTURE NUMBER 13 7 DAYS 3 HRS 0 MIN TO ENCOUNTER JD 2445738.500

PLANET JUPITE		SATELLITE CALLI	
RANGE (KM)	= 3.34298327E+06	RANGE (KM)	= 4.61086320E+06
CONE (DEG)	= 94.37	CONE (DEG)	= 70.44
CLOCK (DEG)	= 87.31	CLOCK (DEG)	= 88.12
PHASE (DEG)	= 77.82	PHASE (DEG)	= 101.75
DIAM (DEG)	= 2.07	DIAM (DEG)	= .06

RESOLUTION OF PLANET
CENTER = 762.13 KM/PIXEL
LIMB = 776.05 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -1.22 DEG LAT 229.60 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	762.13 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	11.07 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	971.85 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.10 KM
NUMBER OF PIXELS SMEARED	.00013 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 389.016 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 762.2 KM/PIXEL
AT SUBSPACECRAFT POINT 762.2 KM/PIXEL
AT LIMB OF TARGET BODY 776.1 KM/PIXEL

EXPOSURE TIME FOR PIONEER SIT CAMERA = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.6151E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.6151E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 80.676
DIGITAL NUMBER OF EXPOS = 51 (OF 64 LEVELS)
ONE DIGITAL NUMBER EQUALS 3.1125E-05 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
RESOLUTION LEVELS 300.0 100.0 50.0 10.0 KM/PIXEL

PLANET	1.0	0.	0.	0.
SATELLITE 1	1.0000	0.	0.	0.
SATELLITE 2	2.0000	0.	0.	0.
SATELLITE 3	0.	0.	0.	0.
SATELLITE 4	5.0000	2.0000	1.0000	0.

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	3.58308793E+06	74.50	97.69	87.31
2	4.60161687E+06	79.07	93.12	87.19
3	2.87364462E+06	78.66	93.53	87.71
4	4.61086320E+06	101.75	70.44	88.12

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	7.45021165E+01	5.34086559E-02
2	7.90687476E+01	3.63575855E-02
3	7.86565142E+01	1.01685682E-01
4	1.01749057E+02	5.86519442E-02

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	7.05093576E+02	7.05332239E+02
2	9.05542749E+02	9.05830105E+02
3	5.65176144E+02	5.65677890E+02
4	9.07185728E+02	9.07650176E+02

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.31836480E+01	9.24994799E+02	1.29926415E-04	3.84833214E-01
1.53365216E+01	1.14123829E+03	1.27228663E-04	3.92993205E-01
9.23603441E+00	7.18333745E+02	1.25961697E-04	3.96946367E-01
6.66490743E+00	9.15573784E+02	1.01570152E-04	4.92270605E-01

VIEW FROM SPACECRAFT

Table A-23 (cont)

JUPITER CHECK OUT CASE NO 8

PICTURE NUMBER 24 12 DAYS 12 HRS 0 MIN TO ENCOUNTER JD 2445744.000

PLANET JUPITE
RANGE (KM) = 4.19284240E+06
CONE (DEG) = 103.04
CLOCK (DEG) = 87.53
PHASE (DEG) = 68.54
DIAM (DEG) = 1.95

SATELLITE CALLI
RANGE (KM) = 5.93924852E+06
CONE (DEG) = 111.33
CLOCK (DEG) = 86.81
PHASE (DEG) = 60.25
DIAM (DEG) = .05

RESOLUTION OF PLANET
CENTER = 811.31 KM/PIXEL
LIMB = 825.24 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -1.51 DEG LAT 90.87 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 811.31 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 11.16 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 1109.46 KM/SEC
OBJECT MOTION FROM ALL SOURCES .11 KM
NUMBER OF PIXELS SMEARED .00014 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 363.250 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 811.4 KM/PIXEL
AT SUBSPACECRAFT POINT 811.4 KM/PIXEL
AT LIMB OF TARGET BODY 825.4 KM/PIXEL

EXPOSURE TIME FOR PIONEER SIT CAMERA = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.5349E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.5349E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 76.652
DIGITAL NUMBER OF EXPOS = 49 (OF 64 LEVELS)
ONE DIGITAL NUMBER EQUALS 3.1125E-05 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.3	50.0	10.0	KM/PIXEL
PLANET	1.0	0.	0.	0.	
SATELLITE 1	1.0000	0.	0.	0.	
SATELLITE 2	2.0000	0.	0.	0.	
SATELLITE 3	0.	0.	0.	0.	
SATELLITE 4	5.0000	2.0000	1.0000	0.	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	3.77295651E+06	68.56	103.02	87.70
2	3.51504093E+06	68.44	103.14	87.84
3	4.33942397E+06	54.27	117.31	86.99
4	5.93824852E+06	60.25	111.33	86.81

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	6.85627840E+01	5.07209425E-02
2	6.84429485E+01	4.75965100E-02
3	5.42704968E+01	6.73380833E-02
4	6.02534078E+01	4.55413891E-02

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	7.42379281E+02	7.42707949E+02
2	6.91649834E+02	6.91937176E+02
3	8.53715403E+02	8.54217224E+02
4	1.16848207E+03	1.16894654E+03

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.59155790E+01	1.01643258E+03	1.35531639E-04	3.68917413E-01
1.21244141E+01	9.48420615E+02	1.35976872E-04	3.67709590E-01
4.51957831E+00	1.26178601E+03	1.48089132E-04	3.37634499E-01
9.40183897E+00	1.67743003E+03	1.44043253E-04	3.47117959E-01

VIEW FROM SPACECRAFT

Table A-23 (cont)

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JUPITER CHECK OUT CASE 40 8

PICTURE NUMBER    33                    17 DAYS  0 HRS  0 MIN TO ENCOUNTER          JD  2445748.500

PLANET JUPITE                           SATELLITE  CALLI
RANGE (KM)  =  3.22745334E+06           RANGE (KM)  =  2.99044792E+06
CONE  (DEG) = 112.07                    CONE  (DEG) = 146.80
CLOCK (DEG) =  87.67                    CLOCK (DEG) =  86.81
PHASE (DEG) =  59.12                    PHASE (DEG) =  24.40
DIAM  (DEG) =   2.53                    DIAM  (DEG) =   .09


RESOLUTION OF PLANET
CENTER =   621.28 KM/PIXEL
LIMB   =   635.17 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE          (PICTURE CENTERED AT  -1.77 DEG LAT  110.10 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =   621.28 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES     10.71 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES     897.75 KM/SEC
OBJECT MOTION FROM ALL SOURCES        .09 KM
NUMBER OF PIXELS SMEARED           .00015 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR  343.482 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION      621.4 KM/PIXEL
 AT SUBSPACECRAFT POINT     621.4 KM/PIXEL
 AT LIMB OF TARGET BODY     635.3 KM/PIXEL

EXPOSURE TIME FOR PIONEER SIT CAMERA              =    .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 1.4487E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.4487E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 72.323
 DIGITAL NUMBER OF EXPOS  =  46 (OF  64 LEVELS)
 ONE DIGITAL NUMBER EQUALS 3.1125E-05 ERGS/SQ CM


NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET                1.0            0.             0.            0.
 SATELLITE 1           1.0000         0.             0.            0.
 SATELLITE 2           2.0000         0.             0.            0.
 SATELLITE 3           0.             0.             0.            0.
 SATELLITE 4           5.0000         2.0000         1.0000        0.


          SATELLITE DATA

            NUM      RANGE (KM)          PHASE (DEG)     CONE (DEG)      CLOCK (DEG)

             1     3.64362320E+06          58.43          112.77           87.42
             2     3.23775087E+06          71.01          100.18           88.15
             3     3.95108232E+06          71.81           99.39           87.79
             4     2.99044792E+06          24.40          146.80           86.81

            NUM        EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

             1          5.84280909E+01                    5.24493486E-02
             2          7.10135691E+01                    5.16728089E-02
             3          7.18057575E+01                    7.39565699E-02
             4          2.43999492E+01                    9.04333111E-02

          RESOLUTION (KM/PIX) DATA FOR SATELLITES
            NUM   RES ALONG RADIUS VECTOR            RES AT SATELLITE LIMB

             1          7.17904220E+02                    7.18232885E+02
             2          6.37065172E+02                    6.37352509E+02
             3          7.77270192E+02                    7.77771999E+02
             4          5.88206322E+02                    5.88670706E+02

          SMEAR DATA FOR SATELLITES
          SMEAR DUE TO        SMEAR DUE TO          NUMBER OF          TIME TO SMEAR
          VEL (KM/SEC)        S/C (KM/SEC)        PIXELS SMEARED       1/2 PIXEL (SEC)

           1.91862732E+01      1.04060414E+03      1.46584976E-04       3.41093076E-01
           2.63472248E+00      8.36818946E+02      1.34835516E-04       3.70822180E-01
           9.13962438E+00      1.03708316E+03      1.34224043E-04       3.72511504E-01
           5.44711330E+00      8.93744593E+02      1.52435754E-04       3.28007038E-01
      VIEW FROM SPACECRAFT
```

Table A-23 (concl)

```
JUPITER CHECK OUT CASE NO 8

PICTURE NUMBER    41                    21 DAYS  0 HRS  0 MIN TO ENCOUNTER          JD  2445752.500

PLANET JUPITE                           SATELLITE  CALLI
RANGE (KM)  =  6.24472053E+05           RANGE (KM)  =  1.32873119E+06
CONE  (DEG) = 155.75                    CONE  (DEG) =  58.61
CLOCK (DEG) =  87.34                    CLOCK (DEG) = 264.38
PHASE (DEG) =  15.25                    PHASE (DEG) = 130.38
DIAM  (DEG) =  13.13                    DIAM  (DEG) =    .20


RESOLUTION OF PLANET
CENTER =   108.88 KM/PIXEL
LIMB   =   122.12 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE          (PICTURE CENTERED AT  -2.21 DEG LAT  242.73 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =   108.88 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES      2.61 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES     160.56 KM/SEC
OBJECT MOTION FROM ALL SOURCES        .02 KM
NUMBER OF PIXELS SMEARED            .00015 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR  335.337 MILLISEC


EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION      108.9 KM/PIXEL
 AT SUBSPACECRAFT POINT     108.9 KM/PIXEL
 AT LIMB OF TARGET BODY     122.1 KM/PIXEL

EXPOSURE TIME FOR PIONEER SIT CAMERA             =      .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 1.0133E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.0133E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 50.466
 DIGITAL NUMBER OF EXPOS  =  32 (OF  64 LEVELS)
 ONE DIGITAL NUMBER EQUALS 3.1125E-05 ERGS/SQ CM


NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET                3.0            0.             0.            0.
 SATELLITE 1           3.0000         0.             0.            0.
 SATELLITE 2           6.0000         0.             0.            0.
 SATELLITE 3           2.0000         0.             0.            0.
 SATELLITE 4          10.0000         2.0000         1.0000        0.



          SATELLITE DATA

            NUM     RANGE (KM)          PHASE (DEG)    CONE (DEG)     CLOCK (DEG)

             1    9.29926477E+05          6.71          177.56          70.52
             2    8.86088816E+05         63.84          107.16          87.92
             3    1.11144736E+06         54.58          134.42         267.40
             4    1.32873119E+06        130.38           58.61         264.38

            NUM       EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

             1         6.71089378E+00                    2.05788319E-01
             2         6.38420790E+01                    1.88811493E-01
             3         5.45769709E+01                    2.62908297E-01
             4         1.30375269E+02                    2.03529670E-01

          RESOLUTION (KM/PIX) DATA FOR SATELLITES
            NUM   RES ALONG RADIUS VECTOR            RES AT SATELLITE LIMB

             1         1.82727665E+02                    1.83056110E+02
             2         1.74139542E+02                    1.74426707E+02
             3         2.1828689oE+02                    2.18788288E+02
             4         2.6109670gE+02                    2.61560863E+02

          SMEAR DATA FOR SATELLITES
          SMEAR DUE TO        SMEAR DUE TO          NUMBER OF          TIME TO SMEAR
          VEL (KM/SEC)        S/C (KM/SEC)        PIXELS SMEARED       1/2 PIXEL (SEC)

           2.96176778E+01      2.35618103E+02      1.40198929E-04       3.56636106E-01
           4.76016831E+00      2.45479165E+02      1.42921763E-04       3.49841751E-01
           2.73423110E+01      1.85334015E+02      9.74254023E-05       5.13213175E-01
           8.66284764E+00      3.90205470E+02      1.51097850E-04       3.30911393E-01
      VIEW FROM SPACECRAFT
      LAT    1 , LONG  152 NOT VISIBLE
```

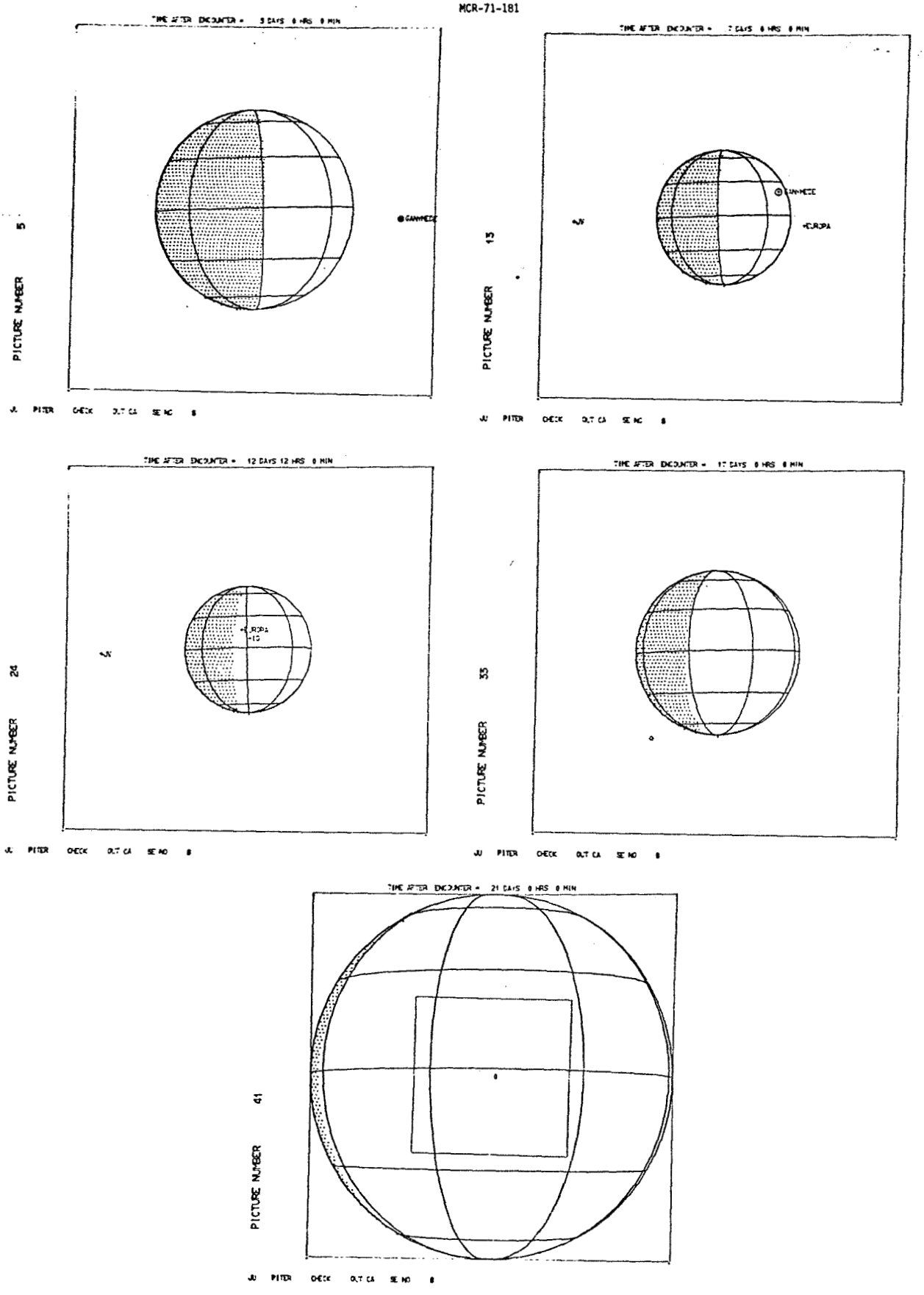

Fig. A-19 Scenes Before and After Closest Approach

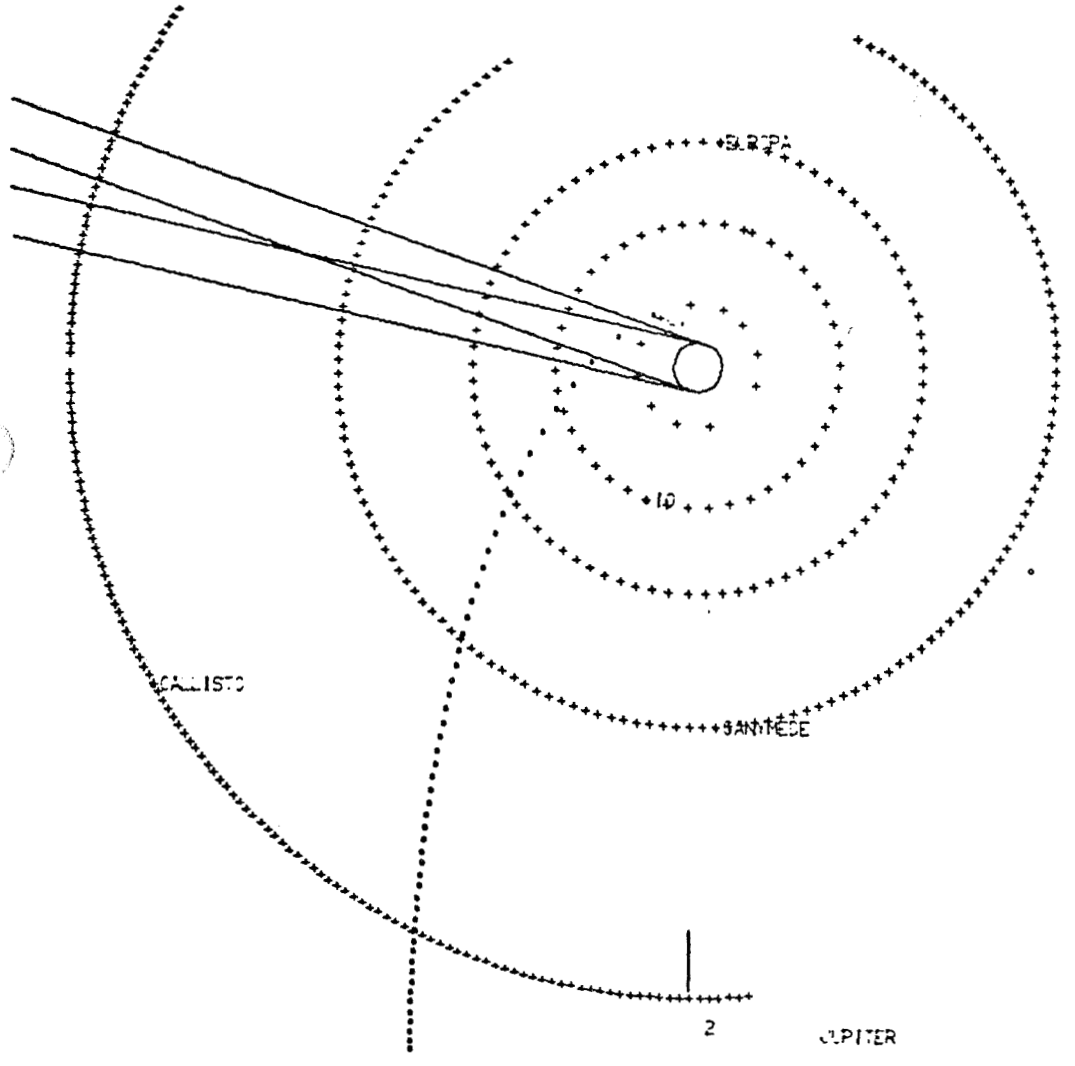

Fig. A-20 Flyby Encounter Geometry

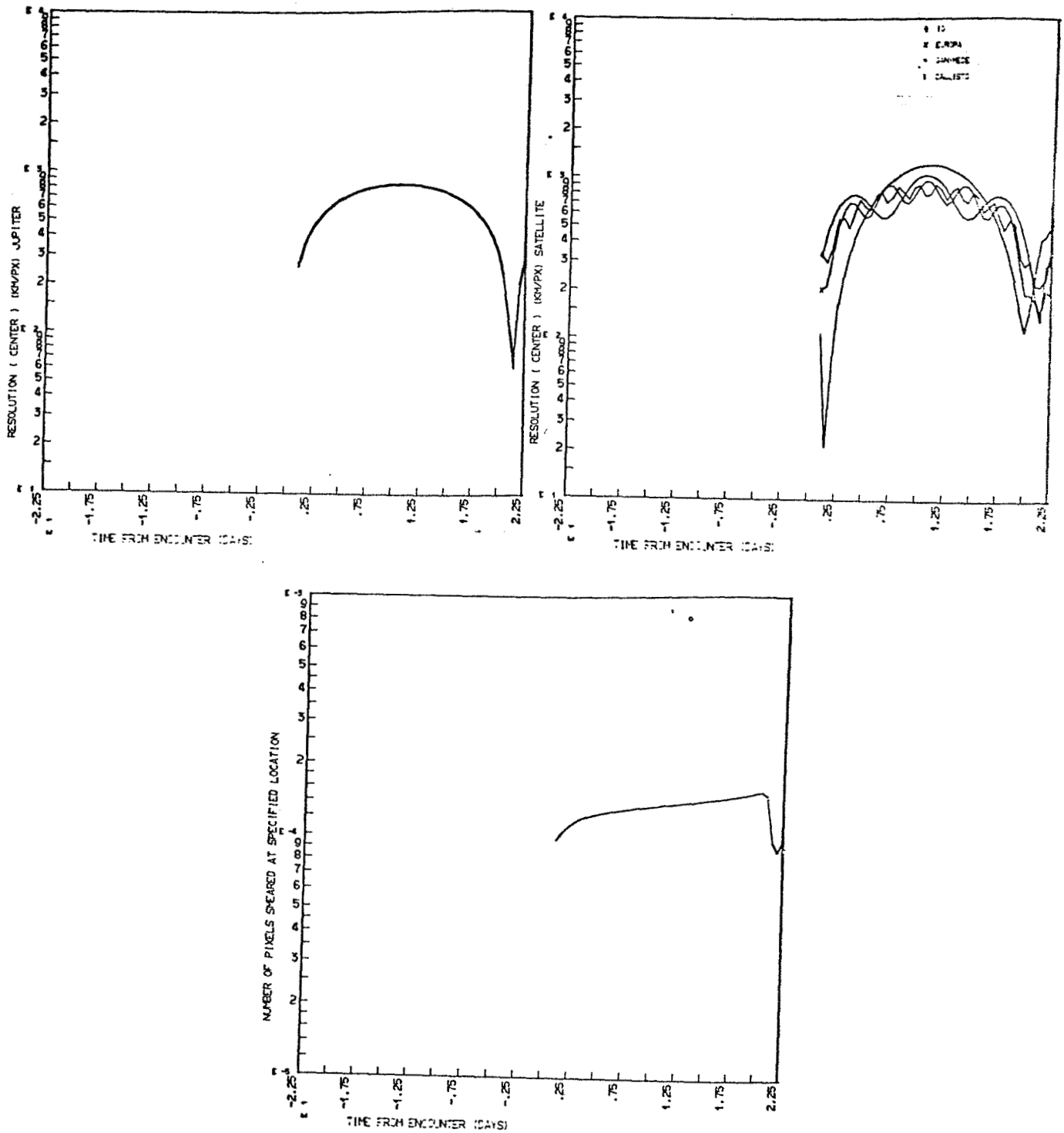

Fig. A-21 TV Summaries

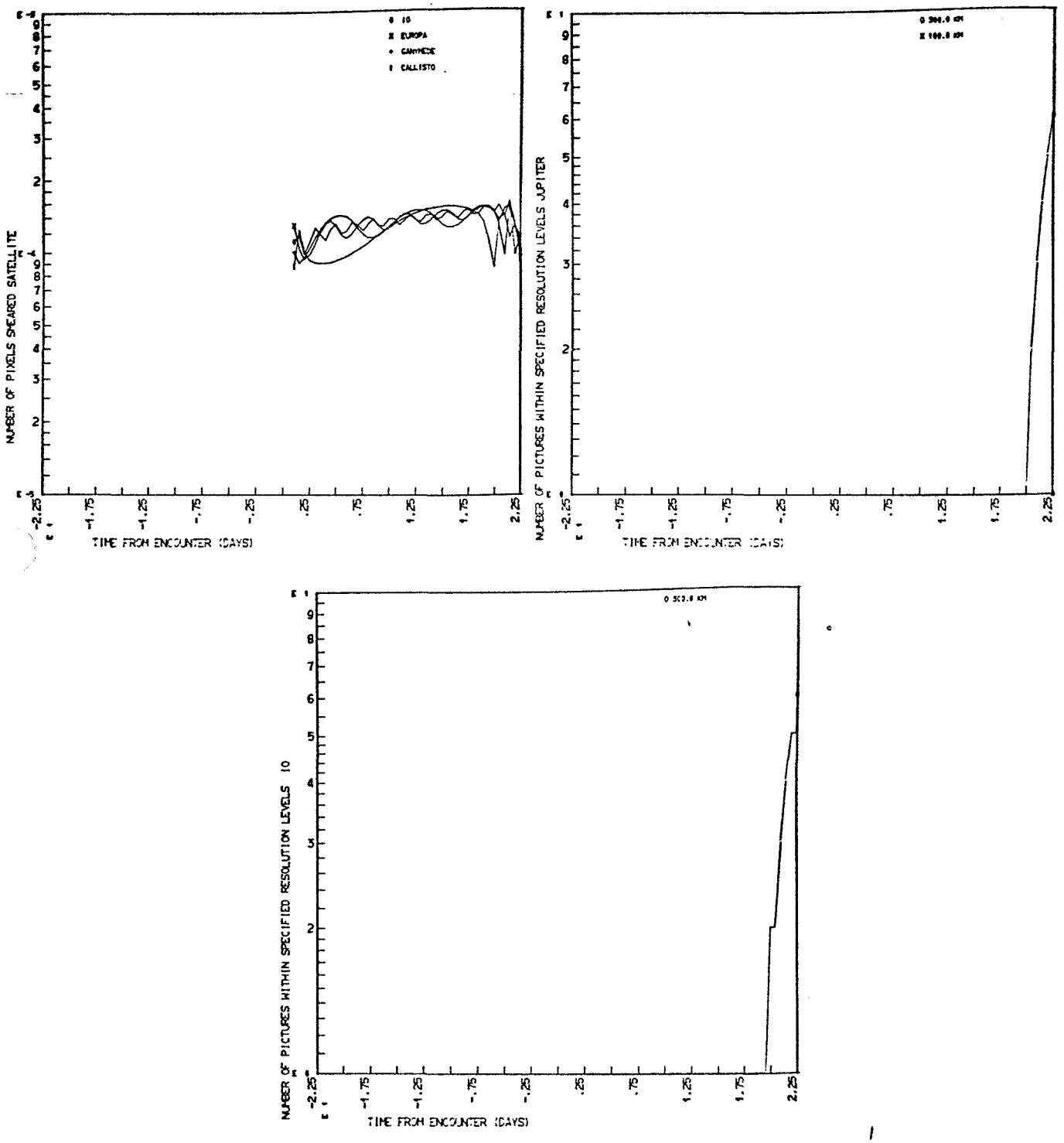

Fig. A-21 (concl)

4. Case 9

a. Input Data - This case is the Jupiter orbiter mission with a TOPS narrow-angle camera. The input listing is given in Table A-24; narrow-angle camera specifications are given in Table A-25.

Table A-24 Case 9 Input Listing

```
   JUPITER CHECK OUT CASE NO 9

 2        5.0000000    PLANET
 3        4.0000000    SATEL
 4        840201.00    DATE
 6        1.0000000E+01
 7        2.2550000    STATE1
 8        59.884000    STATE2
 9        70.630000    STATE3
22        110.00000    LISTIO
31      -0.            NAME-1
32      -0.            NAME-2
33      -0.            NAME-3
34      -0.            NAME-4
35      -0.            NAME-5
51        1.0000000
61        1.0000000    TSTAR
62        22.000000    TSTOP
63        720.00000    DTINST
64      20.000000000E+08
65        0.
66        28500.000    BITRAT
67        640.00000
68        2000000.0
69        1.0000000    CALCST
81        1.0000000    DPLOT
82        1.0000000    DPRNT
90        1111111.0
98
```

```
   JUPITER CHECK OUT CASE NO 9

XZ(I) VALUES IN STORAGE

  1   0   0.                          2   1   5.0000000000E+00
  3   1   4.0000030000E+00            4   1   8.4020100000E+05
  5   0   0.                          6   1   1.0000000000E+01
  7   1   2.2550000000E+00            8   1   5.9884000000E+01
  9   1   7.0680000300E+01           10   0   0.
 11   0   0.                         12   0   0.
 13   0   0.                         14   0   0.
 15   0   3.0000000000E+00           16   0   0.
 17   0   0.                         18   0   0.
 19   0   0.                         20   0   0.
 21   0   0.                         22   1   1.1000000000E+02
 23   0   0.                         24   0  -7.1738305547E+57
 25   0  -7.1738305547E+57           26   0   0.
 27   0   0.                         28   0   0.
 29   0   0.                         30   0   0.
 31   1  -0.                         32   1  -0.
 33   1  -0.                         34   1  -0.
 35   1  -0.                         36   0   0.
 37   0   0.                         38   0   0.
 39   0   0.                         40   0   0.
 41   0   0.                         42   0   0.
 43   0   0.                         44   0   0.
 45   0   0.                         46   0   0.
 47   0   0.                         48   0   0.
 49   0   0.                         50   0   0.
 51   1   1.0000000000E+00           52   0   0.
 53   0   0.                         54   0   0.
 55   0   0.                         56   0   0.
 57   0   0.                         58   0   0.
 59   0   0.                         60   0   0.
 61   1   1.0300000000E+00           62   1   2.2000000000E+01
 63   1   7.2000001000E+02           64   1   2.0000000000E+09
 65   1   0.                         66   1   2.8500000000E+04
 67   1   6.4000000000E+02           68   1   2.0000003000E+06
 69   1   1.0000006000E+00           70   0   0.
 71   0   0.                         72   0   0.
 73   0   0.                         74   0   0.
 75   0   0.                         76   0   0.
 77   0   0.                         78   0   0.
 79   0   0.                         80   0   0.
 81   1   1.0000000000E+00           82   1   1.0000000000E+00
 83   0   0.                         84   0   0.
 85   0   0.                         86   0   0.
 87   0   0.                         88   0   0.
 89   0   0.                         90   1   1.1111110000E+06
 91   0   0.                         92   0   0.
 93   0   0.                         94   0   0.
 95   0   0.                         96   0   0.
```

Table A-25 Narrow-Angle Camera Specifications

JUPITER CHECK OUT CASE NO 9

TV CHARACTERISTICS FOR TOPS NA SIT CAMERA

6	FOC LN=	2.000000000E+02	
7	DIAM =	2.300000000E+01	
8	OBSCUR=	0.	
9	TRANS =	8.500000000E-01	
10	SIZE-V=	1.600000000E+00	
11	SIZE-H=	1.600000000E+00	
12	LINES =	8.000000000E+02	
13	PIXELS=	8.000000000E+02	
14	BIT/PX=	8.000000000E+00	
15	MINEXP=	8.000000000E-06	
16	MAXEXP=	2.000000000E-03	
17	RESO-1=	3.000000000E+02	
18	RESO-2=	1.000000000E+02	
19	RESO-3=	5.000000000E+01	
20	RESO-4=	1.000000000E+01	
21	SENSOR=	1.000000000E+00	USER INPUT
22	B FILT=	1.000000000E+00	
23	G FILT=	1.000000000E+00	
24	R FILT=	1.000000000E+00	
25	P FILT=	-1.000000000E+00	
26	DT EXP=	1.000000000E-03	
27	OPEN =	0.	
28	OPEN =	0.	
29	T READ=	4.000000000E+01	
30	ERASET=	1.000000000E-01	
31	TSTART=	1.000000000E+00	USER INPUT
32	TSTOP =	2.200000000E+01	USER INPUT
33	DEL T =	7.200000000E+02	USER INPUT
34	BULK =	2.000000000E+09	USER INPUT
35	BULK-0=	0.	USER INPUT
36	BITRAT=	2.850000000E+04	USER INPUT
37	SCIBPS=	6.400000000E+02	USER INPUT
38	BUFFER=	2.000000000E+06	USER INPUT
39	PIC/ST=	1.000000000E+00	USER INPUT
40	DEL TF=	7.200000000E+02	
41	F/STOP=	8.69565217E+00	COMPUTED VALUES
42	A BLOC=	0.	COMPUTED VALUES
43	DIF LM=	2.91739130E-06	COMPUTED VALUES
44	FOV-V =	4.58364179E-01	COMPUTED VALUES
45	FOV-H =	4.58364179E-01	COMPUTED VALUES
46	RES-C =	1.000000000E-05	COMPUTED VALUES
47	RES-V =	8.042089817E-06	COMPUTED VALUES
48	RES-H =	8.042089817E-06	COMPUTED VALUES
49	BIT/PC=	5.120000000E+06	COMPUTED VALUES
50	RR-BPS=	1.280000000E+05	COMPUTED VALUES
51	T/NUM =	9.431759604E+00	COMPUTED VALUES
52	T/NUMF=	9.431759604E+00	COMPUTED VALUES
53	OPEN =	0.	COMPUTED VALUES
54	OPEN =	0.	COMPUTED VALUES
55	OPEN =	0.	COMPUTED VALUES
56	OPEN =	0.	COMPUTED VALUES
57	OPEN =	0.	COMPUTED VALUES
58	OPEN =	0.	COMPUTED VALUES
59	OPEN =	0.	COMPUTED VALUES
60	OPEN =	0.	COMPUTED VALUES

JUPITER CHECK OUT CASE NO 9

TV ENERGY DATA FOR TOPS NA SIT CAMERA

PLANET 5 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.3000	0	1.0000	5.250000E-05	0.
.2750	.0204	.2820	.0020	1.0000	1.433200E-04	2.870400E-07
.3000	.0514	.2700	.0950	1.0000	3.469500E-04	3.296025E-05
.3250	.0971	.2650	.4760	1.0000	6.432875E-04	3.062049E-04
.3500	.1093	.2690	.7620	1.0000	7.350425E-04	5.601024E-04
.3750	.1157	.2720	.9530	1.0000	7.867600E-04	7.497823E-04
.4000	.1429	.2850	.9840	1.0000	1.018162E-03	1.001872E-03
.4250	.1693	.3150	1.0000	1.0000	1.333237E-03	1.333237E-03
.4500	.2006	.3640	.9840	1.0000	1.825460E-03	1.796253E-03
.4750	.2044	.3850	.9530	1.0000	1.967350E-03	1.874885E-03
.5000	.1942	.4050	.7940	1.0000	1.971130E-03	1.565077E-03
.5250	.1852	.4300	.7620	1.0000	1.990900E-03	1.517066E-03
.5500	.1725	.4500	.6820	1.0000	1.940625E-03	1.323506E-03
.5750	.1719	.4600	.5550	1.0000	1.976350E-03	1.097152E-03
.6000	.1666	.4650	.4760	1.0000	1.936725E-03	9.218811E-04
.6250	.1586	.4690	.4450	1.0000	1.859585E-03	8.275153E-04
.6500	.1511	.4700	.3600	1.0000	1.775425E-03	6.391530E-04
.6750	.1442	.4690	.2540	1.0000	1.690745E-03	4.294492E-04
.7000	.1369	.4580	.2060	1.0000	1.567505E-03	3.229060E-04
.7250	.1302	.4400	.1590	1.0000	1.432200E-03	2.277198E-04
.7500	.1235	.4100	.0950	1.0000	1.265875E-03	1.202581E-04
.7750	.1171	.3800	.0400	1.0000	1.112450E-03	4.449800E-05
.8000	.1107	.3550	.0240	1.0000	9.824625E-04	2.357910E-05
.8250	.1048	.3300	.0100	1.0000	8.646000E-04	8.646000E-06
.8500	.0988	.3150	.0030	1.0000	7.780500E-04	2.334150E-06
.8750	.0939	.3000	.0220	1.0000	7.042500E-04	1.549350E-05
.9000	.0889	.2820	0	1.0000	6.267450E-04	0.
.9250	.0862	.2640	0	1.0000	5.689200E-04	0.
.9500	.0835	.2460	0	1.0000	5.135250E-04	0.
.9750	.0791	.2320	0	1.0000	4.587800E-04	0.
1.0000	.0746	.2220	0	1.0000	4.140300E-04	0.

Table A-25 (cont)

JUPITER CHECK OUT CASE NO 9

TV ENERGY DATA FOR TOPS NA SIT CAMERA

SATELLITE 1 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.618045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190350E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

JUPITER CHECK OUT CASE NO 9

TV ENERGY DATA FOR TOPS NA SIT CAMERA

SATELLITE 2 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	3.150000E-05	0.
.2750	.0204	.0500	.0020	1.0000	1.020000E-04	2.040000E-07
.3000	.0514	.0550	.0950	1.0000	2.827000E-04	2.685650E-05
.3250	.0971	.0600	.4760	1.0000	5.826000E-04	2.773176E-04
.3500	.1093	.0650	.7620	1.0000	7.104500E-04	5.413629E-04
.3750	.1157	.0700	.9530	1.0000	8.099000E-04	7.718347E-04
.4000	.1429	.0750	.9840	1.0000	1.071750E-03	1.054602E-03
.4250	.1693	.0800	1.0000	1.0000	1.354400E-03	1.354400E-03
.4500	.2006	.0850	.9840	1.0000	1.705100E-03	1.677818E-03
.4750	.2044	.1000	.9530	1.0000	2.044000E-03	1.947932E-03
.5000	.1942	.1050	.7940	1.0000	2.039100E-03	1.618045E-03
.5250	.1852	.1130	.7620	1.0000	2.092760E-03	1.594683E-03
.5500	.1725	.1200	.6820	1.0000	2.070000E-03	1.411740E-03
.5750	.1719	.1250	.5550	1.0000	2.148750E-03	1.192556E-03
.6000	.1666	.1300	.4760	1.0000	2.165800E-03	1.030921E-03
.6250	.1586	.1350	.4450	1.0000	2.141100E-03	9.527895E-04
.6500	.1511	.1450	.3600	1.0000	2.190350E-03	7.887420E-04
.6750	.1442	.1550	.2540	1.0000	2.235100E-03	5.677154E-04
.7000	.1369	.1650	.2060	1.0000	2.258850E-03	4.653231E-04
.7250	.1302	.1700	.1590	1.0000	2.213400E-03	3.519306E-04
.7500	.1235	.1750	.0950	1.0000	2.161250E-03	2.053187E-04
.7750	.1171	.1800	.0400	1.0000	2.107800E-03	8.431200E-05
.8000	.1107	.1850	.0240	1.0000	2.047950E-03	4.915080E-05
.8250	.1048	.2900	.0100	1.0000	3.039200E-03	3.039200E-05
.8500	.0988	.2950	.0030	1.0000	2.914600E-03	8.743800E-06
.8750	.0939	.2000	.0220	1.0000	1.878000E-03	4.131600E-05
.9000	.0889	.2000	0	1.0000	1.778000E-03	0.
.9250	.0862	.2000	0	1.0000	1.724000E-03	0.
.9500	.0835	.2050	0	1.0000	1.711750E-03	0.
.9750	.0791	.2080	0	1.0000	1.645280E-03	0.
1.0000	.0746	.2100	0	1.0000	1.566600E-03	0.

Table A-25 (cont)

JUPITER CHECK OUT CASE NO 9

TV ENERGY DATA FOR TOPS NA SIT CAMERA

SATELLITE 3 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.567125E-05	0.
.2750	.0204	.0500	.0020	1.0000	5.074500E-05	1.014900E-07
.3000	.0514	.0550	.0950	1.0000	1.406432E-04	1.336111E-05
.3250	.0971	.0600	.4760	1.0000	2.898435E-04	1.378655E-04
.3500	.1093	.0650	.7620	1.0000	3.534489E-04	2.693280E-04
.3750	.1157	.0700	.9530	1.0000	4.029252E-04	3.838878E-04
.4000	.1429	.0750	.9840	1.0000	5.331956E-04	5.246645E-04
.4250	.1693	.0800	1.0000	1.0000	6.738140E-04	6.738140E-04
.4500	.2006	.0850	.9840	1.0000	8.482872E-04	8.347147E-04
.4750	.2044	.1000	.9530	1.0000	1.016890E-03	9.690962E-04
.5000	.1942	.1050	.7940	1.0000	1.014452E-03	8.054751E-04
.5250	.1852	.1130	.7620	1.0000	1.041148E-03	7.933549E-04
.5500	.1725	.1200	.6820	1.0000	1.029825E-03	7.023406E-04
.5750	.1719	.1250	.5550	1.0000	1.063003E-03	5.932967E-04
.6000	.1666	.1300	.4760	1.0000	1.077485E-03	5.128831E-04
.6250	.1586	.1350	.4450	1.0000	1.065197E-03	4.741128E-04
.6500	.1511	.1450	.3600	1.0000	1.089998E-03	3.923991E-04
.6750	.1442	.1550	.2540	1.0000	1.111962E-03	2.824384E-04
.7000	.1369	.1650	.2060	1.0000	1.123778E-03	2.314982E-04
.7250	.1302	.1700	.1590	1.0000	1.101166E-03	1.750655E-04
.7500	.1235	.1750	.0950	1.0000	1.075222E-03	1.021461E-04
.7750	.1171	.1800	.0400	1.0000	1.048630E-03	4.194522E-05
.8000	.1107	.1850	.0240	1.0000	1.018455E-03	2.445252E-05
.8250	.1048	.2000	.0100	1.0000	1.512002E-03	1.512002E-05
.8500	.0988	.2950	.0030	1.0000	1.450013E-03	4.350040E-06
.8750	.0939	.2000	.0220	1.0000	9.343050E-04	2.055471E-05
.9000	.0889	.2000	0	1.0000	8.845550E-04	0.
.9250	.0862	.2000	0	1.0000	8.576300E-04	0.
.9500	.0835	.2050	0	1.0000	8.515956E-04	0.
.9750	.0791	.2080	0	1.0000	8.185268E-04	0.
1.0000	.0746	.2100	0	1.0000	7.793835E-04	0.

JUPITER CHECK OUT CASE NO 9

TV ENERGY DATA FOR TOPS NA SIT CAMERA

SATELLITE 4 DATA

MICRONS	SOLAR	ALBEDO	SENSOR	FILTER	BO(W/SQCM)	BEFF(W/SQCM)
.2500	.0070	.0450	0	1.0000	1.779750E-05	0.
.2750	.0204	.0500	.0020	1.0000	5.763000E-05	1.152600E-07
.3000	.0514	.0550	.0950	1.0000	1.597255E-04	1.517392E-05
.3250	.0971	.0600	.4760	1.0000	3.291690E-04	1.566844E-04
.3500	.1093	.0650	.7620	1.0000	4.014042E-04	3.058700E-04
.3750	.1157	.0700	.9530	1.0000	4.575935E-04	4.360966E-04
.4000	.1429	.0750	.9840	1.0000	6.055387E-04	5.958501E-04
.4250	.1693	.0800	1.0000	1.0000	7.652360E-04	7.652360E-04
.4500	.2006	.0850	.9840	1.0000	9.633815E-04	9.479674E-04
.4750	.2044	.1000	.9530	1.0000	1.154860E-03	1.100582E-03
.5000	.1942	.1050	.7940	1.0000	1.152091E-03	9.147607E-04
.5250	.1852	.1130	.7620	1.0000	1.182409E-03	9.009966E-04
.5500	.1725	.1200	.6820	1.0000	1.169550E-03	7.976331E-04
.5750	.1719	.1250	.5550	1.0000	1.214044E-03	6.737943E-04
.6000	.1666	.1300	.4760	1.0000	1.223677E-03	5.824703E-04
.6250	.1586	.1350	.4450	1.0000	1.209721E-03	5.383261E-04
.6500	.1511	.1450	.3600	1.0000	1.237387E-03	4.456392E-04
.6750	.1442	.1550	.2540	1.0000	1.262831E-03	3.207592E-04
.7000	.1369	.1650	.2060	1.0000	1.276250E-03	2.629076E-04
.7250	.1302	.1700	.1590	1.0000	1.250571E-03	1.988408E-04
.7500	.1235	.1750	.0950	1.0000	1.221106E-03	1.160051E-04
.7750	.1171	.1800	.0400	1.0000	1.190907E-03	4.763628E-05
.8000	.1107	.1850	.0240	1.0000	1.157092E-03	2.777020E-05
.8250	.1048	.2000	.0100	1.0000	1.717148E-03	1.717148E-05
.8500	.0988	.2950	.0030	1.0000	1.646749E-03	4.940247E-06
.8750	.0939	.2000	.0220	1.0000	1.061070E-03	2.334354E-05
.9000	.0889	.2000	0	1.0000	1.004570E-03	0.
.9250	.0862	.2000	0	1.0000	9.740600E-04	0.
.9500	.0835	.2050	0	1.0000	9.671387E-04	0.
.9750	.0791	.2080	0	1.0000	9.295832E-04	0.
1.0000	.0746	.2100	0	1.0000	8.851290E-04	0.

Table A-25 (concl)

```
JUPITER CHECK OUT CASE NO 9

COMPUTATIONS FOR MINIMUM PICTURE TAKING INTERVAL

PICTURE START TIME (DAYS) =  1.00003000E+00
PICTURE STOP TIME  (DAYS) =  2.20003000E+01
DELTA T REQUESTED  (SEC)  =  4.32000000E+04
FRAME READ TIME    (SEC)  =  4.00000000E+01
FRAME READ RATE    (BPS)  =  1.25000000E+05


BULK DATA STORAGE CAPACITY (BITS) =  2.00003000E+09
PICTURE SIZE               (BITS) =  5.12000000E+06
BULK DATA STORAGE CAPACITY (PICS) =  3.90625000E+02
BULK CONTENTS IN USE       (BITS) =  0.
BUFFER STORAGE CAPACITY    (BITS) =  2.00000000E+06


DATA TRANSMISSION RATE       (BPS) =  2.45000000E+04
RATE FROM OTHER INSTRUMENTS  (BPS) =  6.40000000E+02
REAL TIME PICTURE RATE       (BPS) =  2.78600000E+04


BUFFER CAPACITY LESS THAN ONE PICTURE, CAPACITY SET TO   5.120E+06

 MINIMUM PICTURE INTERVAL  (SEC)  =  1.83776023E+02
MAXIMUM PICTURE RATE  (PICS/HR)   =  1.95890625E+01
MAXIMUM PICTURE RATE  (PIC/DAY)   =  4.70137500E+02
MAXIMUM NUMBER OF PICTURES        =  9472
ACTUAL  PICTURE RATE  (PIC/DAY)   =  2.00000000E+00
ACTUAL  NUMBER OF PICTURES        =  41


PERIAPSIS STATE VECTOR
-1.55615045E+05      -4.03051226E+04       3.07916842E+02
 9.75526852E+00      -3.77127648E+01       0.
VIEW FROM INPUT VIEWPOINT
```

```
JUPITER CHECK OUT CASE NO 9

PLOT INTERVAL =  1 CALC STEPS =  720.00MINUTES
PRNT INTERVAL =  1CALC STEPS =  720.00 MINUTES

TIME INTERVAL FOR CALCULATIONS =  720.00 MINUTES
```

PICTURE	CALC	TIME (DAYS)	TIME (HRS)	TIME (MIN)
1	1	1.00000000E+00	2.40000000E+01	1.44000000E+03
2	2	1.50000000E+00	3.60000000E+01	2.16000000E+03
3	3	2.00000000E+00	4.80000000E+01	2.88000000E+03
4	4	2.50000000E+00	6.00000000E+01	3.60000000E+03
5	5	3.00000000E+00	7.20000000E+01	4.32000000E+03
6	6	3.50000000E+00	8.40000000E+01	5.04000000E+03
7	7	4.00000000E+00	9.60000000E+01	5.76000000E+03
8	8	4.50000000E+00	1.08000000E+02	6.48000000E+03
9	9	5.00000000E+00	1.20000000E+02	7.20000000E+03
10	10	5.50000000E+00	1.32000000E+02	7.92000000E+03
11	11	6.00000000E+00	1.44000000E+02	8.64000000E+03
12	12	6.50000000E+00	1.56000000E+02	9.36000000E+03
13	13	7.00000000E+00	1.68000000E+02	1.00800000E+04
14	14	7.50000000E+00	1.80000000E+02	1.08000000E+04
15	15	8.00000000E+00	1.92000000E+02	1.15200000E+04
16	16	8.50000000E+00	2.04000000E+02	1.22400000E+04
17	17	9.00000000E+00	2.16000000E+02	1.29600000E+04
18	18	9.50000000E+00	2.28000000E+02	1.36800000E+04
19	19	1.00000000E+01	2.40000000E+02	1.44000000E+04
20	20	1.05000000E+01	2.52000000E+02	1.51200000E+04
21	21	1.10000000E+01	2.64000000E+02	1.58400000E+04
22	22	1.15000000E+01	2.76000000E+02	1.65600000E+04
23	23	1.20000000E+01	2.88000000E+02	1.72800000E+04
24	24	1.25000000E+01	3.00000000E+02	1.80000000E+04
25	25	1.30000000E+01	3.12000000E+02	1.87200000E+04
26	26	1.35000000E+01	3.24000000E+02	1.94400000E+04
27	27	1.40000000E+01	3.36000000E+02	2.01600000E+04
28	28	1.45000000E+01	3.48000000E+02	2.08800000E+04
29	29	1.50000000E+01	3.60000000E+02	2.16000000E+04
30	30	1.55000000E+01	3.72000000E+02	2.23200000E+04
31	31	1.60000000E+01	3.84000000E+02	2.30400000E+04
32	32	1.65000000E+01	3.96000000E+02	2.37600000E+04
33	33	1.70000000E+01	4.08000000E+02	2.44800000E+04
34	34	1.75000000E+01	4.20000000E+02	2.52000000E+04
35	35	1.80000000E+01	4.32000000E+02	2.59200000E+04
36	36	1.85000000E+01	4.44000000E+02	2.66400000E+04
37	37	1.90000000E+01	4.56000000E+02	2.73600000E+04
38	38	1.95000000E+01	4.68000000E+02	2.80800000E+04
39	39	2.00000000E+01	4.80000000E+02	2.88000000E+04
40	40	2.05000000E+01	4.92000000E+02	2.95200000E+04
41	41	2.10000000E+01	5.04000000E+02	3.02400000E+04
42	42	2.15000000E+01	5.16000000E+02	3.09600000E+04
43	43	2.20000000E+01	5.28000000E+02	3.16800000E+04
44	44	2.25000000E+01	5.40000000E+02	3.24000000E+04
45	45	2.30000000E+01	5.52000000E+02	3.31200000E+04
46	46	2.35000000E+01	5.64000000E+02	3.38400000E+04
47	47	2.40000000E+01	5.76000000E+02	3.45600000E+04

```
JUPITER CHECK OUT CASE NO 9
IOPS NA SIT CAMERA

EXPOSURE TOO HIGH   2.862E-02 (ERGS/CM**2)
EXPOSURE TIME REDUCED TO  5.871E-05 SEC
EXPOSURE IS  1.701E-03 (ERGS/CM**2)
    CHG    1
EXPOSURE TIME SET TO 0.1 MILLISEC
REQUIRED FILTER FACTOR IS  1.647E+00
    CHG    1
VIEW FROM SPACECRAFT
```

b. Output Data - The frame times used were the same as for case 8, which used a Pioneer type camera. Table A-26 presents the tabular output for the selected frames.

The graphic output presents closest approach geometry (Fig. A-22), TV summaries (Fig. A-23), and satellite geometry summaries (Fig. A-24).

Table A-26 Case 9 Tabular Output

JUPITER CHECK OUT CASE NO 9

PICTURE NUMBER 5 3 DAYS 0 HRS 0 MIN TO ENCOUNTER JD 2445734.500

PLANET JUPITE		SATELLITE CALLI	
RANGE (KM) =	2.66269379E+06	RANGE (KM) =	1.19299507E+06
CONE (DEG) =	84.10	CONE (DEG) =	46.28
CLOCK (DEG) =	87.14	CLOCK (DEG) =	90.60
PHASE (DEG) =	98.63	PHASE (DEG) =	126.46
DIAM (DEG) =	3.07	DIAM (DEG) =	.23

RESOLUTION OF PLANET
CENTER = 25.91 KM/PIXEL
LIMB = 26.62 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -.83 DEG LAT 130.07 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION =	25.91 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES	10.30 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES	589.04 KM/SEC
OBJECT MOTION FROM ALL SOURCES	.06 KM
NUMBER OF PIXELS SMEARED	.00230 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 21.741 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 26.0 KM/PIXEL
AT SUBSPACECRAFT POINT 26.0 KM/PIXEL
AT LIMB OF TARGET BODY 26.7 KM/PIXEL

EXPOSURE TIME FOR TOPS NA SIT CAMERA = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 2.0449E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.7612E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 85.000
DIGITAL NUMBER OF EXPOS = 217 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	5.0	5.0	5.0	0.	
SATELLITE 1	5.0000	5.0000	5.0000	0.	
SATELLITE 2	5.0000	5.0000	5.0000	0.	
SATELLITE 3	5.0000	5.0000	5.0000	0.	
SATELLITE 4	5.0000	5.0000	5.0000	4.0000	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	2.85040788E+05	80.74	91.99	85.76
2	3.18056131E+06	96.97	75.76	87.45
3	3.72563611E+06	30.91	81.82	87.05
4	1.19299507E+06	126.46	46.28	90.60

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	8.07429149E+01	6.71370283E-02
2	9.69706902E+01	5.26019358E-02
3	9.69100043E+01	7.84318409E-02
4	1.26460415E+02	2.26686818E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	2.84873768E+01	2.85040739E+01
2	3.17910131E+01	3.18056098E+01
3	3.72308611E+01	3.72563523E+01
4	1.19063507E+01	1.19299273E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.02079370E+01	6.37139128E+02	2.47172619E-03	2.02287778E-02
1.44858817E+01	6.62074560E+02	2.12056304E-03	2.35736435E-02
1.34111532E+01	8.24296713E+02	2.24146304E-03	2.23028789E-02
1.37585854E+00	2.10885749E+02	1.78263138E-03	2.80484235E-02

VIEW FROM SPACECRAFT

Table A-26 (cont)

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JUPITER CHECK OUT CASE NO 9

PICTURE NUMBER    24                    12 DAYS 12 HRS  0 MIN TO ENCOUNTER          JD  2445744.000

PLANET JUPITE                           SATELLITE  CALLI
RANGE (KM)  =  4.19284240E+06           RANGE (KM)  =  5.93824852E+06
CONE  (DEG) = 103.04                    CONE  (DEG) = 111.33
CLOCK (DEG) =  87.53                    CLOCK (DEG) =  86.81
PHASE (DEG) =  68.54                    PHASE (DEG) =  60.25
DIAM  (DEG) =   1.95                    DIAM  (DEG) =    .05


RESOLUTION OF PLANET
CENTER =    41.21 KM/PIXEL
LIMB   =    41.92 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE          (PICTURE CENTERED AT  -1.51 DEG LAT   90.87 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =    41.21 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES     11.16 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES    1109.46 KM/SEC
OBJECT MOTION FROM ALL SOURCES         .11 KM
NUMBER OF PIXELS SMEARED             .00271 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR   18.453 MILLISEC


EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION       41.3 KM/PIXEL
 AT SUBSPACECRAFT POINT      41.3 KM/PIXEL
 AT LIMB OF TARGET BODY      42.0 KM/PIXEL

EXPOSURE TIME FOR TOPS NA SIT CAMERA              =     .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 1.5349E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.5349E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 76.652
 DIGITAL NUMBER OF EXPOS  = 196 (OF 256 LEVELS)
 ONE DIGITAL NUMBER EQUALS 7.7812E-05 ERGS/SQ CM


NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET               24.0           24.0          24.0           0.
 SATELLITE 1          24.0000        24.0000       24.0000        0.
 SATELLITE 2          24.0000        24.0000       24.0000        0.
 SATELLITE 3          24.0000        24.0000       20.0000        0.
 SATELLITE 4          24.0000        24.0000       14.0000        4.0000


          SATELLITE DATA

           NUM     RANGE (KM)          PHASE (DEG)     CONE (DEG)      CLOCK (DEG)

            1   3.77295651E+06          68.56          103.02          87.70
            2   3.51504033E+06          68.44          103.14          87.84
            3   4.33942397E+06          54.27          117.31          86.99
            4   5.93824852E+06          60.25          111.33          86.81

           NUM       EARTH-SAT-S/C ANG                SATELLITE ANG DIAM

            1         6.85627840E+01                   5.07209425E-02
            2         6.84429485E+01                   4.75965100E-02
            3         5.42704968E+01                   6.73380833E-02
            4         6.02534078E+01                   4.55413891E-02

          RESOLUTION (KM/PIX) DATA FOR SATELLITES
            NUM   RES ALONG RADIUS VECTOR          RES AT SATELLITE LIMB

            1         3.77128651E+01                   3.77295614E+01
            2         3.51358093E+01                   3.51504063E+01
            3         4.33687397E+01                   4.33942322E+01
            4         5.93588652E+01                   5.93824805E+01

          SMEAR DATA FOR SATELLITES
          SMEAR DUE TO      SMEAR DUE TO        NUMBER OF        TIME TO SMEAR
          VEL (KM/SEC)      S/C (KM/SEC)      PIXELS SMEARED     1/2 PIXEL (SEC)

           1.59155730E+01    1.01643259E+03    2.66794680E-03     1.87410034E-02
           1.21244141E+01    9.48420615E+02    2.67671026E-03     1.86795460E-02
           4.51957831E+00    1.26173601E+03    2.91514059E-03     1.71519314E-02
           9.40163897E+00    1.67743003E+03    2.83549729E-03     1.76335912E-02
        VIEW FROM SPACECRAFT
        LAT   -2 , LONG  167 NOT VISIBLE
```

Table A-26 (cont)

JUPITER CHECK OUT CASE NO 9

PICTURE NUMBER 13 7 DAYS 0 HRS 0 MIN TO ENCOUNTER JD 2445738.500

PLANET JUPITE
RANGE (KM) = 3.94298327E+06
CONE (DEG) = 94.37
CLOCK (DEG) = 87.31
PHASE (DEG) = 77.82
DIAM (DEG) = 2.07

SATELLITE CALLI
RANGE (KM) = 4.61086320E+06
CONE (DEG) = 70.44
CLOCK (DEG) = 88.12
PHASE (DEG) = 101.75
DIAM (DEG) = .06

RESOLUTION OF PLANET
CENTER = 38.72 KM/PIXEL
LIMB = 39.42 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -1.22 DEG LAT 229.60 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 38.72 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 11.07 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 971.85 KM/SEC
OBJECT MOTION FROM ALL SOURCES .10 KM
NUMBER OF PIXELS SMEARED .00253 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 19.762 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 38.8 KM/PIXEL
AT SUBSPACECRAFT POINT 38.9 KM/PIXEL
AT LIMB OF TARGET BODY 39.5 KM/PIXEL

EXPOSURE TIME FOR TOPS NA SIT CAMERA = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.6151E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.6151E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 80.676
DIGITAL NUMBER OF EXPOS = 206 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
RESOLUTION LEVELS 300.0 100.0 50.0 10.0 KM/PIXEL

PLANET	13.0	13.0	13.0	0.
SATELLITE 1	13.0000	13.0000	13.0000	0.
SATELLITE 2	13.0000	13.0000	13.0000	0.
SATELLITE 3	13.0000	13.0000	13.0000	0.
SATELLITE 4	13.0000	13.0000	13.0000	4.0000

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	3.58308793E+06	74.50	97.69	87.31
2	4.60161687E+06	79.07	93.12	97.19
3	2.87364462E+06	78.66	93.53	87.71
4	4.61086320E+06	101.75	70.44	88.12

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	7.45021165E+01	5.34086559E-02
2	7.90687476E+01	3.63575855E-02
3	7.86565142E+01	1.01685682E-01
4	1.01749057E+02	5.86519442E-02

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	3.58141793E+01	3.58308754E+01
2	4.60015687E+01	4.60161664E+01
3	2.87109463E+01	2.87364349E+01
4	4.60850320E+01	4.61086259E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.31836480E+01	9.24994799E+02	2.55760677E-03	1.95495260E-02
1.53965216E+01	1.14125829E+03	2.50450140E-03	1.99640535E-02
9.23603441E+00	7.18333745E+02	2.47956112E-03	2.01648589E-02
6.66490743E+00	9.15573784E+02	1.99941256E-03	2.50073451E-02

VIEW FROM SPACECRAFT

Table A-26 (cont)

```
JUPITER CHECK OUT CASE NO 9

PICTURE NUMBER    33                    17 DAYS  0 HRS  0 MIN TO ENCOUNTER          JD  2445743.500

PLANET JUPITE                           SATELLITE  CALLI
RANGE (KM)  =  3.22745354E+06           RANGE (KM)  =  2.99044792E+06
CONE  (DEG) = 112.07                    CONE  (DEG) = 146.80
CLOCK (DEG) =  67.67                    CLOCK (DEG) =  86.81
PHASE (DEG) =  59.12                    PHASE (DEG) =  24.40
DIAM  (DEG) =   2.53                    DIAM  (DEG) =   .09


RESOLUTION OF PLANET
CENTER =    31.56 KM/PIXEL
LIMB   =    32.27 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE          (PICTURE CENTERED AT  -1.77 DEG LAT  110.10 DEG LONG )


RESOLUTION AT SPECIFIED LOCATION =    31.56 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES     10.71 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES     897.75 KM/SEC
OBJECT MOTION FROM ALL SOURCES        .09 KM
NUMBER OF PIXELS SMEARED            .00287 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR   17.449 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
 AT SPECIFIED LOCATION       31.7 KM/PIXEL
 AT SUBSPACECRAFT POINT      31.7 KM/PIXEL
 AT LIMB OF TARGET BODY      32.4 KM/PIXEL

EXPOSURE TIME FOR TOPS NA SIT CAMERA            =     .100 MILLISEC
 POWER DENSITY = 0          ERGS/SQ CM/SEC AT LENS
 POWER DENSITY = 1.4487E+01 ERGS/SQ CM/SEC ON SENSOR
 EXPOSURE      = 1.4487E-03 ERGS/SQ CM


 PERCENT OF DYNAMIC RANGE = 72.323
 DIGITAL NUMBER OF EXPOS  = 185 (OF 256 LEVELS)
 ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN
 RESOLUTION LEVELS   300.0          100.0          50.0          10.0          KM/PIXEL

 PLANET              33.0           33.0           33.0           0.
 SATELLITE 1         33.0000        33.0000        33.0000        0.
 SATELLITE 2         33.0000        33.0000        33.0000        0.
 SATELLITE 3         33.0000        33.0000        29.0000        0.
 SATELLITE 4         33.0000        33.0000        20.0000        4.0000
```

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	3.64862320E+06	58.43	112.77	87.42
2	3.23775087E+06	71.01	100.18	88.15
3	3.95108232E+06	71.81	99.39	87.79
4	2.99044792E+06	24.40	146.80	86.81

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	5.84280909E+01	5.24493486E-02
2	7.10135691E+01	5.16728089E-02
3	7.18057575E+01	7.39565699E-02
4	2.43999492E+01	9.04353111E-02

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	3.64695323E+01	3.64862282E+01
2	3.23629087E+01	3.23775054E+01
3	3.94953232E+01	3.95108150E+01
4	2.98808792E+01	2.99044699E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
1.91862732E+01	1.04060414E+03	2.88953122E-03	1.73278319E-02
2.83472248E+00	8.56818946E+02	2.65424261E-03	1.88377655E-02
9.13362430E+00	1.33708310E+03	2.64220573E-03	1.89235832E-02
5.44711330E+00	8.93744593E+02	3.00070401E-03	1.66627564E-02

```
VIEW FROM SPACECRAFT
LAT   -2 , LONG  147 NOT VISIBLE
```

Table A-26 (concl)

JUPITER CHECK OUT CASE NO 9

PICTURE NUMBER 41 21 DAYS 0 HRS 0 MIN TO ENCOUNTER JD 2445752.500

PLANET JUPITE
RANGE (KM) = 6.24472353E+05
CONE (DEG) = 155.75
CLOCK (DEG) = 87.34
PHASE (DEG) = 15.25
DIAM (DEG) = 13.13

SATELLITE CALLI
RANGE (KM) = 1.32373119E+06
CONE (DEG) = 58.61
CLOCK (DEG) = 264.38
PHASE (DEG) = 130.38
DIAM (DEG) = .20

RESOLUTION OF PLANET
CENTER = 5.53 KM/PIXEL
LIMB = 6.20 KM/PIXEL
INSTRUMENT DATA FOR PLANET JUPITE (PICTURE CENTERED AT -2.21 DEG LAT 242.73 DEG LONG)

RESOLUTION AT SPECIFIED LOCATION = 5.53 KM/PIXEL
SMEAR DUE TO RELATIVE VELOCITIES 2.61 KM/SEC
SMEAR DUE TO S/C ATTITUDE RATES 160.56 KM/SEC
OBJECT MOTION FROM ALL SOURCES .02 KM
NUMBER OF PIXELS SMEARED .00293 PIXELS

EXPOSURE TIME FOR ONE-HALF PIXEL SMEAR 17.066 MILLISEC

EFFECTIVE RESOLUTION WITH SMEAR
AT SPECIFIED LOCATION 5.5 KM/PIXEL
AT SUBSPACECRAFT POINT 5.5 KM/PIXEL
AT LIMB OF TARGET BODY 6.2 KM/PIXEL

EXPOSURE TIME FOR TOPS NA SIT CAMERA = .100 MILLISEC
POWER DENSITY = 0 ERGS/SQ CM/SEC AT LENS
POWER DENSITY = 1.0133E+01 ERGS/SQ CM/SEC ON SENSOR
EXPOSURE = 1.0133E-03 ERGS/SQ CM

PERCENT OF DYNAMIC RANGE = 50.466
DIGITAL NUMBER OF EXPOS = 129 (OF 256 LEVELS)
ONE DIGITAL NUMBER EQUALS 7.7812E-06 ERGS/SQ CM

NUMBER OF PICTURES WITH RESOLUTION BETTER THAN

RESOLUTION LEVELS	300.0	100.0	50.0	10.0	KM/PIXEL
PLANET	41.0	41.0	41.0	1.0	
SATELLITE 1	41.0000	41.0000	41.0000	1.0000	
SATELLITE 2	41.0000	41.0000	41.0000	3.0000	
SATELLITE 3	41.0000	41.0000	37.0000	0.	
SATELLITE 4	41.0000	41.0000	28.0000	7.0000	

SATELLITE DATA

NUM	RANGE (KM)	PHASE (DEG)	CONE (DEG)	CLOCK (DEG)
1	9.29926477E+05	6.71	177.56	70.52
2	8.86088816E+05	63.84	107.16	87.92
3	1.11144736E+06	54.53	134.42	267.40
4	1.32873119E+06	130.38	58.61	264.38

NUM	EARTH-SAT-S/C ANG	SATELLITE ANG DIAM
1	6.71069378E+00	2.05793319E-01
2	6.38420790E+01	1.88811493E-01
3	5.45769709E+01	2.62908297E-01
4	1.30375269E+02	2.03529670E-01

RESOLUTION (KM/PIX) DATA FOR SATELLITES

NUM	RES ALONG RADIUS VECTOR	RES AT SATELLITE LIMB
1	9.28256477E+00	9.29924977E+00
2	8.84628816E+00	8.86087613E+00
3	1.10889736E+01	1.11144443E+01
4	1.32637119E+01	1.32872910E+01

SMEAR DATA FOR SATELLITES

SMEAR DUE TO VEL (KM/SEC)	SMEAR DUE TO S/C (KM/SEC)	NUMBER OF PIXELS SMEARED	TIME TO SMEAR 1/2 PIXEL (SEC)
2.96176778E+01	2.35618103E+02	2.75982161E-03	1.81171130E-02
4.76016831E+00	2.45479165E+02	2.81342072E-03	1.77719598E-02
2.73423113E+01	1.85334015E+02	1.91782300E-03	2.60712276E-02
8.66234754E+00	3.90205470E+02	2.97436732E-03	1.68102977E-02

VIEW FROM SPACECRAFT
LAT 1 . LONG 152 NOT VISIBLE

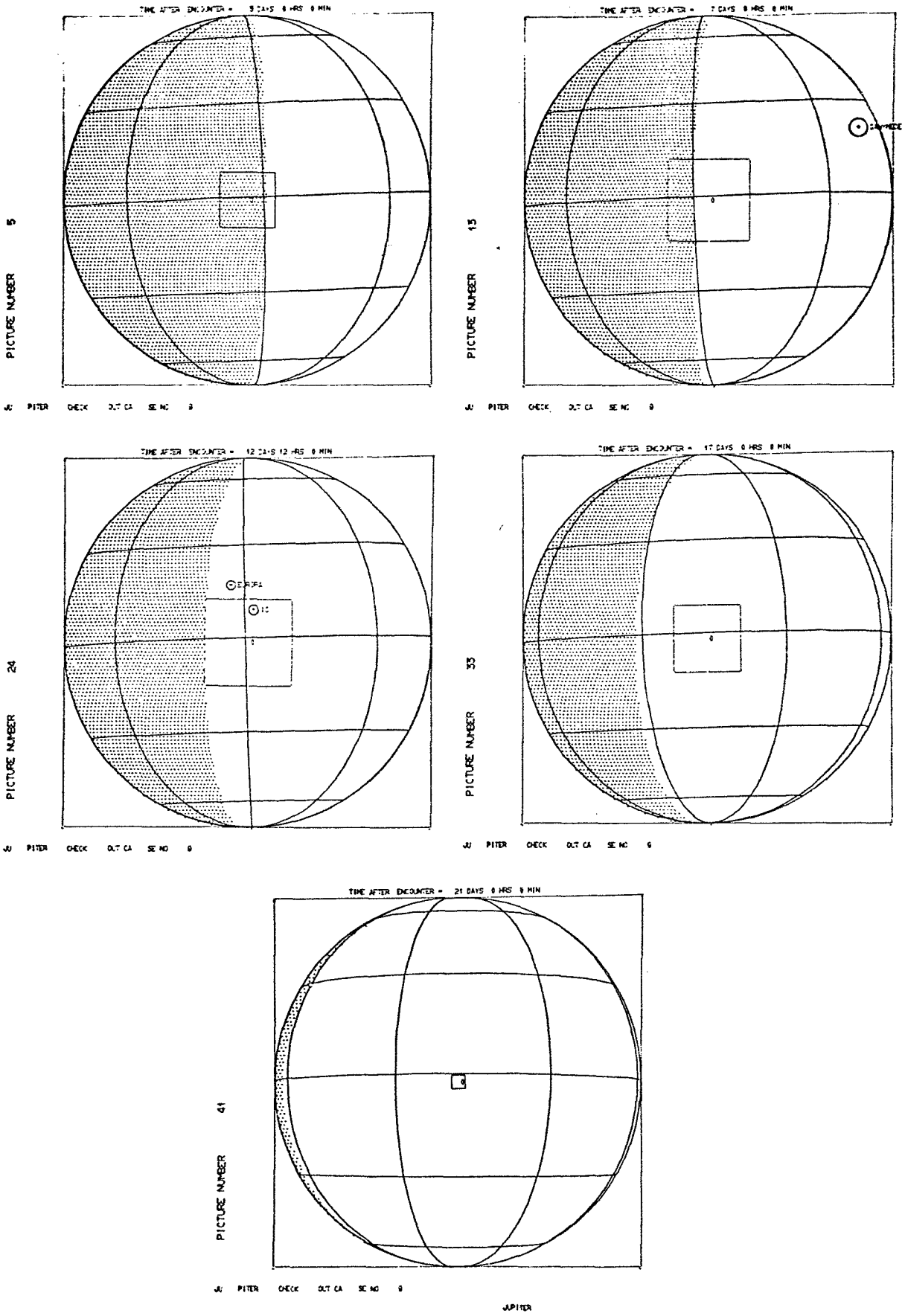


Fig. A-22 Scenes Before and After Closest Approach

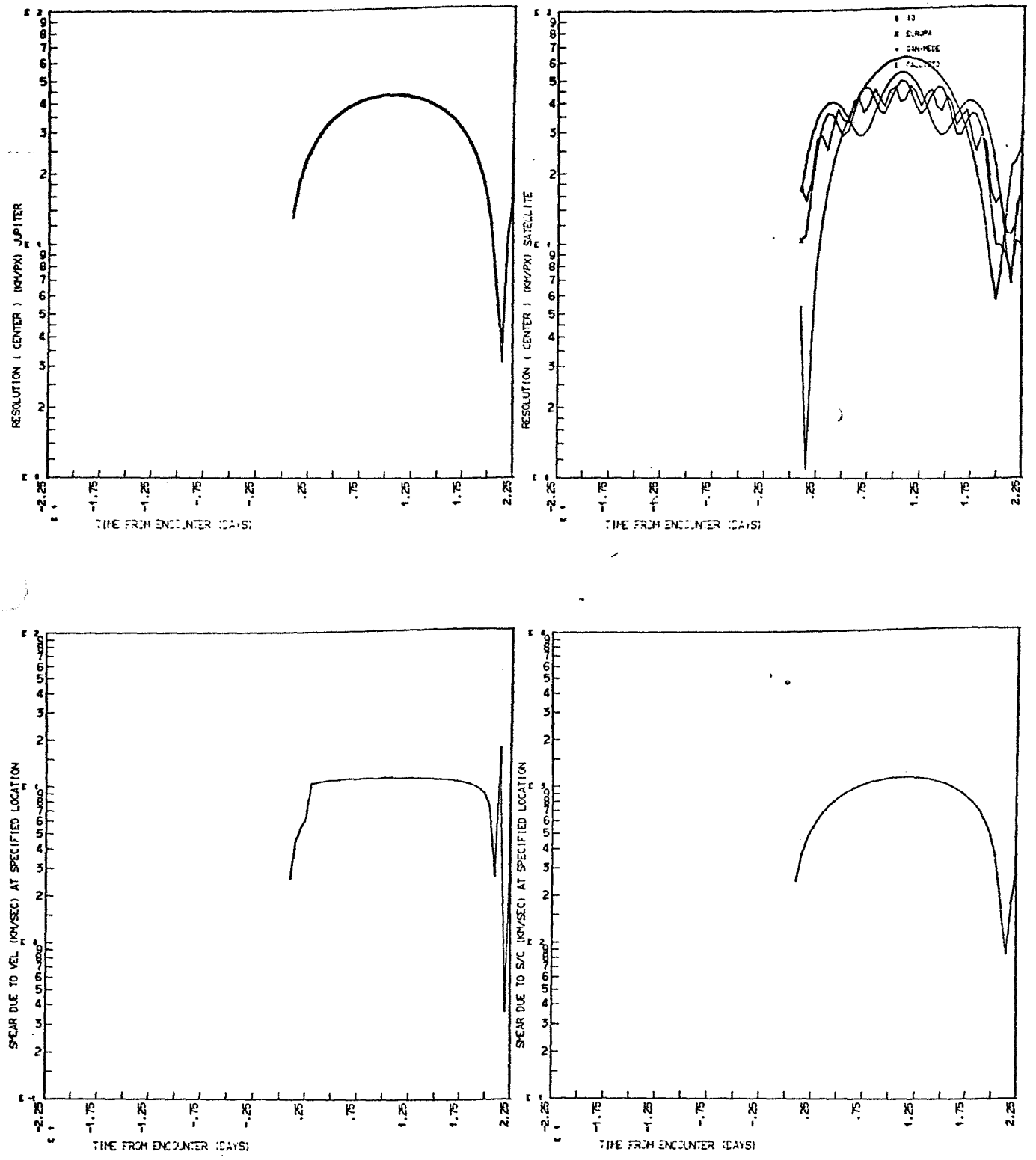


Fig. A-23 TV Summaries

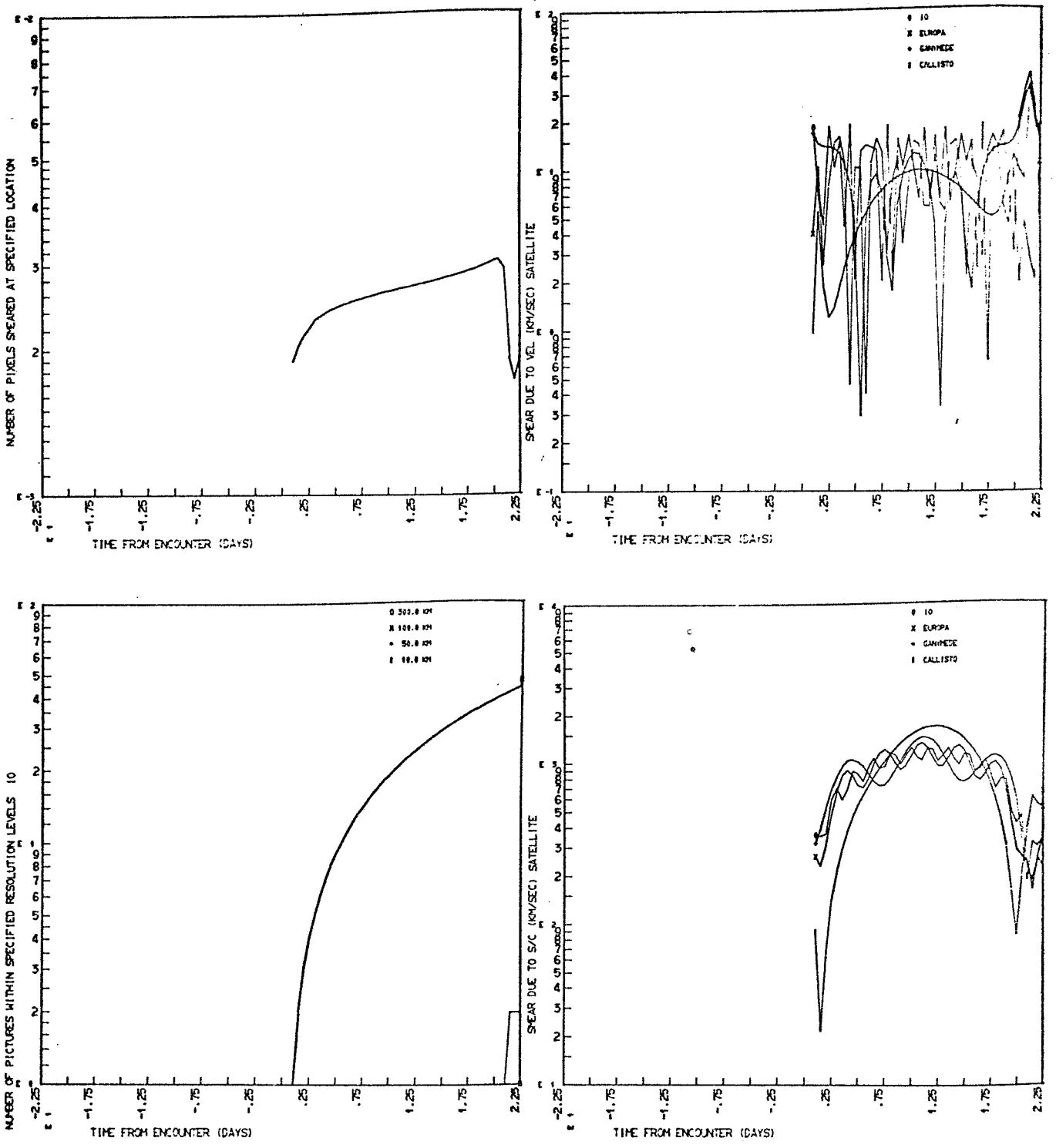
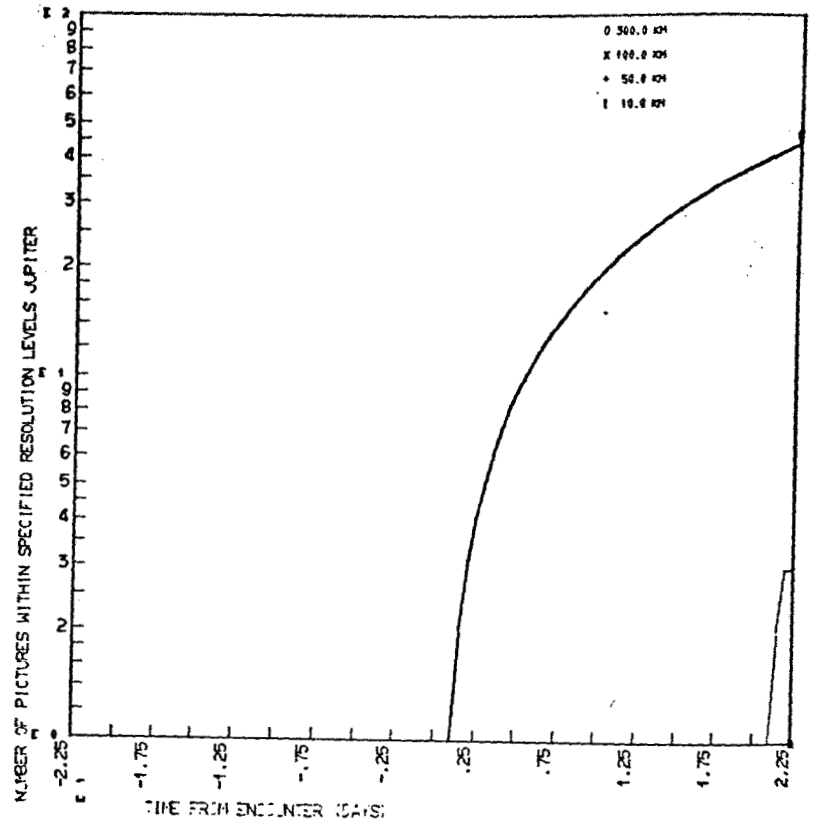

NUMBER OF PIXELS SMEARED AT SPECIFIED LOCATION
TIME FROM ENCOUNTER (DAYS)
SMEAR DUE TO VEL (KM/SEC) SATELLITE
TIME FROM ENCOUNTER (DAYS)
0 IO
X EUROPA
+ GANYMEDE
I CALLISTO
NUMBER OF PICTURES WITHIN SPECIFIED RESOLUTION LEVELS IO
TIME FROM ENCOUNTER (DAYS)
SMEAR DUE TO S/C (KM/SEC) SATELLITE
TIME FROM ENCOUNTER (DAYS)
0 IO
X EUROPA
+ GANYMEDE
I CALLISTO

Fig. A-23 (cont)



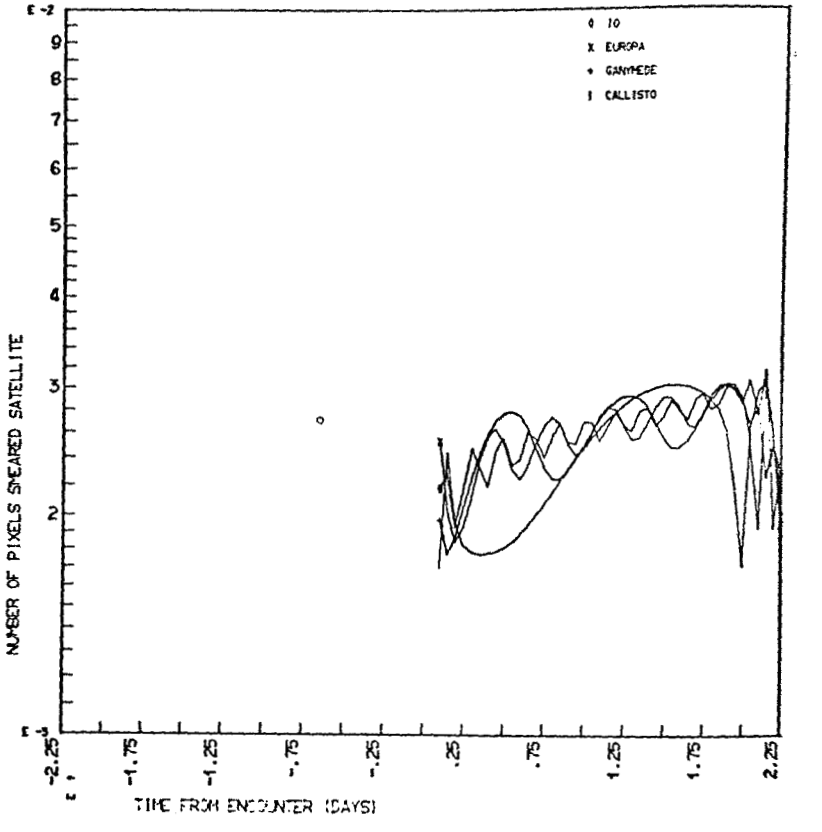


Fig. A-23 (concl)

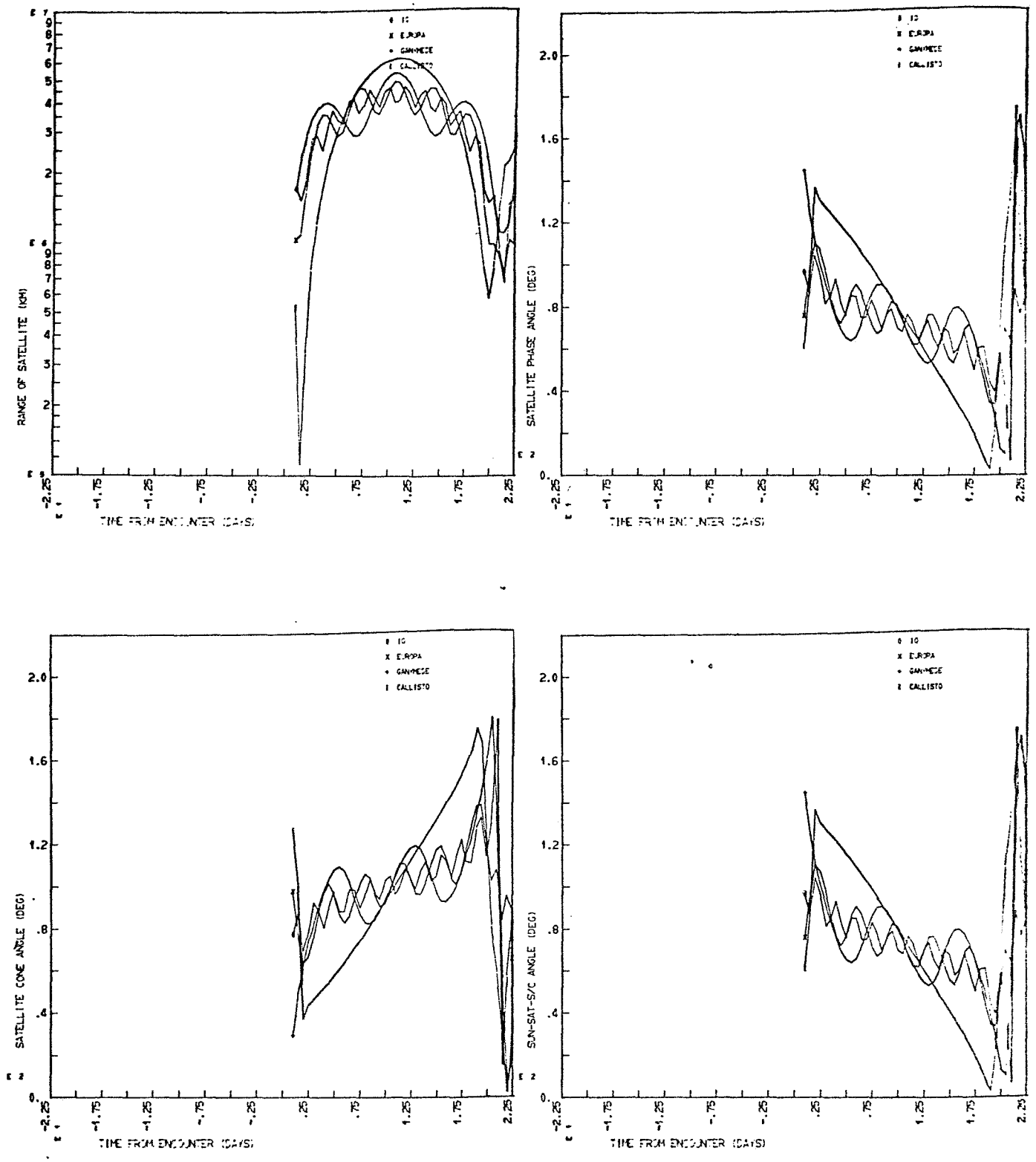
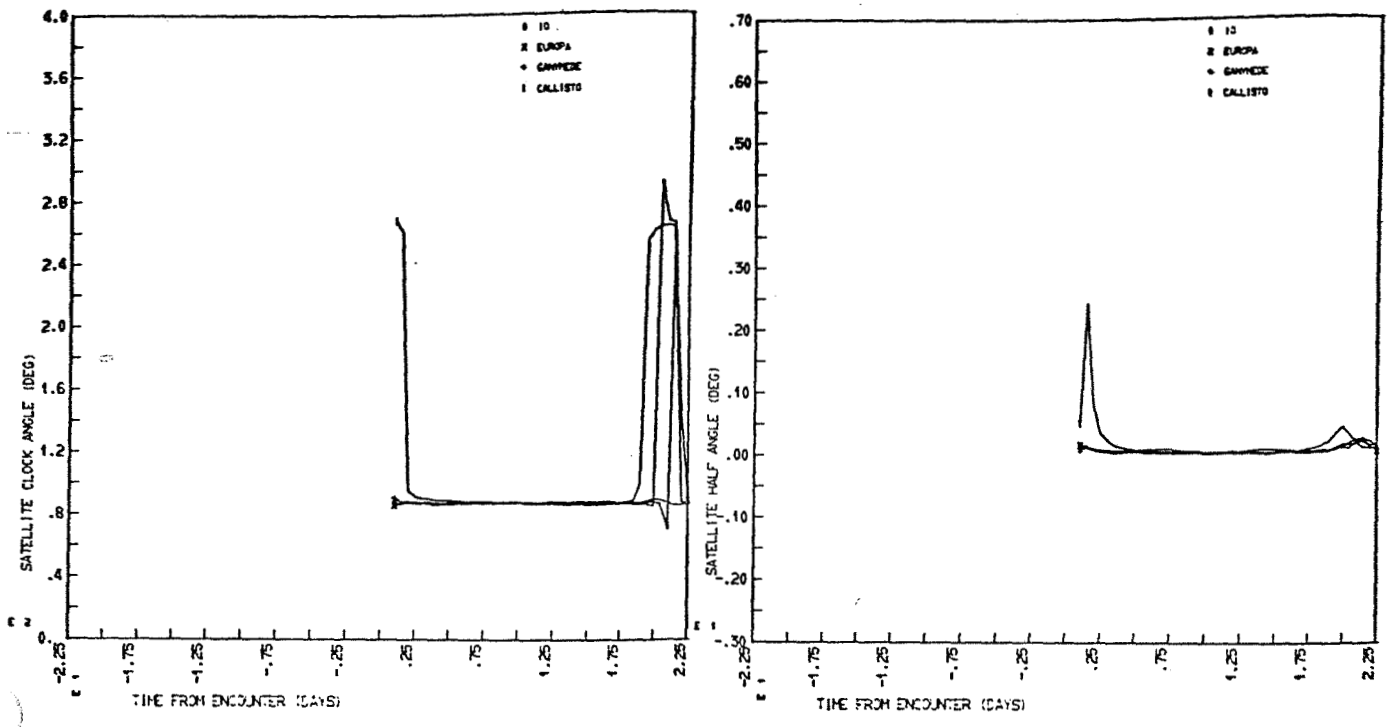


Fig. A-24 Satellite Geometry Summaries



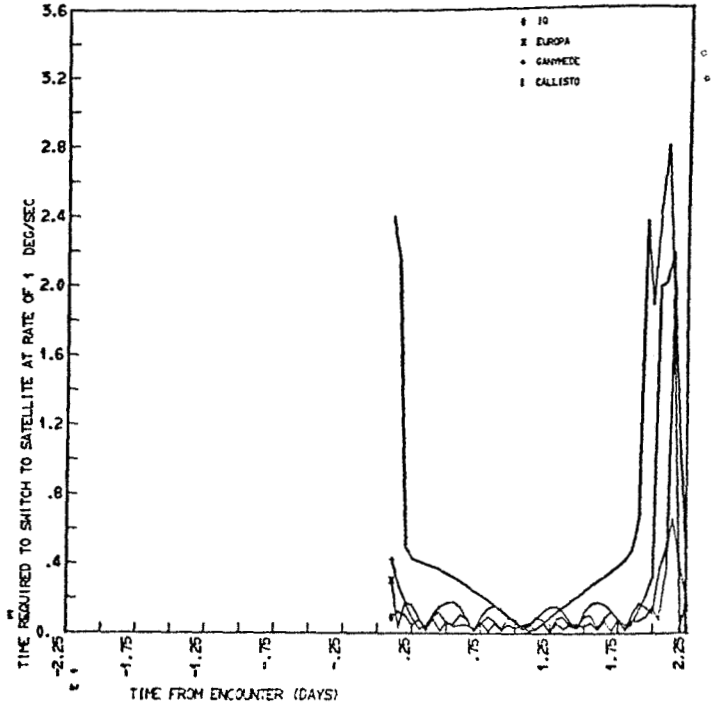


Fig. A-24 (concl)

5. Case 10

a. Input Data - This case is a Jupiter orbital mission that exercises the particle and field instrument subroutine. The input tabular listing and additional instrument values are given in Table A-27.

Table A-27 Case 10 Input Listing and Instrument Values

```
                JUPITER CHECK OUT CASE NO 10

          2       5.0000J000    PLANET
          3       4.0000000     SATEL
          4       840201.00     DATE
          6       1.0000000E+01
          7       2.2550000     STATE1
          8       59.884000     STATE2
          9       70.640000     STATE3
         22       210.00000     INSTID
         61       0.            TSTAR
         62       1.0000000     TSTOP
         63       30.000000     DTINST
         69       2.0000000     CALCST
         81       3.0000000     DPLOT
         82       1.0000000     DPRNT
         86       15.000000     SATRNG
         90       1111111.0
         98


      JUPITER CHECK OUT CASE NO 10

      FP CHARACTERISTICS FOR FIELDS AND PARTICLE INSTRUMENT

        6          =  5.16000000E+01
        7          =  6.58000000E+01
        8          =  8.00000000E+01
        9          =  1.90000000E+02
       10          =  2.00000000E-06


      PERIAPSIS STATE VECTOR
      -1.55815045E+05      -4.03051226E+04      3.07916842E+02
       9.75526852E+00      -3.77127648E+01      0.
  VIEW FROM INPUT VIEWPOINT
  VIEW FROM INPUT VIEWPOINT


        JUPITER CHECK OUT CASE NO 10

XZ(I) VALUES IN STORAGE

  1   0   0.                          2   1   5.0000000000E+00
  3   1   4.0000000000E+00            4   1   8.4020100000E+05
  5   0   0.                          6   1   1.0000000000E+01
  7   1   2.2550000000E+00            8   1   5.9884000000E+01
  9   1   7.0640000000E+01           10   0   0.
 11   0   0.                         12   0   0.
 13   0   0.                         14   0   0.
 15   0   3.0000000000E+00           16   0   0.
 17   0   0.                         18   0   0.
 19   0   0.                         20   0   0.
 21   0   0.                         22   1   2.1000000000E+02
 23   0   0.                         24   0  -7.1738305547E+57
 25   0  -7.1738305547E+57           26   0   0.
 27   0   0.                         28   0   0.
 29   0   0.                         30   0   0.
 31   0   0.                         32   0   0.
 33   0   0.                         34   0   0.
 35   0   0.                         36   0   0.
 37   0   0.                         38   0   0.
 39   0   0.                         40   0   0.
 41   0   0.                         42   0   0.
 43   0   0.                         44   0   0.
 45   0   0.                         46   0   0.
 47   0   0.                         48   0   0.
 49   0   0.                         50   0   0.
 51   0   0.                         52   0   0.
 53   0   0.                         54   0   0.
 55   0   0.                         56   0   0.
 57   0   0.                         58   0   0.
 59   0   0.                         60   0   0.
 61   1   0.                         62   1   1.0000000000E+00
 63   1   3.0000000000E+01           64   0   0.
 65   0   0.                         66   0   0.
 67   0   0.                         68   0   0.
 69   1   2.0000000000E+00           70   0   0.
 71   0   0.                         72   0   0.
 73   0   0.                         74   0   0.
 75   0   0.                         76   0   0.
 77   0   0.                         78   0   0.
 79   0   0.                         80   0   0.
 81   1   3.0000000000E+00           82   1   1.0000000000E+00
 83   0   0.                         84   0   0.
 85   0   0.                         86   1   1.5000000000E+01
 87   0   0.                         88   0   0.
 89   0   0.                         90   1   1.1111110000E+06
 91   0   0.                         92   0   0.
 93   0   0.                         94   0   0.
 95   0   0.                         96   0   0.
```

b. Output Data - Outputs are trajectory trace, showing bow shock and magnetopause input locations (Fig. A-25), dipole magnetic field lines for an input surface strength and magnetic pole tilt (Fig. A-26), minimum detectivity versus distance (Fig. A-27), and cone and clock angles versus time to look down the field line vector (Fig. A-28).

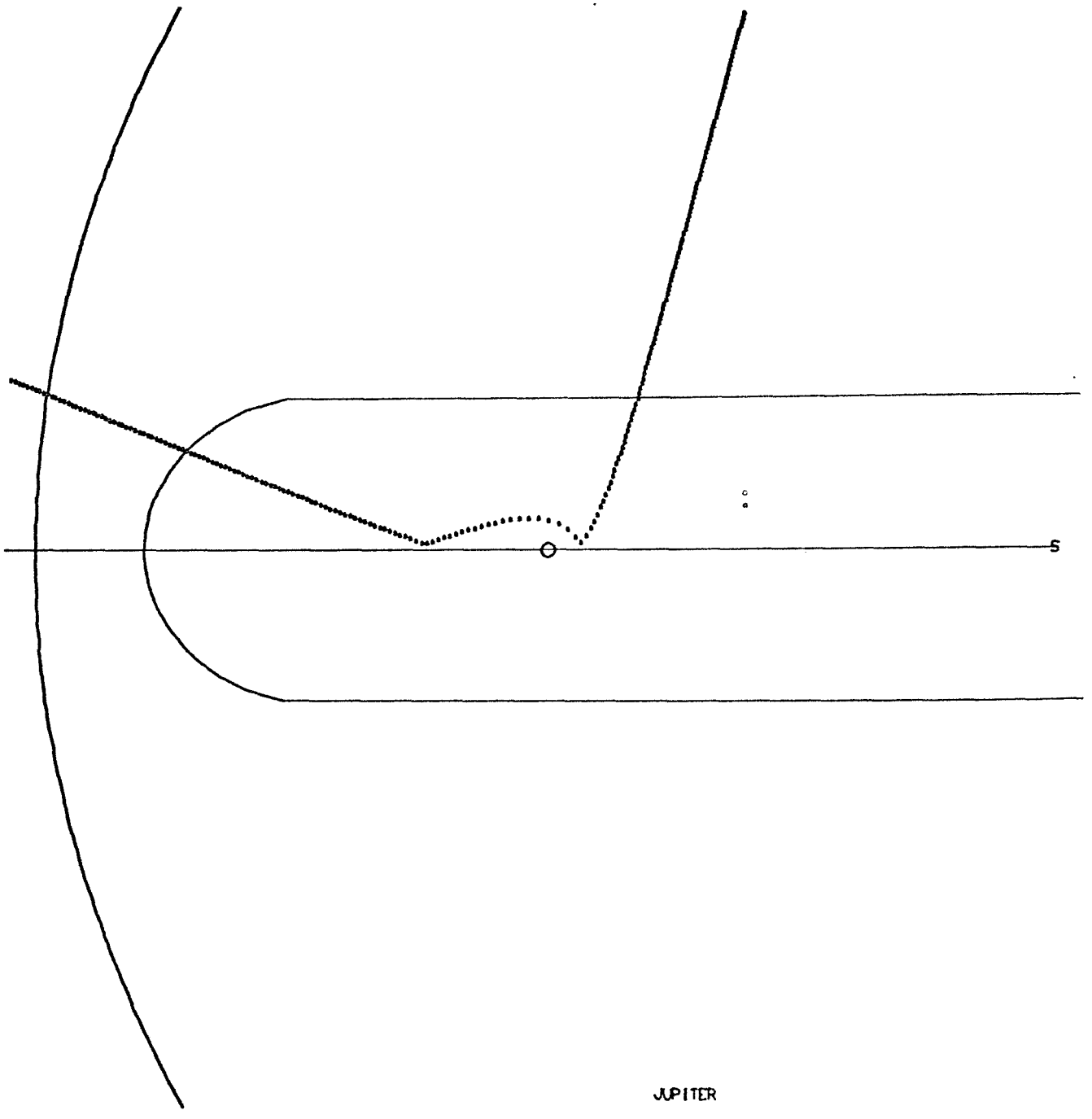


Fig. A-25 Bow Shock and Magnetopause Input Locations

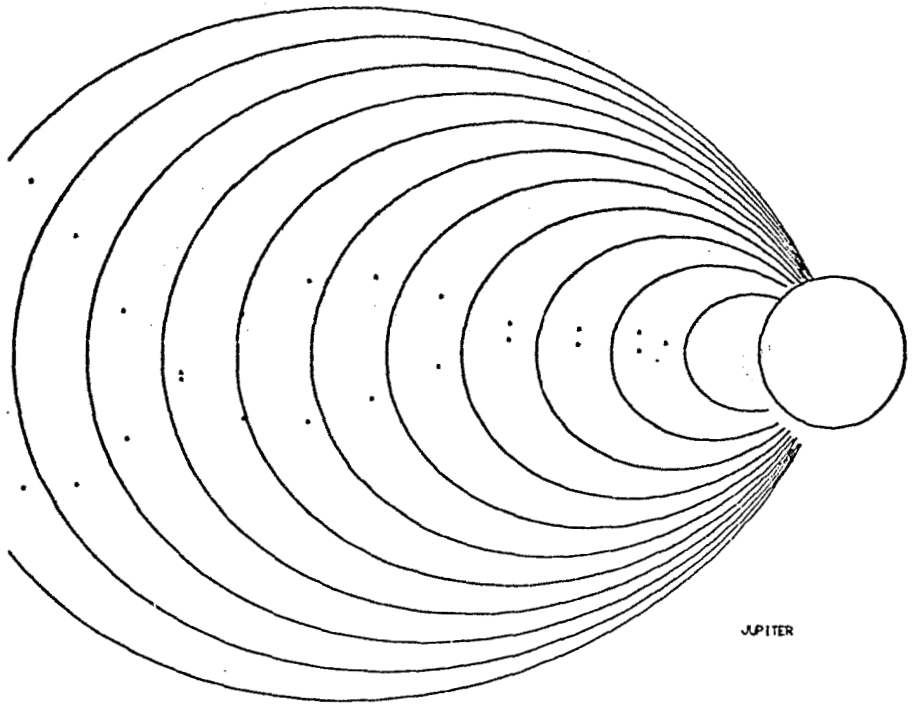


Fig. A-26 Dipole Magnetic Field

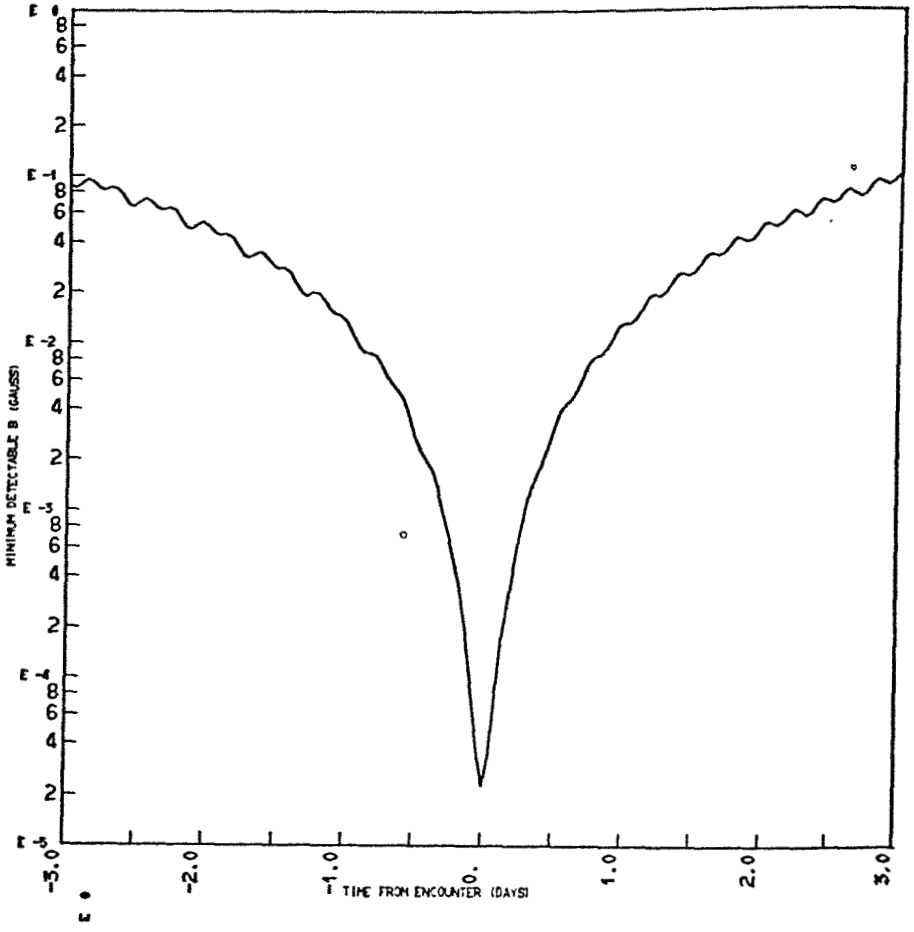
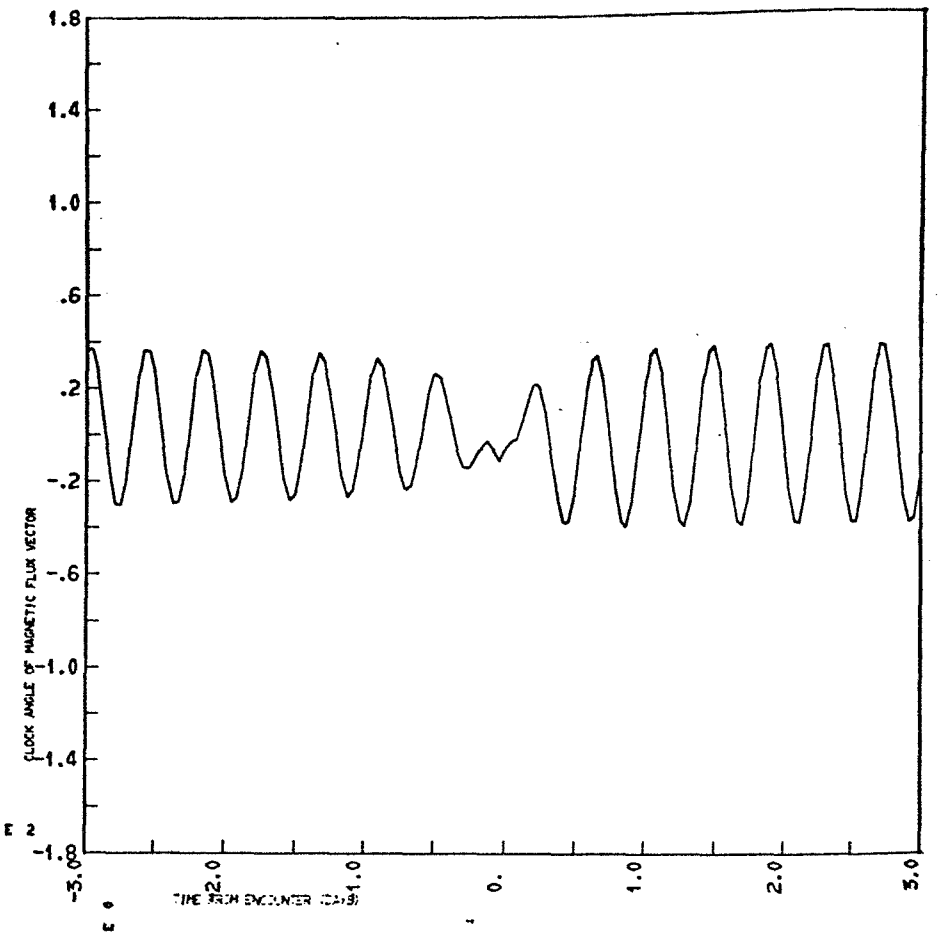


Fig. A-27 Minimum Detectivity



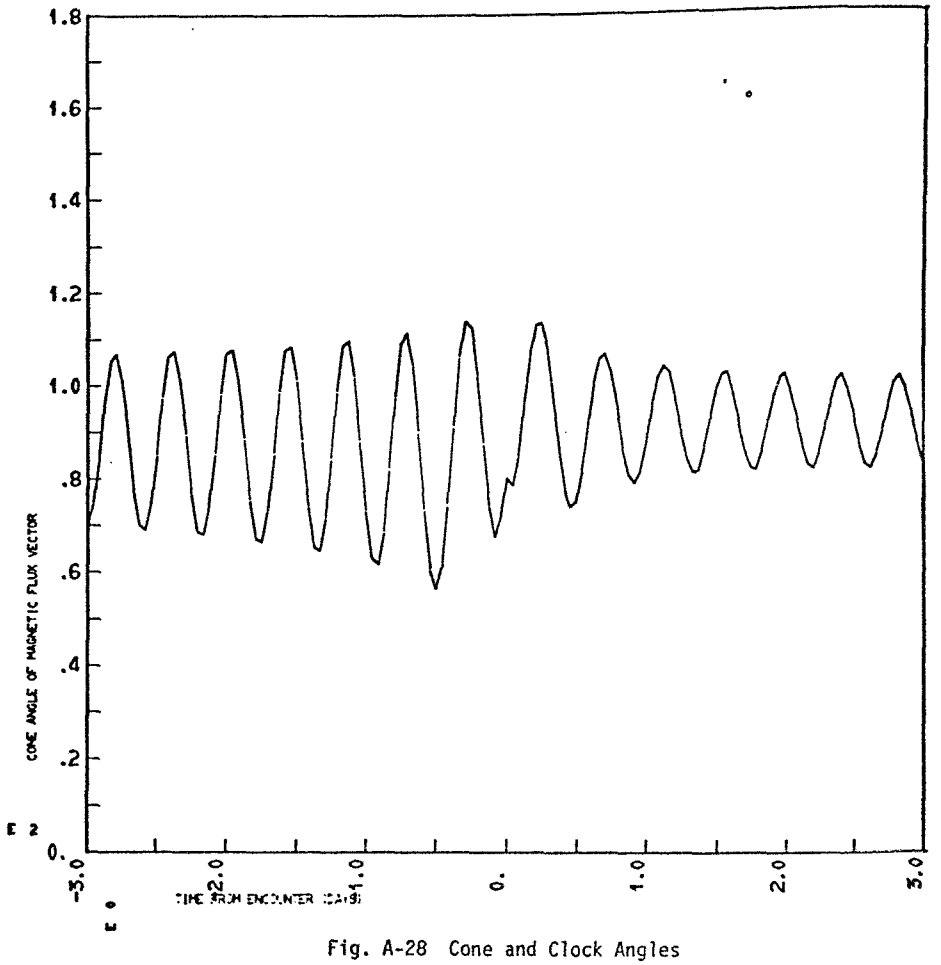


Fig. A-28 Cone and Clock Angles

APPENDIX B

COMPUTER PROGRAM CARD LISTING

```
MARTIN*GT.MAIN
      1            COMMON/HEDING/TITLE(13)
      2            COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
      3            DOUBLE PRECISION JDE
      4            DOUBLE PRECISION JDV, SAVE
      5            COMMON/JDAYS/JDV,TT
      6            COMMON /PLCONS/GMS,AMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
      7           X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SORL,PLORL(12)
      8            COMMON/REVER/ROTW(3)
      9            COMMON/CHARAC/P(60)
     10            COMMON/FOROUT/DUMMYB(13),IPCN,DUMMYC(6)
     11            COMMON/CELEST/C(3),S(3),SN(3)
     12            COMMON/STUFF/XN(3),DUMMF(110)
     13            COMMON/STUF1/XSAT(3)
     14            COMMON/GEOM/XE(3),XP(3)
     15            COMMON/CAM/CCONE(200),CCLOCK(200)
     16            COMMON/TEST/ITEST(97)
     17            COMMON/FLAGS/IFLT,IFLPL,IFLPR
     18            COMMON/TCONS/TCONS(200)
     19            COMMON /TRA/TRACE,DUMMYA(13)
     20            COMMON/XZ/XZ(97),IXZ6 /VAR/VAR(97)
     21            COMMON/FLYBY/DUM1(6),X(3),DUM2(9)
     22            DATA C/-.06034330,.23724160,-.96957469/
     23            FLAG(A,B)=AMOD(A,B)
     24      C
     25      C        INITIALIZATION AND ONE TIME CALCULATIONS
     26      C
     27       1000 CONTINUE
     28            REWIND 13
     29            REWIND 8
     30            REWIND 9
     31            REWIND 10
     32            REWIND 11
     33            REWIND 12
     34            RPD=3.14159/180.0
     35             I=1
     36            NREC=1
     37            NCB=0
     38            IFLST=0
     39            CALL PLANET(5HNOTRA)
     40            CALL INPUT(NP)
     41            IF(XZ(85).NE.0) IFLST=1
     42            DATE=XZ(4)
     43            IP=XZ(2)
     44            NSC=XZ(18)
     45            CALL CPLANN(IP)
     46            CALL SCROT(ROTW)
     47      C
     48      C  RETRIEVE INSTRUMENT CHARACTERISTICS
     49      C
     50            INST=1
     51            IF(ITEST(22).NE.0) INST=XZ(22)+0.01
     52            INSTR=INST/100 + 1
     53            GO TO (10,11,12,13,14),INSTR
     54         10 CALL NOCHAR(INST)
     55            GO TO 20
     56         11 CALL TVCHAR(INST)
     57            GO TO 20
     58         12 CALL FPCHAR(INST)
     59            GO TO 20
     60         13 CALL IRCHAR(INST)
     61            GO TO 20
     62         14 CALL UVCHAR(INST)
     63      C
     64      C  SET UP TIME SEQUENCING FOR CALCULATIONS
     65      C
     66         20 CONTINUE
     67          2    IF(DATE.GE.0) CALL CALNDR(JDF,2HJD,DATE,5HCAL19)
     68               IF(DATE.LT.0) CALL CALNDR(JDE,2HJD,-DATE,5HMODJD)
     69               IXZ6 = XZ(6) + .4
     70               CALL ORBIN(XZ(7),IXZ6)
     71               SAVE=JDV
     72               JDV=JDE
     73               CALL PSATP
     74               JDV=JDE
     75               IF(INSTR.EQ.3) CALL FIELDS
     76               JDV=SAVE
     77               IF(INSTR.EQ.3) GO TO 800
     78               CALL TCON(NP)
     79               INTPL=1
     80               INTPR=1
     81               IF(ITEST(81).EQ.1) INTPL=XZ(81)
     82               IF(ITEST(82).EQ.1) INTPR=XZ(82)
     83               RAPER=RPL(IP)
     84               IF(ITEST(85).EQ.1) CALL PSCONS(RAPER,6HRADIUS,IVS,IP)
     85               NPC=P(39)
     86      C
     87      C        START LOOP
     88      C
     89          5    JDV=JDE+TCONS(I)
     90               IVS=XZ(3)
     91               IFLPL=0
     92               IFLPR=0
     93               IF((FLOAT((I-1)/INTPL)).EQ.(FLOAT(I)-1.0)/FLOAT(INTPL)) IFLPL=1
     94               IF((FLOAT((I-1)/INTPR)).EQ.(FLOAT(I)-1.0)/FLOAT(INTPR)) IFLPR=1
     95               CALL TCONV(TT,3HSEC,TCONS(I),3HDAY)
```

```
      IF(NSC.GE.0) CALL PLPOS(XE,JDV,3)
       CALL PLPOS(XP,JDV,IP)
    8 IF(IVS.GT.0) CALL PLASAT(XSAT,JDV,IVS,IP)
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(X,TT)
      CALL VEQUAL(XN,X)
      TX=TT/86400.
      IPCN=(I-1)*NPC+1
      TMAGX=ABSV(X)
      TANGLE=ASIN(RAPER/TMAGX)*RPD
      IF(ITEST(83).EQ.1.AND.TMAGX.GT.XZ(83)) GO TO 102
      IF(ITEST(84).EQ.1.AND.TANGL.LT.XZ(84)) GO TO 102
      GO TO 50
  102 IFLPL = 0
      IFLPR = 0
   50  CONTINUE
      CALL VCOMB(S,XP,-1.0,X,-1.0)
      CALL CACL
      GO TO (800,210,220,230,240),INSTR
  210 CONTINUE
C
C        TV ROUTINES
C
C      IF(IFLPL.EQ.1) CALL PIC2(P(44),P(45))
      CALL RESO(4HCALC)
      CALL SMEAR(4HCALC)
      CALL MRLC(4HCALC)
      GO TO 290
  220 CONTINUE
C
C        FP ROUTINES
C
      GO TO 290
  230 CONTINUE
C
C        IR ROUTINES
C
      GO TO 290
  240 CONTINUE
C
C        UV ROUTINES
C
  290 CONTINUE
      CALL OTJAZ(4HCALC)
      IF(IFLPR.EQ.1) CALL OUTS
       I=I+1
      NREC=NREC+1
      IF(I.LT.NP+1) GO TO 5
C
C        END LOOP
      END FILE 13
      END FILE 12
      END FILE 11
      END FILE 10
      END FILE 9
      END FILE 8
C
      ZOUT=XZ(90)
      IF(FLAG(ZOUT,10.).GT.0.) CALL GEOPLT
      CALL ADV
      GO TO (800,310,320,330,340),INSTR
  310 CONTINUE
C
C        TV ROUTINES
C
      IF(FLAG(ZOUT,100.).GE.10.)  CALL RESO(4HPLOT)
      IF(FLAG(ZOUT,1000.).GE.100.) CALL SMEAR(4HPLOT)
      GO TO 390
  320 CONTINUE
C
C        FP ROUTINES
C
      GO TO 390
  330 CONTINUE
C
C        IR ROUTINES
C
      GO TO 390
  340 CONTINUE
C
C        UV ROUTINES
C
  390 CONTINUE
      IF(FLAG(ZOUT,10000.).GE.1000.) CALL MRLC(4HPLOT)
      IF(FLAG(ZOUT,100000.).GE.10000.) CALL OTJAZ(4HPLOT)
      IF(FLAG(ZOUT,1000000.).GE.100000.) CALL OTPLT
  800 CONTINUE
      IF(ITEST(96).EQ.0) GO TO 1000
      IF(XZ(96).EQ.0.0) GO TO 1000
      IF(XZ(96).NE.1.0) CALL STERM
      DO 2000 I=1,96
      ITEST(I)=0
      XZ(I)=0.0
 2000 CONTINUE
      IFLST=0
      NSC=0
```

```
      NCB=0
      NCODE=0
      IFLT=0
      IFLPL=1
      IFLPR=1
      GO TO 1000
  900 FORMAT(3E25.8)
      END
```

@PRT GT.CACL

MARTIN*GT.CACL

```
      SUBROUTINE CACL
C
C                                                          CACL-2
C
      COMMON/JUNK/B,EFB,SB(8),SEFB(8)
      COMMON/POREAR/SSV(8),SAF(8),HANG2,DCNCLK(8)
      COMMON/HEDING/TITLE(13)
      COMMON/TNME/TVNAME(5)
      DIMENSION ZSAT(3),VORB(3)
      DATA AU/1.49599E08/
      DATA WTERG/1.E+7/
      DATA NCHGT/0/,NCHGF/0/
      COMMON/TEST/ITEST(97)
      COMMON/XZ/XZ(97)
      COMMON/CHARAC/P(60)
      COMMON/FLYBY/DUM(6),XN(3),DUMM(9)
      COMMON/CELEST/C(3),S(3),SN(3)
      COMMON/GEOM/XE(3),XP(3)
      COMMON/PHASER/PHAS(8),SRAT(3,8)
      COMMON/STUFF/X(3),TARGE(3),POTV(3),VSV(3,8),VVSAT(3,8),SVSV(3,8)
     X,RCCL(3),DTARE(3),DROTV(3)
      COMMON/STUF1/XSAT(3)
      COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
     X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SOBL,PLOBL(12)
      COMMON/PCOORD/PV(3),VE(3),PM(3)
      COMMON/VCONS/UX(3),UY(3),UZ(3),PI
      COMMON/REVER/ROTW(3)
      COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCR
      DIMENSION       U(3),XSN(3),UXSS(3),TARG(3),XTER(3)
     X,                                XSAT1(3),RADP(3),VV(3)
     X,RAD1(3),C2(3),C1(3),XS(3),XSS(3),VSAT(3)
     X,TARGV(3)          ,UXP(3),ROTC(3)
      COMMON/FOROUT/POWER,ENERGY,PERCT,IDN,R(3),RSAT(3),TARGP(3),IPCN
     X,FRACT,PHASED,PHASEP  ,POWLN,NDN,EPERDN
      COMMON/FLAGS/IMODE,IFLPL,IFLPR
      COMMON/CAM/CCONE(200),CCLOCK(200)
      DOUBLE PRECISION JDV
      COMMON/JDAYS/JDV,TT
       DIMENSION NS(9)
       DATA NSO/9/,NS/0,0,1,2,4,7,5,2,0/
      T=TT/3600.
      TTT=TT/86400.
      XPM=(ABSV(XP)/AU)**2
      TS1=XZ(87)
      TS2=XZ(88)
      ISAVE=0
      NCB=0
      IDN=2.**P(14)+0.01
      PI=3.1415926536
C
C
C
C
      CALL VUNIT(UXP,XP)
      IF(NSC.LT.0) GO TO 6
      CALL VDIF (XP,XP,XE)
    6 CALL VSCALE(XS,XP,-1.)
      CALL VDIF (XS,XS,X)
      CALL VSCALE(R,X,-1.)
      CALL RCNCLK(R,XS)
      CALL VUNIT(U ,X)
      CALL VSCALE(UXP,UXP,-1.)
      PHASE=ACOS(DOT(UXP,U ))
      CALL PGLOBE(PM,JDV,IP)
      CALL VSCALE(TARG,U , RPL(IP))
      CALL VDIF(RADP,TARG,X)
      HANG=ASIN(RPL(IP)/R(1))*180./PI
      HANG2=2.*HANG
C
C     IMODE NE 0 MEANS CONE/CLOCK IS INPUT
C
      IF(IMODE.NE.0) GO TO 10
      IF(PHASE.LT.PI/2.) GO TO 20
C     SUBVEHICLE POINT IN SHADOW
      CALL VCROSS(XSN,UXP,U)
      CALL UCROSS(XTER,XSN,UXP)
      ANGL=90.-HANG
      ANGL=PHASE*180./PI-ANGL
      DEL=(90.-ANGL)/2.
      ANGL=ANGL+DEL
```

```
      C     PICTURE CENTER BISECTS ANGLE BETWEEN LIT LIMB + TERMINATOR
            CALL VCOMB(TARG,UXP,COS(ANGL*PI/180.),XTER,SIN(ANGL*PI/180.))
            CALL VSCALE(TARG,TARG,RPL(IP))
      C     RADP IS VECTOR FROM S/C TO PIC CENTER
            CALL VDIF(RADP,TARG,X)
            CALL VEQUAL(RAD1,RADP)
            CALL RCNCLK(RAD1,XS)
            GO TO 20
      C
      C
      C
        10  CALL VLOAD(RCCL,1.,CCONE(NREC),CCLOCK(NREC))
            CALL SPHERE(RCCL,RCCL,4HFROM,5HPOLAR,6HDEGREE)
            CALL VTRANS(RADP,RCCL,4HFROM,C,XS)
            CALL VSCALE(U,U,-1.)
            CA=DOT(U,RADP)
            SROOT=RPL(IP)**2-R(1)**2*(1.-CA*CA)
      C     IF SROOT LE 0 CENTER OF FRAME IS OOF PLANET
            IF(SROOT.LT.0.) SROOT=0.
            TARGM=R(1)*CA-SQRT(SROOT)
            CALL VCOMB(TARG,RADP,TARGM,U,-R(1))
            CALL VSCALE(RADP,RADP,TARGM)
      C
      C
      C
        20   CONTINUE
            CALL VTRANS(TARGP,TARG,2HTO,PM,PV)
            CALL VCROSS(TARGV,UZ,TARGP)
            CALL SPHERE(TARGP,TARGP,2HTO,6HLATLON,6HDEGREE)
            CALL VSCALE(TARGV,TARGV,PLROT(IP)/86400.*2.*PI)
            CALL VTRANS(TARGE,TARGV,4HFROM,PM,PV)
            CALL ORBVEL(VV,TT)
            CALL VDIF(VV,TARGE,VV)
            EM=180.-ANGV(RADP,TARG,6HDEGREE)
      C
      C
      C
            IF(IVS.EQ.0) GO TO 8
      C     XSS IS VECTOR FROM SATELLITE TO S/C
            CALL VDIF(XSS,X,XSAT)
            CALL VUNIT(UXSS,XSS)
      C     ASSUMES SUN VECTOR IS SAME AS PLANETS
            PHASES=ACOS(DOT(UXP,UXSS))
            CALL VSCALE(RSAT,XSS,-1.)
            CALL RCNCLK(RSAT,XS)
      C     CHECK TO SEE IF PLANET OBSCURES SATELLITE
            IF((ANGV(X,XSS,6HDEGREE)).LT.HANG.AND.RSAT(1).GT.R(1))
           XPRINT 999,TTT
         8  CONTINUE
      C
      C
      C
            CALL ORBVEL(VORB,TT)
            NSP=NS(IP)
            IF(NSP.EQ.0) GO TO 106
            ZAP=R(3)
            IF(ZAP.GT.180.) ZAP=ZAP-360.
            DO 500 I=1,NSP
            IS=I
            IF(IP.EQ.6.AND.IS.EQ.1) GO TO 500
            CALL PLASAT(ZSAT,JDV,IS,IP)
            CALL VDIF(VSV(1,IS),X,ZSAT)
            SSV(I)=ANGV(VSV(1,I),XS,6HDEGREE)
            CALL PSCONS(RPSAT,6HRADIUS,I,IP)
            RPSC=ABSV(VSV(1,I))
       600  SAF(I)=ASIN(RPSAT/RPSC)*(360./PI)
            CALL VUNIT(UXSS,VSV(1,IS))
            PHAS(I)=ACOS(DOT(UXP,UXSS))
            CALL VSCALE(SRAT(1,IS),VSV(1,IS),-1.)
            CALL RCNCLK(SRAT(1,IS),XS)
            SAP=SRAT(3,IS)
            IF(SAP.GT.180.) SAP=SAP-360.
            DCNCLK(I)=ABS(SRAT(2,IS)-R(2)) + ABS(SAP-ZAP)
            CALL PLASAT(XSAT1,JDV+1./8640.,IS,IP)
            CALL VDIF(XSAT1,XSAT1,ZSAT)
            CALL VSCALE(XSAT1,XSAT1,.1)
            CALL VDIF(VVSAT(1,IS),VORB,XSAT1)
            CALL VSCALE(VSV(1,IS),VSV(1,IS),-1.)
            CALL UCROSS(C2,XS,VSV(1,IS))
            CALL UCROSS(C1,C2,VSV(I,IS))
            CALL VTRANS(VVSAT(1,IS),VVSAT(1,IS),2HTO,C1,VSV(1,IS))
            CALL VTRANS(ROTC,ROTW,4HFROM,C,XS)
            CALL VTRANS(ROTC,ROTC,2HTO,C1,VSV(1,IS))
            CALL VTRANS(VSV(1,IS),VSV(1,IS),2HTO,C1,VSV(1,IS))
            CALL VCROSS(SVSV(1,IS),ROTC,VSV(1,IS))
            IF(IP.EQ.6.AND.I.EQ.1) GO TO 700
            IF(ISAVE.NE.0) GO TO 650
            PHASES=PHAS(I)
            RMIN=SRAT(1,I)
            CALL VEQUAL(XSAT,ZSAT)
            ISAVE=I
       650  IF(SRAT(1,I).GT.RMIN) GO TO 700
            PHASES=PHAS(I)
            RMIN=SRAT(1,I)
            CALL VEQUAL(XSAT,ZSAT)
            ISAVE=I
```

```
177      700   CONTINUE
178      500   CONTINUE
179            IF(XZ(3).NE.0) GO TO 106
180            CALL VEQUAL(RSAT,SRAT(1,ISAVE))
181            IF(RSAT(1).GT.XZ(86).OR.(T.GT.TS1.AND.T.LT.TS2)) GO TO 105
182            IVS=ISAVE
183            CALL VUNIT(UXSS,VSV(1,ISAVE))
184            CALL VEQUAL(XSS,VSV(1,ISAVE))
185      C
186      C
187      C
188      106   IF(IFLST.EQ.1) GO TO 99
189      C     RADP IS VECTOR FROM S/C TO PIC CENTER
190            IF(ITEST(86).EQ.1.AND.RSAT(1).LT.XZ(86)) GO TO 99
191            GO TO 105
192      99    CALL PSCONS(RADS,6HRADIUS,IVS,IP)
193            NCB=1
194            CALL VCOMB(RADP,XSS,-1.,UXSS,RADS )
195            CALL VSUM(TARG,XSS,RADP)
196            CALL VTRANS(TARGP,TARG,2HTO,PM,PV)
197            CALL SPHERE(TARGP,TARGP,2HTO,6HLATLON,6HDEGREE)
198            CALL PLASAT(XSAT1,JDV+1./8640.,IVS,IP)
199            CALL VDIF(VSAT,XSAT1,XSAT)
200            CALL VSCALE(VSAT,VSAT,.1)
201            CALL ORBVEL(VV,TT)
202            CALL VDIF(VV,VV,VSAT)
203            CALL VEQUAL(XN,XSS)
204            IF(IVS.NE.0) ISAVE=IVS
205            SSB=SB(ISAVE)/XPM
206            SBBEF=SEFB(ISAVE)/XPM
207            PZ=(SIN(PHASES)+(PI-PHASES*COS(PHASES))/PI)
208            POWER=SBBEF/(4.*P(51)**2)*PZ*WTERG
209            POWLN=SSB*PZ*WTERG
210      105   CONTINUE
211      C
212      C
213      C
214      C
215            IF(NCB.EQ.1) GO TO 101
216            BB=B/XPM
217            BBEF=EFB/XPM
218      C      LAMBERT PLANET PHASE FUNCTION
219            PZ=(SIN(PHASE)+(PI-PHASE*COS(PHASE))/PI*ABS(COS(EM*PI/180.)))
220            POWLN= BB*PZ*WTERG
221            POWER= BBEF/(4.*P(51)**2)*PZ*WTERG
222      101   CONTINUE
223            ENERGY=POWER*P(26)
224            IF(ENERGY-0.95*P(16))2,2,1
225          1 DTMIN=(.85*(P(16)-P(15))+P(15))/POWER
226            P(26)=DTMIN
227            WRITE(6,1005)TITLE,TVNAME
228            WRITE(6,1000)ENERGY,DTMIN
229            ENERGY=0.85*(P(16)-P(15))+P(15)
230            WRITE(6,1001)ENERGY
231            NCHGT=NCHGT+1
232            WRITE(6,1004)NCHGT
233            IF(DTMIN-1.E-4)3,2,2
234          3 DTMIN=1.E-4
235            P(26)=DTMIN
236            POWXX=POWER*(P(51)**2)/(P(52)**2)
237            FILTF=DTMIN*POWXX/ENERGY
238            P(51)=P(52)*SQRT(FILTF)
239            WRITE(6,1002)FILTF
240            NCHGF=NCHGF+1
241            WRITE(6,1004)NCHGF
242          2 IF(ENERGY-P(15))4,5,5
243          4 IF(POWER.LT.1.E-8)GOTO11
244            DTMAX=P(15)/POWER
245            ENERGY=P(15)
246            P(26)=DTMAX
247            WRITE(6,1003)DTMAX
248            GO TO 5
249         11 WRITE(6,1006)POWER
250          5 CONTINUE
251            FRACT=0.0
252            IF(ENERGY.GT.P(15).AND.ENERGY.LT.P(16))FRACT=(ENERGY-P(15))/
253           $  (P(16)-P(15))
254            XDN=IDN
255            NDN=FRACT*XDN + 0.001
256            EPERDN=(P(16)-P(15))/XDN
257            PERCT=FRACT*100.
258      C
259      C
260      C
261            CALL UCROSS(C2, XS,RADP)
262            CALL UCROSS(C1,C2,RADP)
263            CALL VROTAT(C1,C1,RADP,TWIST*PI/180.)
264            CALL VTRANS(TARGE,VV,2HTO,C1,RADP)
265            CALL VTRANS(RCCL,RADP,2HTO,C1,RADP)
266            CALL VTRANS(ROTC,ROTW,4HFROM,C,XS)
267            CALL VTRANS(ROTC,ROTC,2HTO,C1,RADP)
268            CALL VCROSS(ROTV,ROTC,RCCL)
269            SMEAR=ABSV(TARGE)
270            SCMER=ABSV(ROTV)
271            PHASEP=PHASES*180./PI
272            PHASED=PHASE*180./PI
```

```
      WRITE(13)TT,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT,PHASES,XSS,
     XJDV,EM
C
C
C
      CALL VEQUAL(DTARE,TARGE)
      IF(NCB.EQ.1) CALL VEQUAL(DTARE,VVSAT(1,IVS))
      CALL VEQUAL(DROTV,ROTV)
      IF(NCB.EQ.1) CALL VEQUAL(DROTV,SVSV(1,IVS))
      RETURN
  901 FORMAT(5X,11HPLANET DATA,/)
  904 FORMAT(5X,14HPICTURE LAT = ,F6.2,5X,6HLON = ,F6.2,8HSMEAR = ,
     XE16.8,5X,12HSMEAR S/C = ,F16.8)
  902 FORMAT(5X,14HSATELLITE DATA,/)
  906 FORMAT(5X,8HRANGE = ,E16.8,5X,7HCONE = ,F6.2,5X,8HCLOCK = ,F6.2,5X
     X,8HPHASE = ,F6.2,/)
  999 FORMAT(28HSATELLITE OBSCURED BY PLANET,F6.2,19HDAYS FROM ENCOUNTER
     X)
 1000 FORMAT(1X ,19HEXPOSURE TOO HIGH  ,E10.3,13H (ERGS/CM**2),/
     $ 26H EXPOSURE TIME REDUCED TO ,E10.3,4H SEC)
 1003 FORMAT(47H EXPOSURE LESS THAN MINIMUM  , EXP TIME SET TO ,E10.3,/)
 1001 FORMAT(13H EXPOSURE IS ,E10.3,12H (ERG/CM**2),)
 1002 FORMAT(34H EXPOSURE TIME SET TO 0.1 MILLISEC,/
     $27H REQUIRED FILTER FACTOR IS ,E10.3)
 1004 FORMAT(5X,3HCHG,I5)
 1005 FORMAT(1H1,13A6,/,5A6/)
 1006 FORMAT(/,35H POWER DENSITY THRU LENS TOO LOW = ,E15.8,14H ERGS/SQC
     *M/SEC   ,/)
      END
```

@PRT GT,CIRC

MARTIN*GT.CIRC

```
      SUBROUTINE  CIRC(R,D)
      TH=0
    1 X1=R*COS(TH)
      Y1=R*SIN(TH)
   10 TH=TH+D
      IF(ABS(Y1).GT.2.625) GO TO 1
      X2=R*COS(TH)
      Y2=R*SIN(TH)
      IF( ABS(Y2).GT.2.625) GO TO 12
      CALL LINE(X1,Y1,X2,Y2)
   12 Y1=Y2
      X1=X2
      IF (TH-6.2832)10,11,11
   11 RETURN
      END
```

@PRT GT,FIELDS

MARTIN*GT.FIELDS

```
      SUBROUTINE FIELDS
      COMMON / XZ / XZ(97), IXZ6
      DIMENSION DIRB(3),REF(3),XMA(3),YMA(3),ZMA(3),XE(3),XP(3)
      COMMON/CHARAC/PF(60)
      COMMON /PLTBUF/BUF(20)
      COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
     X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SOBL,PLOBL(12)
      COMMON/PLOTER/PEN,RX(3),SCALE,R2,VT(3),VR(3),VW(3),RPP,TANR
       COMMON/PCOORD/PV(3),VE(3),PM(3)
      COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
      COMMON/ORBITO/DUMZ(7),E,H,PP,AA,DUMZZ(4)
      DOUBLE PRECISION JD,JDV
       COMMON/JDAYS/JDV,TT
      DIMENSION BLNK(10), BLNK2(10)
      DATA BLNK / 3*1H , 15HMAGNETIC DIPOLE, 4*1H  /
      DATA BLNK2 / 3*1H , 30HMAGNETO-PAUSE AND BOW SHOCK     , 2*1H  /
       DIMENSION XM(3),X(3),XF(3),V(3),XS(3) ,SN(3)
      DIMENSION COORD(4)
      GM = GMPL(IP)
      PI=3.14159
       RTD=57.295780
      CALL ARCSTP(5,)
      SENS=PF(10)
      XLAT=PF(8)
      XLON=PF(9)
      DPAUSE=PF(6)*RPL(IP)
      DINC=PF(7)*RPL(IP)
      A=AA
      ECC=E
      AE=ECC
       DPAUSE=64.*RPL(IP)
       DINC=0.275*DPAUSE
       DELANG=0.
       DELTR=DELANG/RTD
       R2=0.
      CALL ORBIN(XZ(7),IXZ6)
```

```
      CALL ORBPOS(X,0.)
      SCALE=ABSV(X)*5.
      IF(SCALE.LT.11.*RPL(IP)) SCALE=11.*RPL(IP)
      SCALE=SCALE+RPL(IP)*1.1
      COORD(1) =  SCALE - RPL(IP)*1.1
      COORD(2) =  RPL(IP)*1.1
      COORD(3) = -SCALE/2.
      COORD(4) =  SCALE/2.
      CALL MAP(COORD(1),COORD(2),COORD(3),COORD(4),0.,1.,0.,1.)
       RPP=RPL(IP)
       CALL UCROSS(VW,PV,X)
       CALL VPROJ
      CALL VVIEW(11,1,10,0,0,0,0)
       DMDT=SQRT(GM/ABS(A)**3)
C      PLOT PLANET DISK
      CALL DISK(IP,0,BLNK,0,0,0)
       IJK=0
       X(3)=0.
C   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C      PLOT THE MAGNETIC FIELD
      NMAX=SCALE/RPL(IP)
      DO 101 I=2,NMAX
       RO= I*RPL(IP)
       DO 100 J=90,270,2
       ALAT=(J-5)/RTD
       ANG=ALAT-DELTR
       RADIUS=RO*COS(ANG)**2
       IF(RPL(IP) .GT. RADIUS) GO TO 50
C      X IS THE VECTOR TO THE SPACECRAFT
       CALL VCOMB(X,VR,RADIUS*SIN(ALAT),VT,RADIUS*COS(ALAT))
       IF(IJK .EQ. 1)  GO TO 75
       IF(J .EQ. 5)  GO TO 75
C      PLOT MAGNETIC LINES OF FLUX
       CALL VPLOT(X)
       GO TO 100
 50    IJK=1
C      LIFT THE PEN
       CALL SINTRP(BUF)
       GO TO 100
 75    IJK=0
 100   CONTINUE
       CALL SINTRP(BUF)
C      LIFT THE PEN
 101   CONTINUE
 250   R=SCALE
C   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C      COMPUTE TRAJECTORY PARAMETERS
       CAT=(P/R-1.)/ECC
       AT=ACOS(CAT)
       T=ANOMLY(-AE,AT)/DMDT
      N=ABS(T)/3600.
      NN=-N
C   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C      COMPUTE MAGNETIC POLE VECTOR (V)
       CALL VLOAD(V,1.,XLAT,XLON)
       CALL SPHERE(V,V,4HFROM,6HLATLON,6HDEGREE)
C      COMPUTE AND PLOT S/C TRAJECTORY
      DO 300 I=NN,N
      T=I*3600.
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(XS,T)
       JD=JDV+ I*3600./86400.
       CALL PGLOBE(PV,JD,IP)
      CALL VTRANS(ZMA,V,4HFROM,PM,PV)
      DEC= ANGV(ZMA,XS,6HRADIAN)
       RADIUS=ABSV(XS)
      TMP=90./RTD+DEC
       CALL VCOMB(X,VR,RADIUS*SIN(TMP),VT,RADIUS*COS(TMP))
       CALL VPPLT(X,1H*)
 300 CONTINUE
      CALL SINTRP(BUF)
 310   CALLADV
C   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
      SCALE=DINC*1.1
       CALL PLPOS(XS,JDV,IP)
       CALL VSCALE(XS,XS,-1.)
C      XS IS THE VECTOR POINTING TO THE SUN
      CALL MAP(-SCALE,SCALE,-SCALE,SCALE,0.0,1.0,0.0,1.0)
C      PLOT PLANET DISK
      CALL LINE(-SCALE,0.,.9*SCALE,0.)
      CALL SYMBOL(3HS$.)
      CALL DISK(IP,0,BLNK2,0,0,0)
      N=30
       NN=-N
C   * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C      PLOT MAGNETOPAUSE CONTOUR
       DO 400 J=NN,N
       ALAT=J/RTD
       RPAUSE=DPAUSE*COS(ALAT)**2
       CALL VCOMB(X,VR,RPAUSE*SIN(ALAT),VT,RPAUSE*COS(ALAT))
       CALL VPLOT(X)
 400  CONTINUE
C      LIFT THE PEN
       CALL SINTRP(BUF)
      RPAUSE=DPAUSE*COS(PI/6.)**2
```

```
      Y=RPAUSE*SIN(PI/6.)
      XX=RPAUSE*COS(PI/6.)
      CALL VCOMB(X,VR,Y,VT,XX)
      CALL VPLOT(X)
      CALL VCOMB(X,VR,Y,VT,-SCALE)
      CALL VPLOT(X)
      CALL SINTRP(BUF)
      CALL VCOMB(X,VR,-Y,VT,XX)
      CALL VPLOT(X)
      CALL VCOMB(X,VR,-Y,VT,-SCALE)
      CALL VPLOT(X)
      CALL SINTRP(BUF)
C     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
      N=90
      NN=-N
C      PLOT BOW SHOCK CONTOUR
      PP=2.*DINC
       DO 500 J=NN,N
       ALAT=J/RTD
       RBOWS=PP/(1.+COS(ALAT))
       CALL VCOMB(X,VR,RBOWS *SIN(ALAT),VT,RBOWS *COS(ALAT))
       CALL VPLOT(X)
 500   CONTINUE
       CALL SINTRP(BUF)
C      LIFT THE PEN
       R=SCALE
       CAT=(P/R-1.)/ECC
       AT=ACOS(CAT)
       T=ANOMLY(-AE,AT)/DMDT
      N=ABS(T)/3600.
      NN=-N
C      PLOT TRAJECTORY
C     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
       DO 600 I=NN,N
      T=I*3600.
C      X IS THE VECTOR TO THE SPACECRAFT
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(X ,T)
       JD=JDV+ I*3600./86400.
       CALL PLPOS(XS,JD,IP)
       CALL VSCALE(XS,XS,-1.)
      CALL ORBIN(XZ(7),IXZ6)
       CALL ORBPOS(X,T)
       PHASE=ANGV(XS,X,6HRADIAN)
       XM=ABSV(X)
       CALL VCOMB(XF,VR,XM*SIN(PHASE),VT,XM*COS(PHASE))
       CALL VPPLT(XF,1H*)
 600   CONTINUE
C      LIFT THE PEN
       CALL SINTRP(BUF)
       CALL ADV
      N=3.*24.
      NN=-N
      DO 612 I=NN,N
      T=I*3600.
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(XS,T)
      TX=T/86400.
      IF(I.EQ.NN)TSTART=TX
      IF(I.EQ.N)TSTOP=TX
      JD=JDV+TX
      CALL PGLOBE(PM,JD,IP)
      CALL VTRANS(ZMA,V,4HFROM,PM,PV)
      CALL PLPOS(XE,JD,3)
      CALL PLPOS(XP,JD,IP)
      CALL VDIF(REF,XE,XP)
      RM=ABSV(XS)
      ANGLE=ANGV(ZMA,XS,6HRADIAN)
      ANGLE=PI/2. -ANGLE
      BMINS=(SENS/((RPL(IP)/RM)**3*SQRT(1.+3.*SIN(ANGLE)**2)/COS(ANGLE)*
     X*6))
       IF(I.EQ.NN)XMIN=BMINS
       XMIN=AMIN1(XMIN,BMINS)
       XMAX=AMAX1(XMAX,BMINS)
       CALL UCROSS(YMA,ZMA,XS)
       CALL  UCROSS(XMA,YMA,ZMA)
       CALL VTRANS(XS,XS,2HTO,XMA,ZMA)
       XX=XS(1)
       YY=XS(3)
       CALL SPHERE(XS,XS,2HTO,LATLON,6HRADIAN)
       RIB=XS(1)/COS(XS(2))**2
       IF(ABS(YY).LT.1.E-6) GO TO 610
       SLOPE=(2.*XX*RIB-3.*XX*SQRT(XX**2 + YY**2))
      X/(3.*YY*SQRT(XX**2 + YY**2))
       Y1=YY-SLOPE*XX
       IF(YY.LT.0.) CALL VLOAD(DIRB,XX,0.,(YY-Y1))
       IF(YY.GT..0) CALL VLOAD(DIRB,-XX,0.,(Y1-YY))
       GO  TO 611
 610   CALL VSCALE(DIRB,ZMA,-1.)
 611   CALL VUNIT(DIRB,DIRB)
       CALL VSCALE(DIRB,DIRB,-1.)
       CALL VTRANS(DIRB,DIRB,4HFROM,XMA,ZMA)
       CALL RCNCLK(DIRB,REF)
 612   WRITE (8)TX,BMINS,DIRB
       CALL MAPSSL(TSTART,TSTOP,XMIN,XMAX,.1,1.,.1,1.)
       CALL CHAROP (0,0,0,1,0)
```

```
      CALL ABSREM (.05,.4)
      CALL SYMBOL(22HMINIMUM DETECTABLE BS,)
      CALL SYMBOL(10H (GAUSS)$,)
      CALL ABSREM (.4,.05)
      CALL CHAROP (0,0,0,0,0)
      CALL SYMBOL(29H TIME FROM ENCOUNTER (DAYS)$,)
      REWIND 8
      READ(8)TX,BMINS
  502 READ(8,END=501)TX2,BMINS2
  503 CALL LINE(TX,BMINS,TX2,BMINS2)
      TX=TX2
      BMINS=BMINS2
      GO TO 502
  501 CONTINUE
      CALL ADV
      REWIND 8
      CALL MAPS(TSTART,TSTOP,-180.,180.,.1,1.,.1,1.)
      CALL CHAROP (0,0,0,1,0)
      CALL ABSREM (.05,.2)
      CALL SYMBOL(37HCLOCK ANGLE OF MAGNETIC FLUX VECTOR$,)
      CALL CHAROP (0,0,0,0,0)
      CALL ABSREM (.2,.05)
      CALL SYMBOL(28HTIME FROM ENCOUNTER (DAYS)$,)
      READ (8,END=622) TX,BMIN,DIRB
  621 CLOCK=DIRB(3)
      IF(CLOCK.GT.180.0) CLOCK=CLOCK-360.0
      T=TX
  624 READ (8,END=622) TX,BMIN,DIRB
  623 ZAP=DIRB(3)
      IF(ZAP.GT.180.) ZAP=ZAP-360.
      CALL LINE(T,CLOCK,TX,ZAP)
      T=TX
      CLOCK=ZAP
      GO TO 624
  622 REWIND 8
      CALL ADV
      CALL MAPS(TSTART,TSTOP,0.,180.,.1,1.,.1,1.)
      CALL CHAROP (0,0,0,1,0)
      CALL ABSREM (.05,.2)
      CALL SYMBOL(36HCONE ANGLE OF MAGNETIC FLUX VECTOR$,)
      CALL CHAROP (0,0,0,0,0)
      CALL ABSREM (.2,.05)
      CALL SYMBOL(28HTIME FROM ENCOUNTER (DAYS)$,)
      READ (8,END=626) TX,BMIN,DIRB
  627 CONE=DIRB(2)
      T=TX
  628 READ (8,END=626) TX,BMIN,DIRB
  629 CALL LINE(T,CONE,TX,DIRB(2))
      CONE=DIRB(2)
      T=TX
      GO TO 628
  626  CONTINUE
      CALL ADV
       RETURN
       END
```

```
@PRT GT,FOLDER
```

```
MARTIN*GT.FOLDER
      SUBROUTINE FOLDER(INST)
      DIMENSION NS(9)
      DATA NS/0,0,1,2,4,7,5,1,0/
      DIMENSION PLNMUL(9),MOD(9),SATMUL(8,4)
      REAL MULT
      INTEGER CAMK
      COMMON/HEDING/TITLE(13)
      COMMON/TNME/TVNAME(5)
      COMMON/TEST/ITEST(97)
      COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
      COMMON /JUNK/PB,EFBP,BS(8),EFBS(8)
      COMMON/PHOTO/SOLAR(31),ALBDO(31,3),F(31,4),CAMEF(31,3)
      COMMON/CHARAC/P(60)
      DATA  F   / 31*1.0,            5*0.,.035,.500,.860,.990,.960,.500,
     X .080,.030,.010,.015, 21*.0,
     X            .150,.010,.150,.020,.080,.500,.950,.930,.895,.500,.100,
     X .027,.015,.013,18*0.,
     X            .005,.010,.020,.005,.005,.010,.025,.080,.500,.850,.930,
     X .750,.800,.160,.050,.015,.005,.010,.010,.025,.005,.005,.010,.040,
     X .030/
      DATA SOLAR /.0070,.0204,.0514,.0971,.1093,.1157,.1429,.1693,.2006,
     X.2044      ,.1942,.1852,.1725,.1719,.1666,.1586,.1511,.1442,.1369,
     X.1302,.1235,.1171,.1107,.1048,.0988,.0939,.0889,.0862,.0835,.0791,
     X.0746/
      DATA ALBDO/.300,.282,.270,.265,.269,.272,.285,.315,.364,.385,.406,
     X.430,.450,.460,.465,.469,.470,.469,.458,.440,.410,.380,.355,.330,
     X.315,.300,.282,.264,.246,.232,.222,
     X.045,.050,.055,.060,.065,.070,.075,.080,.085,.100,.105,.113,.120,
     X.125,.130,.135,.145,.155,.165,.170,.175,.180,.185,.290,.295,.200,
     X.200,.200,.205,.209,.210,
     X.075,.060,.047,.045,.040,.045,.050,.060,.075,.100,.120,.140,.155,
     X.180,.210,.225,.250,.260,.275,.280,.290,.295,.300,.300,.302,.300,
     X.300,.300,.298,.295,.290/
      DATA CAMEF/.0  ,.002,.095,.476,.762,.953,.984,1.00,.984,.953,.794,
```

```
     X .762,.682,.555,.476,.445,.360,.254,.206,.159,.095,.040,.024,.010,
     X .003,.022, 10*.0
     X                                    ,.238,.799,.905,.954,.976,1.00,
     X 1.00,.994,.960,.916,.870,.834,.810,.799,.785,.740,.685,.620,.542,
     X .477,.417,.357,.310,.250,.202,.167,
     X                    .025,.050,.100,.200,.500,.750,1.00,.910,.700,
     X .565,.450,.415,.365,.340,.245,.092,.025,.009,13*.0/
      DATA PLNMUL/1.0,1.0,1.0,1.0,1.0,1.0,1.04,1.28,1.07,0.655/
      DATA MOD/1,1,1,3,1,1,1,4/
      DATA SATMUL/
     X4.00,4.00,4.00,1.99,2.26,2.32,4.00,0.50,
     X3.72,4.00,4.00,4.00,4.00,1.79,1.31,3.75,
     X4.00,4.00,4.00,4.00,4.00,0.00,0.00,0.00,
     X2.67,4.00,0.00,0.00,0.00,0.00,0.00,0.00/
C
      NSP=1+NS(IP)
      CAMK=P(21) + 0.01
      NF=P(23) + 0.01
C
      DO 200 KIL=1,NSP
      IMOD=2
      IF(KIL.EQ.1) IMOD=MOD(IP)
      MULT=PLNMUL(IP)
      IF(KIL.NE.1) MULT=SATMUL(KIL,IP-4)
      B=0.
      EFB=0.
      WL=.25
      WRITE(6,101)TITLE
      WRITE(6,100)TVNAME
      IF(KIL.NE.1) GO TO 70
      WRITE(6,160) IP
      GO TO 80
   70 CONTINUE
      KIK=KIL-1
      WRITE(6,170) KIK
   80 CONTINUE
      WRITE(6,110)
      DO 10 I=1,31
      BO=SOLAR(I)*ALBDO(I,IMOD)*0.025*MULT
      IF(NF.NE.0) BO=BO*F(I,NF)
      BEF=BO*CAMEF(I,CAMK)
      WRITE(6,120) WL,SOLAR(I),ALBDO(I,IMOD),CAMEF(I,CAMK),F(I,NF),BO,
     * BEF
      WL=WL+.025
      B=B+BO
   10 EFB=EFB+BEF
      IF(KIL.NE.1) GO TO 150
      PB=B
      EFBP=EFB
      GO TO 200
  150 CONTINUE
      BS(KIL-1)=B
      EFBS(KIL-1)=EFB
  200 CONTINUE
      RETURN
  100 FORMAT(5X,19HTV ENERGY DATA FOR ,5A6,//)
  101 FORMAT(1H1,4X,13A6,//)
  110 FORMAT(4X,7HMICRONS,4X,5HSOLAR,5X,6HALBEDO,4X,6HSENSOR,4X,6HFILTER
     *,4X,10HBO(W/SQCM),4X,13HBEFF(W/SQCM) )
  120 FORMAT(5(4X,F6.4),2X,2E14.6)
  160 FORMAT(5X,7HPLANET ,I2,5H DATA/)
  170 FORMAT(5X,10HSATELLITE ,I2,5H DATA/)
      END
```

@PRT GT.FPCHAR

MARTIN*GT.FPCHAR

```
      SUBROUTINE FPCHAR(INST)
      COMMON/HEDING/TITLE(13)
      COMMON/TNME/TVNAME(5)
      COMMON/CHARAC/P(60)
      COMMON/TEST/ITEST(97)
      COMMON/XZ/XZ(97)
C
C 1 THRU 5 INSTRUMENT NAME
C 6  MAGNETOPAUSE RANGE (RADII)
C 7 BOW SHOCK RANGE (RADII)
C 8  LAT MAG POLE (DEG)
C 9  LON MAG POLE (DEG)
C 10 INSTRUMENT SENSITIVITY (GAUSS)
C
      P(1)=6HFIELDS
      P(2)=6H AND P
      P(3)=6HARTICL
      P(4)=6HE INST
      P(5)=6HRUMENT
      IF(XZ(2).EQ.6) GO TO 90
      P(6)=51.6
      P(7)=65.8
      P(8)=80.0
      P(9)=190.0
      GO TO 95
```

```
      90 CONTINUE
         P(6)=63.0
         P(7)=80.3
         P(8)=90.0
         P(9)=0.0
      95 CONTINUE
         P(10)=0.000002
         IF(ITEST(1).EQ.0) GO TO 110
         DO 100 I=1,5
         P(I)=TVNAME(I)
     100 CONTINUE
     110 CONTINUE
         DO 120 I=6,10
         P(I)=XZ(I+30)
     120 CONTINUE
         DO 130 I=1,5
     130 TVNAME(I)=P(I)
         WRITE(6,1000) TITLE
         WRITE(6,1010) (P(I),I=1,5)
         DO 140 I=6,10
         IF(ITEST(I+30).EQ.1) WRITE(6,1020)  I,P(I)
         IF(ITEST(I+30).NE.1) WRITE(6,1030)  I,P(I)
     140 CONTINUE
         RETURN
    1000 FORMAT(1H1,13A6/)
    1010 FORMAT(5X,23HFP CHARACTERISTICS FOR ,5A6/)
    1020 FORMAT(5X,I2,5X,6X,2H= ,E15.8,5X,10HUSER INPUT)
    1030 FORMAT(5X,I2,5X,6X,2H= ,E15.8)
         END

@PRT GT,GEOPLT

MARTIN*GT.GEOPLT
         SUBROUTINE  GEOPLT
         DOUBLE PRECISION JDV
         DIMENSION X(3),XP(3),XSAT(3),XE(3),RADP(3),TARGE(3),TARGP(3),
        XRSAT(3),XSS(3)
         DIMENSION A(3),V(3),V1(3)
         DIMENSION NUM(8)
         COMMON/PTLB/THA,R(3),DEI,K
         COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
        X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SOBL,PLOBL(12)
         COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
         DIMENSION SCUNIT(4)
         DATA NUM/30,60,90,120,150,180,270,0/
         DATA SCUNIT/0.,1.,0.,1./
         SCAL2=2.625
         CALL CHAROP (0,0,1,0,0)
         K=1
          KREC=0
         PI=3.1415926536
          RAD=57.2957795
           STEP=2./RAD
         SCALE=3.5
      50 CALL MAP(-SCALE,SCALE,-SCALE,SCALE,SCUNIT(1),SCUNIT(2),SCUNIT(3),
        XSCUNIT(4))
         CALL LINE(-SCALE,-SCALE, SCALE,-SCALE)
         CALL LINE( SCALE,-SCALE, SCALE, SCALE)
         CALL LINE( SCALE, SCALE,-SCALE, SCALE)
         CALL LINE(-SCALE, SCALE,-SCALE,-SCALE)
         CALL LINE(-SCALE,-SCALE/2.,SCALE,-SCALE/2.)
         CALL MAP(-3.5,3.5,-2.625,2.625,0.,1.,.25,1.)
         CALL LINE(-3.5,0.,3.5,.0)
         CALL LINE(0.,-2.625,0.,2.625)
         DEI=3.5/90.
         R0=15.*DEI
         DO 12 I=10,360,10
         TH=I/RAD
         SN=SIN(TH-PI/2.)
         CS=COS(TH-PI/2.)
         X1=R0*CS
         Y1=R0*SN
         RMAX=3.5
         X2=RMAX*CS
         Y2=RMAX*SN
         IF(ABS(Y2).LT.2.625) GO TO 12
         Y2=SIGN(2.625,Y2)
         SL=SN/CS
         X2=Y2/SL
      12 CALL LINE (X1,Y1,X2,Y2)
         DO 15 I=1,6
         R=R0*I
      15 CALL CIRC(R ,STEP)
          CALL SETBEM (.08,-SCAL2)
         CALL NUMBER(NUM(8),2HI1)
         CALL SET BEM (.08,SCAL2- .17)
         CALL NUMBER(NUM(6),2HI3)
         CALL SET BEM  (-SCALE+.01,.0)
         CALL NUMBER(NUM(7),2HI3)
         IF(K.EQ.2) GO TO 21
         DO 20 I=1,3
         R0=I*R0*2.-.25
         CALL SET BEM (R0,0)
```

```
      20    CALL NUMBER(NUM(I),2HI3)
            GO TO 23
         21 DO 22 I=1,3
            M=7-I
            RO=2.*(I-1)*RO-.25
            CALL SET BEM (RO,0)
         22 CALL NUMBER(NUM(M),2HI3)
         23 REWIND 13
         10 READ(13,END=31)TT,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,PSAT,
           X                  PHASES,XSS,JDV,EM
         11 KREC=KREC+1
            TMAX=TT
            TMIN=TT
            IF(NCB  .EQ.1) CALL VEQUAL(R,RSAT)
             IF(K.EQ.1.AND.R(2).GT.90.) GO TO 10
             IF(K.EQ.2.AND.R(2).LT.90.) GO TO 10
            RPP=RPL(IP)
            IF(IFLST.EQ.1.OR.NCB.EQ.1)CALL PSCONS(RPP,6HRADIUS,IVS,IP)
            THA=ASIN(RPP/R(1))
            CALL XLIMB
            CALL VLOAD(A,1.,R(2),R(3))
            CALL SPHERE(V,A,4HFROM ,5HPOLAR,6HDEGREE)
      6     READ(13,END=30)TT,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT,
           X                  PHASES,XSS,JDV,EM
          7 KREC=KREC+1
            IF(NCB  .EQ.1) CALL VEQUAL(R,RSAT)
            IF(K.EQ.1.AND.RSAT(2).GT.90.) GO TO 40
            IF(K.EQ.2.AND.RSAT(2).LT.90.) GO TO 40
            CON=DEI*ABS(180.*(K-1)-RSAT(2))
            ZON=PSAT(3)*PI/180.-PI/2.
            X=CON*COS(ZON)
            Y=CON*SIN(ZON)
            CALL POINT(X,Y)
            IF(RSAT(1).LT.R(1)) CALL SYMBOL(3H*$.)
            IF(RSAT(1).GT.R(1)) CALL SYMBOL(3H+$.)
         40 CONTINUE
            IF(K.EQ.1.AND.R(2).GT.90.) GO TO 6
            IF(K.EQ.2.AND.R(2).LT.90.) GO TO 6
            TMAX=AMAX1(TMAX,TT)
            TMIN=AMIN1(TMIN,TT)
            CALL VLOAD(A,1.,R(2),R(3))
            CALL SPHERE(V1,A,4HFROM,5HPOLAR,6HDEGREE)
            CSA=DOT(V,V1)
            SNA=SQRT(1.-CSA**2)
            THA=RPP/R(1)
            IF(SNA.LT.THA) GO TO 6
            THA=ASIN(THA)
            CALL XLIMB
            CALL VEQUAL(V,V1)
            IF(KREC.EQ.NREC) GO TO 30
            GO TO 6
         31 CONTINUE
         30 K=K+1
            CALL ABSBEM (.1,.05)
            CALL SYMBOL(14HSTART TIME  $.)
            CALL NUMBEF(TMIN/86400.,4HF4.1)
            CALL SYMBOL(13HSTOP TIME  $.)
            CALL NUMBEF(TMAX/86400.,4HF4.1)
            IF(K.GT.2) RETURN
            CALL ADV
            GO TO 50
            END
```

```
@PRT GT.INPUT
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```
MARTIN*GT.INPUT
            SUBROUTINE INPUT(NP)
            COMMON/HEDING/TITLE(13)
            COMMON/FLAGS/IFLT,IFLPL,IFLPR
            COMMON/TCONS/TCONS(200)
            COMMON/CAM/CCONE(200),CCLOK(200)
            COMMON/TEST/ITEST(97)
            COMMON /TRA/TRACE,COMENT(13)
            COMMON/TNME/TVNAME(5)
            COMMON /PLTBUF/BUF(20)
      C INPUT QUANTITIES
            COMMON/XZ/XZ(97) /VAR/VAR(97)
            DATA XZ/14*0.,3.,8*0.,2*1H ,72*0./
            DATA VAR/6H      ,6HPLANET,6HSATEL ,6HDATE  ,6HORIENT,6H      ,
           *6HSTATE1,6HSTATE2,6HSTATE3,6HSTATE4,6HSTATE5,6HSTATE6,6H      ,
           *6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,
           *6H      ,6HINSTID,6H      ,6H      ,6H      ,6H      ,6H      ,
           *6H      ,6H      ,6H      ,6HNAME-1,6HNAME-2,6HNAME-3,6HNAME-4,
           *6HNAME-5,6HCHAR-1,6HCHAR-2,6HCHAR-3,6HCHAR-4,6HCHAR-5,6HCHAR-6,
           *6HCHAR-7,6HCHAR-8,6HCHAR-9,6HCHAR10,6HCHAR11,6HCHAR12,6HCHAR13,
           *6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,
           *6H      ,6H      ,6H      ,6H      ,6H      ,6HTSTAR ,6HTSTOP ,
           *6HDTINST,6H      ,6H      ,6HBITRAT,6H      ,6H      ,6HCALCST,
           *6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,
           *6H      ,6H      ,6H      ,6H      ,6HDPLOT ,6HDPRNT ,6H      ,
           *6H      ,6H      ,6HSATRNG,6H      ,6H      ,6H      ,6H      ,
           *6H      ,6H      ,6H      ,6H      ,6H      ,6H      ,6H      /
```

```
      DATA TVNAME/5*6H
C
C EJECT PAGE AND READ TITLE CARD
      PRINT 998
      READ(5,1000)TITLE
 1000 FORMAT(13A6)
      WRITE(6,1001)TITLE
 1001 FORMAT(5X,13A6,/)
C
      N1=0
      N2=0
      NP=0
      ITFLB=0
      ITFLA=0
      IFLT=0
      IF(XZ(71).NE..0) GO TO 1
      DO 10 I=1,97
10    ITEST (I)=0
  250 CONTINUE
C
C  READ INPUT CARDS
1     READ(5,994)              I,XV,WORD,(COMENT(J),J=1,10)
  260 CONTINUE
      IF(I.LT.1 .OR. I.GT.97) GO TO 2
      PRINT 995, I,XV,VAR(I),(COMENT(J),J=1,10)
      IF(I.GE.31.AND.I.LE.35) TVNAME(I-30)=WORD
      XZ(I)=XV
      ITEST(I)=1
      IF(I.NE.22) GO TO 200
      IF(IFIX(XV/100.).NE.3) ITFLB=1
  200 CONTINUE
      IF(I.EQ.23) GO TO 300
      GO TO 1
  300 CONTINUE
      IFLT=XV
      IF(XV.NE.1) GO TO 250
      IF(ITFLB.EQ.1) GO TO 310
      WRITE(6,993) COMENT
      GO TO 250
  310 ITFLA=1
  320 READ(5,994) I,XV,WORD,(COMENT(J),J=1,10)
      IF(I.LT.24.OR.I.GT.30) GO TO 260
      IF(I.EQ.24) N1=N1+1
      IF(I.EQ.25) N2=N2+1
      IF(I.EQ.26) NP=NP+1
      ITEST(I)=1
      XZ(I)=XV
      PRINT 995,I,XV,VAR(I),(COMENT(J),J=1,10)
      IF(I.EQ.24) CCONE (N1)=XV
      IF(I.EQ.25) CCLOK(N2)=XV
      IF(I.EQ.26) TCONS(NP)=XV
      GO TO 320
2     PRINT 996, I,WORD,(COMENT(J),J=1,10)
      IF(I.EQ.98) GO TO 5
      IF(I.EQ.99) GO TO 4
      DO 3 I=1,97
3     XZ(I) = 0.
      XZ(15) = 3.
      XZ(24) = 1H
      XZ(25) = 1H
      GO TO 1
C FINISHES PLOT TAPE
4     CALL STERM(BUF)
      STOP
5     CALL VECTOR (WORD)
      IF(TRACE.EQ.5HTRACE) PRINT 999
C
      PRINT 998
      WRITE(6,1001)TITLE
      WRITE(6,1002)
 1002 FORMAT(24H XZ(I) VALUES IN STORAGE,/)
      DO 9 I=1,96,2
      K=I+1
    9 WRITE(6,1003)I,ITEST(I),XZ(I),K,ITEST(K),XZ(K)
 1003 FORMAT(I4,I4,2X,E17.10,13X,I4,I4,2X,E17.10)
C
      RETURN
991   FORMAT(5X,I2,3X,A6,11X,10A6,A2)
992   FORMAT(13A6)
993   FORMAT(' ERROR******',13A6,'******ERROR THIS CARD IGNORED')
994   FORMAT(I2,G15.8,10A6,A2)
995   FORMAT(5X,I2,1PG20.8,10A6,A2)
996   FORMAT(5X,I2,20X,10A6,A2)
997   FORMAT(1P4(/1X,5(3X,A6,G15.8))/1X,3(3X,A6,G15.8),2(3X,A6,6X,A6,3X
     X ),15(/1X,5(3X,A6,G15.8)))
998   FORMAT('1')
999   FORMAT('1INPUT SUBROUTINE')
      END
```

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@PRT GT.MRLC
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```
MARTIN*GT.MRLC
      1            SUBROUTINE MRLC(DIREC)
      2            COMMON/PLCONS/DUMMYD(28), PLNAME(2,12),DUMMYE(104)
      3            COMMON/RAZOR/PICS(4,9),SPPICS(4)
      4            DIMENSION SYM(4)
      5            DATA SYM/3HO$.,3HX$.,3H+$.,3HI$./
      6            COMMON/HANDO/TIM,REC(9),REL(9),RES,SMR(9),SMRR(9),SMRS(9),TSMR(9)
      7           X,SPSMR,SPSMRS,SPTSMR,SPSMRR
      8            DIMENSION SOUNIT(4),NS(9),ACPIC(4,8),ION(4,8)       ,THING(3),PP(4)
      9            DATA THING(3)/2H$./
     10            DATA ION/32*0/
     11            COMMON/FOROUT/DUMMYB(13),IPCN,DUMMYC(4)
     12            COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCR
     13            COMMON/CHARAC/P(60)
     14            COMMON/JDAYS/ JDV,TT
     15            DOUBLE PRECISION JDV
     16            DATA NS/0,0,1,2,4,7,5,2,0/
     17            DATA SOUNIT/0.1,1.0,0.1,1.0/
     18            IF(DIREC.EQ.4HPLOT) GO TO 300
     19            IF(IFR.NE.0) GO TO 100
     20            REWIND 12
     21            PMAX=0.0
     22            IFR=1
     23      C
     24      C        MINIMUM RESOLUTION LEVEL CALCULATION (MRLC) SUBROUTINE
     25      C        WILL COMPUTE THE NUMBER OF PICTURES VS TIME WITHIN A
     26      C        GIVEN RESOLUTION RANGE (SEE TVCHAR P(17) THRU P(20)).
     27      C     BECAUSE CALCULATIONS TAKE PLACE DURING CALC STEPS ACCURACY
     28      C        LIES WITHIN PLUS OR MINUS P(39).
     29      C
     30            NSP=NS(IP)
     31            NSX=NSP+1
     32          100 DO 140 I=1,NSX
     33            DO 130 J=1,4
     34            IF(ION(J,I).NE.0) GO TO 110
     35            IF(REC(I).GT.P(16+J)) GO TO 130
     36            ION(J,I)=IPCN
     37            ACPIC(J,I)=1.
     38          110 CONTINUE
     39            IF(REC(I).GT.P(16+J)) GO TO 120
     40            ACPIC(J,I)=ACPIC(J,I)+IPCN-ION(J,I)
     41      120   ION(J,I)=IPCN
     42            PICS(J,I)=ACPIC(J,I)
     43            IF(PICS(J,I).GT.PMAX) PMAX=PICS(J,I)
     44          130 CONTINUE
     45          140 CONTINUE
     46            TP=TT/86400.
     47            WRITE(12) TP,PICS,SPPICS
     48            RETURN
     49      C
     50      C        PLOT OF PICTURES PER MRL VS TIME
     51      C
     52          300 CONTINUE
     53            DO 400 I=1,NSX
     54            REWIND 12
     55            IFR=0
     56            CALL ADV
     57            CALL MAPSSL(-TIM,TIM,1.0,PMAX,SOUNIT(1),SOUNIT(2),SOUNIT(3),SOUNIT
     58           *(4))
     59            CALL CHAROP (0,0,1,1,0)
     60            CALL ABSREM (0.05,0.02)
     61            CALL SYMBOL(56HNUMBER OF PICTURES WITHIN SPECIFIED RESOLUTION LEVE
     62           XLS $,)
     63            IF(I.NE.1) GO TO 310
     64            DO 305 K=1,2
     65          305 THING(K)=PLNAME(K,IP)
     66            GO TO 315
     67          310 CALL PSCONS(THING,4HNAME,I-1,IP)
     68          315 CONTINUE
     69            CALL SYMBOL(THING )
     70            CALL CHAROP (0,0,1,0,0)
     71            CALL ABSREM (0.2,0.01)
     72            CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
     73            CALL CHAROP (0,0,0,0,0)
     74          320 READ(12,END=360) T,PICS,SPPICS
     75          325 IF(IFR.EQ.0) GO TO 340
     76            DO 330 J=1,4
     77            IF(PP(J).LE.0.0.OR.PICS(J,I).LE.0.0) GO TO 330
     78            CALL LINE(TP,PP(J),T,PICS(J,I))
     79          330 CONTINUE
     80            GO TO 350
     81          340 CONTINUE
     82            IFR=1
     83            DO 345 J=1,4
     84            IF(PICS(J,I).LE.0.0) GO TO 345
     85            CALL POINT(TP,PICS(J,I))
     86            CALL SYMBOL(SYM(J))
     87          345 CONTINUE
     88          350 CONTINUE
     89            DO 355 J=1,4
     90          355 PP(J)=PICS(J,I)
     91            TP=T
     92            GO TO 320
     93          360 DO 365 J=1,4
     94            IF(PP(J).LE.0.0) GO TO 365
     95            CALL POINT(TP,PP(J))
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     96            CALL SYMBOL(SYM(J))
     97            XHT=0.98-(J-1)*0.03
     98            CALL ABSREM (0.75,XHT)
     99            CALL SYMBOL(SYM(J))
    100            CALL SYMBOL(3H $.)
    101            CALL NUMBER(P(16+J), 4HF5.1)
    102            CALL SYMBOL(5H KM$.)
    103        365 CONTINUE
    104        400 CONTINUE
    105            RETURN
    106            END


@PRT GT.OTJAZ


MARTIN*GT.OTJAZ
      1            SUBROUTINE OTJAZ(DIREC)
      2            COMMON /XZ/ XZ(97), IXZ6
      3            COMMON/POBEAR/SSV(8),SAF(8),HANG2,DCNCLK(8).
      4            DIMENSION DUMMYC(13)
      5            COMMON/PHASER/PHASE(8),XRCC(3,8)
      6            COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
      7            COMMON/JDAYS/JDV,TT
      8            DIMENSION NS(9),THING(3)
      9            DIMENSION SYM(8)
     10            DATA SYM/3H0$.,3HX$.,3H+$.,3HI$.,3HH$.,3HT$.,3HZ$.,3HP$./
     11            DATA THING(3)/2H$./
     12            DATA IFR,ITR1/0,11/
     13            DATA NS/0,0,1,2,4,7,5,2,0/
     14            REALJDV
     15            DIMENSION X(3),XP(3),XSAT(3),XE(3),R(3),      RADP(3),TARGE(3),
     16           *TARGP(3) ,RSAT(3),       XSS(3),SDUNIT(4)   ,RDMIN(3)
     17            DATA SDUNIT/0.1,1.0,0.1,1.0/
     18            COMMON/HANDO/TIM,REC(9),PEL(9),RES,SMR(9),SMRR(9),SMRS(9),TSMR(9)
     19           X,SPSMR,SPSMRS,SPTSMR,SPSMRR
     20            IF(DIREC.EQ.4HPLOT) GO TO 120
     21            IF(IFR.EQ.1) GO TO 100
     22            REWIND 9
     23            RPD=3.14159/180.
     24            CALL ORBIN(XZ(7),IXZ6)
     25            CALL ORBPOS(RDMIN,0.0)
     26            RAMIN=ABSV(RDMIN)
     27            NSP=NS(IP)
     28            REWIND ITR1
     29            IFR=1
     30        100 CONTINUE
     31            T=TT/86400.
     32            WRITE(ITR1) T,PHASE,XRCC
     33            WRITE(9) T,SSV,SAF,HANG2,DCNCLK
     34            RETURN
     35        120 CONTINUE
     36      C
     37      C  SATELLITE RANGE VS TIME PLOT
     38      C
     39            REWIND 13
     40            READ(13)DUMMYC,R,A
     41            RP=R(1)
     42            REWIND 13
     43            CALL ADV
     44            CALL MAPSSL(-TIM,TIM,RAMIN,RP,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     45           *SDUNIT(4))
     46            CALL CHAROP (0,0,1,1,0)
     47            CALL ABSREM (0.05,0.2)
     48            CALL SYMBOL(25HRANGE OF SATELLITE (KM)$.)
     49            CALL CHAROP (0,0,1,0,0)
     50            CALL ABSREM (0.2,0.01)
     51            CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
     52            CALL CHAROP (0,0,0,0,0)
     53            DO 150 ITB=1,NSP
     54            REWIND ITR1
     55            READ(ITR1) TP,PHASE,XRCC
     56            RP=XRCC(1,ITB)
     57            IF(RP.LE.0.0) GO TO 150
     58            CALL POINT(TP,RP)
     59            CALL SYMBOL(SYM(ITB))
     60        130 CONTINUE
     61            READ(ITR1,END=148) T,PHASE,XRCC
     62        140 CONTINUE
     63            CALL LINE(TP,RP,T,XRCC(1,ITB))
     64            TP=T
     65            RP=XRCC(1,ITB)
     66            GO TO 130
     67        148 CONTINUE
     68            CALL POINT(TP,RP)
     69            CALL SYMBOL(SYM(ITB))
     70            XHT=0.98-(ITB-1)*0.03
     71            CALL ABSREM (0.75,XHT)
     72            CALL SYMBOL(SYM(ITB))
     73            CALL SYMBOL(3H $.)
     74            CALL PSCONS(THING,4HNAME,ITB,IP)
     75            CALL SYMBOL(THING)
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  150 CONTINUE
      REWIND ITR1
      CALL ADV
C
C  SATELLITE PHASE ANGLE VS TIME PLOT
C
      CALL MAPS (-TIM,TIM,0.0,210.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT
     X(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(29HSATELLITE PHASE ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      CALL CHAROP (0,0,0,0,0)
      DO 153 ITB=1,NSP
      REWIND ITR1
      READ(ITR1) TP,PHASE,XRCC
      PHP=PHASE(ITB)/RPD
      CALL POINT(TP,PHP)
      CALL SYMBOL(SYM(ITB))
  151 CONTINUE
      READ (ITR1,END=1053) T,PHASE,XRCC
  152 CONTINUE
      PHASES=PHASE(ITB)/RPD
      CALL LINE(TP,PHP,T,PHASES)
      TP=T
      PHP=PHASES
      GO TO 151
 1053 CONTINUE
      CALL POINT(TP,PHP)
      CALL SYMBOL(SYM(ITB))
      XHT=0.98-(ITB-1)*0.03
      CALL ABSREM (0.75,XHT)
      CALL SYMBOL(SYM(ITB))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB,IP)
      CALL SYMBOL(THING)
  153 CONTINUE
      CALL ADV
C
C  SATELLITE CONE ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,210.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(28HSATELLITE CONE ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      CALL CHAROP (0,0,0,0,0)
      DO 156 ITB=1,NSP
      REWIND ITR1
      READ(ITR1) TP,PHASE,XRCC
      RP=XRCC(2,ITB)
      CALL POINT(TP,RP)
      CALL SYMBOL(SYM(ITB))
  154 CONTINUE
      READ (ITR1,END=1056) T,PHASE,XRCC
  155 CONTINUE
      CALL LINE(TP,RP,T,XRCC(2,ITB))
      TP=T
      RP=XRCC(2,ITB)
      GO TO 154
 1056 CONTINUE
      CALL POINT(TP,RP)
      CALL SYMBOL(SYM(ITB))
      XHT=0.98-(ITB-1)*0.03
      CALL ABSREM (0.75,XHT)
      CALL SYMBOL(SYM(ITB))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB,IP)
      CALL SYMBOL(THING)
  156 CONTINUE
      CALL ADV
C
C  SATELLITE CLOCK ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,390.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(29HSATELLITE CLOCK ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      CALL CHAROP (0,0,0,0,0)
      DO 159 ITB=1,NSP
      REWIND ITR1
      READ(ITR1) TP,PHASE,XRCC
      RP=XRCC(3,ITB)
      CALL POINT(TP,RP)
      CALL SYMBOL(SYM(ITB))
  157 CONTINUE
```

```
      READ (ITR1,END=1059) T,PHASE,XRCC
  158 CONTINUE
      CALL LINE(TP,RP,T,XRCC(3,ITB))
      TP=T
      RP=XRCC(3,ITB)
      GO TO 157
 1059 CONTINUE
      CALL POINT(TP,RP)
      CALL SYMBOL(SYM(ITB))
      XHT=0.98-(ITB-1)*0.03
      CALL ABSREM (0.75,XHT)
      CALL SYMBOL(SYM(ITB))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB,IP)
      CALL SYMBOL(THING)
  159 CONTINUE
      REWIND ITR1
      CALL ADV
      CALL MAPS(-TIM,TIM,   0.0,210.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     XSDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(25HSUN-SAT-S/C ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      CALL CHAROP (0,0,0,0,0)
      DO 360 ITB=1,NSP
      REWIND 9
      IFR=0
  310 CONTINUE
      READ(9, END=350)T,SSV,SAF
  320 IF(IFR.EQ.0) GO TO 330
      CALL LINE(TP,SSP,T,SSV(ITB))
  330 CONTINUE
      IF(IFR.NE.0) GO TO 340
      IFR=1
      CALL POINT(T,SSV(ITB))
      CALL SYMBOL(SYM(ITB))
  340 CONTINUE
      TP=T
      SSP=SSV(ITB)
      GO TO 310
  350 CONTINUE
      CALL POINT(TP,SSP)
      CALL SYMBOL(SYM(ITB))
      XHT=0.98-(ITB-1)*0.03
      CALL ABSREM (0.75,XHT)
      CALL SYMBOL(SYM(ITB))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB,IP)
      CALL SYMBOL(THING)
  360 CONTINUE
      CALL ADV
      CALL MAPS(-TIM,TIM,-03.,07.,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     XSDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(28HSATELLITE HALF ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      CALL CHAROP (0,0,0,0,0)
      DO 460 ITB=1,NSP
      REWIND 9
      IFR=0
  410 CONTINUE
      READ(9,END=450) T,SSV,SAF
  420 IF(IFR.EQ.0) GO TO 430
      CALL LINE(TP,SSP,T,SAF(ITB))
      IF(IFR.NE.0) GO TO 440
  430 CONTINUE
      IFR=1
      CALL POINT(T,SAF(ITB))
      CALL SYMBOL(SYM(ITB))
  440 CONTINUE
      TP=T
      SSP=SAF(ITB)
      GO TO 410
  450 CONTINUE
      CALL POINT(TP,SSP)
      CALL SYMBOL(SYM(ITB))
      XHT=0.98-(ITB-1)*0.03
      CALL ABSREM (0.75,XHT)
      CALL SYMBOL(SYM(ITB))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB,IP)
      CALL SYMBOL(THING)
  460 CONTINUE
      IFR=0
      CALL ADV
      CALL MAPS(-TIM,TIM,0.,360.,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT
     X(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,.05)
      CALL SYMBOL(60HTIME REQUIRED TO SWITCH TO SATELLITE AT RATE OF 1
```

```
     XDEG/SEC$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      CALL CHAROP (0,0,0,0,0)
      DO 500  ITB=1,NSP
      REWIND 9
      IFR=0
465   CONTINUE
      READ(9,END=485) T,SSV,SAF,HANG2,DCNCLK
470   IF(IFR.EQ.0) GO TO 475
      CALL LINE(TP,DCNCL1,T,DCNCLK(ITB))
      IF(IFR.NE.0) GO TO 480
475   CONTINUE
      IFR=1
      CALL POINT(T,DCNCLK(ITB))
      CALL SYMBOL(SYM(ITB))
480   CONTINUE
      TP=T
      DCNCL1=DCNCLK(ITB)
      GO TO 465
485   CONTINUE
      CALL POINT(TP,DCNCL1)
      CALL SYMBOL(SYM(ITB))
      XHT=0.98-(ITB-1)*0.03
      CALL ABSBEM (0.75,XHT)
      CALL SYMBOL(SYM(ITB))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB,IP)
      CALL SYMBOL(THING)
500   CONTINUE
      IFR=0
      CALL ADV
      RETURN
      END
```

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@PRT GT,OTPLT
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```
MARTIN*GT,OTPLT
      SUBROUTINE OTPLT
      COMMON / XZ / XZ(97), IXZ6
      DIMENSION X(3),XP(3),XSAT(3),XE(3),R(3),      RADP(3),TARGE(3),
     *TARGP(3) ,RSAT(3),        XSS(3),SDUNIT(4)   ,RDMIN(3)
      COMMON/HANDO/TIM,REC(9),REL(9),RES,SMR(9),SMRR(9),SMRS(9),TSMR(9)
     X,SPSMR,SPSMRS,SPTSMR,SPSMRR
      DATA SDUNIT/0.1,1.0,0.1,1.0/
      RPD=3.14159/180.
C
C  PLANET RANGE PLOT
C
      REWIND 13
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(RDMIN,0.0)
      RAMIN=ABSV(RDMIN)
      READ(13)TX,X,XP,XSAT,XE,R
      RP=R(1)
      TP=TX/86400.
      CALL MAPSSL(-TIM,TIM,RAMIN,RP,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     * SDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
      CALL SYMBOL(23HRANGE OF PLANET (KM) $.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
  100 CONTINUE
      READ(13,END=120)TX,X,XP,XSAR,XE,R
  110 T=TX/86400.
      CALL LINE(TP,RP,T,R(1))
      TP=T
      RP=R(1)
      GO TO 100
  120 CONTINUE
      REWIND 13
      CALL ADV
C
C  PLANET PHASE ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,180.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
      CALL SYMBOL(26HPLANET PHASE ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      READ(13) TX,X,XP,XSAT,XE,R,PHASE
      TP=TX/86400.
      PHP=PHASE/RPD
  121 CONTINUE
      READ(13,END=123)TX,X,XP,XSAT,XE,R,PHASE
  122 CONTINUE
      PHASE=PHASE/RPD
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```
      T=TX/86400.
      CALL LINE(TP,PHP,T,PHASE)
      TP=T
      PHP=PHASE
      GO TO 121
  123 CONTINUE
      REWIND 13
      CALL ADV
C
C  PLANET CONE ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,180.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(25HPLANET CONE ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      READ(13) TX,X,XP,XSAT,XE,R,PHASE
      TP=TX/86400.
      RP=R(2)
  124 CONTINUE
      READ(13,END=126)TX,X,XP,XSAT,XE,R,PHASE
  125 CONTINUE
      T=TX/86400.
      CALL LINE(TP,RP,T,R(2))
      TP=T
      RP=R(2)
      GO TO 124
  126 CONTINUE
      REWIND 13
      CALL ADV
C
C  PLANET CLOCK ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,360.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(26HPLANET CLOCK ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      READ(13) TX,X,XP,XSAT,XE,R,PHASE
      TP=TX/86400.
      RP=R(3)
  127 CONTINUE
      READ(13,END=129)TX,X,XP,XSAT,XE,R,PHASE
  128 CONTINUE
      T=TX/86400.
      CALL LINE(TP,RP,T,R(3))
      TP=T
      RP=R(3)
      GO TO 127
  129 CONTINUE
      REWIND 13
      CALL ADV
C
C  SATELLITE RANGE VS TIME PLOT
C
      READ(13)TX,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT
      RP=RSAT(1)
      TP=TX/86400.
      CALL MAPSSL(-TIM,TIM,RAMIN,RP,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     *SDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(25HRANGE OF SATELLITE (KM)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
  130 CONTINUE
      READ(13,END=150)TX,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT
  140 CONTINUE
      T=TX/86400.
      CALL LINE(TP,RP,T,RSAT(1))
      TP=T
      RP=RSAT(1)
      GO TO 130
  150 CONTINUE
      REWIND 13
      CALL ADV
C
C  SATELLITE PHASE ANGLE VS TIME PLOT
C
      CALL MAPS (-TIM,TIM,0.0,180.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT
     X(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(29HSATELLITE PHASE ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      READ(13) TX,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT,PHASES
      TP=TX/86400.
```

```
      PHP=PHASES/RPD
  151 CONTINUE
      READ(13,END=153)TX,X,XP,XSAT,XE,R,PHASE,PADP,TARGE,TARGP,RSAT,PHAS
     XES
  152 CONTINUE
      PHASES=PHASES/RPD
      T=TX/86400.
      CALL LINE(TP,PHP,T,PHASES)
      TP=T
      PHP=PHASES
      GO TO 151
  153 CONTINUE
      REWIND 13
      CALL ADV
C
C  SATELLITE CONE ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,180.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
      CALL SYMBOL(28HSATELLITE CONE ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      READ(13) TX,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT,PHASES
      TP=T/86400.
      RP=RSAT(2)
  154 CONTINUE
      READ(13,END=156)TX,X,XP,XSAT,XE,R,PHASE,PADP,TARGE,TARGP,RSAT,PHAS
     XES
  155 CONTINUE
      T=TX/86400.
      CALL LINE(TP,RP,T,RSAT(2))
      TP=T
      RP=RSAT(2)
      GO TO 154
  156 CONTINUE
      REWIND 13
      CALL ADV
C
C  SATELLITE CLOCK ANGLE VS TIME PLOT
C
      CALL MAPS(-TIM,TIM,0.0,360.0,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNIT(
     X4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
      CALL SYMBOL(29HSATELLITE CLOCK ANGLE (DEG)$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS)$. )
      READ(13) TX,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT,PHASES
      TP=TX/86400.
      RP=RSAT(3)
  157 CONTINUE
      READ(13,END=159) TX,X,XP,XSAT,XE,R,PHASE,RADP,TARGE,TARGP,RSAT,
     .                 PHASES
  158 CONTINUE
      T=TX/86400.
      CALL LINE(TP,RP,T,RSAT(3))
      TP=T
      RP=RSAT(3)
      GO TO 157
  159 CONTINUE
      REWIND 13
      CALL ADV
      RETURN
      END
```

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@PRT GT.OUTS
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```
MARTIN*GT.OUTS
      SUBROUTINE OUTS
      COMMON/RAZOR/PICS(4,9),SPPICS(4)
      DIMENSION SATNAM(2) ,SATELL(2)
      COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
     X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SOBL,PLOBL(12)
      COMMON/POBEAR/SSV(8),SAF(8),HANG2,OCNCLK(8)
      COMMON/HEDING/TITLE(13)
      COMMON/TNME/TVNAME(5)
      DOUBLE PRECISION TJDV
      DIMENSION ICK(4)
      COMMON/JDAYS/TJDV,TT
      COMMON/FOROUT/POWER,ENERGY,PERCT,IND,R(3),RSAT(3),RAD1(3),IPCN
     X,FRACT,PHASED,PHASEP  ,POWLN,NDN,EPERDN
      COMMON/FLAGS/IFLT,IFLPL,IFLPR
      COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCR
      COMMON/FLYBY/DUM1(6),X(3),DUM2(9)
      COMMON/HANDO/TIM,REC(9),REL(9),RES,SMR(9),SMRR(9),SMRS(9),TSMR(9)
     X,SPSMR,SPSMRS,SPTSMR,SPSMRR
      COMMON/PHASER/PHASE(8),XRCC(3,8)
      DIMENSION NS(9)
      COMMON/CHARAC/P(60)
```

```
      DATA NS/0,0,1,2,4,7,5,1,0/
      DATA IFP/0/
C
C OUTS-2                                                    OUTS-2
C
      CALL TCONV(ICK,5HCLOCK,ABS(TT),3HSEC)
      CLOCK=ICK(1)
      CLOCK=SIGN(CLOCK,TT)
      ICK(1)=CLOCK
      WRITE(6,1001)TITLE
      WRITE(6,1000)IPCN,(ICK(I),I=1,3) ,TJDV
      CALL PSCONS(SATNAM,4HNAME,IVS,IP)
      WRITE(6,1010) PLNAME(1,IP),PLNAME(2,IP),SATNAM
      WRITE(6,1020) (R(I),RSAT(I),I=1,3)
      WRITE(6,1030) PHASED,PHASEP,HANG2,SAF(IVS)
      IF(NCB.EQ.1) GO TO 100
      WRITE(6,1040) PLNAME(1,IP),PLNAME(2,IP),RAD1(2),RAD1(3)
      GO TO 110
  100 WRITE(6,1045) SATNAM
  110 CONTINUE
      WRITE(6,1060) RES,REC(1),REL(1)
      SMRKM=SPSMRR * RES
      RESSMR=SMRKM + RES
      RECSMR=SMRKM + REC(1)
      RELSMR=SMRKM + REL(1)
      WRITE(6,1070) SPSMR,SPSMRS,SMRKM,SPSMRR
      TSMRMS=SPTSMR*1.E+3
      WRITE(6,1080) TSMRMS
      WRITE(6,1081) RESSMR,RECSMR,RELSMR
      TEXP=P(26)*1.E+3
      WRITE(6,1090) TVNAME,TEXP,POWLN,POWER,ENERGY
      WRITE(6,1091) PERCT,NDN,IND,EPERDN
      NSP=NS(IP)
      WRITE(6,3000)(P(I),I=17,20)
      WRITE(6,3010)(PICS(I,1),I=1,4)
      NSP=NSP+1
      DO 300 J=2,NSP
      ISAT=J-1
  300 WRITE(6,3020)ISAT,(PICS(I,J),I=1,4)
      NSP=NSP-1
      WRITE(6,5000)
      WRITE(6,5010)
      DO 500 I=1,NSP
      PHASEZ=PHASE(I)*(180./3.14159)
  500 WRITE(6,5020) I,XRCC(1,I),PHASEZ  ,XRCC(2,I),XRCC(3,I)
      WRITE(6,5070)
      DO 530 I=1,NSP
      CALL PSCONS(SATELL,4HNAME,I  ,IP)
  530 WRITE(6,5040) I,SSV(I),SAF(I)
      NSP=NSP+1
      WRITE(6,5030)
      DO 510 I=2,NSP
      NST=I-1
  510 WRITE(6,5040) NST,REC(I),REL(I)
      WRITE(6,5060)
      DO 520 I=2,NSP
      NST=I-1
  520 WRITE(6,5050) SMR(I),SMRS(I),SMRR(I),TSMR(I)
      RETURN
 1000 FORMAT(    5X,15HPICTURE NUMBER ,I5,19X,I3,6H DAYS ,I2,5H HRS ,
     XI2,17H MIN TO ENCOUNTER,10X,3HJD ,F12.3,//)
 1001 FORMAT(1H1,13A6,//)
 1005 FORMAT(//5X,80(1H-)//,5X,15HPICTURE NUMBER ,I5,19X,I3,6H DAYS ,I2,
     X5H HRS ,I2,17H MIN TO ENCOUNTER//)
 1010 FORMAT(5X,7HPLANET ,2A6,20X,10HSATELLITE ,2A6)
 1020 FORMAT(5X,13HRANGE (KM)  =,E16.8,11X,13HRANGE (KM)  =,E16.8/
     X       5X,13HCONE  (DEG) =,F7.2 ,20X,13HCONE  (DEG) =,F7.2 /
     X       5X,13HCLOCK (DEG) =,F7.2 ,20X,13HCLOCK (DEG) =,F7.2 )
 1030 FORMAT(5X,13HPHASE (DEG) =,F7.2 ,20X,13HPHASE (DEG) =,F7.2/
     $       5X,13HDIAM  (DEG) =,F7.2 ,20X,13HDIAM  (DEG) =,F7.2//)
 1040 FORMAT(5X,27HINSTRUMENT DATA FOR PLANET ,2A6,5X,
     $ 21H(PICTURE CENTERED AT  ,F6.2,9H DEG LAT ,F7.2,11H DEG LONG )/)
 1045 FORMAT(5X,30HINSTRUMENT DATA FOR SATELLITE ,2A6/)
 1060 FORMAT(4X,26HRESOLUTION FOR TARGET BODY ,/,
     $ 5X,24HAT SPECIFIED LOCATION   ,F8.1,9H KM/PIXEL /
     $ 5X,24HAT SUBSPACECRAFT POINT  ,F8.1,9H KM/PIXEL /
     $ 5X,24HAT LIMB OF TARGET BODY  ,F8.1,9H KM/PIXEL /)
 1070 FORMAT(5X,34HSMEAR DUE TO RELATIVE VELOCITIES  ,F8.2,7H KM/SEC /
     $       5X,34HSMEAR DUE TO S/C ATTITUDE RATES   ,F8.2,7H KM/SEC /
     $       5X,34HOBJECT MOTION FROM ALL SOURCES    ,F8.2,3H KM /
     $       5X,34HNUMBER OF PIXELS SMEARED          ,F8.5,7H PIXELS //)
 1080 FORMAT(4X,39HEXPOSURE TIME FOR ONE-HALF PIXEL SMEAR ,F8.3,
     $ 9H MILLISEC //)
 1081 FORMAT(4X,31HEFFECTIVE RESOLUTION WITH SMEAR /
     $ 5X,24HAT SPECIFIED LOCATION   ,F8.1,9H KM/PIXEL /
     $ 5X,24HAT SUBSPACECRAFT POINT  ,F8.1,9H KM/PIXEL /
     $ 5X,24HAT LIMB OF TARGET BODY  ,F8.1,9H KM/PIXEL /)
 1090 FORMAT(4X,18HEXPOSURE TIME FOR  ,5A6,3H = ,F8.3,9H MILLISEC /
     $ 5X,16HPOWER DENSITY =  ,E10.4,24H ERGS/SQ CM/SEC AT LENS  /
     $ 5X,16HPOWER DENSITY =  ,E10.4,26H ERGS/SQ CM/SEC ON SENSOR    /
     $ 5X,16HEXPOSURE      =  ,E10.4,11H ERGS/SQ CM  //)
 1091 FORMAT(5X,26HPERCENT OF DYNAMIC RANGE =  ,F7.3 /
     $       5X,26HDIGITAL NUMBER OF EXPOS  =  ,I4,4H (OF,I4,8H LEVELS)/
     $       5X,26HONE DIGITAL NUMBER EQUALS  ,E10.4,12H ERGS/SQ CM //)
 3000 FORMAT(4X,46HNUMBER OF PICTURES WITH RESOLUTION BETTER THAN   /
     $ 5X,17HRESOLUTION LEVELS ,3X,4(F5.1,10X) ,9H KM/PIXEL  /)
```

```
 3010 FORMAT(5X,06HPLANET,11X,4(F10.1,5X))
 3020 FORMAT(5X,10HSATELLITE ,I1,9X,4(F10.4,5X))
 5000 FORMAT(1H1)
 5010 FORMAT(     5X,14HSATELLITE DATA//7X,3HNUM,5X,10HRANGE (KM),10X,
     X11HPHASE (DEG),4X,10HCONE (DEG),5X,11HCLOCK (DEG)/)
 5020 FORMAT(8X,I1,4X,E15.8,6X,F7.2,8X,F7.2,8X,F7.2)
 5030 FORMAT(   /5X,39HRESOLUTION (KM/PIX) DATA FOR SATELLITES   /
     X,7X,3HNUM,3X,23HRES ALONG RADIUS VECTOR,12X,21HRES AT SATELLITE LI
     XNE/)
 5040 FORMAT(8X,I1,8X,E15.8,20X,E15.8)
 5050 FORMAT(4(5X,E15.8))
 5060 FORMAT(    /,5X,26HSMEAR DATA FOR SATELLITES  /
     X5X,12HSMEAR DUE TO ,8X,12HSMEAR DUE TO,10X,09HNUMBER OF,9X,13HTIME
     X TO SMEAR/
     X5X,12HVEL (KM/SEC),08X,12HS/C (KM/SEC),08X,14HPIXELS SMEARED,6X,
     X15H1/2 PIXEL (SEC)/)
 5070 FORMAT(   /,7X,3HNUM,7X,17HEARTH-SAT-S/C ANG ,
     $ 17X,18HSATELLITE ANG DIAM/)
      END
```

```
@PRT GT,PICIN

MARTIN*GT.PICIN
      SUBROUTINE PICIN
C
C ROUTINE FOR COMPUTING MIN PICTURE TAKING INTERVAL FROM BIT RATE
C
C
C INPUT BULK   = BULK STORAGE CAPACITY, BITS
C INPUT BULKO  = BITS ALREADY IN BULK STORAGE
C INPUT DTUSE  = USER INPUT PICTURE TAKING INTERVAL, MIN   P(33)
C INPUT XBPS   = TRANSMIT BIT RATE, BPS
C INPUT SCIBPS = BIT RATE FROM OTHER INSTRUMENTS, BPS
C INPUT BUFCAP = BUFFER STORAGE CAPACITY, BITS
C INPUT BPPIC  = BITS PER PICTURE, P(49)
C INPUT TFRAM  = FRAME READOUT TIME, SEC, P(29)
C INPUT TSTAR  = PICTURE SEQUENCE START TIME, DAYS
C INPUT TSTOP  = PICTURE SEQUENCE STOP  TIME, DAYS
C INPUT RPM    = S/C SPIN RATE, ROTW(3) IN RAD/SEC
C
      COMMON/HEDING/TITLE(13)
      COMMON/REVER/ROTW(3)
      COMMON/CHARAC/P(60)
      EQUIVALENCE (P(29),TFRAM),(P(49),BPPIC)
     X,(P(34),BULK),(P(35),BULKO),(P(38),BUFCAP)
     X,(P(36),XBPS),(P(37),SCIBPS)
      DTUSE=P(33)*60.
      RPM=ROTW(3)*57.2957795131/6.
      TSTAR=P(31)
      TSTOP=P(32)
      WRITE(6,107)TITLE
      WRITE(6,104) TSTAR,TSTOP,DTUSE,TFRAM,P(50)
      DTTOT=(TSTOP-TSTAR)*86400.
      TSTAR=TSTAR*86400.
      TSTOP=TSTOP*86400.
      STORD=BULK/BPPIC
      WRITE(6,105)BULK,BPPIC,STORD,BULKO,BUFCAP
      TVOUT=XBPS-SCIBPS
      WRITE(6,108)XBPS,SCIBPS,TVOUT
      IF(BUFCAP-BPPIC)10,11,11
   10 BUFCAP=BPPIC
      WRITE(6,100)BUFCAP
   11 CONTINUE
      TBUFO=BUFCAP/TVOUT
      TBUFI=BUFCAP/P(50)
C
C TEST FOR TOPS OR PIONEER (BULK GREATER THAN 0 FOR TOPS)
C
      IF(BULK)1,1,2
C
C SPINNING S/C WITH BUFFER FOR ONE PICTURE (IE, PIONEER)
    1 DTPIC = TBUFO+ TFRAM
      IF(RPM)8,8,9
    8 WRITE(6,103)
      DTPIC=DTTOT
      GO TO 6
    9 IF(DTPIC-   60./RPM)3,3,7
    3 NROLL=1
      DTPIC=60./RPM
      WRITE(6,101)DTPIC,NROLL
      GO TO 4
    7 NROLL=DTPIC*RPM/60. +1
      DTPIC=NROLL*60./RPM
      WRITE(6,101)DTPIC,NROLL
      GO TO 4
C
C THREE AXIS STABLE S/C WITH MORE THAN ONE PICTURE STORAGE (IE, TOPS)
C
    2 DTPIC=BPPIC/TVOUT
C
C TEST IF USER INTERVAL LESS THAN MINIMUM
C
    4 CONTINUE
```

```
      IF(DTUSE-DTPIC)5,6,6
    5 DTUSE=DTPIC
      P(33)=DTUSE/60.
      WRITE(6,102) DTUSE
C
C MAXIMUM NO OF PICTURES/HOUR
    6 PICPHR=3600./DTPIC
      PICPDA=24.*PICPHR
C
C MAXIMUM NO OF PICTURES THAT CAN BE TAKEN
      NPIC=DTTOT/DTPIC
      ACTPIC=86400./DTUSE
      NPICA=DTTOT/DTUSE
      WRITE(6,106)DTPIC,PICPHR,PICPDA,NPIC,ACTPIC,NPICA
      RETURN
  100 FORMAT(5X,56HBUFFER CAPACITY LESS THAN ONE PICTURE, CAPACITY SET T
     *O    ,E10.3,/)
  101 FORMAT(5X,38HPICTURE INTERVAL BASED ON ROLL RATE = ,E15.8,4H SEC,
     *20H, NO OF ROLLS/PIC =  ,I4,/)
  102 FORMAT(5X,36HREQUESTED DELTA T LESS THAN MINIMUM /
     X      ,5X,32HDELTA T (SEC) HAS BEEN RESET TO ,F15.8)
  103 FORMAT(5X,21HROLL RATE EQUALS ZERO)
  104 FORMAT(    5X,48HCOMPUTATIONS FOR MINIMUM PICTURE TAKING INTERVAL
     X,//5X,28HPICTURE START TIME (DAYS) = ,E15.8/
     X,  5X,28HPICTURE STOP TIME  (DAYS) = ,E15.8/
     X,  5X,28HDELTA T REQUESTED  (SEC)  = ,E15.8/
     X,  5X,28HFRAME READ TIME    (SEC)  = ,E15.8/
     X,  5X,28HFRAME READ RATE    (BPS)  = ,E15.8//)
  105 FORMAT(5X,36HBULK DATA STORAGE CAPACITY (BITS) = ,F15.8/
     X       5X,36HPICTURE SIZE                (BITS) = ,E15.8/
     X       5X,36HBULK DATA STORAGE CAPACITY (PICS) = ,E15.8/
     X       5X,36HBULK CONTENTS IN USE       (BITS) = ,F15.8/
     X       5X,36HBUFFER STORAGE CAPACITY    (BITS) = ,F15.8//)
  106 FORMAT(5X,36H MINIMUM PICTURE INTERVAL  (SEC)  = ,E15.8/
     *       5X,36HMAXIMUM PICTURE RATE  (PICS/HR)  = ,F15.8/
     *       5X,36HMAXIMUM PICTURE RATE  (PIC/DAY)  = ,F15.8/
     *       5X,36HMAXIMUM NUMBER OF PICTURES       = ,I6/
     *       5X,36HACTUAL  PICTURE RATE  (PIC/DAY)  = ,E15.8/
     *       5X,36HACTUAL  NUMBER OF PICTURES       = ,I6//)
  107 FORMAT(1H1,4X,13A6,/)
  108 FORMAT(5X,36HDATA TRANSMISSION RATE      (BPS) = ,E15.8/
     X       5X,36HRATE FROM OTHER INSTRUMENTS (BPS) = ,F15.8/
     X       5X,36HREAL TIME PICTURE RATE      (BPS) = ,E15.8//)
      END
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@PRT GT,PIC2
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```
MARTIN*GT.PIC2
      SUBROUTINE PIC2(ANG2A,ANG2B)
      COMMON/FOROUT/DUMMYB(13),IPCN,DUMMYC(4)
      COMMON/HEDING/TITLE(13)
      COMMON/CHARLI/NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
      COMMON/GEOM/XE(3),XP(3)
      DIMENSION ICLK(3)
      DIMENSION CLOCK(4),LABLE(8),SN(3)
      DIMENSION UX(3),UPV(3),UPM(3)
      COMMON/EXTRA/RPLP,ROT
      COMMON/VW/VWP(3),RIP,ASOP
      COMMON/POINT/VC(3,9),P(3,9)
      COMMON/FLYBY/DUM1(6),X(3),DUM2(6),SV(3)
      COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
     X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SORL,PLORL(12)
      COMMON / PLOTER / PEN, R(3), SCALE, R2, VT(3), VR(3), VW(3),
     .          RPP, TANR
      COMMON/PCOORD/PV(3),VE(3),PM(3)
      DIMENSION QL(3)
      COMMON/PLTBUF/BUF(20)
      DIMENSION UCK(8)
      DIMENSION QZ(3)
      COMMON/TRA/TRACE
      REAL LAT,LONG
      DIMENSION GOK(3)
      DOUBLE PRECISION JDV
      DIMENSION V0(3,9)
      COMMON/JDAYS/JDV,TT
      DATA PI/3.1415926536/
      DATA QZ/7.0,-90.0,30.0/
      DATA QL/08.,-180.0,45.0/
      ANG2=AMAX1(ANG2A,ANG2B)
      NSAT=0
      CALL TCONV(CLOCK,5HCLOCK,ARS(TT),3HSEC)
  884 FORMAT('TIME AFTER  ENCOUNTER = 'I4,' DAYS 'I2,' HRS 'I2,' MIN')
  883 FORMAT('TIME BEFORE ENCOUNTER = 'I4,' DAYS 'I2,' HRS 'I2,' MIN')
      CALL ARCSTP(5,)
      TWIST=0.0
      IF(NCB.EQ.1) CALL PLASAT(SV,JDV,IVS,IP)
      RPP=RPL(IP)
      IF(NCB.EQ.1) CALL PSCONS(RPP,6HRADIUS,IVS,IP)
      IF(RPP.LE.0.) GO TO 10
      ANG3=ANG2/2.0
      CALL VVIEW(0.0,0.0,0.0,0.0,0.0)
      CALL VPROJ
```

```
      TANR=SQRT(RPP*RPP/(R2*R2-RPP*RPP))
      TANK=ATAN(TANR)*(180.0/PI)
      IF(TANK.GE.ANG3) ANG3=TANK
      SCALE=TAN(ANG3*PI/180.0)
      CALL SCLPLT(SCALE)
      CALL LINE( SCALE, SCALE, SCALE,-SCALE)
      CALL LINE( SCALE,-SCALE,-SCALE,-SCALE)
      CALL LINE(-SCALE,-SCALE,-SCALE, SCALE)
      CALL LINE(-SCALE, SCALE, SCALE, SCALE)
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
C       CALL SYMBOL(17HPICTURE NUMBER $.)
      CALL NUMBER(IPCN,2HI8)
      IF(IFLST.NE.1.AND.NCB.NE.1) GO TO 1
      NSAT=IVS
1     CALL SATS(1,0,IP,NSAT,JDV,0,0,0)
      CALL DISK(IP,NSAT,TITLE,0,0,0)
C     CALL SHADER(20,0,SN,IP,NSAT)
      CALL PGLOBE(PM,JDV,IP)
      CALL PARLEL(PV,QZ)
      CALL MERION (PV,PM,QL)
      CALL VSCALE(SN,XP,-1.)
      IF(TT.LE.0.) ENCODE(48,883,LABLE)(CLOCK(J),J=1,3)
      IF(TT.GT.0.) ENCODE(48,884,LABLE)(CLOCK(J),J=1,3)
      CALL SCPRNA(BUF,890,300,20,90.,LABLE,8)
          GO TO 10
      IF(TANK.LT.ANG2/2.0) GO TO 10
      SAVE=TRACE
      ASDP=TANK
      CALL VUNIT(UX,X)
      CALL VUNIT(UPV,PV)
      CALL VUNIT(UPM,PM)
      RPLP=RPP
      ROT=PLROT(IP)
      DO 5 I=1,3
    5 VWP(I)=VW(I)
      RIP=R2
      ANG4A=ANG2A/2.0
      ANG4B=ANG2B/2.0
      CALL FRAME1(P,ANG4A,ANG4B)
      LAT=90.0-ANGV(UPV,UX,6HDEGREE)
      CALL VCROSS(GOK,UX,UPV)
      LONG=90.0+ANGV(GOK,UPM,6HDEGREE)
      CALL LOOK(DUM,CONE,CLOCK,LAT,LONG)
      CALL LOCATE(VQ,CONE,CLOCK,TWIST)
      CALL FPLOT(VC)
      TRACE=SAVE
   10 CONTINUE
      CALL ADV
      RETURN
      END
```

@PRT GT.PSATP

MARTIN*GT.PSATP

```
      SUBROUTINE PSATP
      COMMON /XZ/ XZ(97), IXZ6
      COMMON /HEDING / TITLE(13)
      COMMON/FLYBY/DUMMYA(3),GUSY(3),DUMMYB(12)
      COMMON /PLTBUF/BUF(20)
      COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
     X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SOBL,PLOBL(12)
      COMMON / PLOTER / PEN, R(3), SCALE, R2, VT(3), VR(3), VW(3),
     .                  RPP, TANR
      COMMON/PCOORD/PV(3),VE(3),PM(3)
      COMMON/CHARLI /NCODE,NREC ,IP,IVS,NSC,IFLST,NCB
      COMMON/JDAYS/JDV,TT
      COMMON/PLAN/GM
      DIMENSION XM(3),X(3),XF(3),V(3),XS(3)
      COMMON/GEOM/XS,XM
      DOUBLE PRECISION JD,JDV
      EQUIVALENCE (JD,JDV)
      DIMENSION NS(9)
      DATA NS0/9/
      DATA NS/0,0,1,2,4,7,5,2,0/
C     NUMBER OF SATELLITES
      RPP=RPL(IP)
      R2=0.
      S=5.
      CALL ARCSTP(S)
      CALL PLASAT(XM,JD,NS(IP),IP)
      SCALE=ABSV(XM)*1.1
      IF(NS(IP).EQ.0) SCALE=15.*RPL(IP)
      CALL SCLPLT(SCALE)
      CALL VPROJ
      CALL ORBVEL(VR,.0)
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(VT,.0)
      CALL UCROSS(VW,VT,VR)
      CALL VEQUAL(GUSY,VW)
      CALL VVIEW(11,1,10,0,0,0,0)
      N=3.*24.
```

```
      N=2*N
      CALL PLPOS(XS,JD,IP)
      CALL PLPOS(XM,JD,3)
      CALL VSCALE(XS,XS,-1.)
      CALL VSUM(XM,XM,XS)
      CALL ARROCC(3,32,5.,4)
      CALL ARROCC(0,64,5.,4)
      CALL SATS(N,0,IP,0,JD,3600.,0,0)
      N=N/2
      NN=-N
      DO 233 I=NN,N
      T=I*3600.
      CALL ORBIN(XZ(7),IXZ6)
      CALL ORBPOS(XS,T)
  233 CALL VPPLT(XS,1H*)
      CALL DISK(IP,0,TITLE,0,0,0)
      CALL SINTRP(BUF)
  310 CALL ADV
   30 RETURN
      END
```

@PRT GT.RESO

```
MARTIN*GT.RESO
      SUBROUTINE RESO(DIREC)
      COMMON/HANDO/TIM,REC(9),REL(9),RES,SMR(9),SMRR(9),SMRS(9),TSMR(9)
     X,SPSMR,SPSMRS,SPTSMR,SPSMRR
      DIMENSION SDUNIT(4)
      COMMON/GEOM/XE(3),XP(3)
      COMMON/STUFF/XPL(3),VPLV(3),VPLS(3),XSA(3,8),VSAV(3,8),VSAS(3,8),
     XXCL(3),VCLV(3),VCLS(3)
      COMMON/JDAYS/JDV,TT
      DOUBLE PRECISION JDV
      COMMON/FLAGS/IFLT,IFLPL,IFLPR
      COMMON/CHARLI/NCODE,NREC ,IP,IVS,NSC,IFLST,NCR
      COMMON /PLCONS/GMS,GMPL(12),RS,RPL(12),SNAME(2),PLNAME(2,12),
     X SPV(3),PLPV(3,12),SVE(3),PLVE(3,12),SROT,PLROT(12),SORL,PLORL(12)
      COMMON/CHARAC/P(60)
      COMMON/XZ/XZ(97)
      COMMON/TRA/TRACE
      DIMENSION NAME(4)
      INTEGER CAMK
      DATA NAME(3), NAME(4) /6H (KM/P , 4HX)$. /
      DIMENSION PLACE(2,3)
      DIMENSION XTRA(3,9),XTRA1(3)
      DIMENSION NS(9)
      DIMENSION RPPS(9)
      DIMENSION THING(3)
      DATA THING(3)/2H$./
      DATA NS/0,0,1,2,4,7,5,2,0/
      DIMENSION SYM(8)
      DATA SYM/3H0$.,3HX$.,3H+$.,3HI$.,3HH$.,3HT$.,3HZ$.,3HP$./
      DATA PLACE/10H( CENTER ),10H(VER EDGE),10H(HOR EDGE) /
      DATA SDUNIT/0.1,1.0,0.1,1.0/
      DATA PI,RPD/3.141592653589B,1.745329251994329E-02/
      DATA IFR/0/
      PETE(RADIUS)=SQRT(RADIUS*RADIUS-RPP*RPP)
      IF(IFR.EQ.1) GO TO 60
      ITR1=10
      NSP=NS(IP)
      NXTR=NSP+1
      RPPS(1)=RPL(IP)
      DO 50 I=1,NSP
      CALL PSCONS(RPPS(I+1),6HRADIUS,I,IP)
   50 CONTINUE
   60 CONTINUE
      IF(DIREC.EQ.4HPLOT) GO TO 200
      DO 90 I=1,3
   90 XTRA(I,1)=XPL(I)
      DO 96 ITB=1,NSP
      DO 94 I=1,3
   94 XTRA(I,ITB+1)=XSA(I,ITB)
   96 CONTINUE
      DO 120 ITB=1,NXTR
      CALL VEQUAL(XTRA1,XTRA(1,ITB))
      RCEN=ABSV(XTRA1)
      IF(RCEN.LE.0.0) GO TO 120
      RPP=RPPS(ITB)
      RLIM=PETE(RCEN)
      RCEN=RCEN-RPP
      IF(IFR.EQ.0) RMAX=RLIM
      IF(IFR.EQ.0) RMIN=RCEN
      IFR=1
      RMAX1=AMAX1(RCEN,RLIM)
      RMIN1=AMIN1(RCEN,RLIM)
      IF(RMAX1.GT.RMAX) RMAX=RMAX1
      IF(RMIN1.LT.RMIN) RMIN=RMIN1
      I=1
      REC(ITB)=RCEN*P(45+I)
      REL(ITB)=RLIM*P(45+I)
  100 CONTINUE
  120 CONTINUE
      RSPE=ABSV(XCL)
```

```
      RES=RSPE*P(46)
      RETURN
  200 CONTINUE
      REWIND 13
      REWIND ITR1
      TIM=AMAX1(ABS(P(31)),ABS(P(32)))
      I=1
      RESMAX=RMAX*P(45+I)
      RESMIN=RMIN*P(45+I)
      DO 300 ITB=1,NXTR
      CALL ADV
      IF(ITB.GT.2) GO TO 204
      CALL MAPSSL(-TIM,TIM,RESMIN,RESMAX,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     $SDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(12HRESOLUTION$.)
      CALL SYMBOL(3H $.)
      NAME(1)=PLACE(1,I)
      NAME(2) = PLACE(2,I)
      CALL SYMBOL(NAME)
      CALL SYMBOL(3H $.)
      IF(ITB.EQ.2) GO TO 202
      DO 201 J=1,2
  201 THING(J)=PLNAME(J,IP)
      GO TO 203
  202 THING(1)= 6HSATELL
      THING(2)=6HITE $.
  203 CONTINUE
      CALL SYMBOL(THING)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSREM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
  204 CONTINUE
      IFR=0
      REWIND ITR1
  205 READ(ITR1,END=240)TT,REC,REL,RES,SMR,SMRR
  210 CONTINUE
      IF(IFR.EQ.0) GO TO 220
      IF(REC(ITB).LE.0.0.OR.REL(ITB).LE.0.0) GO TO 300
      CALL LINE(TTP,RECP,TT,REC(ITB))
      CALL LINE(TTP,RELP,TT,REL(ITB))
  220 CONTINUE
      IF(ITB.EQ.1) GO TO 225
      IF(IFR.EQ.1) GO TO 225
      CALL CHAROP (0,0,0,0,0)
      CALL POINT(TT,REC(ITB))
      CALL SYMBOL(SYM(ITB-1))
  225 CONTINUE
      IFR=1
      TTP=TT
      RECP=REC(ITB)
      RELP=REL(ITB)
      GO TO 205
  240 CONTINUE
      REWIND ITR1
      IF(ITB.EQ.1) GO TO 300
      CALL POINT(TTP,RECP)
      CALL SYMBOL(SYM(ITB-1))
      XHT=0.98-(ITB-2)*0.03
      CALL ABSREM (0.75,XHT)
      CALL SYMBOL(SYM(ITB-1))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,ITB-1,IP)
      CALL SYMBOL(THING)
  300 CONTINUE
      CALL ADV
      IFR=0
      CALL MAPSSL(-TIM,TIM,RESMIN,RESMAX,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     $SDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSREM (0.05,0.2)
      CALL SYMBOL(12HRESOLUTION$.)
      CALL SYMBOL(3H $.)
      NAME(1)=PLACE(1,I)
      NAME(2) = PLACE(2,I)
      CALL SYMBOL(NAME)
      CALL SYMBOL(19H FOR PRIMARY BODY$.)
      CALL ABSREM (0.2,0.01)
      CALL CHAROP (0,0,1,0,0)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
  305 READ(ITR1,END=340)TT,REC,REL,RES,SMR,SMRR
  310 CONTINUE
      IF(IFR.EQ.0) GO TO 320
      CALL LINE(TTP,RESP,TT,RES)
  320 CONTINUE
      IFR=1
      TTP=TT
      RESP=RES
      GO TO 305
  340 CONTINUE
      CALL ADV
      REWIND ITR1
      IFR=0
      RETURN
      END
```

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@PRT GT.SCROT


MARTIN*GT.SCROT
     1              SUBROUTINE SCROT(ROTW)
     2              COMMON/XZ/XZ(97)
     3              DIMENSION ROT(6),ROTW(3)
     4              DATA ROT/.01,.01,.01,.01,.01,90./
     5              DATA PI/3.14159/
     6              NS=XZ(18)
     7              IF(NS.LT.0) NS=0
     8              NS=NS+1
     9              GO TO (1,2,3,3,3),NS
    10        1     DO 5 I=1,3
    11        5     ROTW(I)=ROT(I)*(PI/180.)
    12              RETURN
    13        2     DO 6 I=4,6
    14        6     ROTW(I-3)=ROT(I)*(PI/180.)
    15              RETURN
    16        3     DO 7 I=1,3
    17        7     ROTW(I)=XZ(I+18)*(PI/180.)
    18              RETURN
    19              END


@PRT GT.SMEAR


MARTIN*GT.SMEAR
     1              SUBROUTINE SMEAR(DIREC)
     2              DATA INP/0/
     3              DIMENSION NS(9)
     4              DATA NS/0,0,1,2,4,7,5,2,0/
     5              COMMON/CHARLI/NCODE,NREC ,IP,IVS,NSC,IFLST,NCR
     6              DIMENSION DUMV(3),RUN(3),VIM(3)
     7              COMMON/HANDO/TIM,REC(9),REL(9),RES,SMR(9),SMRR(9),SMRS(9),TSMR(9)
     8             X,SPSMR,SPSMRS,SPTSMR,SPSMRR
     9              COMMON/CHARAC/P(60)
    10              DIMENSION SDUNIT(4)
    11              DATA SDUNIT/0.1,1.0,0.1,1.0/
    12              COMMON/JDAYS/JDV,TT
    13              DOUBLE PRECISION JDV
    14              COMMON/FLAGS/IFLT,IFLPL,IFLPR
    15              COMMON/STUFF/XPL(3),VPLV(3),VPLS(3),XSA(3,8),VSAV(3,8),VSAS(3,8),
    16             XXCL(3),VCLV(3),VCLS(3)
    17              DIMENSION THING(3)
    18              DATA THING(3)/2H$,/
    19              DIMENSION SYM(8)
    20              DATA SYM/3H0$.,3HX$.,3H+$.,3HI$.,3HH$.,3HT$.,3HZ$.,3HP$./
    21              IF(DIREC.EQ.4HPLOT) GO TO 200
    22              ITR2=10
    23              IF(INP.NE.0) GO TO 90
    24              NST=NS(IP)
    25         90   CONTINUE
    26              SMR(1)=SQRT(VPLV(1)*VPLV(1)+VPLV(2)*VPLV(2))
    27              SMRS(1)=SQRT(VPLS(1)*VPLS(1)+VPLS(2)*VPLS(2))
    28              CALL VSUM(VIM,VPLS,VPLV)
    29              SMRT=SQRT(VIM(1)*VIM(1)+VIM(2)*VIM(2))
    30              TSMR(1)=REC(1)/(SMRT*2.0)
    31              SMRR(1)=(SMRT/REC(1))*P(26)
    32              DO 100I=1,NST
    33              IF(REC(I+1).LE.0.0) GO TO 100
    34              SMR(I+1)=SQRT(VSAV(1,I)*VSAV(1,I)+VSAV(2,I)*VSAV(2,I))
    35              SMRS(I+1)=SQRT(VSAS(1,I)*VSAS(1,I)+VSAS(2,I)*VSAS(2,I))
    36              CALL VSUM(VIM,VSAS(1,I),VSAV(1,I))
    37              SMRT=SQRT(VIM(1)*VIM(1)+VIM(2)*VIM(2))
    38              TSMR(I+1)=REC(I+1)/(SMRT*2.0)
    39              SMRR(I+1)=(SMRT/REC(I+1))*P(26)
    40        100   CONTINUE
    41              TX=TT/86400.
    42              SPSMR      =SQRT(VCLV(1)*VCLV(1)+VCLV(2)*VCLV(2))
    43              SPSMRS      =SQRT(VCLS(1)*VCLS(1)+VCLS(2)*VCLS(2))
    44              CALL VSUM(VIM,VCLS,VCLV)
    45              SMRT=SQRT(VIM(1)*VIM(1)+VIM(2)*VIM(2))
    46              SPTSMR      =RES/(SMRT*2.0)
    47              SPSMRR      =(SMRT/RES)*P(26)
    48              WRITE(ITR2) TX,REC,REL,RES,SMR,SMRR,SMRS
    49             X,SPSMR,SPSMRS,SPSMRR
    50              IF(INP.GT.0) GO TO 120
    51              INP=INP+1
    52              SMRN=SPSMR
    53              SMRX=SPSMR
    54              SMRSN=SPSMRS
    55              SMRSX=SPSMRS
    56              SMRRN=SPSMRR
    57              SMRRX=SPSMRR
    58              NSX=NST+1
    59        120   CONTINUE
    60              DO 130 I=1,NSX
    61              IF(SMR(I).LE.0.0) GO TO 130
    62              SMRN=AMIN1(SMRN,SPSMR,SMR(I))
    63              SMRX=AMAX1(SMRX,SPSMR,SMR(I))
    64              SMRSN=AMIN1(SMRSN,SPSMRS,SMRS(I))
    65              SMRSX=AMAX1(SMRSX,SPSMRS,SMRS(I))
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      SMRRN=AMIN1(SMRRN,SPSMRR,SMRR(I))
      SMRRX=AMAX1(SMRRX,SPSMRR,SMRR(I))
  130 CONTINUE
      RETURN
  200 CONTINUE
      REWIND ITR2
      CALL MAPSSL(-TIM,TIM,SMRN,SMRX,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNI
     $T(4))
      CALL ABSBEM (0.05,0.2)
      CALL CHAROP (0,0,1,1,0)
      CALL SYMBOL(27HSMEAR DUE TO VEL (KM/SEC)$.)
      CALL SYMBOL(24H AT SPECIFIED LOCATIONS$.)
      CALL ABSBEM (0.2,0.01)
      CALL CHAROP (0,0,1,0,0)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      IFR=0
      REWIND ITR2
  210 CONTINUE
      READ(ITR2,END=230)TT,REC,REL,RES,SMR,SMRR,SMRS
     X,SPSMR,SPSMRS,SPSMRR
  220 CONTINUE
      IF(IFR.EQ.0) GO TO 225
      CALL LINE(TTP,SMRP,TT,SPSMR)
  225 CONTINUE
      IFR=1
      TTP=TT
      SMRP=SPSMR
      GO TO 210
  230 CONTINUE
      REWIND ITR2
      CALL ADV
      IFR=0
      CALL MAPSSL(-TIM,TIM,SMRSN,SMRSX,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     *SDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
      CALL SYMBOL(27HSMEAR DUE TO S/C (KM/SEC)$.)
      CALL SYMBOL(24H AT SPECIFIED LOCATION$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
  270 CONTINUE
      READ(ITR2,END=290)TT,REC,REL,RES,SMR,SMRR,SMRS
     X,SPSMR,SPSMPS,SPSMRR
  280 CONTINUE
      IF(IFR.EQ.0)GO TO 285
      CALL LINE(TTP,SMRSP,TT,SPSMRS)
  285 CONTINUE
      IFR=1
      TTP=TT
      SMRSP=SPSMRS
      GO TO270
  290 CONTINUE
      IFR=0
      CALL ADV
      REWIND ITR2
      CALL MAPSSL(-TIM,TIM,SMRRN,SMRRX,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     XSDUNIT(4))
      CALL ABSBEM (0.05,0.2)
      CALL CHAROP (0,0,1,1,0)
      CALL SYMBOL(26HNUMBER OF PIXELS SMEARED$.)
      CALL SYMBOL(24H AT SPECIFIED LOCATION$.)
      CALL ABSBEM (0.2,0.01)
      CALL CHAROP (0,0,1,0,0)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
  240 CONTINUE
      READ(ITR2,END=260)TT,REC,REL,RES,SMR,SMRR,SMRS
     X,SPSMR,SPSMRS,SPSMRR
  250 CONTINUE
      IF(IFR.EQ.0) GO TO 255
      CALL LINE(TTP,SMRRP,TT,SPSMRR)
  255 CONTINUE
      IFR=1
      TTP=TT
      SMRRP=SPSMRR
      GO TO 240
  260 CONTINUE
      CALL ADV
      CALL MAPSSL(-TIM,TIM,SMRN,SMRX,SDUNIT(1),SDUNIT(2),SDUNIT(3),SDUNI
     $T(4))
      CALL ABSBEM (0.05,0.2)
      CALL CHAROP (0,0,1,1,0)
      CALL SYMBOL(27HSMEAR DUE TO VEL (KM/SEC)$.)
      CALL SYMBOL(3H $.)
      CALL SYMBOL(11HSATELLITE$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      CALL CHAROP (0,0,0,0,0)
      DO 330 I=1,NST
      REWIND ITR2
      IFR=0
  310 CONTINUE
      READ(ITR2,END=329)TT,REC,RFL,RES,SMR,SMRR,SMRS
     X,SPSMR,SPSMRS,SPSMRR
  320 CONTINUE
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```
      IF(IFR.EQ.0) GO TO 325
      IF(SMRP.LE.0.0) GO TO 330
      CALL LINE(TTP,SMRP,TT,SMR(I+1))
325   CONTINUE
      IF(IFR.NE.0) GO TO 328
      IF(SMR(I+1).LE.0.0) GO TO 330
      CALL POINT(TT,SMR(I+1))
      CALL SYMBOL(SYM(I))
      IFR=1
328   CONTINUE
      TTP=TT
      SMRP=SMR(I+1)
      GO TO 310
329   CONTINUE
      CALL POINT(TTP,SMRP)
      CALL SYMBOL(SYM(I))
      XHT=0.98-(I-1)*0.03
      CALL ABSBEM (0.75,XHT)
      CALL SYMBOL(SYM(I))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,I,IP)
      CALL SYMBOL(THING)
330   CONTINUE
      CALL ADV
      CALL MAPSSL(-TIM,TIM,SMRSN,SMRSX,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     *SDUNIT(4))
      CALL CHAROP (0,0,1,1,0)
      CALL ABSBEM (0.05,0.2)
      CALL SYMBOL(27HSMEAR DUE TO S/C (KM/SEC)$.)
      CALL SYMBOL(3H $.)
      CALL SYMBOL(11HSATELLITE$.)
      CALL CHAROP (0,0,1,0,0)
      CALL ABSBEM (0.2,0.01)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
      CALL CHAROP (0,0,0,0,0)
      DO 390 I=1,NST
      REWIND ITR2
      IFR=0
370   CONTINUE
      READ(ITR2,END=388)TT,REC,REL,RES,SMR,SMRR,SMRS
     X    ,SPSMR,SPSMRS,SPSMRR
380   CONTINUE
      IF(IFR.EQ.0)GO TO 385
      IF(SMRSP.LE.0.0) GO TO 390
      CALL LINE(TTP,SMRSP,TT,SMRS(I+1))
385   CONTINUE
      IF(IFR.NE.0) GO TO 386
      IF(SMRS(I+1).LE.0.0) GO TO 390
      CALL POINT(TT,SMRS(I+1))
      CALL SYMBOL(SYM(I))
      IFR=1
386   CONTINUE
      TTP=TT
      SMRSP=SMRS(I+1)
      GO TO 370
388   CONTINUE
      CALL POINT(TTP,SMRSP)
      CALL SYMBOL(SYM(I))
      XHT=0.98-(I-1)*0.03
      CALL ABSBEM(0.75,XHT)
      CALL SYMBOL(SYM(I))
      CALL SYMBOL(3H $.)
      CALL PSCONS(THING,4HNAME,I,IP)
      CALL SYMBOL(THING)
390   CONTINUE
      CALL ADV
      CALL MAPSSL(-TIM,TIM,SMRRN,SMRRX,SDUNIT(1),SDUNIT(2),SDUNIT(3),
     XSDUNIT(4))
      CALL ABSBEM(0.05,0.2)
      CALL CHAROP (0,0,1,1,0)
      CALL SYMBOL(26HNUMBER OF PIXELS SMEARED$.)
      CALL SYMBOL(3H $.)
      CALL SYMBOL(11HSATELLITE$.)
      CALL ABSBEM(0.2,0.05)
      CALL CHAROP (0,0,1,0,0)
      CALL SYMBOL(29HTIME FROM ENCOUNTER (DAYS) $.)
       CALL CHAROP(0,0,0,0,0)
      DO 360 I=1,NST
      IFR=0
      REWIND ITR2
340   CONTINUE
      READ(ITR2,END=358)TT,REC,REL,RES,SMR,SMRR,SMRS
     X,SPSMR,SPSMRS,SPSMRR
350   CONTINUE
      IF(SMRR(I+1).LE.0) GO TO 360
      IF(IFR.EQ.0) GO TO 355
      IF(SMRRP.LE.0.0) GO TO 360
      CALL LINE(TTP,SMRRP,TT,SMRR(I+1))
355   CONTINUE
      IF(IFR.NE.0) GO TO 356
      IF(SMRR(I+1).LE.0) GO TO 360
      CALL POINT(TT,SMRR(I+1))
      CALL SYMBOL(SYM(I))
      IFR=1
356   CONTINUE
      TTP=TT
```

```
  258            SMRRP=SMRR(I+1)
  259            GO TO 340
  260          358 CONTINUE
  261            CALL POINT(TTP,SMRRP)
  262            CALL SYMBOL(SYM(I))
  263            XHT=0.98-(I-1)*0.03
  264            CALL ABSREM (0.75,XHT)
  265            CALL SYMBOL(SYM(I))
  266            CALL SYMBOL(3H $.)
  267            CALL PSCONS(THING,4HNAME,I,IP)
  268            CALL SYMBOL(THING)
  269          360 CONTINUE
  270            REWIND ITR2
  271            CALL ADV
  272            IFR=0
  273            INP=0
  274            RETURN
  275            END
```

@PRT GT,TCON

```
MARTIN*GT,TCON
    1            SUBROUTINE TCON(NP)
    2            COMMON/HEDING/TITLE(13)
    3            COMMON/CHARAC/P(60)
    4            COMMON/FLAGS/IFLT,IFLPL,IFLPR
    5            COMMON/TCONS/TCONS(200)
    6            COMMON/XZ/XZ(97)
    7            COMMON/TEST/ITEST(97)
    8      C
    9      C P(31)=START TIME FROM PERIAPSIS IN DAYS
   10      C P(32)= STOP TIME FROM PERIAPSIS IN DAYS
   11      C P(39)=PICTURES PER CALC STEP
   12      C P(40)=MINUTES/PICTURE
   13            TCALC=P(39)*P(40)
   14            DELT=TCALC/1440.
   15            START=ABS(P(31))
   16            STOP=P(32)
   17      C NP=NUMBER OF CALC STEPS
   18      C
   19      CIFLPL=CALC STEPS PER PLOT
   20            IFLPL=ABS(P(31))/DELT + 1
   21            IF(ITEST(81).EQ.1) IFLPL=XZ(81)
   22            DTPPL=IFLPL*DELT*1440.
   23      C
   24      CIFLPR=CALC STEPS PER PRNT
   25            IFLPR=1
   26            IF(ITEST(82).EQ.1) IFLPR=XZ(82)
   27            DTPPR=IFLPR*DELT*1440.
   28      C
   29            WRITE(6,1001)TITLE
   30       1001 FORMAT(1H1,13A6,/)
   31            WRITE(6,1020) IFLPL,DTPPL,IFLPR,DTPPR
   32            WRITE(6,1000)TCALC
   33      C
   34            IF(IFLT.EQ.1) GO TO 120
   35            IF(ITEST(69).NE.1) GO TO 5
   36            NP=1+IFIX((START+STOP)/DELT)
   37            IF(NP.GT.200)NP=200
   38            GO TO 100
   39          5 CONTINUE
   40            NP=39
   41            DO 10 I=1,NP
   42            S1=FLOAT(I-21)/20.
   43            S2=FLOAT(I-21)
   44           10 TCONS(I)=START*ABS(S1)*S1*S1*SIGN(1.0,S2)
   45            GO TO 120
   46          100 CONTINUE
   47            DO 110 I=1,NP
   48            TCONS(I)=FLOAT(I-1)*DELT+P(31)
   49          110 CONTINUE
   50          120 CONTINUE
   51            WRITE(6,1030)
   52            DO 130 I=1,NP
   53            NPIC=(I-1)*P(39)+1
   54            TH=TCONS(I)*24.
   55            TM=TH*60.
   56          130 WRITE(6,1010)NPIC,I,TCONS(I),TH,TM
   57            RETURN
   58       1000 FORMAT(/5X,33HTIME INTERVAL FOR CALCULATIONS = ,F7.2,8H MINUTES,/)
   59       1010 FORMAT(5X,I4,2X,I4,3E16.7)
   60       1020 FORMAT(    5X,16HPLOT INTERVAL = ,I2,14H CALC STEPS = ,F7.2,7HMINU
   61           $TES,/,5X,16HPRNT INTERVAL = ,I2,13HCALC STEPS =  ,F7.2,
   62           $8H MINUTES,/)
   63       1030 FORMAT(3X,56HPICTURE CALC   TIME (DAYS)     TIME (HRS)     TIME (M
   64           $IN))
   65            END
```

@PRT GT,TVCHAR

```
MARTIN*GT.TVCHAR
      SUBROUTINE TVCHAR(INST)
      DIMENSION TVAR(55)
      COMMON/HEDING/TITLE(13)
      COMMON/TNVE/TVNAME(5)
      COMMON/XZ/XZ(97)
      COMMON/CHARAC/P(60)
      COMMON/TEST/ITEST(97)
      DATA PI/3.14159/
      DATA TVAR/ 6HFOC LN,6HDIAM  ,6HOBSCUR,6HTRANS ,6HSIZE-V,6HSIZE-H,
     X  6HLINES ,6HPIXELS,6HBIT/PX,6HMINEXP,6HMAXEXP,6HRESO-1,6HRESO-2,
     X  6HRESO-3,6HRESO-4,6HSENSOR,6HB FILT,6HG FILT,6HR FILT,6HP FILT,
     X  6HDT EXP,6H OPEN ,6H OPEN ,6HT READ,6HERASET,6HTSTART,6HTSTOP ,
     X  6HDEL T ,6HBULK  ,6HBULK-0,6HBITRAT,6HSCIRPS,6HBUFFER,6HPIC/ST,
     X  6HDEL TF,6HF/STOP,6HA BLOC,6HDIF LN,6HFOV-V ,6HFOV-H ,6HRES-C ,
     X  6HRES-V ,6HRES-H ,6HBIT/PC,6HRR-BPS,6HT/NUM ,6HT/NUMF,6H OPEN ,
     X  6H OPEN ,6H OPEN ,6H OPEN ,6H OPEN ,6H OPEN ,6H OPEN ,6H OPEN /
C
C INSTR FROM INPUT 22=INST=IJK, I SPECIFIES INSTRUMENT TYPE, I=1 FOR TV
C                                J SPECIFIES WHICH TV IN SUBROUTINE
C INSTR = INST-100 = JK      K IS UNUSED
C IF J=0, J IS SET TO 1
C USER MAY CHANGE TV-J VALUES WITH INPUTS NO 31 THRU 69
C
C 1 THRU 5, INSTRUMENT NAME  (INPUTS 31 THRU 35)
C
C 6 FOCAL LENGTH, CM (36)
C 7 CLEAR APERTURE DIAMETER, CM  (37)
C 8 OBSCURATION DIAMETER, CM  (38)
C 9 OPTICS TRANSMISSION,REFL + ABSORP, FRACTION  (39)
C SENSOR DIMENSIONS,  CM
C 10 VERTICAL, ACROSS SCAN LINES  (40)
C 11 HORIZONTAL, ALONG SCAN LINE  (41)
C 12 NUMBER OF SCAN LINES  (42)
C 13 NUMBER OF PIXELS PER SCAN LINE (43)
C 14 NUMBER OF BITS PER PIXEL (44)
C 15 MINIMUM DETECTABLE EXPOSURE, ERGS/SQ CM
C 16 MAXIMUM OR HIGHLIGHT EXPOSURE, ERGS/SQ CM (46)
C 17 THRU 20, MINIMUM RESOLUTION LEVELS
C 21 SENSOR RESPONSE CURVE IDENTIFICATION (51)
C 22 BLUE FILTER TRANSMISSION CURVE ID (52)
C 23 GREEN FILTER                    (53)
C 24 RED FILTER                     (54)
C 25 POLARIZING FILTER                        (55)
C 26 EXPOSURE TIME        (56)
C 27 THRU 28 OPEN   (57 THRU 58)
C 29 FRAME READ TIME, SECONDS (59)
C 30 FRAME ERASE TIME, SECONDS (60)
C 31 PICTURE TAKING START TIME (DAYS)  (61)
C 32 PICTURE TAKING STOP TIME (DAYS)  (62)
C 33 DELTA T PER PICTURE   (MIN)    (63)    CAN BE CHANGED BY PROGRAM
C 34 BULK STORAGE CAPACITY   (BITS)  (64)
C 35 BULK ZERO STATE         (BITS)  (65)
C 36 TRANSMISSION BIT RATE,BPS   (66)
C 37 OTHER INSTRUMENT BIT RATES   (67)
C 38 BUFFER CAPACITY   (BITS)   (68)
C 39 PICTURES PER CALCULATION STEP   (69)
C
C P(40) THRU P(51) ARE COMPUTED
C 40 DELTA T PER PICTURE   (MIN)    (70)    FIXED
C 41 F/NUMBER OR F/STOP
C 42 AREA BLOCKAGE, FRACTION
C 43 DIFFRACTION LIMIT, RADIANS
C 44 FIELD OF VIEW, VERTICAL, DEGREES
C 45 FIELD OF VIEW, HORIZONTAL, DEGREES
C ANGULAR RESOLUTION, RADIANS/PIXEL
C 46 AT CENTER
C 47 AT VERTICAL EDGE,CENTER
C 48 AT HORIZONTAL EDGE,CENTER
C 49 BITS PER PICTURE
C 50 READ RATE, BPS
C 51 T/NUMBER (CAN BE CHANGED BY PROGRAM
C 52 T/NUMBER-FIXED
C
      INSTR=INST-100
      J=INSTR/10
      IF(J.LT.1.OR.J.GT.6) J=1
      GO TO (1,2,3,4,5,6),J
    1 CONTINUE
C
C  NARROW ANGLE SIT, INSTR=110
C
      P(1)=6HSIT NA
      P(2)=6HRROW A
      P(3)=6HNGLE C
      P(4)=6HAMERA
      P(5)=6H(CAND)
      P(6)=200.0
      P(7)=23.0
      P(15)=8.E-6
      P(16)=P(15)*250.
      P(21)=1.0
      P(26)=0.001
      P(27)=0.
      P(28)=0.
      P(29)=40.
```

```
96            P(30)=0.0
97            GO TO 7
98          2 CONTINUE
99      C
100     C  WIDE ANGLE SIT. INSTR=120
101     C
102           P(1)=6HSIT WI
103           P(2)=6HDE ANG
104           P(3)=6HLE CAM
105           P(4)=6HERA
106           P(5)=6H(CAND)
107           P(6)=20.
108           P(7)=5.0
109           P(15)=8.E-6
110           P(16)=P(15)*250.
111           P(26)=0.0001
112           P(27)=0.001
113           P(28)=0.010
114           GO TO 7
115         3 CONTINUE
116     C
117     C NARROW ANGLE SILICON VIDICON    INSTR=130
118     C
119           P(1)=6HSI NAR
120           P(2)=6HROW AN
121           P(3)=6HGLE CA
122           P(4)=6HMERA
123           P(5)=6H
124           P(6)=200.0
125           P(7)=23.0
126           P(16)=0.5
127           P(15)=P(16)/250.
128           P(26)=.05
129           P(27)=.10
130           P(28)=.50
131           GO TO 7
132         4 CONTINUE
133     C
134     C   WIDE ANGLE SILICON VIDICON    INSTR=140
135     C
136           P(1)=6HSI WID
137           P(2)=6HE ANGL
138           P(3)=6HE CAME
139           P(4)=6HRA
140           P(5)=6H
141           P(6)=20.0
142           P(7)=5.0
143           P(16)=0.5
144           P(15)=P(16)/250.
145           P(26)=.1
146           P(27)=.5
147           P(28)=1.
148           GO TO 7
149         5 CONTINUE
150     C
151     C  NARROW SEC VIDICON   INSTR=150
152     C
153           P(1)=6HOPE 2
154           P(2)=6HDEG FO
155           P(3)=6HV CAME
156           P(4)=6HRA SEC
157           P(5)=6H  TUBE
158           P(6)=50.8
159           P(7)=7.62
160           P(15)=0.0001
161           P(16)=0.01
162           P(26)=0.4
163           P(27)=.1
164           P(28)=.01
165           GO TO 7
166         6 CONTINUE
167     C
168     C   WIDE  SEC VIDICON   INSTR=160
169     C
170           P(1)=6HSEC WI
171           P(2)=6HDE ANG
172           P(3)=6HLE CAM
173           P(4)=6HERA
174           P(5)=6H
175           P(7)=1.524
176           P(6)=10.16
177           P(15)=0.0001
178           P(16)=0.01
179           P(26)=.1
180           P(27)=0.01
181           P(28)=0.001
182         7 CONTINUE
183           P(8)=0.0
184           P(9) = 0.85
185           P(10)=1.60
186           P(11)=1.60
187           P(12)=800.
188           P(13)=800.
189           P(14)=8.0
190           P(17)=300.
191           P(18)=100.0
```

```
  192            P(19)= 50.0
  193            P(20)=10.0
  194            P(21) = 1.0
  195            P(22) = 1.0
  196            P(23)=1.
  197            P(24)=1.0
  198            P(25)=-1.0
  199            P(29) =40.
  200            P(30) = 0.1
  201            P(31)=-1.5
  202            P(32)=1.5
  203            P(33)=15.0
  204            P(34)=1000000000.
  205            P(35)=0.0
  206            P(36)=47400.
  207            P(37)=100.
  208            P(38)=P(14)*P(12)*P(13)
  209            P(39)=4.
  210      C
  211      C OVERLAYS SYTEM VALUES WITH USER INPUTS
  212            DO 77 I=31,35
  213            IF(ITEST(I).EQ.1) P(I-30)=TVNAME(I-30)
  214         77 CONTINUE
  215            DO 8 I=36,70
  216            IF(ITEST(I).EQ.1) P(I-30)=XZ(I)
  217          8 CONTINUE
  218            P(40)=P(33)
  219            P(41)=P(6)/P(7)
  220            P(42)=((P(8)/P(7))**2)
  221            P(43)=(6.71E-05)/P(7)
  222            P(45)=2.*ATAN(P(11)/(2.*P(6)))*180./PI
  223            P(44)=2.*ATAN(P(10)/(2.*P(6)))*180./PI
  224            U=P(10)/(P(12)*P(6))
  225            V=COS(P(44))**2
  226            P(46)=ATAN(U/(1.-2.*(U**2)))
  227            P(47)=ATAN(U*V/(1.-2.*((U*V)**2)))
  228            U=P(11)/(P(13)*P(6))
  229            V=COS(P(45))**2
  230            P(48)=ATAN(U*V/(1.-2.*((U*V)**2)))
  231            P(49)=P(14)*P(12)*P(13)
  232            P(50) = P(49)/P(29)
  233            P(51)=P(41)/SQRT((1.-P(42))*P(9))
  234            P(52)=P(51)
  235            DO 40 I=1,5
  236         40 TVNAME(I)=P(I)
  237            DO 10 I=53,60
  238         10 P(I)=0.
  239            WRITE(6,1040)TITLE
  240            WRITE(6,1010) (P(I),I=1,5)
  241            DO 20 I= 6,40
  242            IF(ITEST(I+30).EQ.1) WRITE(6,1020)I,TVAR(I-5),P(I)
  243         20 IF(ITEST(I+30).NE.1) WRITE(6,1000)I,TVAR(I-5),P(I)
  244            DO 30 I=41,60
  245         30 WRITE(6,1030)I,TVAR(I-5),P(I)
  246      C
  247            CALL FOLDER(INST)
  248            CALL PICIN
  249      C
  250            RETURN
  251       1000 FORMAT(5X,I2,5X,A6,2H= ,E15.8)
  252       1010 FORMAT(5X    ,23HTV CHARACTERISTICS FOR ,5A6/)
  253       1020 FORMAT(5X,I2,5X,A6,2H= ,F15.8,5X,11H USER INPUT )
  254       1030 FORMAT(5X,I2,5X,A6,2H= ,E15.8,5X,16H COMPUTED VALUES )
  255       1040 FORMAT(1H1,13A6,/)
  256            END
```

```
@PRT GT.XLIMB

MARTIN*GT.XLIMB
     1            SUBROUTINE XLIMB
     2            COMMON/PTLB/THA,R(3),DEI,K
     3            DIMENSION FVL(3)
     4            PI=3.1415926536
     5            RTD=57.2957795
     6            DTR=0.01745329
     7            THE=-PI/18.
     8            STHA=SIN(R(3)*DTR)
     9            CTHA=COS(R(3)*DTR)
    10            SPHI=SIN(R(2)*DTR)
    11            CPHI=COS(R(2)*DTR)
    12            PSI=THA
    13            CPSI=COS(PSI)
    14            SPSI=SIN(PSI)
    15            DO 8I=1,37
    16            THE=THE+PI/ 8.
    17            CTHE=COS(THE)
    18            STHE=SIN(THE)
    19            AF=CTHA*CPSI*SPHI-STHA*SPSI*CTHE-CTHA*SPSI*CPHI*STHE
    20            BF=STHA*CPSI*SPHI+CTHA*SPSI*CTHE-STHA*SPSI*CPHI*STHE
    21            CF=CPSI*CPHI+SPSI*SPHI*STHE
    22            FVL(1)=AF
    23            FVL(2)=BF
    24            FVL(3)=CF
```

```
      1            CALL SPHERE(FVL,FVL,2HTO,5HPOLAR,6HDEGREE)
     26            A=DEI*ABS(180.*(K-1)-FVL(2))
     27            ZON=FVL(3)*DTR-PI/2.
     28            X1 = A*COS(ZON)
     29            Y1 = A*SIN(ZON)
     30            IF(K.EQ.2.AND.FVL(2).LT.90.)GO TO 10
     31            IF(K.EQ.1.AND.FVL(2).GT.90.) GO TO 10
     32            IF(I.EQ.1) GO TO 10
     33            CALL LINE(X1,Y1,X2,Y2)
     34        10  X2=X1
     35            Y2=Y1
     36          8 CONTINUE
     37            RETURN
     38            END
```

```
@PRT GT,NOCHAR
```

```
MARTIN*GT.NOCHAR
      1            SUBROUTINE NOCHAR(INST)
      2            COMMON/HEDING/TITLE(13)
      3            COMMON/CHARAC/P(60)
      4            RETURN
      5            END
```

```
@PRT GT,UVCHAR
```

```
MARTIN*GT.UVCHAR
      1            SUBROUTINE UVCHAR(INST)
      2            COMMON/HEDING/TITLE(13)
      3            COMMON/CHARAC/P(60)
      4            RETURN
      5            END
```

```
@PRT GT,ABSBEM
```

```
MARTIN*GT.ABSBEM
      1            SUBROUTINE ABSBEM(X,Y)
      2            COMMON / PLTBUF / BUF(20)
      3            COMMON / CHARF / NSFL
      4            NX = X*1023.
      5            NY = (1. - Y)*1023.
      6            CALL SPRINT(NX,NY,NSFL,1H )
      7            BUF(9) = NX
      8            BUF(10) = NY
      9            RETURN
     10            END
```

```
@PRT GT,CHAROP
```

```
MARTIN*GT.CHAROP
      1            SUBROUTINE CHAROP(DUM,DUM,ISIZE,IOR,DUM)
      2            COMMON / CHARF / NSFL
      3            ISIS = ISIZE + 1
      4            GO TO (10, 20, 30, 40),ISIS
      5         10 NSFL = 4
      6            GO TO 50
      7         20 NSFL = 8
      8            GO TO 50
      9         30 NSFL = 12
     10            GO TO 50
     11         40 NSFL = 16
     12         50 IF(IOR .EQ. 1) NSFL = -NSFL
     13            RETURN
     14            END
```

```
@PRT GT,LINE
```

```
MARTIN*GT.LINE
      1            SUBROUTINE LINE(X1,Y1,X2,Y2)
      2            COMMON /PLTBUF / BUF(20)
      3            CALL SINTRP(BUF)
      4            CALL SONPUT(X1,Y1,BUF,0)
      5            CALL SONPUT(X2,Y2,BUF,0)
      6            RETURN
      7            END
```

```
@PRT GT,MAP
```

```
MARTIN*GT.MAP
     1              SUBROUTINE MAP(XMIN,XMAX,YMIN,YMAX,XMI,XMA,YMI,YMA)
     2              COMMON / PLTBUF / BUF(20)
     3              DIMENSION X(4), S(4)
     4              X(1) = XMIN
     5              X(2) = YMIN
     6              X(3) = XMAX
     7              X(4) = YMAX
     8              S(1) = XMI*1023.
     9              S(2) = ABS(1.0 - YMI)*1023.
    10              S(3) = XMA*1023.
    11              S(4) = ABS(1.0 - YMA)*1023.
    12              CALL SPINIT(BUF,20,X,S)
    13              RETURN
    14              END


@PRT GT.MAPS

MARTIN*GT.MAPS
     1              SUBROUTINE MAPS(XMIN,XMAX,YMIN,YMAX,XMI,XMA,YMI,YMA)
     2              COMMON / PLTBUF / BUF(20)
     3              DIMENSION FMTX(3), FMTY(3)
     4              CALL SCALEK(XMIN,XMAX,C,D,KMAJX,KMINX)
     5              CALL FMTLAB(C,D,KMAJX,15,FMTX)
     6              CALL SCALEK(YMIN,YMAX,C,D,KMAJY,KMINY)
     7              CALL FMTLAB(C,D,KMAJY,15,FMTY)
     8              CALL MAP(XMIN,XMAX,YMIN,YMAX,XMI,XMA,YMI,YMA)
     9              CALL SGRID(BUF,KMAJX,0,FMTX,KMAJY,0,FMTY,1)
    10              RETURN
    11              END


@PRT GT.MAPSSL

MARTIN*GT.MAPSSL
     1              SUBROUTINE MAPSSL(XMIN,XMAX,YMIN,YMAX,XMI,XMA,YMI,YMA)
     2              COMMON / PLTBUF / BUF(20)
     3              DIMENSION FMTX(3), FMTY(3)
     4              CALL SCALEK(XMIN,XMAX,C,D,KMAJX,KMINX)
     5              CALL FMTLAB(C,D,KMAJX,15,FMTX)
     6              CALL SCALEK(YMIN,YMAX,C,D,KMAJY,KMINY)
     7              CALL FMTLAB(C,D,KMAJY,15,FMTY)
     8              CALL MAP(XMIN,XMAX,YMIN,YMAX,XMI,XMA,YMI,YMA)
     9              CALL SGRID(BUF,KMAJX,0,FMTX,-KMAJY,0,FMTY,1)
    10              RETURN
    11              END


@PRT GT.NUMBER

MARTIN*GT.NUMBER
     1              SUBROUTINE NUMBER(N,FMT)
     2              COMMON / PLTBUF / BUF(20)
     3              COMMON / CHARF / NSFL
     4              ENCODE(4,900,LAB) N
     5        900   FORMAT(I4)
     6              NX = BUF(9)
     7              NY = BUF(10)
     8              CALL SPRNTA(NX,NY,NSFL,LAB,1)
     9              RETURN
    10              END


@PRT GT.NUMBEF

MARTIN*GT.NUMBEF
     1              SUBROUTINE NUMBEF(F,FMT)
     2              COMMON / PLTBUF / BUF(20)
     3              COMMON / CHARF  / NSFL
     4              ENCODE(4,900,FAB) F
     5        900   FORMAT(F4.1)
     6              NX = BUF(9)
     7              NY = BUF(10)
     8              CALL SPRNTA(NX,NY,NSFL,FAB,1)
     9              RETURN
    10              END
    11        I T
    12        N


@PRT GT.POINT

MARTIN*GT.POINT
     1              SUBROUTINE POINT(X,Y)
     2              COMMON / PLTBUF / BUF(20)
```

```
      3            CALL SINTRP(BUF)
      4            CALL SDNPUT(X,Y,BUF,0)
      5            CALL SDNPUT(X,Y,BUF,0)
      6            CALL SINTRP(BUF)
      7            RETURN
      8            END


@PRT GT,SETBEM


MARTIN*GT.SETBEM
      1            SUBROUTINE SETBFM(X,Y)
      2            COMMON / PLTBUF / BUF(20)
      3            CALL SINTRP(BUF)
      4            CALL SDNPUT(X,Y,BUF,0)
      5            RETURN
      6            END


@PRT GT,SYMBOL


MARTIN*GT.SYMBOL
      1            SUBROUTINE SYMBOL(A)
      2            COMMON / CHARF / NSFL
      3            COMMON / PLTBUF / BUF(20)
      4            NX = BUF(9)
      5            NY = BUF(10)
      6            IF(NSFL .LT. 0) NY = 1023 - NY
      7            CALL SPRINT(NX,NY,NSFL,A)
      8             RETURN
      9            END


00101     1*         SUBROUTINE ARC
00103     2*         REAL IV(3),IU(3)
00104     3*         DIMENSION VQ(3,9),L(9),V(3),OV(3),U(3),UZ(3),VN(3),VM(3)
00105     4*         COMMON/BRTC/IV,V
00106     5*         COMMON/PCOORD/PV(3),VE(3),PM(3)
00107     6*         COMMON/EXTRA/RPL,ROT
00110     7*         COMMON/VW/VW(3),R2,ASD
00111     8*         COMMON/FLAG/LL,DUM(2),NI,HFL
00112     9*         DATA UZ/0.,0.,1./
00114    10*         CALL PENUP
00115    11*         CALL VTRANS(VN,VW,2HTO,PM,PV)
00116    12*         CALL VCROSS(VM,VN,UZ)
00117    13*         CALL VTRANS(U,V,2HTO,VM,VN)
00120    14*         CALL VTRANS(IU,IV,2HTO,VM,VN)
00121    15*         CALL SPHERE(U,U,2HTO,5HPOLAR,6HDEGREE)
00122    16*         CALL SPHERE(IU,IU,2HTO,5HPOLAR,6HDEGREE)
00123    17*         S = U(3) -IU(3)
00124    18*         IF(S.LT.0.) S = S + 360.
00126    19*         CALL ARCSTP(4.)
00127    20*         CALL PLTARC(IV,VN,S)
00130    21*         RETURN
00131    22*         END

       END OF COMPILATION:          3 DIAGNOSTICS.

00101     1*         SUBROUTINE EUREKA(VQ,VC,PC,P)
00103     2*         DIMENSION VQ(3),P(3),VC(3),PC(3)
00104     3*         COMMON/VW/VW(3),R2,ASD
00105     4*         COMMON/FAME/C1(3),C3(3)
00106     5*         COMMON/PCOORD/PV(3),VE(3),PM(3)
00107     6*         COMMON/EXTRA/RPL,ROT
00110     7*         CALL VTRANS(PC,P,4HFROM,C1,C3)
00111     8*         CA=DOT(PC,VW)
00112     9*         SROOT=RPL**2.0-R2**2.0*(1.-CA**2.0)
00113    10*         IF(SROOT.LT.0.0) SROOT=0.0
00115    11*         CALL VCOMB(VC,PC,R2*CA-SQRT(SROOT),VW,-R2)
00116    12*         CALL VTRANS(VQ,VC,2HTO,PM,PV)
00117    13*         RETURN
00120    14*         END

00101     1*         SUBROUTINE FIND(VQI,LD,I)
00103     2*         REAL M,K
00104     3*         INTEGER F
00105     4*         DIMENSION L(9),VT(3),P(3),Q(3),R(3),VR(3),VCI(3),VQI(3)
00106     5*         COMMON/TRA/TRACE
00107     6*         COMMON/PC/PC(3,9)
00110     7*         COMMON/PCOORD/PV(3),VE(3),PM(3)
00111     8*         COMMON/EXTRA/RPL,ROT
00112     9*         COMMON/VW/VW(3),R2,ASD
00113    10*         DATA L/1,2,3,6,9,8,7,4,1/
00115    11*         IF(TRACE.EQ.5HTRACE)PRINT 999
00120    12*         A = TAN(ASD)
00121    13*         N = L(I+1)
00122    14*         F = L(I)
00123    15*         CALL VEQUAL(P,PC(1,N))
00124    16*         CALL VEQUAL(Q,PC(1,F))
00125    17*         CALL UCROSS(VT,VW,P)
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```
00126    18*          CALL VCROSS(VR,VW,VT)
00127    19*          XP=0.
00130    20*          B=DOT(P,VR)/DOT(P,VW)
00131    21*          QW=DOT(Q,VW)
00132    22*          XQ=DOT(Q,VT)/QW
00133    23*          YQ=DOT(Q,VR)/QW
00134    24*          M=(YQ-B)/XQ
00135    25*          SROOT=(M**2 + 1.)*A**2 - B**2
00136    26*          IF(SROOT.LT.0.) GO TO 1
00140    27*          K=SIGN(1.,LO*XQ)
00141    28*          X =( -M*B + K *SQRT(SROOT))/( M**2 + 1.)
00142    29*          Y = M*X + B
00143    30*          CALL VLOAD(R,X,Y,1.)
00144    31*          CALL VUNIT(R,R)
00145    32*          CALL VTRANS(R,R,4HFROM,VT,VW)
00146    33*          CA=DOT(R,VW)
00147    34*          CALL VCOMB(VC1,VW,-R2,R,R2*CA)
00150    35*          CALL VTRANS(VQ1,VC1,2HTO,PM,PV)
00151    36*          CALL VPLOT(VQ1)
00152    37*          GO TO 3
00153    38*    1     PRINT 2
00155  *DIAGNOSTIC*    *  IS AN IMPROPER PUNCTUATION MARK*
00155    39*    2     FORMAT (1HO,*SUBROUTINE FIND HAD TROUBLE*)
00156    40*    3     IF(TRACE.EQ.5HTRACE) PRINT 999
00161  *DIAGNOSTIC*    *  IS AN IMPROPER PUNCTUATION MARK*
00161    41*  999     FORMAT(* FIND SUBROUTINE*)
00162    42*          RETURN
00163    43*          END


00101     1*          SUBROUTINE FPLOT(VQ)
00103     2*          REAL IV(3),IU(3)
00104     3*          DIMENSION VQ(3,9),L(9),V(3),OV(3),U(3),UZ(3),VN(3),VM(3)
00105     4*          COMMON/BRTC/IV,V
00106     5*          COMMON/PCOORD/PV(3),VE(3),PM(3)
00107     6*          COMMON/EXTRA/RPL,ROT
00110     7*          COMMON/VW/VW(3),R2,ASD
00111     8*          COMMON/FLAG/LL,DUM(2),N1,MFL
00112     9*          COMMON/TRA/TRACE
00113    10*          DATA UZ/0.,0.,1./
00115    11*          DATA L/1,2,3,6,9,8,7,4,1/
00117    12*          IF(TRACE.EQ.5HTRACE) PRINT 999
00122    13*          ENCODE(6,998,LABEL) N1
00125    14*          CALL VPPLT(VQ(1,5),LABEL)
00126    15*          IF(LL.EQ.1) GO TO 12
00130    16*          MFL = 0
00131    17*          CALL VZERO(IV)
00132    18*          CALL VZERO(OV)
00133    19*          CALL VPLOT(VQ(1,1))
00134    20*          LO = 0
00135    21*          IF(ABSV(VQ(1,1)).GT.(.001*RPL) LO=1
00137    22*          DO 10 I=2,9
00142    23*          J=L(I)
00143    24*          LN = 0
00144    25*          IF(ABSV(VQ(1,J)).GT.(.001*RPL) LN = 1
00146    26*          LD = LN - LO
00147    27*          LO = LN


00150    28*          IF(LD.EQ.0) GO TO 10
00152    29*          CALL FIND(V,LD,I)
00153    30*          IF(LD.EQ.1) GO TO 6
00155    31*          IF(ABSV(IV).LE.0.) GO TO 8
00157    32*          CALL ARC
00160    33*          CALL VPLOT(V)
00161    34*          GO TO 10
00162    35*    6     CALL VEQUAL(IV,V)
00163    36*          GO TO 10
00164    37*    8     CALL VEQUAL(OV,V)
00165    38*   10     CALL VPLOT(VQ(1,J))
00167    39*          CALL PENUP
00170    40*          IF(ABSV(OV).LE.0.) GO TO 12
00172    41*          CALL VEQUAL(V,OV)
00173    42*          CALL ARC
00174    43*   12     IF(TRACE.EQ.5HTRACE) PRINT 999
00177    44*  998     FORMAT(I2)
00200  *DIAGNOSTIC*    *  IS AN IMPROPER PUNCTUATION MARK*
00200    45*  999     FORMAT(* FPLOT SUBROUTINE*)
00201    46*          RETURN
00202    47*          END


00101     1*          SUBROUTINE FPRINT(VQ)
00103     2*          REAL IN(9)
00104     3*          DIMENSION VQ(3,9),EM(9),VS(3,9),PN(3),UT(3),CAL(6),TIME(4),CC(3)
00105     4*          COMMON/VW/VW(3),R2,ASD
00106     5*          COMMON/FAME/C1(3),C3(3)
00107     6*          COMMON/FPRT/JDE,TSEC,CONE,CLOCK,U(3),PLNM(2)
00110     7*          COMMON/CELEST/C(3),S(3),SN(3)
00111     8*          COMMON/POINT/VC(3,9),P(3,9)
00112     9*          COMMON/PC/PC(3,9)
00113    10*          COMMON/FLAG/LL,M,MM,DUM(2)
00114    11*          COMMON/TRA/TRACE
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```
00115    12*          DATA PI,F/3.14159265536,.01745329/
00120    13*          IF(TRACE.EQ.5HTRACE) PRINT 999
00123    14*          MM=6
00124    15*          IF(LL.EQ.1) GO TO 8
00126    16*          DO 1 I=1,9
00131    17*    1     CALL TOPO(EM(I),IN(I),VS(1,I),VQ(1,I),VC(1,I),PC(1,I))
00133    18*          J = 1
00134    19*          K = 9
00135    20*          GO TO 30
00136    21*    8     CALL TOPO(EM(5),IN(5),VS(1,5),VQ(1,5),VC(1,5),PC(1,5))
00137    22*          J = 5
00140    23*          K = 5
00140    24*    C     COMPUTE SPACECRAFT VELOCITY W.R.T. THE ROTATING POINT OF T
00141    25*    30    CALL VCROSS(PN,PV,PM)
00142    26*          CALL VCOMB(UT,PN,COS(VS(3,5)*F),PM,-SIN(VS(3,5)*F))
00143    27*          CALL VTRANS(UT,UT,4HFROM,PM,PV)
00144    28*          CALL VSCALE(UT,UT,COS(VS(2,5)*F)*RPL*2.*PI*ROT/86400.)
00145    29*          CALL VDIF(U,U,UT)
00146    30*          CALL VTRANS(U,U,2HTO,C1,C3)
00147    31*          VT=SQRT(U(1)**2 + U(2)**2)
00150    32*          CALL SPHERE(U,U,2HTO,5HPOLAR,6HDEGREE)
00151    33*          PSD=ASD/F
00152    34*          PHA=180.-CONE
00153    35*          CALL VTRANS(CC,VW,2HTO,C,S)
00154    36*          CALL SPHERE(CC,CC,2HTO,5HPOLAR,6HDEGREE)
00155    37*          JDV=JDE + TSEC/86400.
00156    38*          CALL CALNDR(CAL,4HCALN,JDV,2HJD)
00157    39*          CALL TCONV(CAL(3),5HCLOCK,CAL(3),3HDAY)
00160    40*          CALL TCONV(TIME,5HCLOCK,ABS(TSEC),3HSEC)
00161    41*          IF(LL.EQ.0.AND. MOD(M,2).EQ.0) WRITE(MM,10)
00164    42*          IF(LL.EQ.1 .AND. MOD(M,3).EQ.0) WRITE(MM,10)
00167    43*          WRITE(MM,2) TIME,PLNM,CAL
00205    44*          IF(TSEC.LT.0.) WRITE(MM,9)
00210    45*          IF(TSEC.GE.0.) WRITE(MM,11)
00213    46*          WRITE(MM,3)
00215    47*          WRITE(MM,7)
00217    48*          WRITE(MM,4) R2,PSD,CC(2),CC(3),CONE,CLOCK,PHA,VT,U(3)
00232    49*          WRITE(MM,6)
00234    50*          WRITE(MM,5)(I,VS(1,I),VS(2,I),VS(3,I),EM(I),IN(I),I=J,K)
00247    51*          WRITE(MM,20)
00251    52*          M = M + 1
00252    53*          IF(TRACE.EQ.5HTRACE) PRINT 999
00255    54*   10     FORMAT(1H1)
00256  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00256    55*        2 FORMAT(1HO,1X,I2,*/*,I2,*/*,I2,*/*,F5.2,21X,2A6,10X,I5,1X,A3,I3,
00256    56*         *2X,I2,*/*,I2,*/*,F5.2)
00257  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00257    57*        9 FORMAT(1H+,*-*)
00260  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00260    58*       11 FORMAT(1H+,**)
00261  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00261    59*    3     FORMAT(1HO,12X*PLANET CENTER*,31X*INSTRUMENT AXIS*)
00262  *DIAGNOSTIC*   A  DIGIT IMPROPERLY FOLLOWS AN X OR H FIELD.OR A /.OR A )
00262  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00262    60*    7     FORMAT(1HO,2X*RANGE*,5X*ASD*,5X*CONE*,4X*CLOCK*,10X*CONE*,4
00262    61*         *,4X*PHASE*,5X*VSM*,4X*THETA*)
00263    62*        4 FORMAT(1H ,F8.0,2X,F6.2,2X,F7.2,2X,F7.2,7X,F7.2,2X,F7.2,2X,F7.2,
00263    63*         *2X,F6.2,2X,F7.2)
00264  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00264    64*        6 FORMAT(1HO,11X,*RADIUS*,9X,*LATITUDE*,8X,*LONGITUDE*,8X,*EM ANGLE*
00264    65*         *,8X,*IN ANGLE*)
00265    66*    5     FORMAT((12,5(9XF7.2)))
00266    67*   20     FORMAT(1HO//////)
00267  *DIAGNOSTIC*     *  IS AN IMPROPER PUNCTUATION MARK.
00267    68*   999    FORMAT(1HO,*FPRINT SUBROUTINE*)
00270    69*          RETURN
00271    70*          END


00101     1*          SUBROUTINE FRAME(P,FOV1,FOV2)
00103     2*          DIMENSION P(3,9)
00104     3*          COMMON/FLAG/LL
00105     4*          COMMON/TRA/TRACE
00106     5*          DATA PI,F/3.14159265536,.01745329/
00111     6*          IF(TRACE.EQ.5HTRACE) PRINT 999
00114     7*          CALL VLOAD(P(1,5), 0., 0.,1.)
00115     8*          LL = 0
00116     9*          IF(FOV1**2+FOV2**2 .LT. .0000) LL=1
00120    10*          IF(LL.EQ.1) GO TO 2
00122    11*          A1=TAN(FOV1*F)
00123    12*          A2=TAN(FOV2*F)
00124    13*          CALL VLOAD(P(1,1),-A1,-A2,1.)
00125    14*          CALL VLOAD(P(1,2), 0.,-A2,1.)
00126    15*          CALL VLOAD(P(1,3), A1,-A2,1.)
00127    16*          CALL VLOAD(P(1,4),-A1, 0.,1.)
00130    17*          CALL VLOAD(P(1,6), A1, 0.,1.)
00131    18*          CALL VLOAD(P(1,7),-A1, A2,1.)
00132    19*          CALL VLOAD(P(1,8), 0., A2,1.)
00133    20*          CALL VLOAD(P(1,9), A1, A2,1.)
00134    21*          DO 1 I=1,9
00137    22*    1     CALL VUNIT(P(1,I),P(1,I))
00141    23*    2     IF(TRACE.EQ.5HTRACE) PRINT 999
00144    24*   999    FORMAT(1HO,*FRAME SUBROUTINE*)
00145    25*          RETURN
00146    26*          END
```

```
00101     1*          SUBROUTINE LOCATE(VQ,CONE,CLOCK,TWIST)
00103     2*          DIMENSION VQ(3,9),C2(3)
00104     3*          COMMON/VW/VA(3),R2,ASD
00105     4*          COMMON/CELEST/C(3),S(3),SN(3)
00106     5*          COMMON/FAME/C1(3),C3(3)
00107     6*          COMMON/POINT/VC(3,9),P(3,9)
00110     7*          COMMON/PC/PC(3,9)
00111     8*          COMMON/PCOORD/PV(3),VE(3),PM(3)
00112     9*          COMMON/EXTRA/RPL,ROT
00113    10*          COMMON/FLAG/LL,DUM(2),N1,MFL
00114    11*          COMMON/TRA/TRACE
00115    12*          DATA PI,F/3.14159265360.0174532923/
00120    13*          IF(TRACE.EQ.5HTRACE) PRINT 999
00123    14*          CALL VLOAD(C3,1.,CONE,CLOCK)
00124    15*          CALL SPHERE(C3,C3,4HFROM,5HPOLAR,6HDEGREE)
00125    16*          CALL VTRANS(C3,C3,4HFROM,C,S)
00126    17*          CALL UCROSS(C2,S,C3)
00127    18*          CALL VCROSS(C1,C2,C3)
00130    19*          CALL VROTAT(C1,C1,C3,TWIST*F)
00131    20*          IF(LL.EQ.1) GO TO 2
00133    21*          DO 1 I=1,9
00136    22*        1 CALL EUREKA(VQ(1,I),VC(1,I),PC(1,I),P(1,I))
00140    23*          GO TO 3
00141    24*        2 CALL EUREKA(VC(1,5),VC(1,5),PC(1,5),P(1,5))
00142    25*        3 IF (TRACE.EQ.5HTRACE) PRINT 999
00145  *DIAGNOSTIC*   *  IS AN IMPROPER PUNCTUATION MARK.
00145    26*      999 FORMAT(*LOCATE SUBROUTINE*)
00146    27*          RETURN
00147    28*          END
```

```
00101     1*          SUBROUTINE LOOK(DUM,CONE,CLOCK,LAT,LONG)
00103     2*          REAL LAT,LONG
00104     3*          DIMENSION R(3),UX(3),C3(3)
00105     4*          COMMON/CELEST/C(3),S(3)
00106     5*          COMMON/PCOORD/PV(3),VE(3),PM(3)
00107     6*          COMMON/EXTRA/RPL,ROT
00110     7*          COMMON/TRA/TRACE
00111     8*          COMMON/VW/VA(3),R2,ASD
00112     9*          IF(TRACE.EQ.5HTRACE) PRINT 999
00115    10*          CALL VSCALE(UX,VW,-1.)
00116    11*          CALL VLOAD(R,1.,LAT,LONG)
00117    12*          CALL SPHERE(R,R,4HFROM,6HLATLON,6HDEGREE)
00120    13*          CALL VTRANS(R,R,4HFROM,PM,PV)
00121    14*           IF(DOT(UX,R).LT.RPL/R2) GO TO 1
00123    15*          CALL VCOMB (C3,VW,R2,R,RPL)
00124    16*          CALL VTRANS(C3,C3,2HTO,C,S)
00125    17*          CALL SPHERE(C3,C3,2HTO,5HPOLAR,6HDEGREE)
00126    18*          CONE=C3(2)
00127    19*          CLOCK=C3(3)
00130    20*          IF(TRACE.EQ.5HTRACE) PRINT 999
00133    21*          RETURN
00134    22*    1     PRINT 2,LAT,LONG
00140  *DIAGNOSTIC*  COMMA IS MISSING BEFORE A, E, I, O, F, OR HOLLERITH FIELD.
00140  *DIAGNOSTIC*   *  IS AN IMPROPER PUNCTUATION MARK.
00140  *DIAGNOSTIC*   N  IS AN IMPROPER PUNCTUATION MARK.
00140  *DIAGNOSTIC*   *  IS AN IMPROPER PUNCTUATION MARK.
00140    23*    2     FORMAT(1H ,*LAT*,F5.0, * , LONG*,F5.0,* NOT VISIBLE*)
00141    24*          IF(TRACE.EQ.5HTRACE) PRINT 999
00144    25*          RETURN
00145  *DIAGNOSTIC*   *  IS AN IMPROPER PUNCTUATION MARK.
00145    26*   999    FORMAT(1H0,*LOOK SUBROUTINE*)
00146    27*          END
```

APPENDIX C

SUPPORTING JPL MEMOS

JET PROPULSION LABORATORY

TECHNICAL MEMORANDUM
393-10
October 13, 1970

SUBJECT: ORBIT, A General Purpose Conic Orbit Program

Introduction

A general purpose conic orbit program called ORBIT has been written. It allows input of any central body with simplified input for the Sun and planets from the SUBROUTINE PLANET. It allows orbital elements to be input in over 100 different modes. Once the orbital elements are entered the subroutine can be called to give the position velocity or acceleration vectors in cartesian coordinates or to get classical orbital elements all as a function of time. This is accomplished through the use of multiple entry points and flags as explained below. ORBIT may be used by any program as a subroutine by putting the following control cards in the run stream:

```
@COPY,P    PLANET*PLANET., TPF$.
@COPY,P    VECTOR*VECTOR., TPF$.
```

The ORBIT program makes extensive use of the vector subroutines and requires the subroutines CTRANS, OBLATE, PLANET, and ANOMLY all of which are made available with the above statements.

Normal Usage

For ordinary use where units of kilometers, seconds, and degrees; and ecliptic coordinates are suitable; and the Sun or one of the 9 planets is the central body, then the following simple options will be useful.

Any symbol indicated as a vector by an arrow overhead (e.g. $\vec{R}$, $\vec{VV}$) should be considered to have 3 components and to be associated with a dimension statement. (e.g. DIMENSION R(3), VV(3)) The notation $\vec{R}$ = (X,Y,Z) is shorthand for R(1) = X, R(2) = Y, R(3) = Z. For vectors of more than 3 components dimensions will be explicit and no arrow used. Notation such as: DIMENSION X(7) : X = ($\vec{R}$, $\vec{V}$, T) means X(1) = R(1), X(2) = R(2), X(3) = R(3), X(4) = V(1), R(5) = V(2), X(6) = V(3), and X(7) = T.

Option	Description
CALL CPLANN(IP)	IP is input planet number: 0 = Sun, 3 = Earth, etc. Causes planet IP to be the central body. This call must come before the ORBIN call.

Let DIMENSION X(6), R(3), V(3), A(3). ORBIN sets up the orbit of the spacecraft in the subroutine from initial conditions specified in X.

CALL ORBIN(X, 1)	X is input classical orbital elements (a, e, i, Ω, $\tilde{\omega}$, M) at time = 0.
CALL ORBIN(X, 2)	X is input initial position and velocity ($\vec{R}$, $\vec{V}$) at time = 0. Sets up the orbit in the subroutine
CALL ORBIN(X, 3)	X is input hyperbolic parameters (h_p, θ, T, V_∞, β, λ) h_p = periapsis altitude θ = B-plane angle T = time elapsed from periapsis to time = 0 V_∞ = incoming hyperbolic velocity at ∞ β = ecliptic latitude of the incoming asymptote λ = ecliptic longitude of the incoming asymptote Sets up hyperbolic orbit in subroutine.
CALL ORBPOS(R, T)	T is input time, $\vec{R}$ is output position vector of the orbiting body at that time.
CALL ORBVEL(V, T)	T is input time, $\vec{V}$ is output velocity vector of the orbiting body at time T
CALL ORBACC(A, T)	T is input time, $\vec{A}$ is output acceleration of orbiting body at that time.
CALL ORBELM(X, T)	T is input time, X is output classical orbital elements at that time. Heliocentric angles are referenced to the ecliptic; Planetocentric angles, to the planet equator. This call with time = 0 will give the same elements out that were put in with ORBIN(X,1),
CALL ORBTIM(T)	T is output time from periapsis to time = 0, which is time of initial conditions input by ORBIN. For initial conditions indicating the inbound portion of an orbit, T will be negative.

Table 1 Subroutine Orbit Input Options

Digit	6	5	4	3	2	1	Digit
Values of Digits 6 → 2	Effects of Digits 6 → 1 on Input Quantities						Value of Digit 1
0	Not Used	Not Used	Not Used	Not Used	Not Used	No Input	0
0	Not Used	Degrees	Mean Anomaly at time = 0	Longitude of Periapsis	Semi-major Axis	Input is based on classical orbital elements referred to planet equator and equinox*	1
1	Not Used	Radians	Time since Periapsis Passage	Argument of Periapsis	Period of Ellipse		
0	Not Used	Not Used	Not Used	Not Used	Cartesian coordinates referred to base vectors**	Input is position and velocity	2
1	Not Used	Not Used	Not Used	Not Used	Spherical coordinates referred to planet		
0	Incoming Asymptote	Periapsis Altitude	B-plane Aimpoint angle	Spherical Coordinates	V_∞ referred to base vectors	Input is hyperbolic quantities	3
1	Outgoing Asymptote	Periapsis Radius	Orbit Inclination to Planet Equator $\vec{B}\cdot\vec{R}$ negative	Cartesian Coordinates	V_∞ referred to Earth equator and equinox†		
2	Not Used	Magnitude of B-vector	Orbit Inclination to Planet Equator $\vec{B}\cdot\vec{R}$ positive	Not Used	V_∞ referred to planet equator and equinox		

* Except heliocentric orbit is referred to base vectors
** Base vectors are usually ecliptic x, y, z.
† This option only valid if base vectors are ecliptic x, y, z.

Access:

The ANOMLY program is included in the file PLANET and may be accessed by putting the following card before the @XQT card:

```
@COPY,P    PLANET*PLANET.,TPF$.
```

C A L N D R

Introduction:

It is often convenient to be able to use the calendar date for input or output purposes, but it necessary to use Julian date or modified Julian date for actual calculations. Where Julian date is used it is usually a double precision variable in order to have sufficient time resolution in fractions of a day. For input purposes it is convenient to be able to enter the calendar date as a single number of the form YYMMDD.FF. CALNDR is a subroutine to implement conversions between these forms.

Use:

The subroutine has only one entry whose calling sequence is:

```
CALL CALNDR(DOUT, IO, DIN, II)
```

DOUT is the output date, SIN is the input date.

IO describes the form of DOUT; and II, the form or DIN.

The following table gives the forms that DIN and II may take.

II	DIN
'JD'	DIN is double precision Julian date
'MODJD'	DIN is single precision modified Julian date
'CALcc'	DIN is single precision calendar date of the form YYYMMDD.FF and cc is the century number to which the year is referenced (see examples)

The next table gives the forms that DOUT and IO may take.

IO	DOUT
'JD'	DOUT is double precision Julian date
'MODJD'	DOUT is single precision modified Julian date
'CAL'	DOUT is dimensioned DOUT(3) and DOUT(1) = year (integer) DOUT(2) = month number (integer) DOUT(3) = day number (real)
'ALPHA'	DOUT is dimensioned DOUT(3) and DOUT is an 18 character date suitable for printing on a 3A6 format.

Examples:

1. Problem: Find the Julian date and modified Julain date corresponding to August 13, 1976.

   Solution:
```
DOUBLE PRECISION JD
CALL CALNDR(JD, 'JD', 760813., 'CAL19')
CALL CALNDR(D, 'MODJD', JD, 'JD')
```

   Results:
```
JD = 2443003.5 DO
 D = 9721.0 EO
```

2. Problem: Find the calendar date corresponding to modified Julian date 10000.5.

   1st Solution:
```
DIMENSION D(3)
EQUIVALENCE (IYR,D),(MO,D(2)),(DAY,D(3))
CALL CALNDR(D,'CAL',10000.1,'MODJD')
```

   Results:
```
IYR = 1977
MO  = 5
DAY = 19.1
```

   2nd Solution:
```
CALL CALNDR(D,'ALPHA',10000.1,'MODJD')
```

   Results:
```
D(1) = '1977 M'
D(2) = 'AY 19.'
D(3) = '100000'
```

Limitations and Other Details:

Calendar Dates refer to the common Gregorian civil calendar, and therefore do not give the correct civil calendar date for times before 1582 to 1918 depending on when each country adopted the Gregorian calendar. This program is coupled to the trace feature of the vector subroutines. Improper input dates such as 11/45/66 or 38/16/72 will be interpreted as 12/15/66 and 2/16/75 respectively, making it simple to increment by months.

References:

1. P. H. Roberts, "A Set of Matrix Subroutines", IOM 393.1-37, September 10, 1970

2. Future TM describing ORBIT Program by P. H. Roberts.

3. P. H. Roberts, "An Improved Set of Vector Subroutines for the UNIVAC 1108", TM 393-2, August 3, 1970.

JET PROPULSION LABORATORY

TECHNICAL MEMORANDUM
393-5
September 24, 1970

SUBJECT: PLANET, An Analytic Ephemeris of the Planets for the UNIVAC 1108

PLANET is a program for computing the positions, velocities, accelerations, and rotation of the nine usual planets, the Sun, and three fictional planets. In addition to these outputs a common area called /PLCONS/ contains the gravitational constants, radii, names, rotation rates, pole vectors, prime meridian vectors (1900) vernal equinoxes, and oblateness terms for the Sun, usual planets and fictional planets. A standard means for setting up any of the three fictional planets allows convenient entry of the orbit and/or other physical properties of an asteroid or other body in a heliocentric orbit. Special debugging and error return features are also included.

PLANET may be made available to any 1108 user by inserting the cards

```
@COPY,P  PLANET*PLANET.,TPF$.
@COPY,P  VECTOR*VECTOR.,TPF$.
```

into the run stream before the @ XQT card. A listing may be obtained by inserting

```
@ ELT,SL  PLANET
```

in the run stream after the COPY,P statement.

For normal uses involving the Sun and nine planets, four calling sequences may be used without prior initialization. Let JD be a double precision Julian date (2415020.0D0 = 1900, Jan. 0.5 ET), let IP be an integer planet number (0 = Sun, 1 = Mercury, . . . etc.) and let $\vec{X}$, $\vec{V}$, $\vec{A}$, and $\vec{PM}$ be single precision 3-vectors. The calling sequences and output description follows:

Calling Sequence

CALL PLPOS (X, JD, IP)	$\vec{X}$ is heliocentric ecliptic and equinox of date position in km.
CALL PLVEL (V, JD, IP)	$\vec{V}$ is heliocentric ecliptic velocity in km/sec
CALL PLACC(A, JD, IP)	$\vec{A}$ is heliocentric ecliptic acceleration in km/sec^2.
CALL PGLOBE (PM, JD, IP)	PM is planetocentric ecliptic unit vector latitude = 0, longitude = 0 of planet.

Besides these time varying quantities, certain planet constants are available through the following common statement:

COMMON/PLCONS/SGM,PLGM(12), SR, PLR(12), SNAME(2), PLNAME(2, 12), SROT, PLROT(12), SPV(3), PLPV(3, 12), SPM(3), PLPM(3, 12), SVE(3), PLVE(3, 12), SOBL, PLOBL(12)

where

GM = gravitational constant km^3/s^2

R = radius km

NAME = planet's name

ROT = spherical rotation rate rev/day (day = 86400 sec)

PV = pole vector referred to ecliptic

PM = prime meridian vector referred to ecliptic

VE = vernal equinox vector = $\overleftarrow{PV} \times (\overleftarrow{\text{position}} \times \overleftarrow{\text{velocity}})$ referred to ecliptic

OBL = planet oblateness

and where the prefix S = Sun and prefix PL = planet. For example, to use the rotation rate of the planet Mars include the above common statement in your program and refer to PLROT(4).

When it is desired to use a non-standard body as if it were a normal planet then it is necessary to enter the orbital elements and/or planet constants prior to using the calls or the common variables mentioned above. To set up the constants in the common area /PLCONS/ for a fictional planet, and to allow subsequent calls to PGLOBE, PLPOS, PLVEL, and PLACC, for the same, the following calling sequence is convenient:

CALL PLNPUT (X, IP, 0) where IP is the desired number for the new planet (10, 11, or 12 are allowed) and X has dimension X(13) and the values as follows:

X(1) = semi-major axis of orbit (A.U.)
X(2) = eccentricity of orbit
X(3) = inclination of orbit to ecliptic (degrees)
X(4) = longitude of node (degrees)
X(5) = longitude of perihelion (degrees)
X(6) = mean anomaly at time, T_o
X(7) = time, T_o, to which mean anomaly refers
X(8) = first six letters of planet's name
X(9) = second six letters of planet's name
X(10) = radius of planet (km)

X(11) = gravity of planet (km^3/s^2)

X(12) = geo-equatorial declination of planet's pole (degrees)

X(13) = geo-equatorial right ascension of planet's pole (degrees)

X(14) = siderial rotation rate (rev/solar day) = (rev/84600 sec)

If the usual orbital elements as described above are not accurate enough, time polynomials may be inserted as orbital elements. This is done by using the following three calls in any order where X has dimension X(6):

CALL PLNPUT(X, IP, 1)

where X(1) = a in A.U.
X(2) = e
X(3) = i in degrees
X(4) = Ω in degrees
X(5) = $\tilde{\omega}$ in degrees
X(6) = M in degrees

as of JD = 2415020.0

CALL PLNPUT(X, IP, 2)

where X(1) is not used

X(2) = $\frac{de}{dt}$ in centuries^{-1}

X(3) = $\frac{di}{dt}$ in degrees/century

X(4) = $\frac{d\Omega}{dt}$ in degrees/century

X(5) = $\frac{d\tilde{\omega}}{dt}$ in degrees/century

X(6) = $\frac{dM}{dt}$ in degrees/day

CALL PLNPUT(X, IP, 3)

where X(1) is not used

X(2) = d^2e/dt^2 in centuries^{-2}

X(3) = d^2i/dt^2 in degrees/century^2

X(4) = $d^2\Omega/dt^2$ in degrees/century^2

X(5) = $d^2\tilde{\omega}/dt^2$ in degrees/century^2

X(6) = d^2M/dt^2 in degrees/(10000 days)^2

The call sequence CALL PLANET ('TRACE') is a useful debugging aid, especially for problems which can occur with fictional planets or whenever one wishes to monitor the operations of this subroutine. Wherever this call is used any of the subsequent calls to PLPOS, PLVEL, PLACC, PGLOBE or PLNPUT will cause them to print out their names and other important calculations. CALL PLANET('NOTRAC') stops further tracing.

Finally, the next call sequence causes error conditions to transfer to a chosen location in the main program rather than aborting the job. The sequence is CALL PLNERR($nn) where nn is the statement number in the main program to which error returns are made. The use of this call in a subroutine will cause the job to abort when the RETURN statement of the subroutine is executed. The walk back will be from a RETURN 0 in the PLANET subroutine. The coding for this error return involves some tricks possible with the 1108 system and should not be tampered with unless a systems engineer or other cognizant person is consulted.

This subroutine is on a catalogued file which may be accessed by the following card put before the ⓐ XQT card:

```
ⓐ COPY,P  PLANET*PLANET., TPF$.
```

This subroutine requires the vector subroutines which may be accessed with the card:

```
ⓐ COPY,P  VECTOR*VECTOR.,TPF$.
```

and also the subroutines ANOMLY, and CALNDR which are also on the file PLANET*PLANET