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Group Report

1964-46

Haystack Pointing System: Planet

H. E. Frachtman

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
LINCOLN LABORATORY

HAYSTACK POINTING SYSTEM: PLANET

H. E. FRACHTMAN

Group 62

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ABSTRACT

This report describes the procedure used by the Haystack pointing computer program for obtaining the celestial coordinates of the planets at any time.

Accepted for the Air Force
Franklin C. Hudson, Deputy Chief
Air Force Lincoln Laboratory Office

I. INTRODUCTION

PLANETRACK is a program in the Haystack Univac 490 pointing system; whose output is the celestial coordinates of a selected planet at a given time. The program computes the coordinates by 3rd or 4th difference interpolation in the tables of the apparent right ascension, declination, and radius vector of the planets published in The American Ephemeris. The rates of change of the three quantities are computed by numerical differentiation.

II. INPUTS TO PROGRAM

A. Inputs Furnished by Core Memory

The program uses the registers listed in Table I for input information. The year and day are used to select the appropriate entries from the ephemeris. The coordinates of the planet are interpolated for the time which is the sum of the times in CELTIME and DELTATEE.

B. Inputs Furnished by Magnetic Tape

The tape format of the Ephemerides for the planets, which has been edited and recorded on tape by a 7094 program described in Reference (1), is shown in Fig. 1. Each block of 320 words covers a period of 32 days. The ephemeris for each day requires 10 words. The program does not make use of the semi-diameter, horizontal parallax, or the year-month-day words in the block. The tape must be on Unit 1 (normally Servo B), of the Univac 490.

C. Inputs Furnished by Typewriter

During the operation of the initialization section of PLANETRACK an identification number representing the selected planet must be entered via the typewriter.

III. PROGRAM OUTPUTS

A. Outputs Left in Core Memory

The apparent celestial coordinates of the planet, corresponding to the time in the register CELTIME, together with their numerical derivatives, are stored in the appropriate registers, as illustrated in Table II.

<u>Register</u>	<u>Contents and Scaling</u>
W(CELTIME)	Days B28
W(DELTATEE)	Days B28
U(YEARMONTH)	Year B15 (4 decimal digits)
L(YEARMONTH)	Month B0
L(DAY)	Day of Year B0

TABLE I
Core Memory Inputs to PLANETRACK Program

Note: Notation "B28 means that the binary point is to the right of bit 28.

	14	0
I. D. (Planet number)	Conventional Day Number	
	14	8 4 0
All Zero	Year	Month Day
Right Ascension	B26	Radians
First Difference Right Ascension	B26	Radians
Declination	B26	Radians
First Difference Declination	B26	Radians
Radius Vector	B24	Astronomical Units
First Difference Radius Vector	B24	Astronomical Units
Semi-Diameter	B26	Radians
Horizontal Parallax	B26	Radians

Fig. 1 Magnetic Tape Format for Planet Ephemeris

<u>Register</u>	<u>Contents and Scaling</u>
W(RA)	Apparent Right Ascension B27 in revolutions
W(DEC)	Apparent Declination B27 in revolutions
W(RADIUS)	One's Complement Distance from center of Earth to Surface of Planet B24 in Astronomical units
W(RADOT)	Numerical Derivative of Right Ascension B37 radians/sec.
W(DEDOT)	Numerical Derivative of Declination B37 radians/sec.
W(RADIUSDOT)	Numerical Derivative of Radius Vector B24 nautical miles/sec.

TABLE II

Core Memory Outputs of PLANETRACK Program

B. Typewriter Outputs

When the PLANETRACK program is initially called, it will use the INTERCOM subroutine to request from the operator the name of the planet whose coordinates are required. The typewriter will print the names of the planets, (except Earth and Pluto) each followed by the identification number in parenthesis.

During initialization the PLANETRACK program will type, using the INTERCOM subroutine, certain information concerning the selected planet. Items printed are:

1. Julian Day corresponding to values in YEARMONTH, DAY, and CELTIME (7 digits).
2. Apparent Right Ascension of planet (Hours, Minutes, Seconds to hundredths).
3. Apparent Declination of planet (Degrees, Minutes, Seconds to hundredths).
4. Day of Year corresponding to values in YEARMONTH and DAY (up to 3 digits).
5. Universal Time for which the coordinates are interpolated. It is the time in CELTIME at initialization (Hours, Minutes, Seconds to hundredths).
6. The distance between the centers of the Earth and planet (Astronomical Units to hundred millionths).
7. The name of the planet.

If, after a search through 8 files on Unit 1 (or the finding of an end of tape mark), the planet ephemerides are not found, the program will type "(W) EPHEMERIS FOR X/Y NOT AMONG FIRST 8 FILES" and will exit to the master control program error return. "W" is the number specifying the selected planet, "X" and "Y" indicate the current month and year, respectively.

If there is a tape servo malfunction during search, the program will type "IIC STATUS S1 ZZ" and will exit to the master control program error return. The two digit octal number "ZZ" comes from the tape status word and indicates the error condition.

IV. ASTRONOMICAL SIGNIFICANCE

The apparent right ascension and declination of the planet in the ephemerides are referred to the true equinox and equator of date and are corrected for planetary aberration. They are geocentric apparent quantities; the parallax correction is made by the coordinate conversion program (COCON) in the Haystack system. The values

in the tables are computed for Ephemeris Time as argument. The equation

$$ET = UT + \Delta T$$

is used to convert from Universal Time to Ephemeris Time. The constant ΔT , represented by the number in the register DELTATEE is approximately 35 seconds.

The radius vector is the actual geometric distance in astronomical units between the centers of the Earth and planet at the stated time.

The number 934.91 is used to convert astronomical units per day to nautical miles per second in the computation of the number in RADIUSDOT.

$$934.91 = \frac{499.005 \times 2.997925 \times 10^5}{1.852 \times 86400}$$

499.005 = number of seconds per astronomical unit

2.997925×10^5 = velocity of light in kilometers per second

1.852 = kilometers per nautical mile

86400 = seconds per day

A comprehensive explanation of the ephemerides is given in Reference (2).

V. PROGRAM DETAILS

The PLANETRACK program is a subroutine of the Haystack Univac 490 pointing program. The initialization section begins at PLANETINIT, the working section at PLANETCONT. There are several closed subroutines within PLANETRACK. These are: DAYFIND, STATUSCK, INTERPOL, LEFRNDOFF, and ROUNDOFF. A listing of the program is given in Appendix I.

A. Initialization

The program, upon initialization, stores an RIL instruction in the tape channel internal interrupt register and an RJP STATUSCK instruction in the external interrupt register. The area in core into which the tape data will be read is cleared, together with some additional registers. This is done to make diagnosis easier in case of malfunction.

The planet ephemeris entries are serially numbered by the program which generates the magnetic tape (Reference 1). These serial numbers are called "Conventional

Day Numbers" (CDN). An arbitrary decision was made to produce and use tapes such that the CDN for 25 April 1963 is zero. The tape search process looks at the first word in each block, therefore, the PLANETRACK program must compute the CDN of the first word of the block containing the entry for the required day.

Using as inputs the year, day of year, and the effect of integral and half-integral values of CELTIME, the program computes the Julian Day number for the typewriter. The ephemerides start and run continuously from 25 April 1963, which has a Julian Day Number of 2438144.5; this number is subtracted from the computed Julian Day number and appears on tape as the Conventional Day Number. (it is 6 for 1 May 1963, the first day for which ephemerides tapes were made for the system.)

The first CDN in each block will be given by $6 + 32n$ where n is a positive integer or zero. If the first CDN of each record does not belong to this series, the tape search will be unsuccessful. The first CDN in a block is stored in TAPEBLOCK (lower half) and the planet identification number is added to generate a tape search comparison word, stored in TAPESearch and also in SAFE.

The number in SLOTBLOCK represents the number of the entry in the 32-word block.

If $2 < \text{SLOTBLOCK} \leq 28$, only one block need be read in; if not, either the preceding or following tape block should also be read to provide sufficient ephemerides for 4th difference Bessel interpolation for a four-day period.

If the one-or two-block search and read operations are successful, control is regained at NORMAL and the tape is rewound without interrupt or interlock. At this time, planet ephemerides for either 32 or 64 days are in core memory.

The program performs 4th difference interpolation for Mercury and Venus and third difference interpolation for the other planets.

Besselian interpolation of right ascension is done by the INTERPOL subroutine and the interpolated result is converted to hours, minutes, and seconds and stored for type out. Declination and distance are then interpolated and stored for type out. The other quantities which are to be typed out by INTERCOM are set up. Control is transferred to INTERCOM 7 times for the seven line type out, which completes operation of the initialization section of PLANETRACK.

B. Working Section

The PLANETRACK working section begins at PLANETCONT. Control is transferred to the subroutine DAYFIND which selects the day's ephemeris entry, stores the addresses of the table entries, and computes the interpolation argument P from the given value of CELTIME. The INTERPOL subroutine is then entered three times for the interpolation of right ascension, declination, radius and their time rates. An amount corresponding to the radius of the planet is subtracted from the interpolated value for accurate radar range control. All values are converted, scaled and stored properly in core memory and control is transferred to the master control program.

C. Subroutines

The initialization section of the PLANETRACK program makes use of the INTERPOL, DAYFIND, STATUSCK, LEFRNDOFF, and ROUNDOFF subroutines. The working section uses all except STATUSCK.

1. INTERPOL

The PLANETRACK interpolation subroutine uses Bessel's interpolation formula (Reference 3) for 3rd or 4th difference interpolation of the ephemeris. The formula is

$$f_p = f_o + P\delta f_{1/2} + \frac{P(P-1)}{4} [\delta^2 f_o + \delta^2 f_1] \\ + \frac{P(P-1)(P-1/2)}{6} \delta^3 f_{1/2} + \frac{(P+1)P(P-1)(P-2)}{48} (\delta^4 f_o + \delta^4 f_1)$$

The quantities in the formula are associated with computer registers as follows:

- a. The address of f_o is in index register 4.
- b. The interpolation argument P is in register P.
- c. $\delta f_{1/2}$ is in register GAMMA.
- d. $P(P-1)$ is in register PSQMP.
- e. $\delta^2 f_o + \delta^2 f_1$ is in register DMINB.
- f. $\frac{P(P-1)}{6}$ is in register PSQMP6.
- g. $\delta^3 f_{1/2}$ is in register DMIN2CPLB.
- h. $(\delta^4 f_o + \delta^4 f_1)$ is in register EP2BM2DMA.

- i. f_p is in the A register at the finish.

The subroutine also performs numerical differentiation using the following formula (Reference 3):

$$hf'_p = \delta f_{1/2} + \frac{2P-1}{4} [\delta^2 f_0 + \delta^2 f_1] \\ + \frac{3P^2 - 3P + 1/2}{6} \delta^3 f_{1/2}$$

At the completion of the subroutine, hf'_p is stored in the register NUMDERIV.

When the subroutine is entered, Index Register 4 contains the address of f_0 and the register SETINTAD contains the address of $\delta f_{1/2}$ of the quantity to be interpolated. Index register 3 is used to acquire the other two first difference registers.

2. DAYFIND

The DAYFIND subroutine computes the Julian Day number and the addresses of the ephemeris entries corresponding to the current day. It also computes the interpolation argument P by properly scaling the sum of CELTIME and DELTATEE. The value of P is always positive, even though time be set negative by the system control programs. The number in DAYINDEX, which can be -2, -1, 0, or +1, takes account of the effect of the integral part of CELTIME on the selection of ephemeris entry.

3. STATUSCK

The STATUSCK subroutine is entered from the external interrupt register associated with the tape channel when the interrupt occurs. Examination of the status code generates four possible outcomes:

- a. If the code indicates a normal completion, control is returned to the program at the interrupted point.
- b. If the code indicates that an end of tape mark was sensed, the tape is rewound and a message indicating failure to find the ephemeris is printed by the typewriter. The message is described in Section IIIB. Control is passed to the error return of the master control program.
- c. If the code indicates that an end of file mark was sensed, the register IMPERIAL is indexed and tested for the value 8. When less than 8 the next file

is searched by passing control to TRYAGAIN. When IMPERIAL equals 8, an end of tape condition is assumed and the action is as described in (b) above.

d. If the code indicates anything but end of file, end of tape, or normal completion, a tape error has occurred. The message described in Section IIIB, indicating the type of error is printed by the typewriter and control is passed to the error return of the master control program.

4. LEFRNDOFF

The LEFRNDOFF subroutine left shifts the AQ register the number of places indicated by the contents of index register 5 and rounds the A register.

5. ROUND OFF

The ROUND OFF subroutine right shifts the AQ register the number of places indicated by the contents of index register 5 and rounds the A register.

..... SPURT OUTPUT NO. 21C

PLANETRACK FRACHTMAN*8/4/64

NO. OF INSTRUCTIONS 03460
00000 THRU 01553
03452 THRU 03457

PLANETRACK FRACHTMAN*8/4/64

CARDS	LI	ID LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTES
	UC000	PLANETRACK	PROGRAM FRACHTMAN*8/4/64	00000				
	UC001	CRUISE	EQUALS 100	00001	25212	31231		
	UC002	MONITAPE	EQUALS 55	00002	61000	00000		
	UC003	TAPEINPUT	EQUALS 35	00003	11030	01062		
	UC004	EPHEM	MEANS C15*	00004	15030	00055		
	UC005	HENRY	U-TAG PLANETCONT*PLANETINIT	00005	11030	01061		
	UC006		FD 1*PLNET	00006	15030	00035		
	UC007	PLANETINIT	ENTRY	00007	12400	01717		
	UC010		ENT A*(IGNORE)	00010	11000	00000		
	UC011		STR A*(MONITAPE)	00011	15034	01533		1ST TEMP STCR
	UC012		ENT A*(INTERUPT)	00012	72400	00011		
	UC013		STR A*(TAPEINPUT)	00013	65020	63426		
	UC014		ENT B*9750	00014	00566	01034		LIST OF PLANETS
	UC015		CL A*	00015	11030	01040		
	UC016	ERASE	STR A*(IDENT+84)	00016	15020	01533		
	UC017		RJP B*ERASE	00017	11020	63147		
	UC020		RJP U(INTERCOM)	00020	21000	03651		
	UC021		U-TAG BODIES*INPLANET	00021	15030	01041		
	UC022		ENT A*(PLAN)	00022	03000	00036		
	UC023		STR A*(IDENT)	00023	23000	00004		
	UC024		ENT A*(YEARMONTH)	00024	15030	01534		
	UC025		SUB A*1961D	00025	22000	02665		
	UC026		STR A*(MONTHPRINT)	00026	14030	01535		
	UC027		RSH AQ*30D	00027	10030	01534		
	UC030		DIV 4	00030	22000	00555		
	UC031		STR A*(YRREMAIN)	00031	34030	01535		
	UC032		MUL 1461D	00032	65000	00312		
	UC033		STR Q*(WHOLEYEAR)	00033	10030	01540		
	UC034		ENT Q*(YRREMAIN)	00034	05000	00005		
	UC035		MUL 365D	00035	26000	00006		
	UC036		RPL Y+Q*(WHOLEYEAR)	00036	26030	01533		
	UC037		RJP DAYFIND	00037	14130	01552		
	UC040		ENT Q*(TAPEBLOCK)	00040	10030	01552		
	UC041		LSH Q*5	00041	14030	01542		
	UC042		ADD Q*6	00042	10000	00034		
	UC043		ADD Q*(IDENT)	00043	11000	00002		
	UC044		STR Q*(SAFE)*SKIP	00044	04430	01541		
	UC045	TRYAGA(N)	ENT Q*(SAFE)	00045	61000	00533		
	UC046		STR Q*(TAPESEARCH)	00046	73670	00564		
	UC047		ENT Q*28D	00047	12000	00000		
	UC050		ENT A*2	00050	13670	01060		
	UC051		COM AQ*(SLOTBLOCK)*YIN	00051	12000	00000		
	UC052		JP NOTIN	00052	13670	01542		
	UC053	BLOCKREE	(N EPHEM*(EPHEMR)	00053	61000	00053		
	UC054		NO-UP	00054	13670	01063		
	UC055		EX-FCT EPHEM*(SRHIB(N)	00055	12000	00000		
	UC056		NO-UP	00056	13670	01542		
	UC057		EX-FCT EPHEM*(TAPESEARCH)	00057	61000	00053		
	UC060		JP \$	00060	13670	01063		
	UC061	NORMAL	EX-FCT EPHEM*(REWINDNO)	00061	13670	01063		

FRACHTMAN*8/4/64

PLANETRACK

CARDS L1 IO LABEL TA STATEMENT LOC F JKB Y NOTES

00062	ENT	84*L(RAAO)	00055	12410	01543	
00063	ENT	A*L(RADIFAD)	00056	11010	01546	
00064	STR	A*L(SETINTAD)	00057	15010	C1131	
00065	RJP	INTERPOL	00060	65000	01152	
00066	ENT	Q*0*ANEG	00061	10700	000CC	
00067	SUB	A*W(TWOPIE)*APOS	00062	21630	01076	
00070	AOD	A*W(TWOPIE)	00063	20030	01076	
00071	RSH	AQ*270	00064	C3000	00033	
00072	DIV	W(HRAD)	00065	23030	01065	
00073	STR	Q*W(RA2)	00066	14030	C0671	
00074	CL	Q*	00067	10000	C000C	
00075	RSH	AQ*230	00070	C3000	00027	
00076	DIV	W(MINSRAD)	00071	23030	01066	
00077	STR	Q*W(RA4)	00072	14030	00674	
00100	RSH	AQ*300	00073	C3000	00036	
00101	MUL	W(SRAD)	00074	22030	01064	
00102	LSH	AQ*2*QPOS	00075	C7200	C0002	
00103	AOD	A*1	00076	20000	C0001	
00104	STR	A*W(RA6)	00077	15030	00677	
00105	ENT	84*L(DECAD)	00100	12410	01544	
00106	ENT	A*L(DECIFAD)	00101	11010	01547	
00107	STR	A*L(SETINTAD)	00102	15010	01131	
00110	RJP	INTERPOL	00103	65000	01152	
00111	STR	A*W(GMT2)	00104	15030	00757	
00112	ENT	Q*0*APOS	00105	10600	C000C	
00113	CP	A*	00106	15040	00000	
00114	RSH	AQ*220	00107	C3000	00026	
00115	DIV	W(MINSRAD)	00110	23030	C1066	
00116	STR	Q*W(DLN2)	00111	14030	00724	
00117	CL	Q*	00112	10000	00000	
00120	RSH	AQ*240	00113	C3000	C0030	
00121	DIV	W(SECSRAD)	00114	23030	C1072	
00122	STR	Q*W(DLN4)	00115	14030	00727	
00123	RSH	AQ*300	00116	C3000	C0036	
00124	MUL	W(SARAD)	00117	22030	01073	
00125	LSH	AQ*2*QPOS	00120	C7200	C0002	
00126	AOD	A*1	00121	20000	C0001	
00127	STR	A*W(DLN6)	00122	15030	00732	
00130	ENT	A*W(GMT2)*ANEG	00123	11730	00757	
00131	JP	\$+3	00124	61000	C0127	
00132	ENT	A*W(DLN2)	00125	11030	C0724	
00133	STR	A*CP*W(DLN2)	00126	15070	00724	
00134	ENT	A*W(CELTIME)	00127	11030	63133	
00135	ENT	Q*0*APOS	00130	10600	00000	
00136	CP	A*	00131	15040	00000	
00137	RSH	AQ*260	00132	C3000	00032	
00140	DIV	W(HOAY)	00133	23030	01067	
00141	STR	Q*W(GMT2)	00134	14030	00757	
00142	CL	Q*	00135	10000	00000	
00143	RSH	AQ*230	00136	C3000	00027	

FRACHTMAN*8/4/64

ACTES

F JKB Y

LOC

PLANETRACK

TA STATEMENT

CARDS LI ID LABEL

CARDS	LI	ID	LABEL	TA STATEMENT	LOC	F	JKB	Y	ACTES
•	UC144			DIV W(MDAY)	00137	23C30	C107C		
•	OC145			STR Q*W(GMT4)	00140	14030	C0762		
•	UC146			RSH AQ*30D	00141	C3000	C0036		
•	UC147			MUL W(SDAY)	00142	22030	C1071		
•	UC150			LSH AQ*2*QPOS	00143	C7200	C0C02		
•	UC151			ACD A*1	00144	20000	C0001		
•	OC152			STR A*W(GMT6)	00145	15030	C0765		
•	UC153			ENT A*W(CELTIME)*ANEG	00146	11730	63133		
•	UC154			JP \$+3	00147	610C0	CC152		
•	OC155			ENT A*W(GMT2)	00150	11030	C0757		
•	OC156			STR A*CPW(GMT2)	00151	15070	00757		
•	OC157			ENT B4*L(OISTAD)	00152	12410	C1545		
•	OC160			ENT A*L(OISTOIFAD)	00153	11C10	C155C		
•	OC161			STR A*L(SETINTAD)	00154	15010	C1131		
•	OC162			RJP INTERPOL	00155	65C00	C1152		
•	OC163			STR A*W(INITIAL18)	00156	15C30	C10CC		
•	OC164			ENT A*W(JULIANDAY)	00157	11C30	C1536		
•	OC165			STR A*W(INITIAL3)	00160	15030	C0635		
•	UC166			ENT A*L(OAY)	00161	11C10	6315C		
•	OC167			STR A*W(INITIAL12)	00162	15C30	C0646		
•	OC170			ENT A*U(IDENT)	00163	11020	01533		
•	OC171			LSH A*1	00164	C6C00	C0001		
•	OC172			SUB A*2	00165	21C00	C00C2		
•	OC173			STR A*L(SAIGON)	00166	15C10	C1551		
•	OC174			ENT B4*L(SAIGON)	00167	12410	C1551		
•	OC175			CL B5*	00170	12500	C00CC		
•	OC176		SETBOOY	ENT A*W(MERCURY+B4)	00171	11034	C1014		
•	OC177			STR A*W(INITIAL21+B5)	00172	15035	01011		
•	OC200			BSK B4*777	00173	71400	00777		
•	OC201			BSK B5*1	00174	71500	C0001		
•	OC202			JP SETBOOY	00175	610C0	CC171		
•	OC203			RJP U(INTERCOM)	00176	65C20	63426		
•	OC204			U-TAG INITIALJD*0	00177	C0625	0000C		
•	OC205			RJP U(INTERCOM)	00200	65020	63426		
•	OC206			U-TAG RGTASC*0	00201	C0647	C00CC		
•	OC207			RJP U(INTERCOM)	00202	65C20	63426		
•	OC210			U-TAG DLN*0	00203	C0702	C00CC		
•	OC211			RJP U(INTERCOM)	00204	65C20	63426		
•	OC212			U-TAG INITIALDAT*0	00205	CC636	C00CC		
•	OC213			RJP U(INTERCOM)	00206	65C20	63426		
•	OC214			U-TAG GMT*0	00207	C0735	C00CC		
•	OC215			RJP U(INTERCOM)	0021C	65C20	63426		
•	OC216			U-TAG INITIALDIS*0	00211	C0770	C00CC		
•	OC217			RJP U(INTERCOM)	00212	65020	63426		
•	OC220			U-TAG INITIALROD*0	00213	C1001	C00CC		
•	OC221		AIRPORT	RPL Y+1*L(PLANETINIT)	00214	36010	C0CC2		
•	OC222		A	JP A	00215	61C70	C0CCC		
•	OC223		PLANETCONT	ENTRY	00216	61C00	C0CCC		
•	OC224			RPL Y+1*L(PLANETCONT)	00217	36010	00216		
•	OC225			RJP DAYFIND	0022C	65000	C0312		

FRACHTMAN*8/4/64

PLANETRACK

CARDS	LI	IO	LABEL	TA STATEMENT	LCC	F	JKR	Y	NCTES
.	0C226			ENT B4*L(RAAD)	00221	12410	C1543		
.	0C227			ENT A*L(RAOIFAO)	00222	11010	C1546		
.	0C230			STR A*L(SETINTAO)	00223	15010	C1131		
.	0C231			RJP INTERPOL	00224	65000	C1152		
.	0C232			RSH AQ*300	00225	C3000	C0036		
.	0C233			MUL W(REVSRAOIAN)	00226	22030	C1057		
.	0C234			JP MOOSE*QPOS	0C227	60200	CC231		
.	0C235			ADD A*1	00230	20000	CC001		
.	0C236			STR A*W(IRA)	00231	15030	63002		
.	0C237		MOOSE	ENT Q*W(NUMGERIV)	00232	10030	C1137		
.	0C240			MUL W(RORSEC)	00233	22030	C1C74		
.	0C241			ENT B5*4	00234	12500	CC004		
.	0C242			RJP ROUNDOFF	00235	65000	C1512		
.	0C243			STR A*W(RA00T)	00236	15030	63007		
.	0C244			ENT B4*L(OECAO)	00237	12410	C1544		
.	0C245			ENT A*L(OECOIFAO)	00240	11010	C1547		
.	0C246			STR A*L(SETINTAO)	00241	15010	C1131		
.	0C247			RJP INTERPOL	00242	65000	C1152		
.	0C250			RSH AQ*300	00243	C3000	CC036		
.	0C251			MUL W(REVSRAOIAN)	00244	22030	C1057		
.	0C252			JP NEGDEC*ANEG	00245	60700	0053C		
.	0C253			JP BEAVER*QPOS	00246	60200	CC25C		
.	0C254			ADD A*1	00247	20000	CC001		
.	0C255		BEAVER	STR A*W(OEC)	00250	15030	63003		
.	0C256			ENT Q*W(NUMGERIV)	00251	10030	C1137		
.	0C257			MUL W(RORSEC)	00252	22030	C1074		
.	0C260			ENT B5*4	00253	12500	CC004		
.	0C262			RJP ROUNDOFF	00254	65000	C1512		
.	0C263			STR A*W(DEC00T)	00255	15030	6301C		
.	0C264			ENT B4*L(OISTAO)	00256	12410	C1545		
.	0C265			ENT A*L(OISTOIFAO)	00257	11010	C155C		
.	0C266			STR A*L(SETINTAO)	00260	15010	C1131		
.	0C267			RJP INTERPOL	00261	65000	C1152		
.	0C270			ENT B5*U(OENT)	00262	12520	C1533		
.	0C271			SUB A*W(PLANRAD+B5)	00263	21035	C1522		
.	0C272			CP A*	00264	15040	CC00C		
.	0C273			STR A*W(RAOIUS)	00265	15030	63006		
.	0C274			ENT Q*W(NUMGERIV)	00266	10030	C1137		
.	0C275			MUL W(AUDN*SEC)	00267	22030	C1075		
.	0C276			ENT B5*110	00270	12500	CC013		
.	0C277			RJP LEFRNOOFF	00271	65000	C1502		
.	0C300		SEAPORT	STR A*W(RAOIUS00T)	00272	15030	63011		B24 NM/SEC
.	0C301		FLATNEG	EXIT	00273	61010	CC216		
.	0C302			CP A*	00274	15040	CC00C		
.	0C303			SUB A*W(HALFDAY)*APUS	00275	21630	C1C56		
.	0C304			JP LESSONE	00276	61000	CC31C		
.	0C305			RSH AQ*300	00277	C3000	CC036		
.	0C306			DIV W(HALFOAY)	00300	23030	C1C56		
.	0C307			LSH AQ*300	00301	C7000	CC036		
.	0C307			SUR A*1	00302	21000	CC001		

FRACHTMAN*8/4/64

CARDS	LI ID	LAREL	TA STATEMENT	PLANETRACK	LOC	F	JKB	Y	NC	TES
.	0C31C		JP	TWOLESS*AZERO	00303	60400	00306			
.	0C311		JP	TWOLESS*ANEG	00304	60700	00306			
.	0C312		ENT	A*-3*SKIP	00305	11140	77774			
.	0C313	TWOLESS	ENT	A*-2	00306	11040	77775			
.	0C314		JP	STORE	00307	61000	00352			
.	0C315	LCSSONE	ENT	A*-1	00310	11040	77776			
.	0C316		JP	STORE	00311	61000	00352			
.	0C317	DAYFINO	ENTRY		00312	61000	00000			
.	0C320		ENT	A*W(CELTIME)	00313	11030	63133			
.	00321		ADD	A*W(DEL TATEE)*APOS	00314	20630	63316			
.	0C322		JP	NEGTIME	00315	61000	00327			
.	0C323		LSH	A*1*APOS	00316	66600	00001			
.	0C324		SUB	A*W(KE)*SKIP	00317	21130	0111C			
.	0C325		STR	A*W(IP)*SKIP	00320	15130	01117			
.	0C326		STR	A*W(IP)*SKIP	00321	15130	01117			
.	0C327		ENT	A*O*SKIP	00322	11100	00000			
.	0C330		ENT	A*1	00323	11000	00001			
.	0C331		JP	TIMESLIDE	00324	61000	00335			
.	0C332	DAYINDEX	0		00325	00000	00000			
.	0C333	DAYINCRMNT	0		00326	00000	00000			
.	0C334	NEGTIME	LSH	A*1*APOS	00327	66600	00001			
.	0C335		SUB	A*W(KE)*SKIP	00330	21130	0111C			
.	0C336		STR	A*W(IP)*SKIP	00331	15130	01117			
.	0C337		STR	A*W(IP)*SKIP	00332	15130	01117			
.	0C340		ENT	A*-2*SKIP	00333	11140	77775			
.	0C341		ENT	A*-1	00334	11040	77776			
.	0C342	TIMESLIDE	STR	A*W(DAY INOEX)	00335	15030	00325			
.	0C343		ENT	A*W(CELTIME)*APOS	00336	11630	63133			
.	0C344		JP	FLATNEG	00337	61000	00274			
.	0C345		SUB	A*W(HALFOAY)*APOS	00340	21630	01056			
.	0C346		JP	LESSONE	00341	61000	0031C			
.	0C347		KSH	AQ*300	00342	03000	00036			
.	0C350		DIV	W(HALFOAY)	00343	23030	01056			
.	0C351		LSH	AQ*300	00344	07000	00036			
.	0C352		SUB	A*1	00345	21000	00001			
.	0C353		JP	CERO*AZERO	00346	60400	00351			
.	0C354		JP	CERO*ANEG	00347	60700	00351			
.	0C355		ENT	A*1*SKIP	00350	11100	00001			
.	0C356	CERO	ENT	A*O	00351	11000	00000			
.	0C357	STORE	STR	A*W(DAY INCRMNT)	00352	15030	00326			
.	0C360		ADD	A*W(WHOLEYEAR)	00353	20030	01535			
.	0C361		ADD	A*24373000	00354	20030	03454			
.	0C362		ADD	A*1(DAY)	00355	20010	6315C			
.	0C363		STR	A*W(JULIANDAY)	00356	15030	01536			
.	0C364		ADD	A*W(DAY INOEX)	00357	20030	00325			
.	0C365		SUB	A*24381510	00360	21030	03455			
.	0C366		SUB	A*W(DAY INCRMNT)	00361	21030	00326			
.	0C367		RSH	AQ*300	00362	03000	00036			
.	0C37C		DIV	320	00363	23000	0004C			

JD DEC 31 196C GNWCH NCCN

JD MAY 1 1963 GNWCH NOON

PLANETRACK FRACHTMAN*8/4/64

CARDS	LI	IO LABEL	TA STATEMENT	LOC	F	JKB	Y	ACTES
.	0C371		STR Q*W(TAPEBLOCK)	00364	14030	0154C		
.	0C372		STR A*W(SLOTBLOCK)	00365	15030	C1541		
.	0C373		ENT Q*W(SLOTBLOCK)	00366	10030	C1541		
.	0C374		MUL 12	00367	22000	00012		
.	0C375		ADD Q*AEPEM*3220	00370	26000	02255		
.	0C376		STR Q*L(RAAO)	00371	14010	C1543		
.	0C377		ADD Q*1	00372	26000	C0001		
.	0C400		STR Q*L(RAOIFAO)	00373	14010	C1546		
.	0C401		ADD Q*1	00374	26000	CC0C1		
.	0C402		STR Q*L(OECAO)	00375	14010	C1544		
.	0C403		ADD Q*1	00376	26000	CC0C1		
.	0C404		STR Q*L(OECDIFAD)	00377	14010	01547		
.	0C405		ADD Q*1	00400	26000	CC0C1		
.	0C406		STR Q*L(OISTAD)	00401	14010	01545		
.	0C407		ADD Q*1	00402	26000	CC001		
.	0C410		STR Q*L(OISTDIFAD)	00403	14010	0155C		
.	0C411		EXIT	00404	61010	C0312		
.	0C412	STATUSCK	ENTRY	00405	61000	C00CC		
.	0C413		STR EPHEM*W(TAPSTAT)	00406	17670	C0525		
.	0C414		ENT A*U(TAPSTAT)	00407	11020	00525		
.	0C415		RSH A*11D	00410	C2000	00013		
.	0C416		STR A*W(TAPSTAT+1)	00411	15030	00526		
.	0C417		RPL Y+1*L(STATUSCK)	00412	36010	00405		
.	0C420		ENT B3*L(TAPSTAT+1)	00413	12310	C0526		
.	0C421		RIL	00414	60000	0000C		
.	0C422		JP STATACT+B3	00415	61003	00416		
.	0C423	STATACT	JP BUST	00416	61000	00477		
.	0C424		JP BUST	00417	61000	00477		
.	0C425		JP BUST	00420	61000	00477		
.	0C426		JP BUST	00421	61000	00477		
.	0C427		JP BUST	00422	61000	00477		
.	0C430		JP BUST	00423	61000	00477		
.	0C431		JP BUST	00424	61000	00477		
.	0C432		JP BUST	00425	61000	CC477		
.	0C433		EXIT	00426	61010	C0405		
.	0C434		JP BUST	00427	61000	00477		
.	0C435		JP BUST	00430	61000	00477		
.	0C436		JP ENOFIL	00431	61000	C0473		
.	0C437		JP CANTFINO	00432	61000	C0436		
.	0C440		JP BUST	00433	61000	00477		
.	0C441		JP BUST	00434	61000	00477		
.	0C442		JP BUST	00435	61000	CC477		
.	0C443	CANTFINO	EX-FCI EPHEM*W(REWINONC)	00436	13670	C1C63		
.	0C444		ENT A*U(IOENT)	00437	11020	C1533		
.	0C445		ADD A*60	00440	20000	CCC6C		
.	0C446		LSH A*22	00441	C6000	CC022		
.	0C447		ACC A*5100400512	00442	20C30	C3456		
.	0C450		STR A*W(NODATA1)	00443	15030	C0612		
.	0C451		ENT B4*L(MONTHPRINT)	00444	12410	C1041		
.	0C452		ENT A*W(YEARPRINT+R4)	00445	11034	C1C77		

4 SEQ ERR SYNC 20
 5 REWINING 24
 6 CHAR COUNT 30
 7 ILLEGAL 34
 10 40 NCRPAL
 11 REPEAT 44
 12 SEQ ERR CCNT 50
 13 ECF 54
 14 EOT 60
 15 NCNSUCH
 16 ABN F C 70
 17 INTERLOCK 74

PLANETRACK FRACHTMAN#8/4/64

NOTES

CARDS	LI	ID	LABEL	TA	STATEMENT	LUC	F	JKB	Y	NOTES
	0C453				STR A*(NUDATA2)	0C446	15C30	CC616		
	0C454				ENT B4*(YEARMONTH)	0U447	12410	63147		
	0C455				ENT A*(MONTHPRINT+B4)	0C450	11C34	C1C41		
	0C456				RPL A*(MONTHPRINT+B4)	0C451	24C30	CC616		
	0C457				CL A*	0C452	11000	CC000		
	0C460				FNT Q*(BARRIER)	0C453	10C10	CC474		
	0C461				U*IV 12	0C454	23C00	CC012		
	0C462				ADD A*60	0C455	20000	CC06C		
	0C463				STR A*(IMPERIAL)	0C456	15C20	C1537		
	0C464				CL A*	0C457	11C00	CC000		
	0C465				DIV 12	0C460	23C00	CC012		
	0C466				JP ALBERT*AZERO	0C461	60400	CC463		
	0C467				ADD A*60	0C462	20000	CC06C		
	0C470		ALBERT		LSH A*6	0C463	C6C00	CC006		
	0C471				ADD A*(IMPERIAL)	0C464	20020	C1537		
	0C472				LSH A*6	0C465	C6000	CC006		
	0C473				ADD A*3105000005	0C466	20C30	C3457		
	0C474				STR A*(NUDATA3)	0C467	15030	CC622		
	0C475				RJP U*INTERCOM)	0C470	65020	63426		
	0C476				U-TAG NUDATA*0	0C471	C0610	CC000		
	0C477				JP L(PLANETINIT)	0C472	61C10	CC002		
	0C500		ENDFILE		RPL Y+1*(IMPERIAL)	0C473	36010	C1537		
	0C501		BARRIER		SUB A*80	0C474	21C00	CC01C		
	0C502				JP CANTFIND*AZERO	0C475	60400	CC436		
	0C503				JP TRYAGAIN	0C476	61000	CC04C		
	0C504		BUST		EX-FCT EPHM*(REMINDC)	0C477	13670	C1C63		
	0C505				ENT A*(TAPSTAT+1)	0C500	11C10	CC526		
	0C506				RSH A*1	0C501	C2000	CC001		
	0C507				ADD A*60	0C502	20C00	CC06C		
	0C510				LSH A*6	0C503	C6000	CC006		
	0C511				STR A*(TAPSTAT+2)	0C504	15C10	CC527		
	0C512				ENT A*(TAPSTAT+1)	0C505	11010	CC526		
	0C513				SEL CL*X77776	0C506	52040	77776		
	0C514				LSH A*2	0C507	C6C00	CC002		
	0C515				ADD A*60	0C510	20C00	CC06C		
	0C516				ADD A*(TAPSTAT+2)	0C511	20C10	CC527		
	0C517				STR A*(TAPERUST1+3)	0C512	15010	CC523		
	0C520				RJP U*INTERCOM)	0C513	65020	63426		
	0C521				U-TAG TAPERUST*0	0C514	C0516	CC000		
	0C522				JP L(PLANETINIT)	0C515	61010	CC002		
	0C523		TAPERUST		FD U*A	0C516	C6050	5C505		
	0C524				-U TAPERUST1	0C517	77777	CC52C		
	0C525		TAPERUST1		FD U*IIIC	0C520	16161	61C03		
	0C526				FD U*STATU	0C521	30310	63132		
	0C527				FD 2*S 51	0C522	30C50	53C61		
	0C530				-U -U	0C523	C5050	5C505		
	0C531		TAPSTAT		+U +U	0C524	77777	77777		
	0C532				+U +U	0C525	C0C00	CC000		
	0C533				+U +U	0C526	C0C00	CC000		

PLANETS

PLANETRACK FRACHTMAN#8/4/64

CARD	LI	ID LABEL	TA STATEMENT	LOC	F	JKB	Y	ACTES
	0C534	NFGOEC	JP BEAVER*QNEG	00530	60300	0025C		
	0C535		SUB A*1	00531	21000	CC001		
	0C536		JP BEAVER	00532	61000	CC25C		
	0C537	NJT(N	A00 A*1	00533	20000	00001		
	0C540		SUB A*(SLOTBLOCK)	00534	21030	01541		
	0C541		JP BLOCKAY*APOS	00535	60600	00553		
	0C542	BLOCKCEE	IN EPHEM*(EPHEM8)	00536	73670	00564		
	0C543		NO-UP	00537	12000	CC00C		
	0C544		EX-FCI EPHEM*(SRHIBIN)	00540	13670	0106C		
	0C545		NO-UP	00541	12000	CC00C		
	0C546		EX-FCI EPHEM*(TAPESEARCH)	00542	13670	01542		
	0C547		JP \$	00543	61000	00543		
	0C550		IN EPHEM*(EPHEMC)	00544	73670	00565		
	0C551	PATCH	ENT A*40	00545	11000	CC04C		
	0C552		EX-FCI EPHEM*(SRHIBIN)	00546	13670	0106C		
	0C553		RPL A+Y*(TAPESEARCH)	00547	24030	01542		
	0C554		EX-FCI EPHEM*(TAPESEARCH)	00550	13670	01542		
	0C555		JP \$	00551	61000	00551		
	0C556		JP NORMAL	00552	61000	00054		
	0C557	BLOCKAY	IN EPHEM*(EPHEMA)	00553	73670	00563		
	0C560		ENT A*-40	00554	11040	77737		
	0C561		EX-FCI EPHEM*(SRHIBIN)	00555	13670	0106C		
	0C562		RPL A+Y*(TAPESEARCH)	00556	24030	01542		
	0C563		EX-FCI EPHEM*(TAPESEARCH)	00557	13670	01542		
	0C564		JP \$	00560	61000	0056C		
	0C565		IN EPHEM*(EPHEM8)	00561	73670	00564		
	0C566		JP PATCH	00562	61000	00545		
	0C567	EPHEMA	U-TAG AEPHEM+3190*AEPHEM	00563	C252	01553		
	0C570	EPHEM8	U-TAG AEPHEM+6390*AEPHEM+320D	00564	C252	02253		
	0C571	EPHEMC	U-TAG AEPHEM+9590*AEPHEM+6400	00565	C3452	02753		
	0C572	BL0IES	FO O*A	00566	C6050	50505		
	0C573		-O 800IES1	00567	77777	0057C		
	0C574	800IES1	FO O*MERCU	00570	22122	71032		
	0C575		FO O*RY(1)	00571	27365	1614C		
	0C576		FO O* VEN	00572	C5053	31223		
	0C577		FO O*US(2)	00573	32305	1624C		
	0C600		FO O* MAR	00574	C5052	20627		
	0C601		FO O*S(4)	00575	30516	44005		
	0C602		FO O*JUPI	00576	C5173	22516		
	0C603		FO O*TER(5)	00577	31122	75165		
	0C604		FO O*) SA	00600	40050	530C6		
	0C605		FO O*TURN(00601	31322	72351		
	0C606		6640040332	00602	66400	40332		
	0C607		FO O*ANUS	00603	27062	3323C		
	0C610		FO O*(7)	00604	51674	CC505		
	0C611		FO O*NCPTU	00605	23122	53132		
	0C612		FO O*NE(8)	00606	23125	1704C		
	0C613		-U	00607	77777	77777		
	0C614	NU0ATA	FO O*A	00610	C6C50	50505		
	0C615		-O NU0ATA1	00611	77777	CC612		

6) CRLF U

PLANETRACK FRACHTMAN*8/4/64

CAROS	LI	IO LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTES
.	0C616	NUDDATA1	FD O*() E	00612	51054	00512		
.	0C617		FD O*PHEME	00613	25151	22212		
.	UC620		FD O*RTS F	00614	27163	00513		
.	0C621		FO O*OR	00615	24270	50505		
.	0C622	NUDDATA2	FD O*63/63	00616	66637	46663		
.	0C623		FC O* NOT	00617	5232	43105		
.	UC624		FD O*AMUNG	00620	06222	42314		
.	0C625		FD O* FIRS	00621	05131	6273C		
.	0C626	NUDDATA3	FD O*T	00622	31050	50505		
.	UC627		FC O*FILES	00623	13162	1123C		
.	0C630		-0	00624	77777	77777		
.	0C631	INITIALJO	FD O*A	00625	6050	50505		
.	0C632		U-TAG INITIAL2*INITIAL1	00626	0633	0627		
.	0C633	INITIAL1	FD O*JULIA	00627	17322	11606		
.	UC634		FD 2*N DAY	00630	23051	10636		
.	0C635		-0	00631	05050	50505		
.	0C636	INITIAL2	FD U*0	00632	77777	77777		
.	0C637		-0 INITIAL3	00633	11050	50505		
.	0C640	INITIAL3	0	00634	77777	06635		
.	0C641	INITIALOAT	FD O*A	00635	0000	0000C		
.	UC642		U-TAG INITIAL11*INITIAL10	00636	6050	50505		
.	UC643	INITIAL10	FD 3*OAY OF YEAR	00637	0644	0064C		
.	0C644		-0	00640	11063	60524		
.	0C645	INITIAL11	FD O*0	00641	13053	61206		
.	0C646		-0 INITIAL12	00642	27050	50505		
.	0C647	INITIAL12	0	00643	77777	77777		
.	0C650	RIGHTASC	FO O*A	00644	11050	50505		
.	UC651		U RAL	00645	77777	06646		
.	UC652		FO O*0	00646	0000	0000C		
.	UC653		FO O*0	00647	06050	50505		
.	UC654		FO O*A	00650	0000	00665		
.	UC655		0 RA3	00651	11050	50505		
.	UC656		FC O*0	00652	0000	00671		
.	UC657		U RA4	00653	06050	50505		
.	UC660		FO O*A	00654	0000	00672		
.	UC661		0 RA5	00655	11050	50505		
.	UC662		FD O*X2R23	00656	0000	0674		
.	0C663		0 RA6	00657	06050	50505		
.	0C664		FD O*A	00660	0000	00675		
.	UC665		-0 RA7	00661	35620	76263		
.	UC666	RAL	FC 3*RIGHT ASC	00662	0000	0677		
.	0C667		-0	00663	06050	50505		
.	0C670	RA2	U	00664	77777	0070C		
.	0C671	RA3	1505	00665	27161	41531		
.	UC672		-0	00666	05063	01005		
.				00667	05050	50505		
.				00670	77777	77777		
.				00671	0000	0000C		
.				00672	0000	01505		
.				00673	77777	77777		

CAROS	LI	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	0C673		RA4	0		00674	C0000	C0000	C0000	
.	0C674		RA5	2205		00675	C0000	C2205		
.	0C675			-0		00676	77777	77777		
.	0C676		RA6	0		00677	C0000	C0000		
.	0C677		RA7	30		00700	C0000	C003C		
.	0C700			-0		00701	77777	77777		
.	0C701		OLN	0	0*A	00702	C6050	50505		
.	0C702			0	DLN1	00703	C0000	072C		
.	0C703			0	0*0	00704	11050	50505		
.	0C704			0	OLN2	00705	C0000	0724		
.	0C705			0	0*A	00706	C6050	50505		
.	0C706			0	DLN3	00707	C0000	0725		
.	0C707			0	0*0	00710	11050	50505		
.	0C710			0	OLN4	00711	C0000	0727		
.	0C711			0	0*A	00712	C6050	50505		
.	0C712			0	DLN5	00713	C0000	073C		
.	0C713			0	0*X2823	00714	35620	76263		
.	0C714			0	DLN6	00715	C0000	0732		
.	0C715			0	0*A	00716	C6050	50505		
.	0C716			-0	OLN7	00717	77777	0733		
.	0C717		OLN1	0	3*DECLINATION	00720	11121	02116		
.						00721	23063	11624		
.						00722	23050	50505		
.						00723	77777	77777		
.	0C720			-0		00724	C0000	C000C		
.	0C721		OLN2	0		00725	C0000	01105		
.	0C722		OLN3	1105		00726	77777	77777		
.	0C723			-0		00727	C0000	C000C		
.	0C724		OLN4	0		00730	C0000	07205		
.	0C725		OLN5	7205		00731	77777	77777		
.	0C726			-0		00732	C0000	C000C		
.	0C727		OLN6	0		00733	C0000	0052		
.	0C730		OLN7	52		00734	77777	77777		
.	0C731			-0		00735	C6050	50505		
.	0C732		GMT	0	0*A	00736	C0000	0753		
.	0C733			0	GMT1	00737	11050	50505		
.	0C734			0	0*0	00740	C0000	0757		
.	0C735			0	GMT2	00741	C6050	50505		
.	0C736			0	0*A	00742	C0000	076C		
.	0C737			0	GMT3	00743	11050	50505		
.	0C740			0	0*0	00744	C0000	0762		
.	0C741			0	GMT4	00745	C6050	50505		
.	0C742			0	0*A	00746	C0000	0763		
.	0C743			0	GMT5	00747	35620	76263		
.	0C744			0	0*X2823	00750	C0000	0765		
.	0C745			0	GMT6	00751	C6050	50505		
.	0C746			0	0*A	00752	77777	0766		
.	0C747			-0	GMT7	00753	32231	63312		
.	0C750		GMT1	0	3*UNIVERSAL TIME	00754	27300	62105		
.						00755	31162	21205		

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CARDS	L1 ID LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTES
.	0C751	-0	00756	7777	7777	7777	
.	0C752	0	00757	C000	C000	C000	
.	0C753	1505	00760	C000	C1505		
.	0U754	-0	00761	7777	7777		
.	0C755	0	00762	C000	C000	C000	
.	0C756	2205	00763	C000	02205		
.	0C757	-0	00764	7777	7777		
.	0C760	0	00765	C000	C000	C000	
.	0C761	30	00766	C000	00030		
.	0C762	-0	00767	7777	7777		
.	0C763	FD 0*A	00770	C6050	50505		
.	0C764	U-TAG INITIAL17*INITIAL16	00771	00776	00772		
.	0C765	FD 0*OISTA	00772	11163	03106		
.	0C766	FD U*NCE	00773	23101	20505		
.	0C767	FD 0*A U	00774	C6053	20505		
.	0C770	-0	00775	7777	7777		
.	0C771	FD 0*X7B24	00776	35670	76264		
.	0C772	-0 INITIAL18	00777	7777	01000		
.	0C773	0	01000	C000	00000		
.	0C774	FD 0*A	01001	C6050	50505		
.	0C775	U-TAG INITIAL20*INITIAL19	01002	C1007	01003		
.	00776	FD 3*PLANET	01003	25210	62312		
.			01004	31050	50505		
.			01005	C5050	50505		
.	0C777	-0	01006	7777	7777		
.	01000	FD 0*A	01007	C6050	50505		
.	01001	-0 INITIAL21	01010	7777	C1011		
.	01002	0	01011	C000	C000		
.	01003	0	01012	C000	C000		
.	01004	-0	01013	7777	7777		
.	01005	FD 2*MERCURY	01014	22122	71032		
.			01015	27360	50505		
.	01006	FD 2*VENUS	01016	33122	33230		
.	01007	FD 2*EARTH	01017	C5050	50505		
.			01020	12062	73115		
.	01010	FD 2*MARS	01021	C5050	50505		
.			01022	22062	73005		
.	01011	FD 2*JUPITER	01023	C5050	50505		
.			01024	17322	51631		
.	01012	FD 2*SATURN	01025	12270	50505		
.			01026	30063	13227		
.	01013	FD 2*URANUS	01027	23050	50505		
.			01030	32270	62332		
.	01014	FD 2*NEPTUNE	01031	30050	50505		
.			01032	23122	53132		
.	01015	FD 0*0	01033	23120	50505		
.	01016	11 PLAN	01034	11050	50505		
.	01017	1	01035	C0011	C1040		
.	01020	80	01036	C0000	C0001		
.			01037	C0000	CC010		

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PLANETRACK

CARDS	LI	IO LABEL	TA STATEMENT	LOC	F	JKB	Y	ACTES
	01021	PLAN	U	0104C	C0000	C0000	C0000	
	01022	MONTHPRINT	O	01041	C0000	C0000	C0000	
	01023			01042	C0610	00000		
	01024			01043	C0620	00000		
	01025			01044	C0630	C0000		
	01026			01045	C0640	00000		
	01027			01046	C0650	00000		
	01030			01047	C0660	C0000		
	01031			01050	C0670	C0000		
	01032			01051	C0700	00000		
	01033			01052	C0710	C0000		
	01034			01053	61600	C0000		
	01035			01054	61610	C0000		
	01036			01055	61620	00000		
	01037	HALFOAY		01056	10000	C0000		
	01040	REVSRAOIAN	2427630154	01057	24276	30154		DEC C-636661977829
	01041	SRHIBIN	5600000002	01060	56C00	C0002		1 B SEARCH HIOENSITY BINA RY
	01042	INTERUPT	RJP STATUSCK	01061	65000	004C5		
	01043	IGNORE	6000000000	01062	60000	00000		
	01044	REWINONO	2010000002	01063	20100	C0002		1 B NC INT
	01045	SRAO	3266677126	01064	32666	77126		DEC 13750.987815 43
	01046	HRAD	1030124435	01065	10301	24435		200/PI DEC .26179939829 PI
	01047	MINSRAD	2167643241	01066	21676	43241		DEC .55850536829 12
	01050	HUAY	1252525250	01067	12525	25250		DEC .33333333829 8/ 24 R32
	01051	MUAY	2660266026	01070	26602	66026		DEC .71111111829 2E 10/1440
	01052	SUAY	2506000000	01071	25060	00C00		DEC 86400.000812
	01053	SECSRAD	2304045527	01072	23040	45527		DEC .59573905829 2E
	01054	SARAD	3113343172	01073	31133	43172		DEC 13P1/432C0 206264.81811 64
	01055	RDRSEC	3021344241	01074	30213	44241		DEC 8C0/PI .75851852829 2E1
	01056	AUONMSEC	3515643656	01075	35156	43656		DEC 6/86400 934.91819
	01057	TWOPIE	3110375523	01076	31103	75523		DEC 6.2831853826
	01060	YCARPRINT	0000746661	01077	C0007	46661		
	01061		0000746662	01100	C0007	46662		
	01062		0000746663	01101	C0C07	46663		
	01063		0000746664	01102	C0C07	46664		
	01064		0000746665	01103	C0C07	46665		
	01065		0000746666	01104	C0C07	46666		

CARDS	L1 IO LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTFS
	01066	0000746667	01105	C0007	46667		
	01067	0000746670	01106	C0007	46670		
	01070	0000746671	01107	C0007	46671		
	01071 KEY	4000000000	01110	C0000	C0000		
	01072 FIRSTDIFF	0	01111	C0000	C0000		
	01073 BETA	0	01112	C0000	C0000		
	01074 GAMMA	0	01113	C0000	C0000		
	01075 DELTA	0	01114	C0000	C0000		
	01076 EPSILON	0	01115	C0000	C0000		
	01077 FUNCTION	0	01116	C0000	C0000		
	01100 P	0	01117	C0000	C0000		
	01101 HALF	2000000000	01120	20000	C0000		
	01102 OMINB	0	01121	C0000	C0000		
	01103 DMIN2CPLB	0	01122	C0000	C0000		
	01104 EP28M2DMA	0	01123	C0000	C0000		
	01105 BESSEL	0	01124	C0000	C0000		
	01106	0	01125	C0000	C0000		
	01107	0	01126	C0000	C0000		
	01110	0	01127	C0000	C0000		
	01111	0	01130	C0000	C0000		
	01112 SETINTAO	0	01131	C0000	C0000		
	01113 PSQMP	0	01132	C0000	C0000		
	01114 PSQMP6	0	01133	C0000	C0000		
	01115 THIRO	1252525252	01134	12525	25252		
	01116 SIXTH	0525252525	01135	05252	52525		
	01117 KENNEY	0	01136	C0000	C0000		
	01120 NUMBERIV	0	01137	C0000	C0000		
	01121 BESSEL3	ENT Q*-12	01140	10040	77765		
	01122	RPL Y+Q*(SETINTAO)	01141	34010	01131		
	01123	ENT 83*(SETINTAD)	01142	12310	01131		
	01124	CL Q*	01143	10000	00000		
	01125	JP MUNICH	01144	61000	01164		
	01126 FRESSEL	0	01145	C0000	C0000		
	01127	0	01146	C0000	C0000		
	01130	0	01147	C0000	C0000		
	01131	0	01150	C0000	C0000		
	01132	0	01151	C0000	C0000		
	01133 INTERPOL	ENTRY	01152	61000	00000		
	01134	ENT Q*2	01153	10000	C0002		
	01135	COM Q*(IOENT)*YLESS	01154	C4220	01533		
	01136	JP BESSEL3	01155	61000	01140		
	01137	ENT Q*-24	01156	10040	77753		
	01140	RPL Y+Q*(SETINTAO)	01157	34010	C1131		
	01141	ENT 83*(SETINTAD)	01160	12310	C1131		
	01142	ENT A*(O+B3)	01161	11033	C0000		
	01143	STR A*(FIRSTOIFF)	01162	15030	01111		
	01144	ENT 83*12+B3	01163	12303	C0012		
	01145 MUNICH	ENT A*(O+B3)	01164	11033	C0000		
	01146	STR A*(BETA)	01165	15030	01112		
	01147	ENT 83*12+B3	01166	12303	C0012		

CARDS	L1 ID LABEL	TA STATEMENT	LOC	F JKB Y	NOTES
.	01150	ENT A*(U+B3)	01167	11033	0000C
.	01151	STR A*(GAMMA)	01170	15030	01113
.	01152	ENT B3*12+B3	01171	12303	00012
.	01153	ENT A*(O+B3)	01172	11033	0000C
.	01154	STR A*(DELTA)*QNEG	01173	15330	01114
.	01155	JP EGRESS	01174	61000	0120C
.	01156	ENT B3*12+B3	01175	12303	00012
.	01157	ENT A*(O+B3)	01176	11033	0000C
.	01160	STR A*(EPSILON)	01177	15030	01115
.	01161	ENT A*(DELTA)	01200	11030	01114
.	01162	SUB A*(BETA)	01201	21030	01112
.	01163	STR A*(DMINB)	01202	15030	01121
.	01164	ADD A*(DMINB)	01203	20030	01121
.	01165	STR A*(BESSEL)	01204	15030	01124
.	01166	ENT A*(DELTA)	01205	11030	01114
.	01167	ADD A*(BETA)	01206	20030	01112
.	01170	SUB A*(GAMMA)	01207	21030	01113
.	01171	SUB A*(GAMMA)	01210	21030	01113
.	01172	STR A*(OMIN2CPLB)	01211	15030	01122
.	01173	JP DIFF4ZERO*QPOS	01212	60200	01364
.	01174	ENT A*(EPSILON)	01213	11030	01115
.	01175	SUB A*(FIRSTDIFF)	01214	21030	01111
.	01176	SUB A*(BESSEL)	01215	21030	01124
.	01177	STR A*(EP28M2DMA)	01216	15030	01123
.	01200	ENT Q*(P)	01217	10030	01117
.	01201	MUL W*(GAMMA)	01220	22030	01113
.	01202	LSH AQ*1	01221	7000	00001
.	01203	STR A*(BESSEL+1)	01222	15030	01125
.	01204	STR A*(BESSEL)*APOS	01223	15630	01124
.	01205	JP NEGRESS1	01224	61000	01466
.	01206	LSH AQ*290	01225	7000	00035
.	01207	SEL CL*(KEY)	01226	52030	0111C
.	01210	STR A*(FBESSEL)	01227	15030	01145
.	01211	ENT Q*(P)	01230	15030	01146
.	01212	ENT Q*(P)	01231	10030	01117
.	01213	MUL W*(P)	01232	22030	01117
.	01214	ENT B5*1	01233	12500	00001
.	01215	RJP LEFRNDOFF	01234	65000	01502
.	01216	SUB A*(P)	01235	21030	01117
.	01217	STR A*(PSQMP)	01236	15030	01132
.	01220	RSH AQ*300	01237	3000	00036
.	01221	MUL W*(DMINB)	01240	22030	01121
.	01222	RSH AQ*1	01241	3000	00001
.	01223	STR A*(BESSEL+2)*APOS	01242	15630	01126
.	01224	JP NEGRESS2	01243	61000	01471
.	01225	LSH AQ*29D	01244	7000	00035
.	01226	SEL CL*(KEY)	01245	52030	0111C
.	01227	STR A*(FBESSEL+2)	01246	15030	01147
.	01230	ENT A*(PSQMP)	01247	11030	01132
.	01231	RSH AQ*300	01250	3000	00036

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CAROS	L1	IO LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTES
.	01232		DIV 6*AZERO	01251	23400	00006		
.	01233		JP REMAINDER	01252	61000	01366		
.	01234	LINCOLN	STR Q*W(PSQMP6)	01253	14030	01133		
.	01235		ENT Q*W(P)	01254	10030	01117		
.	01236		SUB Q*W(HALF)	01255	27030	0112C		
.	01237		MUL W(PSQMP6)	01256	22030	01133		
.	01240		RJP LEFRNOOFF	01257	65000	01502		
.	01241		RSH AQ*300	01260	30000	00036		
.	01242		MUL W(OMIN2CPLB)	01261	22030	01122		
.	01243		LSH AQ*1	01262	07000	00001		
.	01244		STR A*W(BESSEL+3)*APOS	01263	15630	01127		
.	01245		JP NEGBESS3	01264	61000	01474		
.	01246		LSH AQ*290	01265	07000	00035		
.	01247		SEL CL*W(KEY)	01266	52030	0111C		
.	01250	STOR3	STR A*W(FBESSEL+3)	01267	15030	0115C		
.	01251		ENT A*W(EP28M2DMA)*ANOT	01270	11530	01123		
.	01252		JP NOFOURTH	01271	61000	01361		
.	01253		ENT Q*W(PSQMP6)	01272	10030	01133		
.	01254		SUB Q*W(THIRO)	01273	27030	01134		
.	01255		MUL W(PSQMP)	01274	22030	01132		
.	01256		RJP LEFRNOOFF	01275	65000	01502		
.	01257		RSH AQ*300	01276	30000	00036		
.	01260		MUL W(EP28M2DMA)	01277	22030	01123		
.	01261		RSH AQ*2	01300	30000	00002		
.	01262		STR A*W(BESSEL+4)*APOS	01301	15630	0113C		
.	01263		JP NEGBESS4	01302	61000	01477		
.	01264		LSH AQ*290	01303	07000	00035		
.	01265		SEL CL*W(KEY)	01304	52030	0111C		
.	01266	STOR4	STR A*W(FBESSEL+4)	01305	15030	01151		
.	01267		ENT A*W(FBESSEL)	01306	11030	01145		
.	01270		SEL CP*W(FRESSEL+2)	01307	51030	01147		
.	01271		JP FLOTEST1*APOS	01310	60600	0140C		
.	01272	NUFLO1	ENT Q*W(BESSEL+2)	01311	10030	01126		
.	01273	FIX1	RPL Y+Q*W(BESSEL)	01312	34030	01124		
.	01274		ENT A*W(FBESSEL+2)	01313	11030	01147		
.	01275		RPL A+Y*W(FBESSEL)	01314	24030	01145		
.	01276		SEL CP*W(FBESSEL+3)	01315	51030	0115C		
.	01277		JP FLOTEST2*APOS	01316	60600	01422		
.	01300	NUFLO2	ENT Q*W(BESSEL+3)	01317	10030	01127		
.	01301	FIX2	RPL Y+Q*W(BESSEL)	01320	34030	01124		
.	01302		ENT A*W(FBESSEL+3)	01321	11030	0115C		
.	01303		RPL A+Y*W(FBESSEL)	01322	24030	01145		
.	01304		SEL CP*W(FRESSEL+4)	01323	51030	01151		
.	01305		JP FLOTEST3*APOS	01324	60600	01444		
.	01306	NUFLO3	ENT Q*W(BESSEL+4)	01325	10030	0113C		
.	01307	FIX3	RPL Y+Q*W(BESSEL)	01326	34030	01124		
.	01310		ENT A*W(FBESSEL+4)	01327	11030	01151		
.	01311		RPL A+Y*W(FBESSEL)	01330	24030	01145		
.	01312		ENT Q*W(P)	01331	10030	01117		
.	01313		SUB Q*W(HALF)	01332	27030	0112C		

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CARDS	LI	ID LABEL	TA STATEMENT	LOC	F	JKB	Y	NC	TES
.	01314		MUL W(OMINB)	01333	22030	01121			
.	01315		CL B5	01334	12500	0000C			
.	01316		RJP LEFRNOOFF	01335	65000	01502			
.	01317		STR A*(KENNEDY)	01336	15030	01136			
.	01320		ENT Q*(PSQMP)	01337	10030	01132			
.	01321		ADD Q*(SIXTH)	01340	26030	01135			
.	01322		MUL W(DMIN2CPLB)	01341	22030	01122			
.	01323		RJP LEFRNOOFF	01342	65000	01502			
.	01324		ADD A*(KENNEDY)	01343	20030	01136			
.	01325		ADD A*(GAMMA)	01344	20030	01113			
.	01326		STR A*(NUMOERIV)	01345	15030	01137			
.	01327		ENT A*(FBESSEL)*APOS	01346	11630	01145			
.	01330		JP MINUS	01347	61000	01355			
.	01331		LSH A*1*ANEG	01350	67000	00001			
.	01332		ENT A*(BESSEL)*SKIP	01351	11130	01124			
.	01333		RPL Y+1*(BESSEL)	01352	36030	01124			
.	01334	SUM	ADD A*(O+B4)	01353	20034	0000C			
.	01335		EXIT	01354	61010	01152			
.	01336	MINUS	LSH A*1*APOS	01355	66600	00001			
.	01337		ENT A*(BESSEL)*SKIP	01356	11130	01124			
.	01340		RPL Y-1*(BESSEL)	01357	37030	01124			
.	01341		JP SUM	01360	61000	01353			
.	01342	NOFOURTH	CL A*	01361	11000	0000C			
.	01343		STR A*(BESSEL*4)	01362	15030	0113C			
.	01344		JP STOR4	01363	61000	01305			
.	01345	DIFF4ZERO	STR Q*(EP2BM2OMA)	01364	14030	01123			
.	01346		JP PARTIAL	01365	61000	01217			
.	01347	REMAINDER	JP CIVIL*QPOS	01366	60200	01374			
.	01350		STR A*A	01367	15040	0000C			
.	01351		SUB A*3*APOS	01370	21600	00003			
.	01352		JP LINCORN	01371	61000	01253			
.	01353		SUR Q*1	01372	27000	00001			
.	01354		JP LINCORN	01373	61000	01253			
.	01355	CIVIL	SUB A*3*APOS	01374	21600	00003			
.	01356		JP LINCORN	01375	61000	01253			
.	01357		ADD Q*1	01376	26000	00001			
.	01360		JP LINCORN	01377	61000	01253			
.	01361	FLOTEST1	ENT A*(FBESSEL)*ANEG	01400	11730	01145			
.	01362		ADD A*(FBESSEL+2)*SKIP	01401	20130	01147			
.	01363		JP BOTHNEG1	01402	61000	01412			
.	01364		JP NOFLO1*APOS	01403	60600	01311			
.	01365		SEL CL*(KEY)	01404	52030	0111C			
.	01366		STR A*(FBCSSEL)	01405	15030	01145			
.	01367		ENT Q*(BCSSEL+2)	01406	10030	01126			
.	01370		ADD Q*1	01407	26000	00001			
.	01371		RPL Y+Q*(BESSEL)	0141C	34030	01124			
.	01372		JP FIX1+3	01411	61000	01315			
.	01373	BUTHNEG1	ADD A*(FBESSEL+2)	01412	20030	01147			
.	01374		JP NOFLO1*ANEG	01413	60700	01311			
.	01375		SEL SET*(KEY)	01414	50030	0111C			

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CARDS	L1	ID	LABEL	TA	STATEMENT	PLANETRACK	LOC	F	JKB	Y	NOTES
.	01376				STR A*(FBESSEL)		01415	15030	01145		
.	01377				ENT Q*(BESSEL+2)		01416	10030	01126		
.	01400				SUB Q*1		01417	27000	00001		
.	01401				RPL Y+Q*(BESSEL)		01420	34030	01124		
.	01402				JP FIX1+3		01421	61000	01315		
.	01403	FLATEST2			ENT A*(FBESSEL)*ANEG		01422	11730	01145		
.	01404				ADD A*(FBESSEL+3)*SKIP		01423	20130	01150		
.	01405				JP BOTHNEG2		01424	61000	01434		
.	01406				JP NOFLO2*APOS		01425	60600	01317		
.	01407				SEL CL*(KEY)		01426	52030	01110		
.	01410				STR A*(FBESSEL)		01427	15030	01145		
.	01411				ENT Q*(BESSEL+3)		01430	10030	01127		
.	01412				ADD Q*1		01431	26000	00001		
.	01413				RPL Y+Q*(BESSEL)		01432	34030	01124		
.	01414				JP FIX2+3		01433	61000	01323		
.	01415	BOTHNEG2			ADD A*(FBESSEL+3)		01434	20030	01150		
.	01416				JP NOFLO2*ANEG		01435	60700	01317		
.	01417				SEL SET*(KEY)		01436	50030	01110		
.	01420				STR A*(FBESSEL)		01437	15030	01145		
.	01421				ENT Q*(BESSEL+3)		01440	10030	01127		
.	01422				SUB Q*1		01441	27000	00001		
.	01423				RPL Y+Q*(BESSEL)		01442	34030	01124		
.	01424				JP FIX2+3		01443	61000	01323		
.	01425	FLATEST3			ENT A*(FBESSEL)*ANEG		01444	11730	01145		
.	01426				ADD A*(FBESSEL+4)*SKIP		01445	20130	01151		
.	01427				JP BOTHNEG3		01446	61000	01456		
.	01430				JP NOFLO3*APOS		01447	60600	01325		
.	01431				SEL CL*(KEY)		01450	52030	01110		
.	01432				STR A*(FBESSEL)		01451	15030	01145		
.	01433				ENT Q*(BESSEL+4)		01452	10030	01130		
.	01434				ADD Q*1		01453	26000	00001		
.	01435				RPL Y+Q*(BESSEL)		01454	34030	01124		
.	01436				JP FIX3+3		01455	61000	01331		
.	01437	BOTHNEG3			ADD A*(FBESSEL+4)		01456	20030	01151		
.	01440				JP NOFLO3*ANEG		01457	60700	01325		
.	01441				SEL SET*(KEY)		01460	50030	01110		
.	01442				STR A*(FBESSEL)		01461	15030	01145		
.	01443				ENT Q*(BESSEL+4)		01462	10030	01130		
.	01444				SUB Q*1		01463	27000	00001		
.	01445				RPL Y+Q*(BESSEL)		01464	34030	01124		
.	01446				JP FIX3+3		01465	61000	01331		
.	01447	NEGRESS1			LSH AQ*29D		01466	7000	00035		
.	01450				SEL SET*(KEY)		01467	50030	01110		
.	01451				JP STOR1		01470	61000	01227		
.	01452	NEGRESS2			LSH AQ*290		01471	7000	00035		
.	01453				SEL SET*(KEY)		01472	50030	01110		
.	01454				JP STOR2		01473	61000	01246		
.	01455	NEGRESS3			LSH AQ*29D		01474	7000	00035		
.	01456				SEL SET*(KEY)		01475	50030	01110		
.	01457				JP STUR3		01476	61000	01267		

CARDS	LI	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	01460		NEGRESS4		LSH AQ*29D	01477	C7000		C0035	
.	01461				SEL SET*(MIKEY)	01500	50030		0111C	
.	01462				JP STOR4	01501	61000		01305	
.	01463		LLEFRNDOFF		ENTRY	01502	61000		C000C	ENTER WITH 85 SET TO SHIFTS
.	01464				JP MIKE*ANEG	01503	60700		01507	
.	01465				LSH AQ*B5*QPOS	01504	07205		C000C	
.	01466				ADD A*1	01505	20000		00001	
.	01467				EXIT	01506	61010		01502	
.	01470		MIKE		LSH AQ*B5*ONEG	01507	C7305		0000C	
.	01471				SUB A*1	01510	21000		C0001	
.	01472				EXIT	01511	61010		01502	
.	01473		RUUNDOFF		ENTRY	01512	61000		C000C	ENTER WITH 85 SET TO SHIFTS
.	01474				JP MAX*ANEG	01513	60700		01517	
.	01475				RSH AQ*B5*QPOS	01514	C3205		0000C	
.	01476				ADD A*1	01515	20000		00001	
.	01477				EXIT	01516	61010		01512	
.	01500		MAX		RSH AQ*B5*ONEG	01517	C3305		0000C	
.	01501				SUB A*1	01520	21000		C0001	
.	01502				EXIT	01521	61010		01512	
.	01503		PLANRAO		0	01522	C0000		0000C	
.	01504				00000000427	01523	C0000		00427	CEC .00001664824 MER
.	01505				U000001266	01524	C0000		01266	C.39 CEC .00004138824 VEN
.	01506				0	01525	C0000		C000C	
.	01507				0000000665	01526	C0000		00665	CEC .00002610824 MAR
.	01510				0000017510	01527	C0000		1751C	S.53 .00047737824 JUP
.	01511				0000015171	01530	C0000		15171	ITER11.19 CEC .00040399824 SAT
.	01512				0000005121	01531	C0000		05121	URN9.47 DEC .00015742824 URA
.	01513				0000004711	01532	C0000		C4711	NUS3.69 CEC .00014931824 NEP
.	01514		TIDENT		0	01533	C0000		C000C	TUNE3.50
.	01515		YKREMAIN		0	01534	C0000		C000C	
.	01516		WHOLEYEAR		0	01535	C0000		C000C	
.	01517		JULIANDAY		0	01536	C0000		C000C	
.	01520		IMPERIAL		U	01537	C0000		C000C	
.	01521		TAPEBLOCK		U	01540	C0000		C000C	
.	01522		SLOTBLOCK		0	01541	C0000		C000C	
.	01523		TAPESEARCH		0	01542	C0000		C000C	
.	01524		RAAO		0	01543	C0000		C000C	
.	01525		DECAD		U	01544	C0000		C000C	
.	01526		OISTAD		U	01545	C0000		C000C	
.	01527		RADIFAD		U	01546	C0000		C000C	
.	01530		DECIFAD		U	01547	C0000		C000C	
.	01531		OISTOIFAD		U	01550	C0000		C000C	
.	01532		SAIGON		0	01551	C0000		C000C	

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CARDS	LI	ID LABEL	TA STATEMENT	LOC	F	JK8	Y	NOTES
.	01533	SAFE	0	01552	C	0000	0	0000
.	01534	AEPHEM	RESERVE 959D	01553	C	0000	0	0000
.	01535	LASTEPHEM	0	03452	C	0000	0	0000
.	01536	RESERVE 1	RESERVE 1	03453	C	0000	0	0000
				03454	C	0112	30264	
				03455	C	0112	32007	
				03456	5	1004	00512	
				03457	3	1050	00005	

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LABEL	LOC	LABEL	LOC	LABEL	LOC	LABEL	LOC
A\$\$\$\$11111	03454	A\$\$\$\$11112	03455	A\$\$\$\$11113	03456		
ACQI	03457	ACQAZIM	63071	ACQELEV	63075		
AEPHEM	01553	ACTUALTIME	63142	ADSCN	63416		
ALBERT	00463	AESCN	63417	AIRPORT	00214		
AUCONVER	63332	ASTRODEC	63106	ASTRORA	63105		
AZIMOUT	64000	AUDNMSEC	01075	AZIM	63053		
AZIMI.N	75000	AZIMOVER	63325	AZIMADC	63442		
BUTHNEG1	01412	BODIES	00566	BODIES1	00570		
BARRIER	00474	BOTHNEG2	01434	BOTHNEG3	01456		
BESSEL3	01140	BEAVER	00250	BESSEL	01124		
BLOCKBEE	00046	BETA	01112	BLOCKAY	00553		
BUST	00477	BLOCKCEE	00536	BLASTOFF	63146		
CORCT	63420	COCON	63414	CONVERTIME	63135		
CANTFIND	00436	COSORIENT	63065	COSAZEL	63070		
CELEV	63061	CAZIM	63060	CELCOMPGM	63424		
CHCOR	63422	CELTIME	63133	CERC	00351		
CRANGE	63057	CHPAR	63431	CIVIL	01374		
DOPPAD	63444	CRUISE	00100	DOPPOUT	66000		
DAYFIND	00312	DATANALYZE	63425	DAY	63150		
DEC	63003	DAYINCRMNT	00326	DAYINDEX	00325		
OECDIFAO	01547	DECAD	01544	DECDCT	63010		
DIFF4ZERO	01364	DELTA	01114	DELTATEE	63316		
DLN	00702	DISTAD	01545	DISTDIFAD	01550		
DLN3	00725	DLN1	00720	CLN2	00724		
DLN6	00732	DLN4	00727	DLN5	00730		
DMINB	01121	DLN7	00733	CMIN2CPLB	01122		
DYDMP	63421	DSECONDS	63141	DUMSECTTG	63154		
ELEVOUT	65000	EGRESS	01200	ELEV	63054		
ENDFILE	00473	ELEVADO	63443	ELEVEM	76000		
EPHEMR	00564	EPHEMC	00565	EPHEMA	00563		
EQUATOR	63323	ERASE	00011	EPSILCN	01115		
EXPNAME	63350	FIRSTHRU	01145	ESTSHIFTED	63143		
FIRSTELEV	63104	FBSSEL	01153	FIRSTDIFF	01111		
FIX2	01320	FIX3	01326	FIX1	01312		
FLOTEST2	01422	FLOTEST3	01444	FLOTEST1	01400		
FRAMESIZE	63101	FREQUENCY	63317	FLATNEG	00274		
GAMMA	01113	GEOCENLAT	63322	FUNCTION	01116		
GMT	00735	GMT1	00753	GEODETLAT	63321		
GMT3	00760	GMT4	00762	GMT2	00757		
GMT6	00765	GMT7	00766	GMT5	00763		
GMTSHIFTED	63144	HOURLMINUTE	63137	GMTDDU24	63145		
HALF	01120	HALFDAY	01056	HOURREG	63151		
HEIGHT	63326	HENRY	00000	HDAY	01067		
ID1ORADIO	66777	ID11RADIO	00000	HRAD	01065		
ID13RADIO	70775	ID14RADIO	70776	ID12RADIU	67777		
ID16RADIO	71777	ID17RADIO	72776	ID15RADIO	71776		
ID19RADIO	73776	ID1CELCOR	63000	ID18RADIO	72777		
ID1RADCOR	63050	ID1RADIO	63440	IC1CENTPT	63410		
ID1SYSENT	77576	ID1SYSNAM	77676	ID1RECRD	63210		
ID1TIME	63130	ID2ORADIO	73777	ID1SYSPAR	63310		
				ID21RADIO	74776		

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LABEL	LOC	LABEL	LOC	LABEL	LOC
ID22RADIO	74777	ID23RADIO	75776	ID24RADIO	75777
ID25RADIO	76775	ID26RADIO	76776	ID2CELCOR	63001
ID2ENTPNT	63411	ID2RADCOR	63051	ID2RADIO	63441
ID2RECRD	63211	ID2SYSENT	77577	ID2SYSNAM	77677
ID2SYSPAR	63311	ID2TIME	63131	ID3RADIO	63776
ID4RADIO	63777	ID5RADIO	64776	ID6RADIO	64777
ID7RADIO	65776	ID8RADIO	65777	ID9RADIO	66776
IOENT	01533	IGNORE	01062	IMPERIAL	01537
INAZIMADD	63446	INELEVADO	63447	INITIAL1	00627
INITIAL10	00640	INITIAL11	00644	INITIAL12	00646
INITIAL16	00772	INITIAL17	00776	INITIAL18	01000
INITIAL19	01003	INITIAL2	00633	INITIAL20	01007
INITIAL21	01011	INITIAL3	00635	INITIALBCD	01001
INITIALOAT	00636	INITIALOIS	00770	INITIALJC	00625
INPLANET	01034	INTER	63413	INTERAZIM	72000
INTERCOM	63426	INTEROOPP	74000	INTERELEV	73000
INTERPOL	01152	INTERRANGE	76777	INTERUPT	01061
JULIANOAY	01536	KENNEDY	01136	KEY	01110
LONGITUDE	63320	LASTEPHEM	03452	LEFRNDOFF	01502
LESSONE	00310	LINGOLN	01253	MOOSE	00231
MONITAPE	00055	MONTHPRINT	01041	MAINSWITCH	63334
MAX	01517	MCPFILLER	71000	MCPGM	63412
MOAY	01070	MERCURY	01014	MIKE	01507
MINREG	63152	MINSRAD	01066	MINUS	01355
MUNICH	01164	NODATA	00610	MINUS	00612
NODATA2	00616	NODATA3	00622	NODATA1	00612
NOFLO1	01311	NOFLO2	01317	NOFORTH	01361
NORMAL	00054	NOTIN	00533	NOFLO3	01325
NEG8ESS2	01471	NEG8ESS3	00533	NEGBESS1	01466
NEGDEC	00530	NEGTIME	00327	NEGBESS4	01477
P	01117	POLE	63324	NUMDERIV	01137
PATCH	00545	PLAN	01040	PARTIAL	01217
PLANETINIT	00002	PLAMP	63434	PLANETCONT	00216
PRLOG	63423	PSQMP	01132	PLANRAD	01522
ROUNDROFF	01512	RA	63002	PSQMP6	01133
RA2	00671	RA3	00672	RA1	00665
RA5	00675	RA6	00677	RA4	00674
RAAD	01543	RADOT	63007	RA7	00700
RADIOMETER	63102	RAOIFAD	01546	RADARMODE	63312
RADIUSOOT	63011	RANGE	63052	RADIUS	63006
RANGEADD	63445	RANGEDOT	63062	RANGEOUT	70777
RORSEC	01074	RDXXX	63433	RDHTR	63430
RECELEV	70000	RECFILE	63212	RDCAZIM	67000
REMAINDER	01366	REVSADIAN	01057	RECRD	63415
RGHTASC	00647	SAFE	01552	REVINDNO	01063
SARAD	01073	SAZIM	63055	SAIGCN	01551
SDAY	01071	SDEC	63005	SCELTIME	63134
SECONDS	63140	SECSRAD	01072	SEAPORT	00273
SETBODY	00171	SETINTAD	01131	SELEV	63056
SINORIENT	63064	SINAZEL	63066	SIDENTIME	63012
SKIP	63331	SLOTBLOCK	01541	SIXTH	01135
				SRA	63004

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PLANETRACK

LABEL	LOC	LABEL	LOC	LABEL	LOC
SRAD	01064	SRADTIME	63136	SRHIBIN	01060
STOR1	01227	STOR2	01246	STOR3	01267
STUR4	01305	STORE	00352	STATACT	00416
STATUSCK	00405	SUM	01353	SYSTEMRIES	77600
SYSNAMES	77700	SYSTAT1	63313	SYSTAT2	63314
SYSTATD	63315	TAPEBLOCK	01540	TAPEBUST	00516
TAPEBUST1	00520	TAPEINPUT	00035	TAPESEARCH	01542
TAPSTAT	00525	THIRD	01134	TIMEMCDE	63103
TIMEP	63435	TIMESLIDE	00335	TRUERANGE	63063
TRUETIME	63132	TRYAGAIN	00040	TWCLESS	00306
TWUPE	01076	VIZDECI	63014	VIZDEC2	63016
VIZRA1	63013	VIZRA2	63015	WFORD	63432
WFADD	63450	WFFREQ	63333	WHOLEYEAR	01535
YEARMUNTH	63147	YEARPRINT	01077	YRREMAIN	01534
YRTRAN	63327	ZRTRAN	63330		

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PLANETRACK

LABEL	LOC	LABEL	LOC	LABEL	LOC	LABEL	LOC
HENRY	0000U	PLANETINIT	00002	ERASE	00011		
TAPEINPUT	00035	TRYAGAIN	00040	BLDCKBEE	00046		
NORMAL	00054	MONITAPE	00055	CRUISE	00100		
SETBOOY	00171	AIRPORT	00214	PLANETCONT	00216		
MOOSE	00231	BEAVER	00250	SEAPORT	00273		
FLATNEG	00274	THOLESS	00306	LESSONE	00310		
OAYFINO	00312	DAYINDEX	00325	DAYINCRMT	00326		
NEGTIME	00327	TIMESLIDE	00335	CERD	00351		
STORE	00352	STATUSCK	00405	STATACT	00416		
CANTFIND	00436	ALBERT	00463	ENDFILE	00473		
BARRIER	00474	BUST	00477	TAPEBUST	00516		
TAPEBUST1	00520	TAPSTAT	00525	NEGDEC	00530		
NOTIN	00533	BLOCKCEE	00536	PATCH	00545		
BLOCKAY	00553	EPHEMA	00563	EPHEMB	00564		
EPHEMC	00565	EPHES	00566	BODIES1	00570		
NOOATA	00610	NOOATA1	00612	NODATA2	00616		
NOOATA3	00622	INITIALJO	00625	INITIAL1	00627		
INITIAL2	00633	INITIAL3	00635	INITIALDAT	00636		
INITIAL10	00640	INITIAL11	00644	INITIAL12	00646		
RGHTASC	00647	RA1	00665	RA2	00671		
RA3	00672	RA4	00674	RA5	00675		
RA6	00677	RA7	00700	DLN	00702		
OLN1	00720	DLN2	00724	DLN3	00725		
OLN4	00727	DLN5	00730	DLN6	00732		
OLN7	00733	GMT	00735	GMT1	00753		
GMT2	00757	GMT3	00760	GMT4	00762		
GMT5	00763	GMT6	00765	GMT7	00766		
INITIALOIS	00770	INITIAL16	00772	INITIAL17	00776		
INITIAL18	01000	INITIALBDD	01001	INITIAL19	01003		
INITIAL20	01007	INITIAL21	01011	MERCURY	01014		
INPLANET	01034	PLAN	01040	MCNTHPRINT	01041		
HALFDAY	01056	REVS RADIAN	01057	SRHIBIN	01060		
INTERUPT	01061	IGNORE	01062	REWINDNO	01063		
SRAD	01064	HRAO	01065	MINSRAD	01066		
HDAY	01067	MDAY	01070	SDAY	01071		
SECSRAO	01072	SARAD	01073	RDRSEC	01074		
AUDMSEC	01075	TWOPIE	01076	YEARPRINT	01077		
KEY	01110	FIRSTDIFF	01111	BETA	01112		
GAMMA	01113	DELTA	01114	EPSILON	01115		
FUNCTION	01116	P	01117	HALF	01120		
DMINR	01121	DMIN2CPLB	01122	EP2BM2DMA	01123		
BESSEL	01124	SETINTAD	01131	PSQMP	01132		
PSQMP6	01133	THIRD	01134	SIXTH	01135		
KENNEYO	01136	NUMBERIV	01137	BESSEL3	01140		
FBESSEL	01145	INTERPOL	01152	MUNICH	01164		
EGRESS	01200	PARTIAL	01217	STDR1	01227		
STOR2	01246	LINCDLN	01253	STDR3	01267		
STOR4	01305	NDFLD1	01311	FIX1	01312		
NOFLO2	01317	FIX2	0132C	NOFLD3	01325		
FIX3	01326	SUM	01353	MINUS	01355		
NDFDURTH	01361	DIFF4ZERD	01364	REMAINDER	01366		

PLANE TRACK		FRACHTMAN*8/4/64	
LABEL	LOC	LABEL	LOC
CIVIL	01374	FLUTEST1	0140C
FLUTEST2	01422	ROTHNEG2	01434
BOTHNEG3	01456	NEGBESS1	01466
NEGBESS3	01474	NEGBESS4	01477
MIKE	01507	ROUND OFF	01512
PLANRAD	01522	IOENT	01533
WHOLEYEAR	01535	JULIANOAY	01536
TAPEBLOCK	01540	SLOTBLOCK	01541
RAAD	01543	DECAO	01544
RAOIFAD	01546	DECDIFAO	01547
SAIGON	01551	SAFE	01552
LASTERPHEM	03452	A\$\$\$\$1111	03454
A\$\$\$\$1113	03456	A\$\$\$\$1114	03457
IO2CELCOR	63001	RA	63002
SRA	63004	SDEC	63005
RAOOT	63007	DECDOT	6301C
SIDERTIME	63012	VIZRAI	63013
VIZRA2	63015	VIZOEC2	63016
IO2RADCOR	63051	RANGE	63052
ELEV	63054	SAZIM	63055
CRANGE	63057	CAZIM	6306C
RANGEOOT	63062	TRUERANGE	63063
COSORIENT	63065	SINAZEL	63066
ACQAZIM	63071	ACQLEV	63075
RAOIMETER	63102	TIMEMODE	631D3
ASTRORA	63105	ASTROOEC	63106
IO2TIME	63131	TRUETIME	63132
SCELTIME	63134	CONVERTIME	63135
HOURLMINUTE	63137	SECUNOS	6314C
ACTUALTIME	63142	ESTSHIFTED	63143
GMTMODU24	63145	BLASTOFF	63146
DAY	63150	HOUREG	63151
FIRSTHRU	63153	DUMSECTTG	63154
IO2RECRD	63211	KCFILE	63212
IO2SYSPAR	63311	RADARMODE	63312
SYSTAT2	63314	SYSTATD	63315
FREQUENCY	63317	LONGITUDE	6332D
GEDCENLAT	63322	EQUATOR	63323
AZIMOVER	63325	HEIGHT	63326
ZRTRAN	63330	SKIP	63331
WFFREQ	63333	MAINSWITCH	63334
IO1ENTPNT	63410	IO2ENTPNT	63411
INTER	63413	COCGN	63414
AOSCN	63416	AESCN	63417
DYDMP	63421	CHCCR	63422
CELCONPGM	63424	DATANALYZE	63425
ACQUI	63427	RDMTX	6343C
WFORD	63432	RDXXX	63434
TIMEP	63435	ID1RADIO	6344C
AZIMADD	63442	ELEVADD	63443
RANGEADD	63445	INAZIMADD	63446
		BCTHNEG1	01412
		FLDTEST3	01444
		NEGBESS2	01471
		LEFRNDCCFF	01502
		MAX	01517
		YRREMAIN	01534
		IMPERIAL	01537
		TAPESEARCH	01542
		DISTAC	01545
		DISTCIFAD	01550
		AEPHEM	01553
		A\$\$\$\$1112	03455
		ID1CELCOR	6300D
		DEC	63003
		RADIUS	63006
		RADIUSDOT	63011
		VIZDECI	63014
		ID1RADCOR	63050
		AZIM	63053
		SELEV	63056
		CELEV	63061
		SINDRIENT	63064
		CDSAZEL	6307D
		FRAMESIZE	63101
		FIRSTELEV	63104
		ID1TIME	6313D
		CELTIME	63133
		SRACTIME	63136
		DSECUNDS	63141
		GMTSHIFTED	63144
		YEARPCNTH	63147
		MINREG	63152
		ID1RECRD	6321D
		ID1SYSPAR	6331D
		SYSTAT1	63313
		DELTATEE	63316
		GEDDELTAI	63321
		POLE	63324
		YRTRAN	63327
		AUCNVER	63332
		EXPNAME	63350
		MCPGM	63412
		RECRD	63415
		CORCT	63420
		PRLDG	63423
		INTERCOM	63426
		CHPAR	63431
		PLANP	63434
		ID2RADID	63441
		CCPPACC	63444
		INELEVADD	63447

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PLANETRACK

LABEL	LOC	LABEL	LOC	LABEL	LOC
WFA00	63450	I03RADIO	63776	I04RADIO	63777
AZIMOUT	64000	I05RADIO	64776	I06RADIO	64777
ELEVOUT	65000	I07RADIO	65776	I08RADIO	65777
DOPPOUT	66000	I09RADIO	66776	I010RADIO	66777
RECAZIM	67000	I011RADIO	67776	I012RADIO	67777
RECELEV	70000	I013RADIO	70775	I014RADIO	70776
RANGEOUT	70777	MCPFILLER	71000	I015RADIO	71776
I016RADIO	71777	INTERAZIM	72000	I017RADIO	72776
I018RADIO	72777	INTERELEV	73000	I019RADIO	73776
I020RADIO	73777	INTEROOPP	74000	I021RADIO	74776
I022RADIO	74777	AZIMIN	75000	I023RADIO	75776
I024RADIO	75777	ELEVIN	76000	I025RADIO	76775
I026RADIO	76776	INTERRANGE	76777	I01SYSENT	77576
I02SYSENT	77577	SYSENTRIES	77600	I01SYSNAM	77676
I02SYSNAM	77677	SYSNAME S	77700		

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<p>This report describes the procedure used by the Haystack Pointing computer program for obtaining the celestial coordinates of the planets at any time.</p>			

14. KEY WORDS	LINK A		LINK B		LINK C	
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Program Computer Planet Pointing Time Input Output						

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