L SYSTEM TEST STANDARD LEAD INS USER«S PAGE NO. 1 E0 S4

```
 0001  REF  15  LAST  242   E5,1671                    EBANK= XSM

 0002                       33,2000                    BANK   33
 0003  REF   1              04,2000                    SETLOC E/PROG
 0004                       04,2557                    BANK

 0005  REF   1                                         COUNT* $$/P07

R0006          SPECIAL PROGRAMS TO EASE THE PANGS OF ERASABLE MEMORY PROGRAMS.

R0007  E/BKCALL  FOR DOING BANKCALLS FROM AND RETURNING TO ERASABLE.

R0008          THIS ROUTINE IS CALLABLE FROM ERASABLE OR FIXED. LIKE BANKCALL, HOWEVER, SWITCHING BETWEEN S3 AND S4
R0010  IS NOT POSSIBLE.

R0011          THE CALLING SEQUENCE IS'

A0012                                                  TC     BANKCALL
A0013                                                  CADR   E/BKCALL
A0014                                                  CADR   ROUTINE        WHERE YOU WANT TO GO IN FIXED.
A0015                                                  RETURN HERE FROM DISPLAY TERMINATE, BAD STALL OR TC Q.
A0016                                                  RETURN HERE FROM DISPLAY PROCEED OR GOOD RETURN FROM STALL.
A0017                                                  RETURN HERE FROM DISPLAY ENTER OR RECYCLE.

R0018          THIS ROUTINE REQUIRES TWO ERASABLES (EBUF2, +1) IN UNSWITCHED WHICH ARE UNSHARED BY INTERRUPTS AND
R0020  OTHER EMEMORY PROGRAMS.

R0021          A + L ARE PRESERVED THROUGH BANKCALL AND E/BKCALL.

 0022  REF   3  LAST  384   04,2557  52 134 0  E/BKCALL DXCH   BUF2          SAVE A,L AND GET DP RETURN.
 0023  REF   1              04,2560  52 365 0            DXCH   EBUF2         SAVE DP RETURN.
 0024  REF   2  LAST  413   04,2561  24 364 0            INCR   EBUF2         RETURN +1 BECAUSE DOUBLE CADR.
 0025  REF  12  LAST  368   04,2562  3 0006 1            CA     BBANK
 0026  REF   5  LAST  367   04,2563  7 4747 0            MASK   LOW10         GET CURRENT EBANK.  (SBANK SOMEDAY)
 0027  REF   3  LAST  413   04,2564  26 365 0            ADS    EBUF2 +1      FORM BBCON.  (WAS FBANK)
 0028  REF   4  LAST  413   04,2565  50 364 0            NDX    EBUF2
 0029                       04,2566  2«7777 0            CA     0 -1          GET CADR OF ROUTINE.
 0030  REF   2  LAST  185   04,2567  0 4561 1            TC     SWCALL        GO TO ROUTINE, SETTING Q TO SWRETURN
A0031                                                                        AND RESTORING A + L.
 0032                       04,2570  0 2574 0            TC     +4            TX Q, V34, OR BAD STALL RETURN.
 0033                       04,2571  0 2573 1            TC     +2            PROCEED OR GOOD STALL RETURN.
 0034  REF   5  LAST  413   04,2572  24 364 0            INCR   EBUF2         ENTER OR RECYCLE RETURN.
 0035  REF   6  LAST  413   04,2573  24 364 0            INCR   EBUF2
 0036  REF   7  LAST  413   04,2574  52 365 0  E/SWITCH DXCH   EBUF2
 0037                       04,2575  52 006 0            DTCB
```

L SYSTEM TEST STANDARD LEAD INS USER'S PAGE NO. 2 E5 S4

P0038 E/CALL FOR CALLING A FIXED MEMORY INTERPRETIVE SUBROUTINE FROM ERASABLE AND RETURNING TO ERASABLE.

R0040 THE CALLING SEQUENCE IS...
A0041
A0042 RTB
A0043 E/CALL
A0044 CADR ROUTINE THE INTERPRETIVE SUBROUTINE YOU WANT.
RETURNS HERE IN INTERPRETIVE.

```
0045  REF  3  LAST  370  04,2576  22 164 1  E/CALL  LXCH  LOC     ADRES -1 OF CADR.
0046  REF  45 LAST  376  04,2577  50 001 0         INDEX L
0047  REF  46 LAST  414  04,2600  3 0001 0        CA    L       CADR IN A.
0048  REF  47 LAST  414  04,2601  24 001 0        INCR  L
0049  REF  48 LAST  414  04,2602  24 001 0        INCR  L       RETURN ADRES IN L.
0050  REF  8  LAST  413  04,2603  52 365 0        DXCH  EBUF2   STORE CADR AND RETURN.
0051  REF  13 LAST  407  04,2604  0 6006 1        TC    INTPRET
0052                     04,2605  77624 1         CALL
0053  REF  9  LAST  414  04,2606  00364 0              EBUF2   INDIRECTLY EXECUTE ROUTINE.  IT MUST
0054                     04,2607  77776 1         EXIT          LEAVE VIA RVQ OR EQUIVALENT.
0055  REF  10 LAST  414  04,2610  22 365 1        LXCH  EBUF2 +1  PICK UP RETURN.
0056  REF  14 LAST  414  04,2611  1 6010 1        TCF   INTPRET +2  SET LOC AND RETURB TO CALLER
```

```
P0057   E/JOBWAK        FOR WAKING UP ERASABLE MEMORY JOBS.

R0058           THIS ROUTINE MUST BE CALLED IN INTERRUPT OR WITH INTERRUPTS INHIBITED.

R0060           THE CALLING SEQUENCE IS'

A0061                                                   INHINT
A0062                                                     .
A0063                                                     .
A0064                                                   CA      WAKEADR         ADDRESS OF SLEEPING JOB
A0065                                                   TC      IBNKCALL
A0066                                                   CADR    E/JOBWAK
A0067                                                     .                     RETURNS HERE
A0068                                                     .
A0069                                                     .
A0070                                                   RELINT                  IF YOU DID AN INHINT.

 0071                   33,2000                         BANK    33
 0072   REF   2 LAST 413 04,2000                       SETLOC E/PROG
 0073                   04,2612                         BANK

 0074   REF   2 LAST 413 TO 415'   27    27*           COUNT* $$/P07

 0075   REF   3 LAST 377 04,2612  0 5074 1 E/JOBWAK    TC      JOBWAKE         ARRIVE IWTH ADRES IN A.
 0076   REF  17 LAST 343 04,2613  4 4700 0             CS      BIT11
 0077   REF   4 LAST 370 04,2614  50 064 0             NDX     LOCCTR
 0078   REF   4 LAST 414 04,2615  26 164 0             ADS     LOC             KNOCK FIXED MEMORY BIT OUT OF ADRES.
 0079   REF   1          04,2616  0 0072 1             TC      RUPTREG3        RETURN
R0080   THESE PROGRAMS ARE PROVIDED TO ALLOW OVERLAY OF BANKS 30 THRU 33 OF THE 205 VERSIONS OF SYSTEM TESTS AND
R0082   PRELAUNCH ALIGN.  THE INTENT IS TO ALLOW THE STG AND HYBRID LABS TO RUN ALL THE TESTS WITH COLOSSUS.
 0084                   33,2000                         BANK    33
 0085   REF   1         33,2000                       SETLOC TESTLEAD
 0086                   33,2000                         BANK

 0087   REF   1                                       COUNT   33/COMST

 0088   REF   5 LAST 241 E5,1425                      EBANK=  QPLACE

 0089   REF   1          33,2000  0 3425 1 COMPVER     TC      GCOMPVER        MUST BE 33,2000.

 0090   REF   1          33,2001  0 3132 1 GTSCPSS1    TC      GTSCPSS         MUST BE AT 33,2001

 0091   REF   1          33,2002  0 5243 1 REDO        TC      NEWMODEX        DISPLAY MM 07.
 0092                   33,2003   00007 0              MM      07              FALL INTO IMUTEST
```

L IMU CALIBRATION AND ALIGNMENT USER«S PAGE NO. 1 E0 S3

R0010 NAME- IMU PERFORMANCE TESTS 2

R0011 DATE- MARCH 20,1967

R0012 BY- SYSTEM TEST GROUP 864-6900 EXT. 1274

R0013 MODNO.- ZERO

R0014 FUNCTIONAL DESCRIPTION

R0015 POSITIONING ROUTINES FOR THE IMU PERFORMANCE TESTS AS WELL AS SOME OF
R0016 THE TESTS THEMSELVES. FOR A DESCRIPTION OF THESE SUBROUTINES AND THE
R0017 OPERATING PROCEDURES (TYPICALLY) SEE STG MEMO 685.THEORETICAL REF.E-1973

```
0018                          33,2004                    BANK   33
0019   REF   1                33,2000                    SETLOC IMUCAL
0020                          33,2004                    BANK

0021   REF   1                E5,1423                    EBANK= POSITON
0022   REF  87  LAST  411     33,2004  3 4714 1  IMUTEST CA     ZERO
0023   REF   1                33,2005  55«452 1          TS     DRIFTT
0024   REF   1                33,2006  55«643 0          TS     GEOCOMP1
00241  REF   1                33,2007  3 2443 0          CAF    TESTTIME
00242  REF   1                33,2010  55«412 0          TS     LENGTHOT
00243  REF   1                33,2011  0 2302 1          TC     COAALIGN      TAKE CARE OF DRIFT FLAG
0025   REF   1                33,2012  3 4734 0          CAF    1SECX
0026   REF   1                33,2013  55«644 1          TS     1SECXT1

00261  REF   1                33,2014  3 2441 1          CA     CC14400
00262  REF   7  LAST  301     33,2015  55«074 1          TS     1/PIPADT
0027   REF  15  LAST  414     33,2016  0 6006 1  GUESS   TC     INTPRET       CALCULATE -COS LATITUDE AND SIN LATITUDE
002701                        33,2017   77624 1          CALL
0028   REF   1                33,2020   10617 0                 LATAZCHK
0029                          33,2021   57546 1          COS    DCOMP
0030                          33,2022   77752 1          SL1
0031   REF   1                33,2023   16447 1          STODL  WANGI
0032   REF   1                33,2024   02403 1                 LATITUDE
0033                          33,2025   72556 1          SIN    SL1
0034   REF   1                33,2026   02445 0          STORE  WANGO
0035                          33,2027   77776 1          EXIT
0036   REF  59  LAST  391     33,2030  0 4555 0  GEOIMUTT TC     BANKCALL      GYROCOMPASS COMES IN HERE
0037   REF   2  LAST  233     33,2031   16516 1          CADR   IMUZERO
0038   REF   1                33,2032  0 2316 1          TC     IMUSTALG
0039   REF  88  LAST  416     33,2033  3 4714 1  IMUBACK CA     ZERO
0040   REF   1                33,2034  55«421 0          TS     NDXCTR
0041   REF   1                33,2035  55«450 0          TS     TORQNDX
0042   REF   2  LAST  416     33,2036  55«451 1          TS     TORQNDX +1
0043   REF   1                33,2037  3 4375 1  NBPOSPL CA     DEC17
0044   REF   1                33,2040  55«655 1          TS     ZERONDX1
0045   REF   1                33,2041  3 2445 0          CA     XNBADR
```

```
0046  REF  1                 33,2042  0 2356 0          TC     ZEROING
0047  REF  1                 33,2043  3 4675 1          CA     HALF
0048  REF  2  LAST  282      33,2044  55"713 1          TS     XNB
0049  REF  16 LAST  416      33,2045  0 6006 1          TC     INTPRET
0050                         33,2046   73545 1          DLOAD  SIN
0051  REF  1                 33,2047   02401 0                 AZIMUTH
0052  REF  2  LAST  282      33,2050   02724 1          STORE  YNB +2
0053  REF  2  LAST  282      33,2051   16734 0          STODL  ZNB +4
0054  REF  2  LAST  417      33,2052   02401 0                 AZIMUTH
0055                         33,2053   77746 1          COS
0056  REF  3  LAST  417      33,2054   02726 0          STORE  YNB +4
0057                         33,2055   77676 0          DCOMP
0058  REF  3  LAST  417      33,2056   02732 0          STORE  ZNB +2
00581                        33,2057   77776 1          EXIT
00582 REF  8  LAST  261      33,2060  0 5253 0          TC     CHECKMM
00583                        33,2061   00003 1          MM     03          SEE IF IN OPTICAL VERIFICATION
00584                        33,2062  1 2064 0          TCF    +2          NO
00585 REF  1                 33,2063  1 3432 0          TCF    SETNBPOS +1 YES
00586 REF  17 LAST  417      33,2064  0 6006 1          TC     INTPRET
00587                        33,2065   77624 1          CALL
0059  REF  1                 33,2066   47244 0                 CALCGA
0060                         33,2067   77776 1          EXIT
0061  REF  60 LAST  416      33,2070  0 4555 0          TC     BANKCALL
0062  REF  2  LAST  235      33,2071   16602 1          CADR   IMUCOARS
0063  REF  35 LAST  377      33,2072  3 4675 1          CAF    BIT14       IF BIT14 SET, GIMBAL LOCK
0064  REF  1                 33,2073  7 0077 0          MASK   FLAGWRD3
0065                         33,2074  0 0006 1          EXTEND
0066                         33,2075  1 2077 1          BZF    +2
0067  REF  2  LAST  416      33,2076   25"421 1          INCR   NDXCTR      +1 IF IN GIMBAL LOCK, OTHERWISE 0
0068  REF  20 LAST  384      33,2077  0 5447 0          TC     DOWNFLAG    RESET GIMBAL LOCK FLAG
0069  REF  1                 33,2100   00056 1          ADRES  GLOKFAIL    BIT 14 FLAG 3
0070  REF  2  LAST  416      33,2101  0 2316 1          TC     IMUSTLLG
0071  REF  3  LAST  417      33,2102   11"421 0         CCS    NDXCTR      IF ONE GO AND DO A PIPA TEST ONLY
0072  REF  1                 33,2103  0 2131 0          TC     PIPACHK     ALIGN AND MEASURE VERTICAL PIPA RATE
0074  REF  61 LAST  417      33,2104  0 4555 0          TC     BANKCALL
0075  REF  2  LAST  237      33,2105   17012 1          CADR   IMUFINE
0076  REF  3  LAST  417      33,2106  0 2316 1          TC     IMUSTLLG
0077                         33,2107  0 0006 1          EXTEND
00771 REF  1                 33,2110  3 1657 1          DCA    PERFDLAY
00772 REF  1                 33,2111  0 5231 1          TC     LONGCALL
00773 REF  2  LAST  416      E5,1423                    EBANK= POSITN
00774 REF  1                 33,2112   02116 0         2CADR  GOESTIMS
00774 REF  1                 33,2113   66065 1
00775 REF  1                 33,2114  3 2121 1                CA     ESTICADR
00776 REF  3  LAST  376      33,2115  0 5070 0          TC     JOBSLEEP
00777 REF  2  LAST  417      33,2116  3 2121 1  GOESTIMS CA     ESTICADR
00778 REF  4  LAST  415      33,2117  0 5074 1          TC     JOBWAKE
00779 REF  18 LAST  411      33,2120  0 5213 1          TC     TASKOVER
007791 REF 1                 33,2121   66453 0 ESTICADR CADR   ESTIMS
```

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0078  REF  89  LAST  416   33,2122  3 4714 1  TORQUE   CA     ZERO
0079  REF   7  LAST  278   33,2123  55,050 1           TS     DSPTEM2
0080  REF   1              33,2124  3 1514 0           CA     DRIFTI
0081  REF   8  LAST  418   33,2125  55,051 0           TS     DSPTEM2 +1
0082  REF   3  LAST  417   33,2126  51,423 0           INDEX  POSITON
0083  REF   2  LAST   96   33,2127  55,430 0           TS     SOUTHDR -1
0084  REF   1              33,2130  0 2427 1           TC     SHOW

0085  REF   4  LAST  417   33,2131  51,421 1  PIPACHK  INDEX  NDXCTR      PIPA TEST
0086                       33,2132  0 2133 1           TC     +1
0087  REF   1              33,2133  0 2417 1           TC     EARTHR*
0090  REF   1              33,2134  3 4374 0           CA     DEC57
0091  REF   2  LAST  416   33,2135  55,412 0           TS     LENGTHOT
0092  REF  55  LAST  409   33,2136  3 4712 1           CA     ONE
0093  REF   1              33,2137  55,547 1           TS     RESULTCT
0094  REF  90  LAST  418   33,2140  3 4714 1           CA     ZERO
0095  REF   1              33,2141  51,422 1           INDEX  PIPINDEX
0096  REF   2  LAST  266   33,2142  54 037 1           TS     PIPAX
0097  REF   1              33,2143  55,502 0           TS     DATAPL
00971 REF   2  LAST  418   33,2144  55,506 1           TS     DATAPL +4
0098  REF   1              33,2145  0 2321 0           TC     CHECKG      PIP PULSE CATCHING ROUTINE
0099                       33,2146  0 0004 0           INHINT
0100  REF  25  LAST  407   33,2147  3 4711 1           CAF    TWO
0101  REF   1              33,2150  0 5130 0           TC     TWIDDLE
0102  REF  16  LAST  413   E5,1671                     EBANK= XSM
0103  REF   1              33,2151   02153 1          ADRES  PIPATASK
0105  REF  53  LAST  409   33,2152  0 5112 0           TC     ENDOFJOB
0106                       33,2153  0 0006 1  PIPATASK EXTEND
0107  REF   3  LAST  418   33,2154  27,412 0           DIM    LENGTHOT
01071 REF   4  LAST  418   33,2155  3 1412 1           CA     LENGTHOT
0108                       33,2156  0 0006 1           EXTEND
0109  REF   1              33,2157  6 2163 1           BZMF   STARTPIP
0110  REF  26  LAST  381   33,2160  3 4701 0           CAF    BIT10
0111  REF   2  LAST  418   33,2161  0 5130 0           TC     TWIDDLE
0112  REF  17  LAST  418   E5,1671                     EBANK= XSM
0113  REF   2  LAST  418   33,2162   02153 1          ADRES  PIPATASK
0114  REF   2  LAST  241   33,2163  3 4675 1  STARTPIP CAF    PRIO20
0115  REF  15  LAST  410   33,2164  0 5042 1           TC     FINDVAC
0116  REF  18  LAST  418   E5,1671                     EBANK= XSM
0117  REF   1              33,2165   02170 0          2CADR  PIPJOBB
0117  REF   1              33,2166   66065 1
0118  REF  19  LAST  417   33,2167  0 5213 1           TC     TASKOVER
0119  REF   5  LAST  418   33,2170  51,421 1  PIPJOBB  INDEX  NDXCTR
0120                       33,2171  0 2172 1           TC     +1
0121  REF   2  LAST  418   33,2172  0 2417 1           TC     EARTHR*
0122  REF   5  LAST  418   33,2173  3 1412 1           CA     LENGTHOT
0123                       33,2174  0 0006 1           EXTEND
0124                       33,2175  6 2177 1           BZMF   +2
0125  REF  54  LAST  418   33,2176  0 5112 0           TC     ENDOFJOB
0126  REF   7  LAST  338   33,2177  3 4715 0           CA     FIVE
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0127  REF   2  LAST  418   33,2200  55,547 1          TS      RESULTCT
0128  REF   2  LAST  418   33,2201  0 2321 0          TC      CHECKG
0134                       33,2202  0 0006 1          EXTEND
0135  REF   3  LAST  418   33,2203  4 1503 1          DCS     DATAPL
0136  REF   4  LAST  419   33,2204  21,507 0          DAS     DATAPL +4

0137  REF  18  LAST  417   33,2205  0 6006 1          TC      INTPRET
0138                       33,2206   45345 1          DLOAD   DSU
0139  REF   5  LAST  419   33,2207   02511 0                   DATAPL +6
0140  REF   6  LAST  419   33,2210   02505 0                   DATAPL +2
0141                       33,2211   45044 0          BPL     CALL
0142  REF   1              33,2212   66214 0                   AINGOIN
0143  REF   1              33,2213   66276 1                   OVERFFIX
0144                       33,2214   56325 0  AINGOIN  PDDL    DDV
0145  REF   7  LAST  419   33,2215   02507 1                   DATAPL +4
0146                       33,2216   57212 1          SL4     DMPR
0147  REF   1              33,2217   27111 0                   DEC585          DEC585 HAS BEEN REDEFINED FOR LEM
0148                       33,2220   77634 0          RTB
0149  REF   1              33,2221   45541 0                   SGNAGREE
0150  REF   9  LAST  418   33,2222   01051 1          STORE   DSPTEM2
0151                       33,2223   77776 1          EXIT
0152  REF   6  LAST  418   33,2224  11,421 0          CCS     NDXCTR
0153  REF   2  LAST  416   33,2225  0 2302 1          TC      COARLIGN        TAKE PLATFORM OUT OF GIMBAL LOCK
0154  REF   2  LAST  418   33,2226  0 2427 1          TC      SHOW
0155  REF   1              33,2227  3 2447 1  VERTDRFT CA      3990DEC         ABOUT 1 HOUR VERTICAL DRIFT TEST
0156  REF   6  LAST  418   33,2230  55,412 0          TS      LENGTHOT
0157  REF   4  LAST  418   33,2231  51,423 0          INDEX   POSITON
0158  REF   3  LAST  418   33,2232  4 1427 0          CS      SOUTHDR -2
0159  REF   2  LAST  416   33,2233  55,452 1          TS      DRIFTT
0160  REF  19  LAST  418   33,2234  3 1675 1          CA      XSM +4          0 IF POSN 4
0161                       33,2235  0 0006 1          EXTEND
0162  REF   1              33,2236  1 2244 0          BZF     PON2
0163  REF  20  LAST  384   33,2237  4 4706 0  PON4     CS      BIT5            OFFSET PLATFORM
0164  REF   1              33,2240  27,651 0          ADS     ERCOMP1 +2
0165  REF  21  LAST  419   33,2241  3 4706 1          CA      BIT5
0166  REF   2  LAST  419   33,2242  27,647 1          ADS     ERCOMP1
0167  REF   1              33,2243  1 2250 0          TCF     PONG
0168  REF  22  LAST  419   33,2244  4 4706 0  PON2     CS      BIT5
0169  REF   3  LAST  419   33,2245  27,651 0          ADS     ERCOMP1 +2
0170  REF  23  LAST  419   33,2246  3 4706 1          CA      BIT5
0171  REF   4  LAST  419   33,2247  27,653 1          ADS     ERCOMP1 +4
0172  REF   3  LAST  418   33,2250  0 2417 1  PONG     TC      EARTHR*
0173  REF  91  LAST  418   33,2251  3 4714 1          CA      ZERO            ALLOW ONLY SOUTH GYRO EARTH RATE COMPENS
0174  REF   1              33,2252  55,404 1          TS      ERVECTOR
0175  REF   2  LAST  419   33,2253  55,405 0          TS      ERVECTOR +1
0176  REF  10  LAST  344   33,2254  3 4672 0  GUESS1   CAF     POSMAX
0177  REF   3  LAST  416   33,2255  55,450 0          TS      TORQNDX
0178  REF   4  LAST  419   33,2256  55,451 1          TS      TORQNDX +1
0179  REF   8  LAST  411   33,2257  3 0032 0          CA      CDUX
0180  REF   2  LAST   98   33,2260  55,413 1          TS      LOSVEC
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0181  REF   2  LAST  417   33,2261  0 2453 1          TC     ESTIMS
0184  REF   1              33,2262  3 1512 0 VALMIS   CA     DRIFTO
0185  REF  10  LAST  419   33,2263  55#051 0          TS     DSPTEM2 +1
0186  REF  92  LAST  419   33,2264  3 4714 1          CA     ZERO
0187  REF  11  LAST  420   33,2265  55#050 1          TS     DSPTEM2
0188  REF   3  LAST  419   33,2266  0 2427 1          TC     SHOW
01894 REF  21  LAST  417   33,2267  0 5447 0 ENDIEST1 TC     DOWNFLAG      IMU NOT IN USE
0190  REF   3  LAST  253   33,2270   00007 0          ADRES  IMUSE         BIT 8 FLAG 0
0191  REF  93  LAST  420   33,2271  4 4714 0          CS     ZERO
0192  REF   2  LAST  415   33,2272  0 5246 1          TC     NEWMODEX +3
0193  REF  62  LAST  417   33,2273  0 4555 0          TC     BANKCALL
0194  REF   1              33,2274   16083 0          CADR   MKRELEAS
0195  REF  18  LAST  391   33,2275  0 5423 1          TC     ENDEXT
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0196                          33,2276   43215 0  OVERFFIX DAD     DAD
0197  REF   1                 33,2277   15340 1                   DPPOSMAX
0198  REF   1                 33,2300   27117 0                   ONEDPP
0199                          33,2301   77616 0          RVQ
0200                          33,2302   0 0006 1  COAALIGN EXTEND            COARSE ALIGN SUBROUTINE
0201  REF   6  LAST  415      33,2303   23,425 0          QXCH    QPLACE
0202  REF  94  LAST  420      33,2304   3 4714 1          CA      ZERO
0203  REF  10  LAST  266      33,2305   55,155 0          TS      THETAD
0204  REF  11  LAST  421      33,2306   55,156 0          TS      THETAD +1
0205  REF  12  LAST  421      33,2307   55,157 1          TS      THETAD +2
0206  REF  63  LAST  420      33,2310   0 4555 0          TC      BANKCALL
0207  REF   3  LAST  417      33,2311    16602 1          CADR    IMUCOARS
0208  REF  64  LAST  421      33,2312   0 4555 0          TC      BANKCALL
0209  REF   6  LAST  298      33,2313    17516 0          CADR    IMUSTALL
0210  REF   1                 33,2314   0 3103 0          TC      SOMERR2
0211  REF   7  LAST  421      33,2315   0 1425 0          TC      QPLACE
0212                          33,2316   0 0006 1  IMUSTLLG EXTEND
0213  REF   8  LAST  421      33,2317   23,425 0          QXCH    QPLACE
0214  REF   3  LAST  419      33,2320   0 2312 0          TC      COAALIGN +10
0215                          33,2321   0 0006 1  CHECKG   EXTEND            PIP PULSE CATCHING ROUTINE
0216  REF   9  LAST  421      33,2322   23,425 0          QXCH    QPLACE
0217                          33,2323   0 2331 1          TC      +6
0218                          33,2324   0 0003 1  CHECKG1  RELINT
0219  REF   2  LAST  187      33,2325   3 0067 0          CA      NEWJOB
0220                          33,2326   0 0006 1          EXTEND
02201                         33,2327   6 2335 0          BZMF    +6
02202 REF   1                 33,2330   0 5057 0          TC      CHANG1
02203                         33,2331   0 0004 0          INHINT
02204 REF   2  LAST  418      33,2332   51,422 1          INDEX   PIPINDEX
02205 REF   3  LAST  418      33,2333   4 0037 1          CS      PIPAX
02206 REF   2  LAST   98      33,2334   55,655 1          TS      ZERONDX
0224                          33,2335   0 0004 0          INHINT
0225  REF   3  LAST  421      33,2336   51,422 1          INDEX   PIPINDEX
0226  REF   4  LAST  421      33,2337   3 0037 0          CA      PIPAX
0227  REF   3  LAST  421      33,2340   6 1655 0          AD      ZERONDX
0228                          33,2341   0 0006 1          EXTEND
0229  REF   1                 33,2342   1 2324 1          BZF     CHECKG1
0230  REF   4  LAST  421      33,2343   51,422 1          INDEX   PIPINDEX
0231  REF   5  LAST  421      33,2344   3 0037 0          CA      PIPAX
0232  REF   3  LAST  419      33,2345   51,547 0          INDEX   RESULTCT
0233  REF   8  LAST  419      33,2346   55,502 0          TS      DATAPL
0234  REF   1                 33,2347   0 4526 1          TC      FINETIME
0235  REF   4  LAST  421      33,2350   51,547 0          INDEX   RESULTCT
0236  REF   9  LAST  421      33,2351   55,503 1          TS      DATAPL +1
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0237   REF   5  LAST  421   33,2352  51«547 0            INDEX   RESULTCT
0238   REF  10  LAST  421   33,2353  23«504 1            LXCH    DATAPL +2
0239                        33,2354  0 0003 1            RELINT
0240   REF  10  LAST  421   33,2355  0 1425 0  ENDOFKG   TC      QPLACE
0241   REF  49  LAST  414   33,2356  54 001 1  ZEROING   TS      L
0242                        33,2357  1 2361 0            TCF     +2
0243   REF   2  LAST  416   33,2360  55«655 1  ZEROING1  TS      ZERONDX1
0244   REF  95  LAST  421   33,2361  3 4714 1            CAF     ZERO
0245   REF  50  LAST  422   33,2362  50 001 0            INDEX   L
0246                        33,2363  54 000 0            TS      0
0247   REF  51  LAST  422   33,2364  24 001 0            INCR    L
0248   REF   3  LAST  422   33,2365  11«655 1            CCS     ZERONDX1
0249   REF   1              33,2366  1 2360 1            TCF     ZEROING1
0250   REF 146  LAST  412   33,2367  0 0002 0            TC      Q
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0251  REP  1                32,2000                          SETLOC  IMUCAL3
0252                        32,2000                          BANK
0254                        32,2000   65345 0  ERTHRVSE      DLOAD   PDDL
0255  REP  1                32,2001   27112 0                SCHZEROS      PD24 = (SIN          -COS    0)(OMEG/MS)
0256  REP  2  LAST  416     32,2002   02403 1                LATITUDE
0257                        32,2003   57546 1          COS   DCOMP
0258                        32,2004   73525 1          PDDL  SIN
0259  REP  3  LAST  423     32,2005   02403 1                LATITUDE
0260                        32,2006   74266 0          VDEP  VXSC
0261  REP  1                32,2007   26450 1                OMEG/MS
0262  REP  3  LAST  419     32,2010   02405 1          STORE ERVECTOR
0263                        32,2011   77634 0          RTB
0264  REP  1                32,2012   45505 0                LOADTIME
0265  REP  1                32,2013   26443 0          STOVL TMARK
0266  REP  2  LAST  423     32,2014   27112 0                SCHZEROS
0267  REP  5  LAST  419     32,2015   02650 0          STORE ERCOMP1
0268                        32,2016   77616 0          RVQ
0269  REP  2  LAST  416     33,2000                          SETLOC  IMUCAL
0270                        33,2370                          BANK
0272                        33,2370   47020 0  EARTHR  ITA   RTB           CALCULATES AND COMPENSATES EARTH RATE
0273  REP  1                33,2371   00051 0                S2
0274  REP  2  LAST  423     33,2372   45505 0                LOADTIME
0275  REP  1                33,2373   02441 1          STORE TEMPTIME
0276                        33,2374   51025 1          DSU   BPL
0277  REP  2  LAST  423     33,2375   02443 0                TMARK
0278  REP  1                33,2376   66401 1                ERTHR
0279                        33,2377   77624 1          CALL
0280  REP  2  LAST  419     33,2400   66276 1                OVERFFIX
0281                        33,2401   74261 1  ERTHR  SL     VXSC
0282                        33,2402   20212 1                9D
0283  REP  4  LAST  423     33,2403   02405 1                ERVECTOR
0284                        33,2404   53321 1          MXV   VAD
0285  REP  20  LAST  419    33,2405   02872 0                XSM
0286  REP  6  LAST  423     33,2406   02650 0                ERCOMP1
0287  REP  7  LAST  423     33,2407   16650 0          STODL ERCOMP1
0288  REP  2  LAST  423     33,2410   02441 1                TEMPTIME
0289  REP  3  LAST  423     33,2411   02443 0          STORE TMARK
0290                        33,2412   47170 1          AXT,1 RTB
0291  REP  8  LAST  423     33,2413   02647 0          ECADR ERCOMP1
0292  REP  1                33,2414   45650 0                PULSEIMU
0293                        33,2415   77650 1          GOTO
0294  REP  2  LAST  423     33,2416   00051 0                S2
0295                        33,2417   0 0006 1 EARTHR*  EXTEND
02951 REP  3  LAST   32     33,2420   23¤426 0         QXCH  QPLACES
02952 REP  19  LAST  419    33,2421   0 6006 1         TC    INTPRET
02953                       33,2422    77624 1         CALL
02954 REP  1                33,2423   66370 0                EARTHR
02955                       33,2424    77776 1 PROUT   EXIT
02956 REP  4  LAST  417     33,2425   0 2316 1         TC    IMUSTLG
02957 REP  4  LAST  423     33,2426   0 1426 0         TC    QPLACES
```

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0296                                33,2427  0 0006 1  SHOW      EXTEND
0297  REF  11  LAST  422            33,2430  23,425 0            QXCH    QPLACE
0298  REF   5  LAST  419            33,2431  3 1423 0  SHOW1     CA      POSITON
0299  REF  12  LAST  420            33,2432  55,052 0            TS      DSPTEM2 +2
0300  REF   1                      33,2433  3 2442 1            CA      VB03N98
0301  REF  65  LAST  421            33,2434  0 4555 0            TC      BANKCALL
0302  REF   3  LAST  391            33,2435   20624 0            CADR    GOFLASH
0304  REF   1                      33,2436  0 2267 0            TC      ENDTEST1        V 34
0305  REF  12  LAST  424            33,2437  0 1425 0            TC      QPLACE          V33
0306  REF   1                      33,2440  1 2431 1            TCF     SHOW1
03061                              33,2441   14400 0  OC14400   OCT     14400
0307  REF   2  LAST  423            33,2447           3990DEC   =       OMEG/MS
0308                               33,2442   01542 0  VB06N98   VN      0698
0309                               33,2443   01602 1  TESTTIME  OCT     01602
0310  REF   5  LAST  359             4375            DEC17     =       ND1
0311  REF   9  LAST  277            33,2444   02757 0  OGCPL     ECADR   OGC
0312  REF   1                       4734            1SECX     =       1SEC
0313  REF  15  LAST  368             4374            DEC57     =       VD1
0314  REF   3  LAST  417            33,2445   01713 0  XNBADR    GENADR  XNB
0315  REF  21  LAST  423            33,2446   01671 0  XSMADR    GENADR  XSM
0316                               33,2447   07623 1  OMEG/MS   2DEC    .24339048
0316                               33,2450   26552 1
03161 REF  66  LAST  424            33,2451  0 4555 0  P11OUT    TC      BANKCALL
03162 REF   2  LAST  207            33,2452   70127 1            CADR    MATRXJOB        RETURN TO P11

03165 REF   1                                                    COUNT   02/COMST

0317                                 4526                       BLOCK   2
0318                                 4526  0 0004 0  FINETIME  INHINT                  RETURNS WITH INTERRUPT INHIBITED
0319                                 4527  0 0006 1            EXTEND
0320  REF   1                       4530  00 004 0            READ    LOSCALAR
0321  REF  52  LAST  422            4531  54 001 1            TS      L
0322                                 4532  0 0006 1            EXTEND
0323  REF   2  LAST  424            4533  06 004 0            RXOR    LOSCALAR
0324                                 4534  0 0006 1            EXTEND
0325                                 4535  1 4541 1            BZF     +4
0326                                 4536  0 0006 1            EXTEND
0327  REF   3  LAST  424            4537  00 004 0            READ    LOSCALAR
0328  REF  53  LAST  424            4540  54 001 1            TS      L
03    REF  11  LAST  419            4541  4 4672 1  +4        CS      POSMAX
0330  REF  54  LAST  424            4542  6 0001 0            AD      L
033                                  4543  0 0006 1            EXTEND
0332  REF   2  LAST  421            4544  1 4527 1            BZF     FINETIME +1
0333                                 4545  0 0006 1            EXTEND
0334  REF   1                       4546  00 003 1            READ    HISCALAR
0335  REF 147  LAST  422            4547  0 0002 0            TC      Q
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R0336   PROGRAM NAME-OPTIMUM PRELAUNCH ALIGNMENT CALIBRATION
R0337   DATE- NOVEMBER 2  1966
R0338   BY- GEORGE SCHMIDT IL 7-146 EXT. 126
R0339   MOD NO 3
R0340   FUNCTIONAL DESCRIPTION

R0341   THIS      SECTION CONSISTS OF PRELAUNCH ALIGNMENT AND GYRO DRIFT TESTS
R0342   INTEGRATED TOGETHER TO SAVE WORDS. COMPASS IS COMPLETELY RESTART
R0343   PROOFED EXCEPT FOR THE FIRST 30 SECONDS OR SO.  PERFORMANCE TESTS OF
R0344   THE IRIGS IS RESTART PROOFED ENOUGH TO GIVE 75 PERCENT CONFIDENCE THAT
R0345   IF A RESTART OCCURS THE DATA WILL STILL BE GOOD. GOOD PRACTICE TO RECYCL
R0346   WHEN A RESTART OCCURS UNLESS IT HAPPENS NEAR THE END OF A TEST-THEN WAIT
R0347   FOR THE DATA TO FLASH.
R03471  A RESTART IN GYROCOMPASS DURING GYRO TORQUING CAUSES PULSES TO BE LOST
R0348   THE PRELAUNCH ALIGNMENT TECHNIQUE IS BASICALLY THE SAME AS IN BLOCK 1
R0349   EXCEPT THAT IT HAS BEEN SIMPLIFIED IN THE SENSE THAT SMALL ANGLE APPROX.
R0350   HAVE BEEN USED. THE DRIFT TESTS USE A UNIQUE IMPLEMENTATION OF THE
R0351   OPTIMUM STATISTICAL FILTER. FOR A DESCRIPTION SEE E-1973.BOTH OF THESE
R0352   ROUTINES USE STANDARD SYSTEM TEST LEADIN PROCEDURES. THE INITIALIZATION
R0353   PROCEDURE FOR THE DRIFT TESTS IS IN THE JDC S. THE INITIALIZATION METHOD
R0354   FOR GYROCOMPASS IS AN ERAS LOAD THEN A MISSION PHASE CALL.
R0355   THE COMPASS ALIGNS TO Z DOWN,X DOWNRANGE, HAS THE CAPABILITY
R0356   CHANGE AZIMUTH WHILE RUNNING , IS COMPENSATED FOR
R0357   COMPONENT ERRORS,IS CAPABLE OF OPTICAL VERIFICATION( CSM ONLY).

R0358   COMPASS ERASABLE LOAD REQUIRED

R0359    1-LAUNCHAZ -DP AZIMUTH IN REV FROM NORTH OF XSM DESIRED      (NOM=.2)
R0360   2- LATITUDE -DP-OF LAUNCH PAD
R0361   3- AZIMUTH-DP-OF ZNB OF VEHICLE
R03611  4- IMU COMPENSATION PARAMETERS
R0362   5-AZ AND ELEVATION OF TARGETS 1,2     ****OPTIONAL****

R0363   TO PERFORM AS PART OF COMPASS

R0364   1-OPTICAL VERIFICATION- V 65 E
R0365   2-AZIMUTH CHANGE-V 78 E

R0366   SUBROUTINES CALLED

R0367   DURING OPTICAL VERIFICATION (CSM ONLY) ESSENTIALLY ALL OF INFLIGHT ALIGN
R0368   IS CALLED IN ONE WAY OR ANOTHER. SEE THE LISTING.

R0369   NORMAL EXIT

R0370   DRIFT TESTS- LENGTHOT GOES TO ZERO-RETURN TO IMU PERF TEST2 CONTROL
R0371   GYROCOMPASS-MANY,SEE THE LISTING
R0372   ALARMS

R0373   1600     OVERFLOW IN DRIFT TEST
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R0374 1601 BAD IMU TORQUE ABORT
R0375 1602 BAD OPTICS DURING VERIFICATION-RETURN TO COMPASS CSM ONLY

R0376 OUTPUT

R0377 DRIFT TESTS- FLASHING DISPLAYS OF RESULTS-CONTROLLED IN IMU PERF TESTS 2
R0378 COMPASS-PROGRAM MODE LIGHTS TELL YOU WHAT PHASE OF PROGRAM YOU ARE IN
R0379 01 INITIALIZING THE PLATFORM POSITION AND ERASABLE
R0380 02 GYROCOMPASSING
R0381 03 DOING OPTICAL VERIFICATION (CSM)
R0382
R0383
R0384 DEBRIS

R0385 ALL CENTRALS,ALL OF EBANK XSM

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R0386    MOST OF THE ROUTINES COMMON TO ALIGNMENT AND CALIBRATION APPEAR
R0387    ON THE NEXT FEW PAGES.
 03875  REF   1                                          COUNT   33/P02

 0388   REF  22  LAST  424   E5,1671                     EBANK=  XSM
 0389                        33,2453                     BANK    33
 0390   REF   3  LAST  423   33,2000                     SETLOC  IMUCAL
 0391                        33,2453                     BANK

 0392   REF   2  LAST  254   33,2453  0 5261 1  ESTIMS   TC      2PHSCHNG      COMES HERE FROM IMU2
 0393                        33,2454   00075 0           OCT     00075
 03931                       33,2455   00004 0           OCT     00004         TURN OFF GROUP 4 IF ON
 0394                        33,2456  0 0004 0  RSTGTS1  INHINT                COMES HERE PHASE1 RESTART
 0395   REF   7  LAST  409   33,2457  3 0025 0           CA      TIME1
 0396   REF   1              33,2460  55#645 0           TS      GTSWTLT1
 0397   REF  96  LAST  422   33,2461  3 4714 1           CAF     ZERO          ZERO THE PIPAS
 0398   REF   6  LAST  421   33,2462  54 037 1           TS      PIPAX
 0399   REF   1              33,2463  54 040 1           TS      PIPAY
 0400   REF   1              33,2464  54 041 0           TS      PIPAZ
 0402                        33,2465  0 0003 1           RELINT
 0403   REF   1              33,2466  3 3130 0           CA      77DECML       ZERO ALL NECESSARY LOCATIONS
 0404   REF   4  LAST  422   33,2467  55#655 1           TS      ZERONDX1
 0405   REF   1              33,2470  3 3131 1           CA      ALXXXZ
 0406   REF   2  LAST  417   33,2471  0 2356 0           TC      ZEROING
 0407   REF  20  LAST  423   33,2472  0 6006 1           TC      INTPRET
 04084                       33,2473   77735 0           SLOAD
 04085  REF   3  LAST  423   33,2474   27112 0                   SCHZEROS
 04086  REF   9  LAST  301   33,2475   25477 1           STOVL   GCOMPSW -1
 0409   REF   1              33,2476   27123 1                   INTVAL +2     LOAD SOME INITIAL DRIFT GAINS
 0410   REF   1              33,2477   26455 1           STOVL   ALX1S
 0411   REF   4  LAST  427   33,2500   27112 0                   SCHZEROS
 0412   REF  17  LAST  301   33,2501   01472 1           STORE   GCOMP
 0413   REF   6  LAST  294   33,2502   01163 1           STORE   DELVX         GCOMPZER SUBROUTINE NO LONGER NEEDED
 0414                        33,2503   77776 1           EXIT

 0415   REF   2  LAST  416   33,2504  11#643 0           CCS     GEOCOMP1      NON ZERO IF COMPASS.
 0416                        33,2505  0 2507 1           TC      +2
 0417   REF   1              33,2506  0 2523 1           TC      SLEEPIE +1
 0422   REF  21  LAST  427   33,2507  0 6006 1           TC      INTPRET
 04221                       33,2510   77624 1           CALL
 04222  REF   1              33,2511   64000 0                   ERTHRVSE
 04223                       33,2512   77776 1           EXIT
 0423   REF   7  LAST  419   33,2513  3 1412 1           CA      LENGTHOT      TIMES FIVE IS THE NUM OF SEC ERECTING
 0424   REF   1              33,2514  55#646 0           TS      ERECTIME

 0425   REF   3  LAST  420   33,2515  0 5243 1           TC      NEWMODEX
 0426                        33,2516   00002 0           MM      02
 0427   REF  67  LAST  424   33,2517  0 4555 0           TC      BANKCALL      SET UP PIPA FAIL TO CAUSE ISS ALARM
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0428  REP  2  LAST  301   33,2520   17075 0          CADR   PIPUSE     COMPASS NEVER TURNS THIS OFF
0429  REP  1                33,2521   0 3376 0       TC     ANNNNNN    END OF FIRST TIME THROUGH
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R0430    COMES HERE AT THE END OF EVERY ITERATION THROUGH DRIFT TEST OR COMPASS

R0431    SET UP WAITLIST SECTION
 0432    REF   8  LAST  427   33,2522  55,412 0  SLEEPIE  TS      LENGTHOT      TEST NOT OVER-DECREMENT LENGTHOT
 0433    REF   7  LAST  385   33,2523  0 5301 0           TC      PHASCHNG      CHANGE PHASE
 0434                         33,2524   00135 0           OCT     00135
 0435    REF   5  LAST  419   33,2525  11,450 0           CCS     TORQNDX       ARE WE DOING VERTDRIFT
 0436    REF   4  LAST  419   33,2526  0 2417 1           TC      EARTHR*       TRUE TORQUE SOUTH GYRO
 0437    REF   1              33,2527  0 3401 1  WTLISTNT TC      CHKCOMED             SEE IF COMPASS OVER
04371    REF   1              33,2530  0 2532 1           TC      SETG=LST
04372    REF  55  LAST  418   33,2531  0 5112 0           TC      ENDOFJOB

04373                        33,2532  0 0006 1  SETGWLST EXTEND
04374    REF 218  LAST  398   33,2533  22 154 1           QXCH    MPAC          CALLED EVERY WAITLIST OR AZIMUTH CHANGE
 0438                        33,2534  0 0004 0           INHINT
 0439    REF   8  LAST  427   33,2535  4 0025 1           CS      TIME1
 0440    REF   2  LAST  427   33,2536  6 1645 1           AD      GTSWTLT1
 0441                        33,2537  0 0006 1           EXTEND
 0442                        33,2540  6 2542 0           BZMF    +2
 0443    REF   2  LAST  409   33,2541  6 4674 0           AD      NEGMAX        10 MS ERROR OK
 0444    REF   2  LAST  416   33,2542  6 1644 0           AD      1SECXT1       1 SEC FOR CALIBRATION, .5 SEC IN COMPASS
 0445                        33,2543  0 0006 1           EXTEND
 0446    REF   1              33,2544  6 2550 0           BZMF    RIGHTGTS
 0447    REF   3  LAST  418   33,2545  0 5130 0  WTGTSMPL TC      TWIDDLE
 0448    REF   1              E5,1540                    EBANK=  ALTIM
 0449    REF   1              33,2546   02575 1           ADRES   ALLOOP
 0451    REF 219  LAST  429   33,2547  0 0154 1           TC      MPAC
 0452    REF   7  LAST  355   33,2550  3 4710 0  RIGHTGTS CAF     FOUR          SET UP NEXT WAITLIST-ALLOW SOME TIME
 0453    REF   1              33,2551  0 2545 1           TC      WTGTSMPL      END OF WAITLIST SECTION
R0454    STORE AND LOAD DATA SECTIONS FOR RESTART PROOFING

 0455                        33,2552   00031 0  25DECML  DEC     25

 0456    REF   1              33,2553  3 2552 1  STOREDTA CAF     25DECML
 0457    REF 220  LAST  429   33,2554  54 154 0           TS      MPAC
 0458    REF 221  LAST  429   33,2555  50 154 1           INDEX   MPAC
 0459    REF   2  LAST   98   33,2556  31,460 1           CAE     THETAX1
 0460    REF 222  LAST  429   33,2557  50 154 1           INDEX   MPAC
 0461    REF   1              33,2560  55,577 1           TS      RESTARPT
 0462    REF 223  LAST  429   33,2561  10 154 0           CCS     MPAC
 0463    REF   1              33,2562  1 2554 0           TCF     STOREDTA +1
 0464    REF 148  LAST  424   33,2563  0 0002 0           TC      0
 0465    REF   2  LAST  429   33,2564  3 2552 1  LOADSTDT CAF     25DECML
 0466    REF 224  LAST  429   33,2565  54 154 0           TS      MPAC
 0467    REF 225  LAST  429   33,2566  50 154 1           INDEX   MPAC
 0468    REF   2  LAST  429   33,2567  3 1577 0           CA      RESTARPT
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0469   REF 226  LAST 429   33,2570  50 154 1          INDEX  MPAC
0470   REF   3  LAST 429   33,2571  55¢460 0          TS     THETAX1
0471   REF 227  LAST 430   33,2572  10 154 0          CCS    MPAC
0472   REF   1             33,2573  1 2565 1          TCF    LOADSTDT +1
0473   REF 149  LAST 429   33,2574  0 0002 0          TC     Q
R0474    COMES HERE EVERY ITERATION BY A WAITLIST CALL SET IN SLEEPIE

0475   REF   9  LAST 429   33,2575  3 0025 0  ALLOOP   CA     TIME1
0476   REF   3  LAST 429   33,2576  55¢645 0          TS     GTS7TLT1        STORE TIME TO SET UP NEXT WAITLIST.
0477   REF   2  LAST 429   33,2577  3 1540 1  ALLOOP3  CA     ALTIM
0478   REF   1             33,2600  55¢631 0          TS     GEOSAVE1
0479   REF   8  LAST 429   33,2601  0 5301 0          TC     PHASCHNG
0480                       33,2602   00115 1          OCT    00115
0481   REF   2  LAST 430   33,2603  31¢631 1  ALLOOP1  CAE    GEOSAVE1
0482   REF   3  LAST 430   33,2604  55¢540 0          TS     ALTIM
0483   REF 130  LAST 409   33,2605  10 000 0          CCS    A
0484   REF 131  LAST 430   33,2606  3 0000 1          CA     A               SHOULD NEVER HIT THIS LOCATION
0485   REF   1             33,2607  55¢541 1          TS     ALTIMS
0486   REF 132  LAST 430   33,2610  4 0000 0          CS     A
0487   REF   4  LAST 430   33,2611  55¢540 0          TS     ALTIM
0488   REF  97  LAST 427   33,2612  3 4714 1          CAF    ZERO
04881  REF   7  LAST 427   33,2613  56 037 0          XCH    PIPAX
0489   REF   7  LAST 427   33,2614  55¢162 1          TS     DELVX
0490   REF  98  LAST 430   33,2615  3 4714 1          CAF    ZERO
04901  REF   2  LAST 427   33,2616  56 040 0          XCH    PIPAY
0491   REF   4  LAST 294   33,2617  55¢164 1          TS     DELVY
0492   REF  99  LAST 430   33,2620  3 4714 1          CAF    ZERO
04921  REF   2  LAST 427   33,2621  56 041 1          XCH    PIPAZ
0493   REF   3  LAST 295   33,2622  55¢166 0          TS     DELVZ
0494   REF   1             33,2623  3 4374 0          CAF    1/PIP
0495   REF   1             33,2624  0 4114 1          TC     NEWPHASE        23 OCT
0496                       33,2625   00005 1          OCT    00005
0501   REF   3  LAST 418   33,2626  3 4675 1  SPECSTS  CAF    PRIO20
0502   REF  16  LAST 418   33,2627  0 5042 1          TC     FINDVAC
0503   REF   3  LAST 430   E5,1631                    EBANK= GEOSAVE1
0504   REF   1             33,2630   02633 0          2CADR  ALPLT           START THE JOB
0504   REF   1             33,2631   66065 1
0505   REF  20  LAST 418   33,2632  0 5213 1          TC     TASKOVER
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B0506   THIS IS PART OF THE JOB DONE EVERY ITERATION

0507  REF   2  LAST  429   33,2633  0 2553 0  ALFLT    TC      STOREDTA      STORE DATA IN CASE OF RESTART IN JOB
0508  REF   9  LAST  430   33,2634  0 5301 0           TC      PHASCHNG      THIS IS THE JOB DONE EVERY ITERATION
0509                        33,2635   00215 1           OCT     00215
0510                        33,2636  1 2640 0           TCF     +2
0511  REF   2  LAST  430   33,2637  0 2564 1  ALFLT1   TC      LOADSTDT      COMES HERE ON RESTART

0512  REF   3  LAST  427   33,2640  11=643 0           CCS     GEOCOMP1
0513                        33,2641  0 2643 1           TC      +2
0514  REF   1               33,2642  0 2646 1           TC      NORMLOP
0515  REF   2  LAST  429   33,2643  0 3401 1           TC      CHKCOMED      SEE IF PRELAUNCH OVER
0516  REF  68  LAST  427   33,2644  0 4555 0           TC      BANKCALL      COMPENSATION IF IN COMPASS
0517  REF   1               33,2645   15262 0           CADR    1/PIPA

0518  REF  22  LAST  427   33,2646  0 6006 1  NORMLOP  TC      INTPRET
0519                        33,2647   77745 1           DLOAD
0520  REF   2  LAST  427   33,2650   27121 0                   INTVAL
0521  REF   5  LAST  403   33,2651   24051 0           STOVL   S1
0522  REF   8  LAST  430   33,2652   01163 1                   DELVX
0523                        33,2653   76505 0           VXM     VSL1
0524  REF  23  LAST  427   33,2654   02672 0                   XSM
0525                        33,2655   57545 1           DLOAD   DCOMP
0526  REF 228  LAST  430   33,2656   00160 0                   MPAC +3
0527  REF   1               33,2657   16533 0           STODL   DPIPAY
0528  REF 229  LAST  431   33,2660   00162 1                   MPAC +5
0529  REF   1               33,2661   02537 1           STORE   DPIPAZ

0530                        33,2662   76001 1           SETPD   AXT,1
0531                        33,2663   00001 0                   0
0532                        33,2664   00010 0                   8D
0533                        33,2665   57535 0           SLOAD   DCOMP
0534  REF   4  LAST  431   33,2666   02644 0                   GEOCOMP1
0535                        33,2667   77640 0           BMN
0536  REF   1               33,2670   67203 1                   ALWAYSG       DO A QUICK COMPASS
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R0537 NOW WE HAVE JUST THE CALIBRATION PARTS OF THE PROGRAM-NEXT PAGES

05375 REP 2 LAST 415 TO 424' 314 314* COUNT 33/COMST

0538					33,2671	50135 0	ALCGKK	SLOAD	BMN	
0539	REP	2	LAST	430	33,2672	02542 0			ALTIMS	
0540	REP	1			33,2673	66706 0			ALFLT3	NO NEW GAINS NEEDED
0541					33,2674	72174 0	ALKCG	AXT,2	LXA,1	LOADS SLOPES AND TIME CONSTANTS AT ROST
0542					33,2675	00014 1			12D	
0543	REP	2	LAST	427	33,2676	02454 0			ALX1S	
0544					33,2677	62143 0	ALKCG2	DLOAD*	INCR,1	
0545	REP	1			33,2700	02243 0			ALFDK +144D,1	
0546					33,2701	77775 1		DEC	-2	
0547	REP	1			33,2702	12555 1		STORE	ALDK +10D,2	
0548					33,2703	66104 1		TIX,2	SXA,1	
0549	REP	1			33,2704	66677 1			ALKCG2	
0550	REP	3	LAST	432	33,2705	02454 0			ALX1S	
0551					33,2706	77770 1	ALFLT3	AXT,1		MEASUREMENT INCORPORATION ROUTINES
0552					33,2707	00010 0			8D	AND GAIN UPDATES
0553					33,2710	41343 0	DELMLP	DLOAD*	DMP	
0554	REP	2	LAST	431	33,2711	02543 1			DPIPAY +8D,1	
0555	REP	1			33,2712	27675 0			PIPASC	
0556					33,2713	43661 1		SLR	BDSU*	
0557					33,2714	21212 0			9D	
0558	REP	1			33,2715	02511 0			INTY +8D,1	
0559	REP	2	LAST	432	33,2716	06511 1		STORE	INTY +8D,1	
0560					33,2717	40725 0		PDDL	DMP*	
0561	REP	1			33,2720	27677 1			VELSC	
0562	REP	1			33,2721	02531 1			VLAUN +8D,1	
0563					33,2722	77732 1		SL2R		
0564					33,2723	45425 0		DSU	STADR	
0565	REP	1			33,2724	71206 0		STORE	DELM +8D,1	
0566	REP	2	LAST	432	33,2725	06573 0		STORE	DELM +10D,1	
0567					33,2726	77100 0		TIX,1	AXT,2	
0568	REP	1			33,2727	66710 1			DELMLP	
0569					33,2730	00004 0			4	
0570					33,2731	56743 1	ALILP	DLOAD*	DMPR*	
0571	REP	3	LAST	98	33,2732	75314 0			ALK +4,2	
0572	REP	2	LAST	432	33,2733	75230 1			ALDK +4,2	
0573	REP	4	LAST	432	33,2734	12463 0		STORE	ALK +4,2	
0574					33,2735	77104 1		TIX,2	AXT,2	
0575	REP	1			33,2736	66731 1			ALILP	
0576					33,2737	00010 0			8D	
0577					33,2740	66140 1	ALKLP	LXC,1	SXA,1	
0578	REP	1			33,2741	02455 1			CMPX1	
0579	REP	2	LAST	432	33,2742	02455 1			CMPX1	
0580					33,2743	56743 1		DLOAD*	DMPR*	
0581	REP	5	LAST	432	33,2744	02460 1			ALK +1,1	
0582	REP	3	LAST	432	33,2745	75206 1			DELM +8D,2	

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0583                          33,2746  77613 0          DAD*
0584  REF   3  LAST  432      33,2747  75266 1                INTY +8D,2
0585  REF   4  LAST  433      33,2750  12511 1          STORE INTY +8D,2
0586                          33,2751  42743 1          DLOAD* DAD*
0587  REF   6  LAST  432      33,2752  75304 1                ALK +12D,2
0588  REF   3  LAST  432      33,2753  75220 0                ALDK +12D,2
0589  REF   7  LAST  433      33,2754  12473 1          STORE ALK +12D,2
0590                          33,2755  42673 0          DMPR* DAD*
0591  REF   4  LAST  432      33,2756  75206 1                DELM +8D,2
0592  REF   5  LAST  433      33,2757  75256 1                INTY +16D,2
0593  REF   6  LAST  433      33,2760  12521 1          STORE INTY +16D,2
0594                          33,2761  40743 0          DLOAD* DMP*
0595  REF   1                 33,2762  27702 1                ALSK +1,1
0596  REF   5  LAST  433      33,2763  75206 1                DELM +8D,2
0597                          33,2764  42772 0          SL1R  DAD*
0598  REF   2  LAST  432      33,2765  75246 0                VLAUN +8D,2
0599  REF   3  LAST  433      33,2766  12531 0          STORE VLAUN +8D,2
0600                          33,2767  76104 0          TIX,2 AXT,1
0601  REF   1                 33,2770  66740 1                ALKLP
0602                          33,2771  00010 0                8D
0603                          33,2772  64743 0  LOOSE   DLOAD* PDDL*          EXTRAPOLATE SWAY VARIABLES
0604  REF   1                 33,2773  02533 0                ACCWD +8D,1
0605  REF   4  LAST  433      33,2774  02531 1                VLAUN +8D,1
0606                          33,2775  55523 0          PDDL* VDEF
0607  REF   1                 33,2776  02541 0                POSNV +8D,1
0608                          33,2777  76521 0          MXV   VSL1
0609  REF   2  LAST   90      33,3000  02001 1                TRANSM1
0610                          33,3001  77745 1          DLOAD
0611  REF 230  LAST  431      33,3002  00155 0                MPAC
0612  REF   2  LAST  433      33,3003  06541 1          STORE POSNV +8D,1
0613                          33,3004  77745 1          DLOAD
0614  REF 231  LAST  433      33,3005  00160 0                MPAC +3
0615  REF   5  LAST  433      33,3006  06531 0          STORE VLAUN +8D,1
0616                          33,3007  77745 1          DLOAD
0617  REF 232  LAST  433      33,3010  00162 1                MPAC +5
0618  REF   2  LAST  433      33,3011  06533 1          STORE ACCWD +8D,1
0619                          33,3012  77700 0          TIX,1
0620  REF   1                 33,3013  66772 0                LOOSE
0621                          33,3014  76174 1          AXT,2 AXT,1           EVALUATE SINES AND COSINES
0622                          33,3015  00006 1                6
0623                          33,3016  00002 0                2
0624                          33,3017  57343 1  BOOP    DLOAD* DMPR
0625  REF   1                 33,3020  02513 1                ANGX +2,1
0626  REF   1                 33,3021  27705 0                GEORGEJ
0627                          33,3022  77722 0          SR2R
0628                          33,3023  73406 1          PUSH  SIN
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0629                          33,3024  56072 1          SL3R   XAD,1
0630  REF  1                  33,3025  00046 0                 X1
0631                          33,3026  10021 0          STORE  16D,2
0632                          33,3027  77745 1          DLOAD
0633                          33,3030  77746 1          COS
0634                          33,3031  10027 0          STORE  22D,2      COSINES
0635                          33,3032  77704 1          TIX,2
0636  REF  1                  33,3033  67017 0                 BOOP
0637                          33,3034  77776 1  PERFERAS EXIT
0638  REF  2  LAST  252       33,3035  3 4753 1         CA     EBANK7
0639  REF  5  LAST  275       E7,1400                   EBANK= LAT(SPL)
06395 REF 18  LAST  372       33,3036  54 003 0         TS     EBANK
0640  REF  6  LAST  434       33,3037  0 1400 1         TC     LAT(SPL)   GO TO ERASABLE ONLY TO RETURN

R0641           CAUTION

R0642  THE ERASABLE PROGRAM THAT DOES THE CALCULATIONS MUST BE LOADED
R0643  BEFORE ANY ATTEMPT IS MADE TO RUN THE IMU PERFORMANCE TEST

0734  REF  9  LAST  429       E5,1412                   EBANK= LENGTHOT
0735  REF 10  LAST  434       33,3040  11∝412 0 ONCEMORE CCS   LENGTHOT
0736  REF  2  LAST  427       33,3041  0 2522 0         TC     SLEEPIE    TEST NOT OVER SET UP NEXT WAITLIST

07361 REF  6  LAST  429       33,3042  11∝450 0         CCS    TORQNDX
07362                         33,3043  1 3045 1         TCF    +2
07363 REF  1                  33,3044  0 3047 1         TC     SETUPER1
07364 REF  9  LAST  419       33,3045  3 0032 0         CA     CDUX
07365 REF  3  LAST  419       33,3046  55∝414 0         TS     LOSVEC +1  FOR TROUBLESHOOTING POSNS 2$4 VD
0737  REF 23  LAST  431       33,3047  0 6006 1 SETUPER1 TC    INTPRET    DRIFT TEST OVER
0738                          33,3050  65345 0          DLOAD  PDDL       ANGLES FROM DRIFT TEST ONLY
0739  REF  1                  33,3051  02503 0                 ANGZ
0740  REF  1                  33,3052  02507 1                 ANGY
0741                          33,3053  55525 0          PDDL   VDEF
0742  REF  2  LAST  433       33,3054  02511 0                 ANGX
0743                          33,3055  74276 1          VCOMP  VXSC
0744  REF  2  LAST  433       33,3056  27705 0                 GEORGEJ
0745                          33,3057  74521 1          MXV    VSR1
0746  REF 24  LAST  431       33,3060  02672 0                 XSM
0747  REF 10  LAST  424       33,3061  02760 1          STORE  CGC
0748                          33,3062  77776 1          EXIT

0749  REF 10  LAST  431       33,3063  0 5301 0 TORQINCH TC    PHASCHNG
0750                          33,3064  00005 1          OCT    00005
0751  REF  1                  33,3065  3 2444 1         CA     CGCPL
0752  REF 69  LAST  431       33,3066  0 4555 0         TC     BANKCALL
0753  REF  3  LAST  298       33,3067  17125 1          CADR   IMUPULSE
0754  REF  5  LAST  423       33,3070  0 2316 1         TC     IMUSTLLG
0755  REF  7  LAST  434       33,3071  11∝450 0         CCS    TORQNDX    + IF IN VERTICAL DRIFT TEST
0756  REF  1                  33,3072  0 2262 0         TC     VALMIS     VERT DRIFT TEST OVER
0757  REF 24  LAST  434       33,3073  0 6006 1         TC     INTPRET
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 07571                          33,3074   77624 1            CALL                SET UP ERATE FOR PIP TEST OR COMPASS
 07572  REF   2  LAST  427      33,3075   64000 0                 ERTHRVSE
 07573                          33,3076   77776 1            EXIT
 0758   REF   1                 33,3077   0 2122 1           TC       TORQUE     GO TO IMU2 FOR A PIPA TEST AND DISPLAY
 0759   REF  21  LAST  251      33,3100   0 5537 0  SOMEERRR TC       ALARM
 0760                          33,3101   01600 0            OCT      1600
 0761                          33,3102   0 3105 0           TC       +3
 0762   REF  22  LAST  435      33,3103   0 5537 0  SOMERR2  TC       ALARM
 0763                          33,3104   01601 1            OCT      1601
 0764   REF  11  LAST  434      33,3105   0 5301 0           TC       PHASCHNG
 0765                          33,3106   00005 1            OCT      00005
 0766   REF   2  LAST  424      33,3107   0 2267 0           TC       ENDTEST1
R0767    THE FAMOUS MAGIC NUMBERS OF SCHMIDT ARE NOW PART OF AN ERASABLE LOAD.
 0768                          33,3110   02222 1  DEC585    OCT      02222          1170 B+14  ORDER IS NOW IMPORTANT
 0769                          33,3111   00000 1  SCHZEROS  2DEC     .00000000
 0769                          33,3112   00000 1
 0770                          33,3113   00000 1            2DEC     .00000000
 0770                          33,3114   00000 1
 0771                          33,3115   00000 1            OCT      00000
 0772                          33,3116   00000 1  ONEDPP    OCT      00000
 0773                          33,3117   00001 0            OCT      00001                ABOVE ORDER IS IMPORTANT
 0774                          33,3120   00004 0  INTVAL    OCT      4
 0775                          33,3121   00002 0            OCT      2
 0776                          33,3122   00220 1            DEC      144
 0777                          33,3123   77776 1            DEC      -1
 0778                          33,3124   35730 0  SCUPLY    2DEC     .93505870      INITIAL GAINS FOR PIP OUTPUTS
 0778                          33,3125   00035 1
 0779                          33,3126   10317 0            2DEC     .26266423      INITIAL GAINS/4 FOR ERECTION ANGLES
 0779                          33,3127   17550 1
 0780                          33,3130   00115 1  77DECML   DEC      77
 0781   REF   4  LAST  432      33,3131   01453 1  ALXXXZ    GENADR   ALX1S -1
R0789    GYROCOMPASS PORTIONS FINISH THIS LOG SECTION
 07895  REF   1                                              COUNT    33/P01

R0790    INITIALIZATION SECTION

 0791   REF  56  LAST  418      33,3132   3 4712 1  GTSCPSS   CAF      ONE            CALLED BY V37.
 0792   REF   5  LAST  431      33,3133   55=643 0           TS       GEOCOMP1       THIS IS THE LEAD IN FOR COMPASS.
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0793  REF   1                    33,3134  3 3424 0          CA     1/PIPAGT
0794  REF   8  LAST  416         33,3135  55¢074 1          TS     1/PIPADT
0795  REF  21  LAST  298         33,3136  3 4703 1  NXXTBNN CA     BIT8
0796  REF  11  LAST  434         33,3137  55¢412 0          TS     LENGTHOT
0797  REF   1                    33,3140  3 4731 0          CAF    1/2SECX        COMPASS IS A .5 SEC LOOP
0798  REF   3  LAST  429         33,3141  55¢644 1          TS     1SECXT1
0799  REF  57  LAST  435         33,3142  3 4712 1          CAF    ONE
0800  REF   1                    33,3143  55¢632 0          TS     PREMTRX1
08005 REF   2  LAST  417         33,3144  55¢657 0          TS     PERFDLAY +1
08006 REF 100  LAST  430         33,3145  3 4714 1          CAF    ZERO
08007 REF   3  LAST  436         33,3146  55¢656 1          TS     PERFDLAY
0801                             33,3147  0 0006 1          EXTEND
0802  REF   4  LAST   98         33,3150  3 1634 1          DCA    LUNCHAZ1
0803  REF   1                    33,3151  53¢636 1          DXCH   NEWAZ1
08031                            33,3152  0 0006 1          EXTEND
08032 REF   5  LAST  436         33,3153  3 1634 1          DCA    LUNCHAZ1
08033 REF   1                    33,3154  53¢640 0          DXCH   OLDAZMTH
0804  REF   2  LAST  416         33,3155  3 4375 1  SETUPGC CA     DEC17
0805  REF   5  LAST  427         33,3156  55¢655 1          TS     ZERONDX1
0806  REF   1                    33,3157  3 2446 0          CA     XSMADR
0807  REF   3  LAST  427         33,3160  0 2356 0          TC     ZEROING
0808  REF   1                    33,3161  0 3163 0          TC     POSN17C
0809  REF   1                    33,3162  0 2030 0          TC     GEOIMUTT       GO TO IMU2 FOR FURTHER INITIALIZATION
0810                             33,3163  0 0006 1  POSN17C EXTEND                COMPASS POSITION Z DOWN,X DOWNRANGE
0811  REF  13  LAST  424         33,3164  23¢425 0          QXCH   QPLACE         FROM NORTH IN REVOLUTIONS + CLOCKWSE
0812  REF   2  LAST  417         33,3165  4 4675 0          CS     HALF           ALL THIS TO INITIALIZE MATRIX
0813  REF   2  LAST   93         33,3166  55¢705 0          TS     ZSM
0814  REF  25  LAST  434         33,3167  0 6006 1          TC     INTPRET
0815                             33,3170   41545 0          DLOAD  PUSH
0816  REF   2  LAST  436         33,3171   02636 0                 NEWAZ1
0817                             33,3172   77756 0          SIN
0818  REF  25  LAST  434         33,3173   02676 1          STORE  XSM +4
0819  REF   2  LAST   93         33,3174   16702 0          STODL  YSM +2
0820                             33,3175   77746 1          COS
0821  REF   3  LAST  436         33,3176   02704 0          STORE  YSM +4
0822                             33,3177   77676 0          DCOMP
0823  REF  26  LAST  436         33,3200   02674 0          STORE  XSM +2
0824                             33,3201   77776 1          EXIT
0825  REF  14  LAST  436         33,3202  0 1425 0          TC     QPLACE
R0826   JOB DONE EVERY ITERATION THROUGH COMPASS PROGRAM. SET BY TASK ALLOOP

08268 REF   2 LAST  427 TO  432'   142   142*          COUNT  33/P02

0827                             33,3203   44743 1  ALWAYSG DLOAD* DSU*           COMPASS AND ERECT
0828  REF   3  LAST  432         33,3204   02543 1                 DPIPAY +8D,1
0829  REF   2  LAST   98         33,3205   02505 0                 PILDELV1 +8D,1
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0830                          33,3206  42675 0          DMPR    DAD*
0831  REF  1                 33,3207  27713 1                  GEOCONS1
0832  REF  3  LAST  436      33,3210  02505 0                  FILDELV1 +8D,1
0833  REF  4  LAST  437      33,3211  06505 1          STORE   FILDELV1 +8D,1
0834                          33,3212  77613 0          DAD*
0835  REF  1                 33,3213  02507 1                  INTVEC1 +8D,1
0836  REF  2  LAST  437      33,3214  06507 0          STORE   INTVEC1 +8D,1
0837                          33,3215  42675 0          DMPR    DAD*
0838  REF  1                 33,3216  27715 1                  GEOCONS2
0839  REF  5  LAST  437      33,3217  02505 0                  FILDELV1 +8D,1
0840                          33,3220  41475 1          DMPR    PUSH
0841  REF  1                 33,3221  15330 0                  GEOCONS5
0842                          33,3222  67300 0          TIX,1   SLOAD
0843  REF  2  LAST  431      33,3223  67203 1                  ALMAYSG
0844  REF  1                 33,3224  02647 0                  ERECTIM1
0845                          33,3225  71254 1          BZE     DLOAD
0846  REF  1                 33,3226  67237 0                  COMPGS
0847  REF  2  LAST   98      33,3227  02471 1                  THETAN1 +2
0848                          33,3230  45425 0          DSU     STADR
0849  REF  3  LAST  437      33,3231  61306 0          STODL   THETAN1 +2      ERECTION ONLY.
0850                          33,3232  77621 1          BDSU
0851  REF  4  LAST  437      33,3233  02473 0                  THETAN1 +4
0852  REF  5  LAST  437      33,3234  02473 0          STORE   THETAN1 +4
0853                          33,3235  77650 1          GOTO
0854  REF  1                 33,3236  67261 0                  ADDINDRF
0855                          33,3237  43345 1  COMPGS  DLOAD  DAD             COMPASS
0856  REF  6  LAST  437      33,3240  02467 0                  THETAN1
0857  REF  6  LAST  437      33,3241  02475 0                  FILDELV1
0858  REF  7  LAST  437      33,3242  16467 0          STODL   THETAN1
0859  REF  7  LAST  437      33,3243  02475 0                  FILDELV1
0860                          33,3244  44275 1          DMPR    BDSU
0861  REF  1                 33,3245  27717 0                  GEOCONS3
0862  REF  8  LAST  437      33,3246  02473 0                  THETAN1 +4
0863  REF  9  LAST  437      33,3247  16473 0          STODL   THETAN1 +4
0864  REF  8  LAST  437      33,3250  02501 1                  FILDELV1 +4
0865                          33,3251  44275 1          DMPR    BDSU
0866  REF  2  LAST  437      33,3252  27717 0                  GEOCONS3
0867  REF 10  LAST  437      33,3253  02471 1                  THETAN1 +2
0868                          33,3254  57325 1          PDDL    DMPR
0869  REF  3  LAST  437      33,3255  02503 0                  INTVEC1 +4
0870  REF  1                 33,3256  27721 0                  GEOCONS4
0871                          33,3257  45421 1          BDSU    STADR
0872  REF 11  LAST  437      33,3260  75306 0          STORE   THETAN1 +2
0873                          33,3261  77776 1  ADDINDRF EXIT
0874  REF 12  LAST  436      33,3262  11«412 0 ENDGTSAL CCS    LENGTHOT        IS 5 SEC OVER-THE TIME TO TORQ PLATFORM
0875  REF  3  LAST  434      33,3263  0 2522 0         TC      SLEEPIE         NO-SET UP NEXT WAITLIST CALL FOR .5 SEC
0876  REF  3  LAST  431      33,3264  0 3401 1         TC      CHKCOMED
0877  REF  2  LAST  188      33,3265  11«304 0         CCS     LGYRO           YES BUT ARE GYROS BUSY
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0878  REF   4  LAST  437   33,3266  1 2523 0          TCF   SLEEPIE +1      BUSY-GET THEM .5 SECONDS FROM NOW

0879  REF  26  LAST  436   33,3267  0 6006 1 LASTGTS  TC    INTPRET
0880                       33,3270   77775 1          VLOAD
0881  REF   9  LAST  423   33,3271   02650 0                ERCOMP1
0882  REF   4  LAST  430   33,3272   16461 0          STODL THETAX1
0883  REF   4  LAST  423   33,3273   02443 0                TMARK
0884  REF   8  LAST  433   33,3274   02457 0          STORE ALK
0885                       33,3275   77776 1          EXIT                  PREVIOUS SECTION WAS FOR RESTARTS

0886  REF  12  LAST  435   33,3276  0 5301 0 RESTAIER TC    PHASCHNG
0887                       33,3277   00275 1          OCT   00275
0888  REF  27  LAST  438   33,3300  0 6006 1          TC    INTPRET         ADD COMPASS COMMANDS INTO ERATE
0889                       33,3301   64375 1          VLOAD MXV
0890  REF  12  LAST  437   33,3302   02467 0                THETAN1
0891  REF  27  LAST  436   33,3303   02672 0                XSM
0892                       33,3304   53372 1          VSL1  VAD
0893  REF   5  LAST  438   33,3305   02461 0                THETAX1
0894  REF  10  LAST  438   33,3306   16650 0          STODL ERCOMP1
0895  REF   9  LAST  438   33,3307   02457 0                ALK
0896  REF   5  LAST  438   33,3310   02443 0          STORE TMARK
0897                       33,3311   77776 1          EXIT
0898  REF   5  LAST  429   33,3312  0 2417 1          TC    EARTHR*         TORQUE IT ALL IN
0899  REF   2  LAST  437   33,3313  31∝646 1          CAE   ERECTIM1
0900  REF   4  LAST  430   33,3314  55∝631 0          TS    GEOSAVE1
0901  REF  13  LAST  438   33,3315  0 5301 0          TC    PHASCHNG
0902                       33,3316   00155 0          OCT   00155
0903  REF  28  LAST  438   33,3317  0 6006 1 RESTEST1 TC    INTPRET
0904                       33,3320   77775 1          VLOAD
0905  REF   5  LAST  427   33,3321   27112 0                SCHZEROS
0906  REF  13  LAST  438   33,3322   02467 0          STORE THETAN1
0907                       33,3323   77776 1          EXIT
0912  REF   1               33,3324  11∝632 0          CCS   PREMTRXC
09121 REF   1               33,3325  0 3374 1          TC    NOCHORLD
09122 REF  14  LAST  438   33,3326  0 5301 0          TC    PHASCHNG
0913                       33,3327   00255 0          OCT   00255
09131 REF  29  LAST  438   33,3330  0 6006 1 RESTEST3 TC    INTPRET
0914                       33,3331   77745 1          DLOAD
09142 REF   2  LAST  169   33,3332   02634 1                LAUNCHAZ
0915                       33,3333   53025 0          DSU   BZE
09151 REF   2  LAST  436   33,3334   02640 1                OLDAZMTH
09152 REF   1               33,3335   67371 0                NOAZCHGE
09153                      33,3336   00001 0          STORE 0D
09154                      33,3337   43335 0          SLOAD DAD
09155 REF   2  LAST  421   33,3340   27120 1                ONEDPP +1
0918  REF   2  LAST  438   33,3341   02633 0                PREMTRXC        DOES NOT CHANGE LAUNCHAZ
0919  REF   3  LAST  438   33,3342   16633 0          STODL PREMTRXC
0920  REF   3  LAST  438   33,3343   02634 1                LAUNCHAZ
09201 REF   1               33,3344   16636 0          STODL NEWAZMTH
09202                      33,3345   00001 0                0D
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09203 REF   1          33,3346   02654 1  ADERCOMP  STORE   ERCOMP +4
09204                  33,3347   77776 1            EXIT
09205 REF   2  LAST 436 33,3350   0 3163 0           TC      POSN17C
09206 REF  15  LAST 438 33,3351   0 5301 0           TC      PHASCHNG
09207                  33,3352    00335 1           OCT     00335
09221                  33,3353   0 0006 1  RESCHNG   EXTEND
09222 REF   2  LAST 438 33,3354   3 1636 0           DCA     NEWAZMTH
09223 REF   3  LAST 438 33,3355   53∝640 0           DXCH    OLDAZMTH
09231 REF  33  LAST 384 33,3356   3 4704 0           CA      BIT7          SPEND 320 SEC. ERECTING
09232 REF  13  LAST 437 33,3357   55∝412 0           TS      LENGTHOT
09224 REF  16  LAST 439 33,3360   0 5301 0           TC      PHASCHNG
09225                  33,3361    00075 0           OCT     00075
09226 REF   1          33,3362   3 3423 1  SPITGYRO CA      ERCOMPPL
09227 REF  70  LAST 434 33,3363   0 4555 0           TC      BANKCALL
09228 REF   4  LAST 434 33,3364    17125 1           CADR    IMUPULSE
09229 REF  71  LAST 439 33,3365   0 4555 0           TC      BANKCALL
09230 REF   7  LAST 421 33,3366    17516 0           CADR    IMUSTALL
09231 REF   2  LAST 421 33,3367   0 3103 0           TC      SOMERR2
09311 REF   3  LAST 420 33,3370   0 2453 1           TC      ESTIMS        RE-INITIALIZE
09232                  33,3371    77776 1  NOAZCHGE  EXIT
09233 REF  58  LAST 436 33,3372   3 4712 1           CA      ONE
09234 REF   4  LAST 438 33,3373   55∝632 0           TS      PREMTRXC
09241 REF   5  LAST 438 33,3374   11∝631 0  NOCHORLD CCS     GEOSAVE1
09242 REF   3  LAST 438 33,3375   55∝646 0           TS      ERECTIM1      COUNTS DOWN FOR ERECTION.

09243 REF   1          33,3376   3 4334 1  ANNNNNN  CAF     NINE
09244 REF  14  LAST 439 33,3377   55∝412 0           TS      LENGTHOT
09245 REF   5  LAST 438 33,3400   0 2523 1           TC      SLEEPIE +1
09246                  33,3401   0 0004 0  CHKCOMED INHINT
09247 REF 101  LAST 436 33,3402   4 4714 0           CS      ZERO
09248                  33,3403   0 0006 1           EXTEND
09249 REF   5  LAST 244 33,3404   06 030 1           RXOR    CHAN30        READ AND INVERT BITS IN CHANNEL 30
09250 REF  24  LAST 419 33,3405   7 4706 0           MASK    BIT5          LIFTOFF BIT
09251 REF 133  LAST 430 33,3406   10 000 0           CCS     A
09252 REF   1          33,3407   1 3416 0           TCF     PRELTERM      LIFTOFF HAS OCCURRED

09253 REF  25  LAST 439 33,3410   3 4706 1           CA      BIT5          CHECK FOR BACKUP LIFTOFF
09254 REF   8  LAST 383 33,3411   7 0101 0           MASK    FLAGWRD5      BIT5 FLAGWRD5
09255 REF 134  LAST 439 33,3412   10 000 0           CCS     A
09256 REF   2  LAST 439 33,3413   1 3416 0           TCF     PRELTERM      BACKUP RECEIVED

09257                  33,3414   0 0003 1           RELINT
09258 REF 150  LAST 430 33,3415   0 0002 0           TC      Q             CONTINUE PRELAUNCH
09259 REF   1          33,3416   3 7657 1  PRELTERM CA      PRIO22        PRELAUNCH DONE - SET UP P11
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0960  REF   4  LAST  385   33,3417  0 5103 0          TC      PRIOCHNG      INCREASE PRIORITY HIGHER THAN SERVICER
0961                       33,3420  0 0004 0          INHINT
0962  REF  34  LAST  380   33,3421  0 4574 0          TC      POSTJUMP
0963  REF   1               33,3422   70002 1          CADR    P11
0965  REF   2  LAST  439   33,3423   02647 0  ERCOMPPL ECADR   ERCOMP

0968  REF   3  LAST  389   26,3327            GEOCONS5 EQUALS  HIDPHALF
0969                       33,3424   06200 0  1/PIPAGT OCT     06200
0970  REF   6  LAST  424      4375            17DECML  =       ND1           OCT 21
0971  REF  16  LAST  424      4374            19DECML  =       VD1           OCT 23
0972  REF   3  LAST  184      4731            1/2SECX  =       .5SEC
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09725 REF 56 LAST 429 5112 GEOSTRT4 EQUALS ENDOFJOB

P0973 OPTICAL VERIFICATION ROUTINES FOR GYROCOMPASS

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09735  REF   1                                          COUNT   33/P03

0974   REF  17  LAST  439  33,3425  0 5301 0  GCOMPVER  TC      PHASCHNG      OPTICAL VERIFICATION ROUTINE
0975                       33,3426   00154 1            OCT     00154
0976   REF   4  LAST  427  33,3427  0 5243 1            TC      NEWMODEX      ENTERED BY VERB 65 ENTER
0977                       33,3430   00003 1            MM      03
09771  REF   1             33,3431  0 2037 1  SETNBPOS  TC      NBPOSPL
0978   REF  72  LAST  439  33,3432  0 4555 0            TC      BANKCALL
0979   REF   2  LAST  420  33,3433   16063 0            CADR    MKRELEAS
0980   REF  34  LAST  379  33,3434  3 4712 1  OPTDATA   CAF     BIT1          CALLS FOR AZIMUTH AND ELEVATION OF TARGE
0981                       33,3435  22 007 0            ZL                    T 1,THEN TARGET 2
0982   REF   1             33,3436  23∝427 1            LXCH    RUN           AZIMUTH CLOCKWSE FROM NORTH TO TARGET
0983   REF  20  LAST  360  33,3437  55∝047 1            TS      DSPTEM1 +2    ELEVATION MEASURED FROM HORIZONTAL
0984                       33,3440  0 0006 1            EXTEND
0985   REF   2  LAST  442  33,3441  5 1427 1            INDEX   RUN
0986   REF   1             33,3442  3 1433 1            DCA     TAZEL1
0987   REF  21  LAST  442  33,3443  53∝046 0            DXCH    DSPTEM1
0988   REF   1             33,3444  3 3467 1            CAF     V05N30E
0989   REF  73  LAST  442  33,3445  0 4555 0            TC      BANKCALL
0990   REF   1             33,3446   20577 0            CADR    GODSPRET
0991   REF   1             33,3447  3 3455 0            CAF     VN0641
09911  REF  74  LAST  442  33,3450  0 4555 0            TC      BANKCALL
09912  REF   4  LAST  424  33,3451   20624 0            CADR    GOFLASH
09913  REF   1             33,3452  0 3610 0            TC      GCOMP5
09914                      33,3453  0 3456 0            TC      +3
09915                      33,3454  0 3444 0            TC      -8D
09916                      33,3455   01451 0  VN0641    VN      0641
0992   REF  22  LAST  442  33,3456  53∝046 0            DXCH    DSPTEM1       TAZEL1  TARGET 1 AZIMUTH
0993   REF   3  LAST  442  33,3457  51∝427 1            INDEX   RUN
0994   REF   2  LAST  442  33,3460  53∝433 0            DXCH    TAZEL1        TAZEL1 +2 TARGET 2 AZIMUTH
0995   REF   4  LAST  442  33,3461  11∝427 0            CCS     RUN
0996                      33,3462  1 3466 1            TCF     +4
0997   REF  26  LAST  418  33,3463  3 4711 1            CAF     TWO
0998   REF  55  LAST  424  33,3464  54 001 1            TS      L
0999   REF   1             33,3465  1 3436 1            TCF     OPTDATA +2    MPAC    1ST PASS=0  2ND PASS=2
09991  REF   1             33,3466  0 3530 1            TC      CONTIN33

099921                     33,3467   01236 1  V05N30E   VN      0530

10136  REF  30  LAST  438  33,3470  0 6006 1            TC      INTPRET       UNDYNAMIC ASSEMBLER
1014                       33,3471   77170 1  TAR/EREF  AXT,1   AXT,2         TARGET VECTOR
1015                       33,3472   00002 0                    2             SIN(EL)  -COS(AZ)COS(EL)  -SIN(AZ)COS(EL
1016                       33,3473   00014 1                    12D
1017                       33,3474   40331 1            SSP     SETPD
1018   REF   3  LAST  423  33,3475   00052 0                    S2
1019                       33,3476   00006 1                    6
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1020                                33,3477   00001 0                    0
1021                                33,3500   60533 1  TAR1      SLOAD*  SR2          X1=2 X2=12 S2=6 X1=0 X2=6 S2=6
1022   REF   3  LAST  442           33,3501   02436 1                    TAZEL1 +3,1
1023                                33,3502   00001 0           STORE    0            PD00    ELEVATION    PD00
1024                                33,3503   77756 0           SIN
1025                                33,3504   10023 1           STORE    18D,2        PD06 ***    SIN(EL)   ***PD12
1026                                33,3505   77745 1           DLOAD
1027                                33,3506   00001 0                    0
1028                                33,3507   41546 0           COS      PUSH         PD00     COS(EL)   PD00
1029                                33,3510   47133 0           SLOAD*   RTB
1030   REF   4  LAST  443           33,3511   02435 1                    TAZEL1 +2,1
1031   REF   4  LAST  398           33,3512   45510 1                    CDULOGIC
1032                                33,3513   00003 1           STORE    2            PD02        AZIMUTH   PD02
1033                                33,3514   41356 1           SIN      DMP
1034                                33,3515   00001 0                    0
1035                                33,3516   77752 1           SL1
1036                                33,3517   10027 0           STORE    22D,2        PD10  *** SIN(AZ)COS(EL)  ***PD16
1037                                33,3520   71545 0           DLOAD    COS
1038                                33,3521   00003 1                    2
1039                                33,3522   72405 0           DMP      SL1
1040                                33,3523   76076 1           DCOMP    AXT,1
1041                                33,3524   00000 1                    0
1042                                33,3525   10025 1           STORE    20D,2        PD08 ***   -COS(AZ)COS(EL)  ***PD14
1043                                33,3526   43504 1           TIX,2    RVQ
1044   REF   1                      33,3527   67500 0                    TAR1
10443                               33,3530                     BANK     33
104435 REF   4  LAST  427           33,2000                     SETLOC   IMUCAL
10444                               33,3530                     BANK
104445 REF   1                                                  COUNT*   $$/PO3

10445  REF  59  LAST  439           33,3530   3 4712 1  CONTIN33 CA       ONE
10446  REF   3  LAST  276           33,3531   54 735 1            TS       STARCODE
10447  REF 102  LAST  439           33,3532   3 4714 1            CA       ZERO
10448  REF   1                      33,3533   0 3625 0            TC       TARGDRVE
10449  REF  31  LAST  442           33,3534   0 6006 1            TC       INTPRET
104492                              33,3535    77624 1            CALL
104494 REF   1                      33,3536    67471 1                     TAR/EREF
104496                              33,3537    64375 1  NEXTBNKS  VLOAD    MXV
1045                                33,3540    00007 0                     6D
1047   REF  28  LAST  438           33,3541    02672 0                     XSM
10471                               33,3542    77772 0            VSL1
1048   REF   3  LAST   93           33,3543    26736 1            STOVL    STARAD
1049                                33,3544    00015 0                     12D
1050                                33,3545    76521 0            MXV      VSL1
1051   REF  29  LAST  443           33,3546    02672 0                     XSM
1052   REF   4  LAST  443           33,3547    02744 1            STORE    STARAD +6
1053                                33,3550    77624 1            CALL
1054   REF   1                      33,3551    67722 1                     LITTLSUB
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1060   REF   4   LAST  434   33,3552   02414 1            STORE  LOSVEC
1061                         33,3553   77776 1            EXIT
1062   REF  75   LAST  442   33,3554   0 4555 0           TC     BANKCALL
1063   REF   3   LAST  442   33,3555    16063 0           CADR   MKRELEAS
1069   REF  27   LAST  442   33,3556   3 4711 1  NEXBNKSS CAF    TWO
1070   REF   4   LAST  443   33,3557   54 735 1           TS     STARCODE
1071   REF  16   LAST  409   33,3560   3 6211 0           CAF    SIX
1072   REF   2   LAST  443   33,3561   0 3625 0           TC     TARGDRVE
1073   REF  32   LAST  443   33,3562   0 6006 1           TC     INTPRET
1074                         33,3563    77624 1           CALL
1075   REF   2   LAST  443   33,3564    67722 1                  LITTLSUB
10751                        33,3565    24015 0           STOVL  12D
10752  REF   5   LAST  444   33,3566    02414 1                  LOSVEC
10753                        33,3567    34007 1           STCALL 06D
10754  REF   1                33,3570    47334 0                  AXISGEN
10755                        33,3571    77624 1           CALL
10756  REF   1                33,3572    47140 1                  CALCGTA
10757                        33,3573    77776 1           EXIT
1076   REF   1                33,3574   3 3621 1  GCOMP4   CAF    V06N93S
1077   REF  76   LAST  444   33,3575   0 4555 0           TC     BANKCALL
1078   REF   5   LAST  442   33,3576    20624 0           CADR   GOFLASH
1079   REF   2   LAST  442   33,3577   0 3610 0           TC     GCOMP5
1080                         33,3600   1 3602 1           TCF    +2
1081   REF   1                33,3601   1 3574 0           TCF    GCOMP4
1082   REF  33   LAST  444   33,3602   0 6006 1           TC     INTPRET
1083                         33,3603    53375 0           VLOAD  VAD
1084   REF  11   LAST  434   33,3604    02760 1                  OGC
1085   REF  11   LAST  438   33,3605    02650 0                  ERCOMP1
1086   REF  12   LAST  444   33,3606    02650 0           STORE  ERCOMP1
1087                         33,3607    77776 1           EXIT
1088   REF  77   LAST  444   33,3610   0 4555 0  GCOMP5   TC     BANKCALL
1089   REF   4   LAST  444   33,3611    16063 0           CADR   MKRELEAS
10895  REF  22   LAST  420   33,3612   0 5447 0           TC     DOWNFLAG
10896  REF   2   LAST  226   33,3613    00032 0           ADRES  IMU3FLG

1090   REF   5   LAST  442   33,3614   0 5243 1           TC     NEWMODEX
1091                         33,3615    00002 0           MM     02
1092   REF  18   LAST  442   33,3616   0 5301 0           TC     PHASCHNG
1093                         33,3617    00004 0           OCT    00004
1094   REF  57   LAST  441   33,3620   0 5112 0           TC     ENDOFJOB
1097                         33,3621    01535 0  V06N93S  VN     0693
1098   REF  23   LAST  435   33,3622   0 5537 0  GTSOPTCS TC     ALARM
1099                         33,3623    01602 1  GTSOPTSS OCT    01602
1100   REF   3   LAST  444   33,3624   0 3610 0           TC     GCOMP5
11001                        34,2002                     BANK   34
11002  REF   1                04,2000                     SETLOC IMUCAL1
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11003                          04,2617                          BANK

110035 REF   1                                                  COUNT  34/COMST

1119                           04,2617   62545 1  LATAZCHK DLOAD  SL2          CALLS FOR AZIMUTH AND LATITUDE
1120   REF   4  LAST  423      04,2620   02403 1                  LATITUDE
1121   REF  23  LAST  442      04,2621   15047 0          STODL   DSPTEM1 +1
1122   REF   3  LAST  417      04,2622   02401 0                  AZIMUTH
1123                           04,2623   77434 1          RTB     EXIT
1124   REF   3  LAST  283      04,2624   45543 1                  1STO2S
1125   REF 233  LAST  433      04,2625   56 154 1         XCH     MPAC
1126   REF  24  LAST  445      04,2626   55¤045 0         TS      DSPTEM1
1127   REF  78  LAST  444      04,2627   0 4555 0         TC      BANKCALL
1128   REF   1                 04,2630    20607 1         CADR    CLEANDSP
1129   REF   1                 04,2631   3 2650 0         CAF     VNG0641.
11291  REF  79  LAST  445      04,2632   0 4555 0         TC      BANKCALL
11292  REF   6  LAST  444      04,2633    20624 0         CADR    GOFLASH
11293                          04,2634   0 2636 0         TC      +2           NOT ALLOWED
11294                          04,2635   0 2637 1         TC      +2
11295                          04,2636   0 2631 1         TC      -5
1130   REF  34  LAST  444      04,2637   0 6006 1         TC      INTPRET
1131                           04,2640    47135 0         SLOAD   RTB
1132   REF  25  LAST  445      04,2641    01046 1                 DSPTEM1
1133   REF   5  LAST  443      04,2642    45510 1                 CDULOGIC
1134   REF   4  LAST  445      04,2643    02401 0         STORE   AZIMUTH
11341                          04,2644    60535 1         SLOAD   SR2
11342  REF  26  LAST  445      04,2645    01047 0                 DSPTEM1 +1
11343  REF   5  LAST  445      04,2646    02403 1         STORE   LATITUDE
1135                           04,2647    77616 0         RVQ
11351                          04,2650    01451 0  VNG0641 VN     0641
1136                           33,3625                    BANK    33
1137   REF   5  LAST  443      33,2000                    SETLOC  IMUCAL
1138                           33,3625                    BANK
1139   REF   2 LAST  442 TO    443'      67    67*        COUNT*  $$/P03
1140                          33,3625   0 0006 1  TARGDRVE EXTEND
1141   REF   1                33,3626   23¤424 1         QXCH    QPLAC
1142   REF   1                33,3627   55¤431 1         TS      TARG1/2
11421  REF  35  LAST  445      33,3630   0 6006 1         TC      INTPRET
1143                           33,3631    77624 1         CALL
1144   REF   2  LAST  443      33,3632    67471 1                 TAR/EREF
1145                           33,3633    76740 0         LXC,1   VLOAD*
1146   REF   2  LAST  445      33,3634    02431 0                 TARG1/2
1147                           33,3635    00007 0                 6D,1
1148   REF  10  LAST  283      33,3636    36766 0         STCALL  STAR
1149   REF   1                 33,3637    46053 0                 SXTANG
1150                          33,3640   77776 1          EXIT
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1151   REF   6  LAST  283   33,3641  3 1773 0          CA    SAC
1152   REF   4  LAST  236   33,3642  55∝161 1          TS    DESOPTS
1153   REF   6  LAST  283   33,3643  3 1775 0          CA    PAC
1154   REF   5  LAST  236   33,3644  55∝160 0          TS    DESOPTT
1155   REF 103  LAST  443   33,3645  3 4714 1  RETARG  CAF   ZERO
1156   REF  22  LAST  385   33,3646  55∝303 1          TS    OPTIND
1157   REF  60  LAST  443   33,3647  3 4712 1          CAF   ONE
1158   REF  80  LAST  445   33,3650  0 4555 0          TC    BANKCALL
1159   REF   1              33,3651   16002 1          CADR  SXTMARK
1160   REF  81  LAST  446   33,3652  0 4555 0          TC    BANKCALL
1161   REF   1              33,3653   17512 1          CADR  OPTSTALL
1162   REF   1              33,3654  0 3622 1          TC    GTSOPTCS
116201 REF  11  LAST  384   33,3655  30 075 0          CAE   FLAGWRD1
116202 REF   1              33,3656  7 4707 1          MASK  TRM03BIT
116203 REF 135  LAST  439   33,3657  10 000 0          CCS   A
116204 REF   4  LAST  444   33,3660  0 3610 0          TC    GCOMP5

11621  REF  26  LAST  261   33,3661  51∝330 0          INDEX MARKSTAT
11622  REF   8  LAST  259   33,3662  3 0052 0          CA    QPRET
11623                       33,3663  0 0006 1          EXTEND
11624  REF   1              33,3664  1 3666 0          BZF   RETARG1
1163   REF   2  LAST  445   33,3665  0 1424 1          TC    QPLAC
1164   REF 104  LAST  446   33,3666  3 4714 1  RETARG1 CA    ZERO        RELEASE PREVIOUSLY GRABBED VAC AREA
1165   REF  27  LAST  446   33,3667  57∝330 0          XCH   MARKSTAT
1166   REF 136  LAST  446   33,3670  10 000 0          CCS   A
1167   REF 137  LAST  446   33,3671  50 000 1          INDEX A
1168   REF 138  LAST  446   33,3672  54 000 0          TS    A
1169   REF   1              33,3673  1 3645 1          TCF   RETARG      GO DO SXTMARK AGAIN
1170                        33,3674                    BANK  33
1171   REF   6  LAST  445   33,2000                    SETLOC IMUCAL
1172                        33,3674                    BANK
1173   REF   3 LAST 445 TO  446'    39   106*          COUNT* $$/P03
1200                        33,3674   30341 1  PIPASC  2DEC  .76376833
1200                        33,3675   22444 0
1201                        33,3676   57223 0  VELSC   2DEC  -.52223476
1201                        33,3677   66451 1
1202                        33,3700   05427 0  ALSK    2DEC  .17329931
1202                        33,3701   12577 1
1203                        33,3702   77567 0          2DEC  -.00835370
1203                        33,3703   44202 1
1204                        33,3704   24276 1  GEORGEJ 2DEC  .63661977
1204                        33,3705   14066 1
1205                        33,3706   23073 1  GEORGEK 2DEC  .59737013
1205                        33,3707   11773 1
1206                        33,3710   00055 1  2DEGRES 2DEC  .00277778
1206                        33,3711   20267 0
1207                        33,3712   03146 1  GEOCONS1 2DEC  .1
1207                        33,3713   14632 0
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1208                          33,3714   00121 0  GEOCONS2  2DEC    .005
1208                          33,3715   35341 1
1209                          33,3716   01767 0  GEOCONS3  2DEC    .062
1209                          33,3717   31666 0
1210                          33,3720   00004 0  GEOCONS4  2DEC    .0003
1210                          33,3721   35223 1
12525 REF   3 LAST  436 TO  442'  146   288*          COUNT  33/P02
1253                          33,3722   77620 0  LITTLSUB  STQ
1254  REF   3 LAST  446       33,3723   02424 1            QPLAC
1255                          33,3724   76740 0            LXC,1  VLOAD*
1256  REF  28 LAST  446       33,3725   01330 0                   MARKSTAT
1257                          33,3726   00003 1                   2,1
1258  REF   4 LAST   73       33,3727   34767 0            STCALL CDUSPOT
1259  REF   1                 33,3730   46000 0                   SXTNB
1260                          33,3731   77624 1            CALL
1261  REF   1                 33,3732   47572 1                   TRG*NBSM
1262                          33,3733   77650 1            GOTO
1263  REF   4 LAST  447       33,3734   02424 1                   QPLAC
1265                          33,3735   77776 1            EXIT
1300  REF  36 LAST  445       33,3736   0 6006 1 AZMTHCG1  TC     INTPRET
1301                          33,3737   47145 1            DLOAD  RTB
1302  REF   3 LAST  439       33,3740   02636 0                   NEWAZMTH
1303  REF   4 LAST  445       33,3741   45543 1                   1STO2S
1304                          33,3742   77776 1            EXIT
1305  REF 234 LAST  445       33,3743   56 154 1           XCH    MPAC
1306  REF  27 LAST  445       33,3744   55*045 0           TS     DSPTEM1
1307  REF  82 LAST  446       33,3745   0 4555 0           TC     BANKCALL
1308  REF   2 LAST  445       33,3746    20607 1           CADR   CLEANDSP
1309  REF   1                 33,3747   3 3771 0           CAF    VN0629
1310  REF  83 LAST  447       33,3750   0 4555 0           TC     BANKCALL
1311  REF   7 LAST  445       33,3751    20624 0           CADR   GOFLASH
1312                          33,3752   1 3754 0           TCF    +2
1313                          33,3753   1 3755 1           TCF    +2
1314                          33,3754   1 3747 1           TCF    -5
1315  REF  37 LAST  447       33,3755   0 6006 1           TC     INTPRET
1316                          33,3756    47135 0           SLOAD  RTB
1317  REF  28 LAST  447       33,3757    01046 1                   DSPTEM1
1318  REF   6 LAST  445       33,3760    45510 1                   CDULOGIC
1319  REF   4 LAST  438       33,3761    02634 1           STORE  LAUNCHAZ
1320                          33,3762    77776 1           EXIT
1321  REF 105 LAST  446       33,3763   3 4714 1           CA     ZERO
1322  REF   5 LAST  439       33,3764   55*632 0           TS     PREMTRXC
1323  REF  19 LAST  444       33,3765   0 5301 0           TC     PHASCHNG
1324                          33,3766    00004 0           OCT    00004
1325  REF  35 LAST  440       33,3767   0 4574 0           TC     POSTJUMP
13255 REF   5 LAST  362       33,3770    21176 1           CADR   PINBRNCH

1326                          33,3771    01435 1 VN0629    VN     0629
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*** END OF KOOLADE .069 ***

L GROUND TRACKING DETERMINATION PROGRAM - P21 USER'S PAGE NO. 1 E0 S3

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P0001   GROUND TRACKING DETERMINATION PROGRAM P21
R0002   PROGRAM DESCRIPTION
R0003   MOD NO - 1
R0004   MOD BY - N.M.NEVILLE
R0005   FUNCTIONAL DECRIPTION-
R0006
R0007   TO PROVIDE THE ASTRONAUT DETAILS OF THE LM OR CSM GROUND TRACK WITHOUT
R0008   THE NEED FOR GROUND COMMUNICATION (REQUESTED BY DSKY).
R0009   CALLING SEQUENCE -
R0010
R0011   ASTRONAUT REQUEST THROUGH DSKY V37E21E
R0012   SUBROUTINES CALLED-
R0013
R0014   GOPERF4
R0015   GOFLASH
R0016   THISPREC
R0017   OTHPREC
R0018   LAT-LONG
R0019   NORMAL EXIT MODES-
R0020
R0021   ASTRONAUT REQUEST TROUGH DSKY TO TERMINATE PROGRAM V34E
R0022   ALARM OR ABORT EXIT MODES-
R0023
R0024   NONE
R0025   OUTPUT -
R0026
R0027   OCTAL DISPLAY OF OPTION CODE AND VEHICLE WHOSE GROUND TRACK IS TO BE
R0028   COMPUTED
R0029            OPTION CODE  00002
R0030            THIS         00001
R0031            OTHER        00002
R0032   DECIMAL DISPLAY OF TIME TO BE INTEGRATED TO HOURS , MINUTES , SECONDS
R0033   DECIMAL DISPLAY OF LAT,LONG,ALT
R0034   ERASABLE INITIALIZATION REQUIRED
R0035
R0036   AXO      2DEC   4.652459653 E-5   RADIANS        Σ68-69 CONSTANTS
R0037
R0038   -AYO     2DEC   2.147535898 E-5   RADIANS
R0039
R0040   AZO      2DEC   .7753206164       REVOLUTIONS
R0041   FOR LUNAR ORBITS 504LM VECTOR IS NEEDED
R0042
R0043   504LM    2DEC   -2.700340600 E-5  RADIANS
R0044
R0045   504LM  2 2DEC   -7.514128400 E-4  RADIANS
R0046
R0047   504LM  4 2DEC    2.553198641 E-4  RADIANS
R0048
R0049   NONE
R0050   DEBRIS
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R0051
R0052  CENTRALS-A,Q,L
R0053  OTHER-THOSE USED BY THE ABOVE LISTED SUBROUTINES
R0054  SEE LEMPREC,LAT-LONG
 0055  REF   3  LAST  279   30,2000                          SBANK= LOWSUPER        FOR LOW 2CADR'S.

 0056                       33,3772                          BANK   33
 0057  REF   1             37,2000                          SETLOC P20S
 0058                       37,2001                          BANK

 0059  REF   3  LAST  256   E4,1715                          EBANK= P21TIME
 0060  REF   1                                              COUNT  24/P21

 0061  REF  61  LAST  446   37,2001  3 4712 1  PROG21       CAF    ONE
 0062  REF   2  LAST  276   37,2002  55'132 1               TS     OPTION2         ASSUMED VEHICLE IS LM , R2 = 00001
 0063  REF  21  LAST  369   37,2003  3 4711 1               CAF    BIT2             OPTION 2
 0064  REF  84  LAST  447   37,2004  0 4555 0               TC     BANKCALL
 0065  REF   1             37,2005   20761 0               CADR   GOPERF4
 0066  REF   3  LAST  385   37,2006  0 4106 1               TC     GOTOPOOH        TERMINATE
 0067                       37,2007  0 2011 0               TC     +2              PROCEED VALUE OF ASSUMED VEHICLE OK
 0068                       37,2010  0 2003 0               TC     -5              R2 LOADED THROUGH DSKY
 0069  REF   1             37,2011  3 2102 0  P21PROG1     CAF    V6N34           LOAD DESIRED TIME OF LAT-LONG.
 0070  REF  85  LAST  450   37,2012  0 4555 0               TC     BANKCALL
 0071  REF   8  LAST  447   37,2013   20624 0               CADR   GOFLASH
 0072  REF   4  LAST  450   37,2014  0 4106 1               TC     GOTOPOOH        TERM
 0073                       37,2015  0 2017 0               TC     +2              PROCEED VALUES OK
 0074                       37,2016  0 2011 0               TC     -5              TIME LOADED THROUGH DSKY
 0075  REF  38  LAST  447   37,2017  0 6006 1               TC     INTPRET
 0076                       37,2020   77745 1               DLOAD
 0077  REF  29  LAST  447   37,2021   01046 1                      DSPTEM1
 0078  REF   4  LAST  450   37,2022   02316 1               STORE  P21TIME
 0079                       37,2023   45335 0               SLOAD  DSU
 0080  REF   3  LAST  450   37,2024   01133 1                      OPTION2
 0081  REF   1             37,2025   36100 0                      P21ONENN
 0082                       37,2026   71230 0               BHIZ   DLOAD
 0083  REF   1             37,2027   76042 0                      P21PROG2        VEHICLE TO BE INTEGRATED IS LEM
 0084  REF   5  LAST  450   37,2030   02316 1                      P21TIME         VEHICLE TO BE INTEGRATED IS CSM
 0085  REF   2  LAST  204   37,2031   34041 0               STCALL TDEC1           INTEGRATE TO TIME SPECIFIED IN TDEC
 0086  REF   1             37,2032   27036 1                      OTHPREC         ADJUST UNITS FOR LAT-LONG ROUTINE
 0087                       37,2033   46135 1  P21PROGA     SLOAD  BHIZ
 0088  REF   1             37,2034   00050 1                      X2
 0089  REF   1             37,2035   76050 0                      P21PROG3
 0090                       37,2036   43175 0               VLOAD  SETGO
 0091  REF   1             37,2037   00001 0                      RATT
 0092  REF   1             37,2040   01423 0                      LUNAFLAG
 0093  REF   1             37,2041   76053 0                      P21PROG4
 0094                       37,2042   77745 1  P21PROG2     DLOAD
 0095  REF   6  LAST  450   37,2043   02316 1                      P21TIME
 0096  REF   3  LAST  450   37,2044   34041 0               STCALL TDEC1
 0097  REF   1             37,2045   27022 1                      THISPREC
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0098                          37,2046  77650 1            GOTO
0099  REF  1                  37,2047  76033 0                 P21PROGA
0100                          37,2050  43175 0  P21PROG3 VLOAD  CLEAR
0101  REF  2  LAST  450       37,2051  00001 0                 RATT
0102  REF  2  LAST  450       37,2052  01663 0                 LUNAFLAG
0103  REF  2  LAST   87       37,2053  16152 0  P21PROG4 STODL  ALPHAV
0104  REF  1                  37,2054  00015 0                 TAT
0105                          37,2055  45014 0            CLEAR CALL
0106  REF  1                  37,2056  00662 0                 ERADFLAG
0107  REF  1                  37,2057  28322 0                 LAT-LONG
0108                          37,2060  77776 1            EXIT
0109  REF  1                  37,2061  3 2101 0           CAF   V06N43      DISPLAY LAT,LONG,ALT
0110  REF 86  LAST  450       37,2062  0 4555 0           TC    BANKCALL    LAT,LONG = 1/2 REVS B0
0111  REF  9  LAST  450       37,2063  20624 0            CADR  GOFLASH     ALT = KM  B14
0112  REF  5  LAST  450       37,2064  0 4106 1           TC    GOTOPOOH    TERM
0113  REF  6  LAST  451       37,2065  0 4106 1           TC    GOTOPOOH
0114  REF 39  LAST  450       37,2066  0 6006 1           TC    INTPRET     V32E RECYCLE
0115                          37,2067  43345 1            DLOAD DAD
0116  REF  7  LAST  450       37,2070  02316 1                 P21TIME
0117  REF  1                  37,2071  36076 0                 600SEC      600 SECONDS OR 10 MIN
0118  REF 30  LAST  450       37,2072  01046 1            STORE DSPTEM1
0119                          37,2073  77634 0            RTB
0120  REF  1                  37,2074  76011 0                 P21PROG1
0121                          37,2075  00003 1  600SEC    2DEC  60000       10 MIN
0121                          37,2076  25140 0
0122                          37,2077  00001 0  P21CNENN OCT   00001       NEEDED TO DETERMINE VEHICLE
0123                          37,2100  00000 1            OCT   00000       TO BE INTEGRATED
0124                          37,2101  01453 1  V06N43    VN    00643
0125                          37,2102  01442 1  V6N34     VN    00634
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P0010   TRANSFER PHASE INITIATION (TPI) PROGRAMS (P34 AND P74)

R0011   MOD NO -1        LOG SECTION - P32-P35, P72-P75
R0012   MOD BY WHITE.P   DATE 1JUNE67

R0013   PURPOSE

R0014           (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0015               REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE TRANSFER
R0016               PHASE INITIATION (TPI) MANEUVER, GIVEN -

R0017                   (A) TIME OF IGNITION TIG (TPI) OR THE ELEVATION ANGLE (E) OF
R0018                       THE ACTIVE/PASSIVE VEHICLE LOS AT TIG (TPI).

R0019                   (B) CENTRAL ANGLE OF TRANSFER (CENTANG) FROM TIG (TPI) TO
R0020                       INTERCEPT TIME (TIG (TPF)).

R0021           (2) TO CALCULATE TIG (TPI) GIVEN E OR E GIVEN TIG (TPI).

R0022           (3) TO CALCULATE THESE PARAMETERS BASED UPON MANEUVER DATA
R0023               APPROVED AND KEYED INTO THE DSKY BY THE ASTRONAUT.

R0024           (4) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0025               VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0026               ASTRONAUT/GROUND.

R0027           (5) TO STORE THE TPI TARGET PARAMETERS FOR USE BY THE DESIRED
R0028               THRUSTING PROGRAM.

R0029   ASSUMPTIONS

R0030           (1) LM ONLY - THIS PROGRAM IS BASED UPON PREVIOUS COMPLETION OF
R0031               THE CONSTANT DELTA ALTITUDE (CDH) PROGRAM (P33/P73).
R0032               THEREFORE -

R0033                   (A) AT A SELECTED TPI TIME (NOW IN STORAGE) THE LINE OF SIGHT
R0034                       BETWEEN THE ACTIVE AND PASSIVE VEHICLES WAS SELECTED TO BE
R0035                       A PRESCRIBED ANGLE (E) (NOW IN STORAGE) FROM THE
R0036                       HORIZONTAL PLANE DEFINED BY THE ACTIVE VEHICLE POSITION.

R0037                   (B) THE TIME BETWEEN CDH IGNITION AND TPI IGNITION WAS
R0038                       COMPUTED TO BE GREATER THAN 10 MINUTES.

R0039                   (C) THE VARIATION OF THE ALTITUDE DIFFERENCE BETWEEN THE
R0040                       ORBITS WAS MINIMIZED.

R0041                   (D) THE PERICENTER ALTITUDES OF ORBITS FOLLOWING CSI AND

R0042                       CDH WERE COMPUTED TO BE GREATER THAN 35,000 FT FOR LUNAR
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R0043 ORBIT OR 85 NM FOR EARTH ORBIT.

R0044 (E) THE CSI AND CDH MANEUVERS WERE ASSUMED TO BE PARALLEL TO
R0045 THE PLANE OF THE PASSIVE VEHICLE ORBIT. HOWEVER, CREW
R0046 MODIFICATION OF DELTA V (LV) COMPONENTS MAY HAVE RESULTED
R0047 IN AN OUT-OF-PLANE MANEUVER.

R0048 (2) STATE VECTOR UPDATED BY P27 ARE DISALLOWED DURING AUTOMATIC
R0049 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (4)).

R0050 (3) THIS PROGRAM MUST BE DONE OVER A TRACKING STATION FOR REAL
R0051 TIME GROUND PARTICIPATION IN DATA INPUT AND OUTPUT. COMPUTED
R0052 VARIABLES MAY BE STORED FOR LATER VERIFICATION BY THE GROUND.
R0053 THESE STORAGE CAPABILITIES ARE LIMITED ONLY TO THE PARAMETERS
R0054 FOR ONE THRUSTING MANEUVER AT A TIME EXCEPT FOR CONCENTRIC
R0055 FLIGHT PLAN MANEUVER SEQUENCES.

R0056 (4) THE RENDEZVOUS RADAR MAY OR MAY NOT BE USED TO UPDATE THE LM
R0057 OR CSM STATE VECTORS FOR THIS PROGRAM. IF RADAR USE IS
R0058 DESIRED THE RADAR WAS TURNED ON AND LOCKED ON THE CSM BY
R0059 PREVIOUS SELECTION OF P20. RADAR SIGHTING MARKS WILL BE MADE
R0060 AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN ENABLED BY THE
R0061 TRACK AND UPDATE FLAGS (SEE P20). THE RENDEZVOUS TRACKING
R0062 MARK COUNTER IS ZEROED BY THE SELECTION OF P20 AND AFTER EACH
R0063 THRUSTING MANEUVER.

R0064 (5) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0065 (6) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0066 ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0067 DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0068 CALCULATES THE MANEUVER PARAMETERS. SET AT THE START OF
R0069 EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0070 FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0071 SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0072 EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0073 REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0074 PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0075 (7) ONCE THE PARAMETWRS REQUIRED FOR COMPUTION OF THE MANEUVER
R0076 HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0077 VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0078 THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0079 THROUGH THE USE OF V06N52.

R0080 THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0081 CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN

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R0082           170 TO 190 DEGREES.  IF THE ANGLE IS WITHIN THIS ZONE THE
R0083           ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0084           UPON DELTA V AND EXPECTED MANEUVER TIME.

R0085       (8) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0086               P34 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0087               P74 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0088   INPUT

R0089       (1) TTPI      TIME OF THE TPI MANEUVER
R0090       (2) ELEV      DESIRED LOS ANGLE AT TPI
R0091       (3) CENTANG   ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0092                     TRANSFER FROM TPI TO TIME OF INTERCEPT

R0093   OUTPUT

R0094       (1) TRKMKCNT NUMBER OF MARKS
R0095       (2) TTOGO     TIME TO GO
R0096       (3) +MGA      MIDDLE GIMBAL ANGLE
R0097       (4) TTPI      COMPUTED TIME OF TPI MANEUVER
R0098             OR
R0099           ELEV      COMPUTED LOS ANGLE AT TPI
R0100       (5) POSTTPI   PERIGEE ALTITUDE AFTER THE TPI MANEUVER
R0101       (6) DELVTPI   MAGNITUDE OF DELTA V AT TPI
R0102       (7) DELVTPF   MAGNITUDE OF DELTA V AT INTERCEPT
R0103       (8) DVLOS     DELTA VELOCITY AT TPI - LINE OF SIGHT
R0104       (9) DELVLVC   DELTA VELOCITY AT TPI - LOCAL VERTICAL COORDINATES

R0105   DOWNLINK

R0114       (1) TTPI      TIME OF THE TPI MANEUVER
R0115       (2) TIG       TIME OF THE TPI MANEUVER
R0116       (3) ELEV      DESIRED LOS ANGLE AT TPI
R0117       (4) CENTANG   ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE DURING
R0118                     TRANSFER FROM TPI TO TIME OF INTERCEPT
R0119       (5) DELVEET3  DELTA VELOCITY AT TPI - REFERENCE COORDINATES
R0120       (6) TPASS4    TIME OF INTERCEPT
R0121   COMMUNICATION TO THRUSTING PROGRAMS

R0122       (1) TIG       TIME OF THE TPI MANEUVER
R0123       (2) RTARG     OFFSET TARGET POSITION
R0124       (3) TPASS4    TIME OF INTERCEPT
R0125       (4) XDELVFLG  RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0126   SUBROUTINES USED

R0127       AVPLAGA
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R0128       AVFLAGP
R0129       VNPOOH
R0130       DISPLAYE
R0131       SELECTMU
R0132       PRECSET
R0133       S33/34.1
R0134       ALARM
R0135       BANKCALL
R0136       GOFLASH
R0137       GOTOPOOH
R0138       TIMETHET
R0139       S34/35.2
R0140       PERIAPO1
R0141       SHIFTR1
R0142       S34/35.5
R0143       VN1645

 0144  REF  1              35,2000                        SETLOC CSI/CDH
 0145                      35,2000                        BANK
 0146  REF  5  LAST  249   E4,1770                        EBANK= SUBEXIT
 0147  REF  1                                           COUNT  35/P3474

 0148  REF  1              35,2000  0 3726 1  P34        TC     AVFLAGA
 0149  REF  1              35,2001  0 2003 0             TC     P34/P74A
 0150  REF  1              35,2002  0 3741 0  P74        TC     AVFLAGP
 0151  REF  1              35,2003  0 3746 1  P34/P74A   TC     P20FLGON      SET UPDATFLG, TRACKFLG
01515  REF  1              35,2004  3 3125 1             CAF    V06N37        TIPI
 0152  REF  1              35,2005  0 3114 0             TC     VNPOOH
 0153  REF  1              35,2006  0 3073 0             TC     DISPLAYE      ELEV AND CENTANG
 0154  REF 40  LAST  451   35,2007  0 6006 1             TC     INTPRET
 0155                      35,2010   71214 0             CLEAR  DLOAD
 0156  REF  3  LAST   48   35,2011   01270 0                    ETPIFLAG
 0157  REF  4  LAST  267   35,2012   03663 1                    TIPI
 0158  REF 16  LAST  267   35,2013   17413 1             STODL  TIG
 0159  REF  5  LAST  275   35,2014   03744 0                    ELEV
 0160                      35,2015   43054 1             BZE    SET
 0161  REF  1              35,2016   72020 0                    P34/P74B
 0162  REF  4  LAST  455   35,2017   01070 1                    ETPIFLAG
 0163                      35,2020   77624 1  P34/P74B  CALL
 0164  REF  1              35,2021   10716 0                    SELECTMU
 0165                         0032           DELELO    EQUALS 26D
 0166                      35,2022   43145 0  P34/P74C  DLOAD  SET
 0167  REF  2  LAST   31   35,2023   15332 1                    ZEROVECS
 0168  REF  1              35,2024   03461 1                    ITSWICH
 0169                      35,2025   43014 0             BON    CLEAR
 0170  REF  5  LAST  455   35,2026   01310 1                    ETPIFLAG
 0171  REF  1              35,2027   72031 0                    SWCHSET
 0172  REF  2  LAST  455   35,2030   03661 0                    ITSWICH
 0173  REF  1              35,2031   02364 1  SWCHSET   STORE  NOMTPI
 0174                      35,2032   43345 1  INTLOOP   DLOAD  DAD
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0175  REF   5  LAST  455   35,2033   03663 1                 TIPI
0176  REF   2  LAST  455   35,2034   02364 1                 NOMTPI
0177  REF   4  LAST  450   35,2035   34041 0          STCALL TDEC1
0178  REF   1               35,2036   45354 1                 PRECSET
0179                        35,2037   77624 1          CALL
0180  REF   1               35,2040   72212 0                 S33/34.1
0181                        35,2041   77454 1          BZE    EXIT
0182  REF   1               35,2042   72053 1                 SWCHCLR
0183  REF  24  LAST  444    35,2043   0 5537 0         TC     ALARM
0184                        35,2044   00611 1          OCT    611
0185  REF   1               35,2045   3 4743 0         CAF    V05N09
0186  REF  87  LAST  451    35,2046   0 4555 0         TC     BANKCALL
0187  REF  10  LAST  451    35,2047    20624 0         CADR   GOFLASH
0188  REF   7  LAST  451    35,2050   0 4106 1         TC     GOTOPOOH
0189  REF   2  LAST  455    35,2051   0 2003 0         TC     P34/P74A      PROCEED
0190                        35,2052   0 2043 1         TC     -7            V32

0191                        35,2053    43014 0  SWCHCLR BONCLR BON
0192  REF   3  LAST  455    35,2054    03601 0                 ITSWICH
0193  REF   1               35,2055    72032 0                 INTLOOP
0194  REF   6  LAST  455    35,2056    01310 1                 ETPIFLAG
0195  REF   1               35,2057    72063 1                 P34/P74D      DISPLAY TTPI
0196                        35,2060    77776 1          EXIT
0197  REF   2  LAST  455    35,2061   0 3073 0         TC     DISPLAYE      DISPLAY ELEV AND CENTANG
0198  REF   1               35,2062   0 2066 0         TC     P34/P74E
0199                        35,2063    77776 1  P34/P74D EXIT
0200  REF   2  LAST  455    35,2064   3 3125 1         CAF    V06N37        TTPI
0201  REF   2  LAST  455    35,2065   0 3114 0         TC     VNPOOH
0202  REF  41  LAST  455    35,2066   0 6006 1  P34/P74E TC     INTPRET
0203                        35,2067    71201 1          SETPD  DLOAD
0204                        35,2070    00001 0                 0D
0205  REF   2  LAST  124    35,2071    03746 1                 RTX1
0206  REF   2  LAST  434    35,2072    14047 1          STODL  X1
0207  REF   4  LAST  275    35,2073    03754 1                 CENTANG
0208                        35,2074    71406 0          PUSH   COS
0209  REF   2  LAST   94    35,2075    16734 0          STODL  CSTH
0210                        35,2076    77756 0          SIN
0211  REF   2  LAST   94    35,2077    26732 0          STOVL  SNTH
0212  REF   2  LAST  120    35,2100    03554 0                 RPASS3
0213                        35,2101    77657 0          VSR*
0214                        35,2102    57176 0                 0,2
0215  REF   1               35,2103    26657 1          STOVL  RVEC
0216  REF   2  LAST  120    35,2104    03562 0                 VPASS3
0217                        35,2105    43057 1          VSR*   SET
0218                        35,2106    57176 0                 0,2
0219  REF   1               35,2107    03466 0                 RVSW
0220  REF   2  LAST   94    35,2110    36746 1          STCALL VVEC
0221  REF   1               35,2111    24737 1                 TIMETHET
0222                        35,2112    77745 1          DLOAD
0223  REF   6  LAST  456    35,2113    03663 1                 TTPI
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0224  REF  2  LAST  121   35,2114   03503 1   STORE  INTIME        FOR INITVEL
0225                      35,2115   77615 0   DAD
0226  REF  1              35,2116   00037 0         T             RENDEZVOUS TIME
0227  REF  4  LAST  171   35,2117   37656 0   STCALL TPASS4        FOR INITVEL
0228  REF  1              35,2120   72534 0         S34/35.2
0229                      35,2121   51575 1   VLOAD  ABVAL
0230  REF  4  LAST  171   35,2122   03646 0         DELVEET3
0231  REF  4  LAST  275   35,2123   26635 0   STOVL  DELVTPI
0232  REF  2  LAST  121   35,2124   03640 0         VPASS4
0233                      35,2125   51451 0   VSU    ABVAL
0234  REF  3  LAST  121   35,2126   03620 0         VTPRIME
0235  REF  4  LAST  275   35,2127   26637 1   STOVL  DELVTPP
0236  REF  3  LAST  120   35,2130   03540 0         RACT3
0237                      35,2131   45115 0   PDVL   CALL
0238  REF  3  LAST  121   35,2132   03612 1         VIPRIME
0239  REF  1              35,2133   45312 0         PERIAPO1
0240                      35,2134   77624 1   CALL
0241  REF  1              35,2135   45422 1         SHIFTR1
0242  REF  2  LAST  275   35,2136   16641 0   STODL  POSTTPI
0243  REF  7  LAST  456   35,2137   03663 1         TTPI
0244  REF 17  LAST  455   35,2140   03413 1   STORE  TIG
0245                      35,2141   77776 1   EXIT
0246  REF  1              35,2142   3 3127 0  CAF    V06N58
0247  REF  3  LAST  456   35,2143   0 3114 0  TC     VNPOOH
0248  REF 42  LAST  456   35,2144   0 6006 1  TC     INTPRET
0249                      35,2145    77624 1  CALL
0250  REF  1              35,2146    72742 0        S34/35.5
0251                      35,2147    77624 1  CALL
0252  REF  1              35,2150    73005 0        VN1645
0253                      35,2151    77650 1  GOTO
0254  REF  1              35,2152    72022 1        P34/P74C
```

P0255 RENDEZVOUS MID-COURSE MANEUVER PROGRAMS (P35 AND P75)

R0256 MOD NO -1 LOG SECTION - P32-P35, P72-P75
R0257 MOD BY WHITE.P DATE 1JUNE67

R0258 PURPOSE

R0259 (1) TO CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL CONDITIONS
R0260 REQUIRED BY THE ACTIVE VEHICLE FOR EXECUTION OF THE NEXT
R0261 MIDCOURSE CORRECTION OF THE TRANSFER PHASE OF AN ACTIVE
R0262 VEHICLE RENDEZVOUS.

R0263 (2) TO DISPLAY TO THE ASTRONAUT AND THE GROUND CERTAIN DEPENDENT
R0264 VARIABLES ASSOCIATED WITH THE MANEUVER FOR APPROVAL BY THE
R0265 ASTRONAUT/GROUND.

R0266 (3) TO STORE THE TPM TARGET PARAMETERS FOR USE BY THE DESIRED
R0267 THRUSTING PROGRAM.

R0268 ASSUMPTIONS

R0269 (1) THE ISS NEED NOT BE ON TO COMPLETE THIS PROGRAM.

R0270 (2) STATE VECTOR UPDATES BY P27 ARE DISALLOWED DURING AUTOMATIC
R0271 STATE VECTOR UPDATING INITIATED BY P20 (SEE ASSUMPTION (3)).

R0272 (3) THE RENDEZVOUS RADAR IS ON AND IS LOCKED ON THE CSM. THIS WAS
R0273 DONE DURING PREVIOUS SELECTION OF P20. RADAR SIGHTING MARKS
R0274 WILL BE MADE AUTOMATICALLY APPROXIMATELY ONCE A MINUTE WHEN
R0275 ENABLED BY THE TRACK AND UPDATE FLAGS (SEE P20). THE
R0276 RENDEZVOUS TRACKING MARK COUNTER IS ZEROED BY THE SELECTION OF
R0277 P20 AND AFTER EACH THRUSTING MANEUVER.

R0278 (4) THE OPERATION OF THE PROGRAM UTILIZES THE FOLLOWING FLAGS -

R0279 ACTIVE VEHICLE FLAG - DESIGNATES THE VEHICLE WHICH IS
R0280 DOING RENDEZVOUS THRUSTING MANEUVERS TO THE PROGRAM WHICH
R0281 CALCULATES THE MANEUVER PARAMETERS. SET AT THE START OF
R0282 EACH RENDEZVOUS PRE-THRUSTING PROGRAM.

R0283 FINAL FLAG - SELECTS FINAL PROGRAM DISPLAYS AFTER CREW HAS
R0284 SELECTED THE FINAL MANEUVER COMPUTATION CYCLE.

R0285 EXTERNAL DELTA V FLAG - DESIGNATES THE TYPE OF STEERING
R0286 REQUIRED FOR EXECUTION OF THIS MANEUVER BY THE THRUSTING
R0287 PROGRAM SELECTED AFTER COMPLETION OF THIS PROGRAM.

R0288 (5) THE TIME OF INTERCEPT (T(INT)) WAS DEFINED BY PREVIOUS
R0289 COMPLETION OF THE TRANSFER PHASE INITIATION (TPI) PROGRAM
R0290 (P34/P74) AND IS PRESENTLY AVAILABLE IN STORAGE.

```
R0291          (6) ONCE THE PARAMETERS REQUIRED FOR COMPUTION OF THE MANEUVER
R0292              HAVE BEEN COMPLETELY SPECIFIED, THE VALUE OF THE ACTIVE
R0293              VEHICLE CENTRAL ANGLE OF TRANSFER IS COMPUTED AND STORED.
R0294              THIS NUMBER WILL BE AVAILABLE FOR DISPLAY TO THE ASTRONAUT
R0295              THROUGH THE USE OF V06N52.

R0296              THE ASTRONAUT WILL CALL THIS DISPLAY TO VERIFY THAT THE
R0297              CENTRAL ANGLE OF TRANSFER OF THE ACTIVE VEHICLE IS NOT WITHIN
R0298              170 TO 190 DEGREES.  IF THE ANGLE IS WITHIN THIS ZONE THE
R0299              ASTRONAUT SHOULD REASSESS THE INPUT TARGETING PARAMETERS BASED
R0300              UPON DELTA V AND EXPECTED MANEUVER TIME.

R0301          (7) THIS PROGRAM IS SELECTED BY THE ASTRONAUT BY DSKY ENTRY -

R0302                  P35 IF THIS VEHICLE IS ACTIVE VEHICLE.

R0303                  P75 IF THIS VEHICLE IS PASSIVE VEHICLE.

R0304    INPUT

R0305          (1) TPASS4   TIME OF INTERCEPT - SAVED FROM P34/P74
R0306    OUTPUT

R0307          (1) TRKMKCNT NUMBER OF MARKS
R0308          (2) TTOGO    TIME TO GO
R0309          (3) +MGA     MIDDLE GIMBAL ANGLE
R0310          (4) DVLOS    DELTA VELOCITY AT MID - LINE OF SIGHT
R0311          (5) DELVLVC  DELTA VELOCITY AT MID - LOCAL VERTICAL COORDINATES

R0312    DOWNLINK

R0325          (1) TIG      TIME OF THE TPM MANEUVER
R0326          (2) DELVEET3 DELTA VELOCITY AT TPM - REFERENCE COORDINATES
R0327          (3) TPASS4   TIME OF INTERCEPT
R0328    COMMUNICATION TO THRUSTING PROGRAMS

R0329          (1) TIG      TIME OF THE TPM MANEUVER
R0330          (2) RTARG    OFFSET TARGET POSITION
R0331          (3) TPASS4   TIME OF INTERCEPT
R0332          (4) XDELVFLG RESET TO INDICATE LAMBERT (AIMPOINT) VG COMPUTATION

R0333    SUBROUTINES USED

R0334          AVFLAGA
R0335          AVFLAGP
R0336          LOADTIME
R0337          SELECTMU
R0338          PRECSET
R0339          S34/35.1
R0340          S34/35.2
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R0341          S34/35.5
R0342          VN1645

 0343   REF  1                                        COUNT  35/P3575

 0344   REF  6  LAST  202   E4,1763                   EBANK= KT

 0345   REF  2  LAST  455   35,2153  0 3726 1  P35    TC     AVFLAGA
 0346                       35,2154  0 0006 1         EXTEND
 0347   REF  1              35,2155  3 1422 1         DCA    ATIGINC
 0348   REF  1              35,2156  0 2162 0         TC     P35/P75A
 0349   REF  2  LAST  455   35,2157  0 3741 0  P75    TC     AVFLAGP
 0350                       35,2160  0 0006 1         EXTEND
 0351   REF  1              35,2161  3 1424 1         DCA    PTIGINC
 0352   REF  7  LAST  460   35,2162  53D764 1  P35/P75A DXCH  KT
03525   REF  2  LAST  455   35,2163  0 3746 1         TC     P20FLGON      SET UPDATFLG, TRACKFLG
 0353   REF 43  LAST  457   35,2164  0 6006 1         TC     INTPRET
 0359                       35,2165   77624 1         CALL
 0360   REF  2  LAST  455   35,2166   10716 0                SELECTMU
 0361                       35,2167   77634 0  P35/P75B RTB
 0362   REF  3  LAST  423   35,2170   45505 0                LOADTIME
03621   REF  3  LAST  123   35,2171   03665 1         STORE  TSTRT
03622                       35,2172   77615 0         DAD
03623   REF  8  LAST  460   35,2173   02364 1                KT
03624   REF 18  LAST  457   35,2174   03413 1         STORE  TIG
 0363   REF  3  LAST  457   35,2175   03503 1         STORE  INTIME        FOR INITVEL
 0364   REF  5  LAST  456   35,2176   34041 0         STCALL TDEC1
 0365   REF  2  LAST  456   35,2177   45354 1                PRECSET       ADVANCE BOTH VEHICLES
 0366                       35,2200   77624 1         CALL
 0367   REF  1              35,2201   72522 1                S34/35.1      GET NORM AND LOS FOR TRANSFORM
 0368                       35,2202   77624 1         CALL
 0369   REF  2  LAST  457   35,2203   72534 0                S34/35.2      GET DELTA V(LV)
 0370                       35,2204   77624 1         CALL
 0371   REF  2  LAST  457   35,2205   72742 0                S34/35.5
 0372                       35,2206   77624 1         CALL
 0373   REF  2  LAST  457   35,2207   73005 0                VN1645
 0379                       35,2210   77650 1         GOTO
 0380   REF  1              35,2211   72167 1                P35/P75B
```

P0381 ..... S33/34.1 .....

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0382                          35,2212  66220 1  S33/34.1 STQ    SSP
0383  REF  1                 35,2213  01340 1           NORMEX
0384  REF  2  LAST  123       35,2214  03685 1           TITER
0385                          35,2215  40000 0           OCT    40000
0386                          35,2216  40345 1           DLOAD  SETPD
0387  REF  1                 35,2217  33136 0           MAX250
0388                          35,2220  00001 0           0D
0389  REF  2  LAST  120       35,2221  27454 1           STOVL  S2CMAX
0390  REF  4  LAST  457       35,2222  03540 0           RACT3
0391  REF  1                 35,2223  27576 0           STOVL  RAPREC
0392  REF  2  LAST  120       35,2224  03546 0           VACT3
0393  REF  1                 35,2225  27570 0           STOVL  VAPREC
0394  REF  3  LAST  456       35,2226  03554 0           RPASS3
0395  REF  1                 35,2227  27620 0           STOVL  RPPREC
0396  REF  3  LAST  456       35,2230  03562 0           VPASS3
0397  REF  1                 35,2231  03612 1           STORE  VPPREC
0398                          35,2232  77624 1  ELCALC   CALL
0399  REF  2  LAST  460       35,2233  72522 1           S34/35.1   NORMAL AND LOS
0400                          35,2234  63235 0           VXV    PDVL
0401  REF  5  LAST  461       35,2235  03540 0           RACT3      (RA*VA)*RA CD
0402                          35,2236  53515 0           PDVL   UNIT     ULOS AT 6D
0403  REF  6  LAST  461       35,2237  03540 0           RACT3
0404                          35,2240  46315 1           PDVL   VPROJ     XCHNJ AND UP
0405                          35,2241  51352 1           VSL2   BVSU
0406  REF  2  LAST   91       35,2242  02625 1           ULOS
0407                          35,2243  63256 0           UNIT   PDVL       UP AT 0D
0408                          35,2244  63241 0           DOT    PDVL       UP.UN*RA AT 0D
0409                          35,2245  00001 0           0D             UP IN MPAC
0410                          35,2246  75241 1           DOT    SIGN
0411  REF  3  LAST  461       35,2247  02625 1           ULOS
0412                          35,2250  65552 0           SL1    ACOS
0413                          35,2251  50315 0           PDVL   DOT        EA AT 0D
0414  REF  4  LAST  461       35,2252  02625 1           ULOS
0415  REF  7  LAST  461       35,2253  03540 0           RACT3
0416                          35,2254  71244 0           BPL    DLOAD
0417  REF  1                 35,2255  72260 0           TESTY
0418  REF  2  LAST  421       35,2256  15340 1           DPPOSMAX
0419                          35,2257  41425 1           DSU    PUSH
0420                          35,2260  71214 0  TESTY    BOFF   DLOAD
0421  REF  4  LAST  456       35,2261  03741 0           ITSWICH
0422  REF  1                 35,2262  72507 0           ELEV
0423  REF  2  LAST  120       35,2263  03452 1           DELEL
0424  REF  1                 35,2264  14033 1           STODL  DELELO
0425                          35,2265  77625 0           DSU
0426  REF  6  LAST  455       35,2266  03744 0           ELEV
0427  REF  3  LAST  461       35,2267  03452 1           STORE  DELEL
0428                          35,2270  45246 0           ABS    DSU
0429  REF  1                 35,2271  33142 0           ELEPS
```

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0430                          35,2272  77640 0          BMN
0431  REF   1                 35,2273  72517 1                   TIMEX     COMMERCIALS EVERYWHERE
0432                          35,2274  70535 0  PIGTIME  SLOAD   SR1
0433  REF   3  LAST  461      35,2275  03665 1                   TITER
0434                          35,2276  72030 1          BHIZ     LXA,1
0435  REF   2  LAST  461      35,2277  01340 1                   NORMEX    TOO MANY ITERATIONS
0436  REF 235  LAST  447      35,2300  00154 1                   MPAC
0437                          35,2301  77330 1          SXA,1    VLOAD
0438  REF   4  LAST  462      35,2302  03664 0                   TITER
0439  REF   4  LAST  461      35,2303  03554 0                   RPASS3
0440                          35,2304  65256 0          UNIT     PDDL
0441                          35,2305  00045 0                   36D
0442                          35,2306  53515 0          PDVL     UNIT
0443  REF   8  LAST  461      35,2307  03540 0                   RACT3
0444                          35,2310  77725 1          PDDL
0445                          35,2311  41525 0          PDDL     PUSH
0446                          35,2312  00045 0                   36D
0447                          35,2313  77621 1          BDSU
0448                          35,2314  00015 0                   12D
0449                          35,2315  14037 0          STODL    30D       RP - RA MAGNITUDES
0450  REF   7  LAST  403      35,2316  15330 0                   DPHALF
0451                          35,2317  41425 1          DSU      PUSH
0452  REF   7  LAST  461      35,2320  03744 0                   ELEV
0453                          35,2321  50165 0          SIGN     BMN
0454                          35,2322  00037 0                   30D
0455  REF   3  LAST  462      35,2323  01340 1                   NORMEX
0456                          35,2324  71545 0          DLOAD    COS
0457                          35,2325  56205 0          DMP      DDV
0458                          35,2326  00017 1                   14D
0459                          35,2327  00015 0                   12D
0460                          35,2330  77676 0          DCOMP                SINCE COS(180-A)=-COS A
0461                          35,2331  00035 1          STORE    28D
0462                          35,2332  44246 1          ABS      BDSU
0463  REF   8  LAST  462      35,2333  15330 0                   DPHALF
0464                          35,2334  77240 1          BMN      VLOAD
0465  REF   4  LAST  462      35,2335  01340 1                   NORMEX
0466  REF   2  LAST   91      35,2336  02617 0                   UNFM
0467                          35,2337  53435 0          VXV      UNIT
0468                          35,2340  00007 0                   6D        UN*RA
0469                          35,2341  41241 0          DOT      DMP
0470  REF   3  LAST  461      35,2342  03546 0                   VACT3
0471                          35,2343  00015 0                   12D
0472                          35,2344  47315 0          PDVL     VXV
0473                          35,2345  00001 0                   0D
0474  REF   4  LAST  461      35,2346  03562 0                   VPASS3
0475                          35,2347  53435 0          VXV      UNIT
0476                          35,2350  00001 0                   0D        (RP*VP)*RP
0477                          35,2351  41241 0          DOT      DMP
0478  REF   5  LAST  462      35,2352  03562 0                   VPASS3
0479                          35,2353  00017 1                   14D
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0480                          35,2354  77621 1          BDSU
0481                          35,2355  63301 0          NORM    PDVL        NORMALIZED WA - WP 12D
0482  REP  3  LAST  456       35,2356  00047 1                  X1
0483                          35,2357  00007 0                  6D
0484                          35,2360  50235 0          VXV     DOT
0485                          35,2361  00001 0                  0D
0486  REP  3  LAST  462       35,2362  02617 0                  UNIT        RA*RP.UN 14D
0487                          35,2363  50315 0          PDVL    DOT
0488                          35,2364  00001 0                  0D
0489                          35,2365  00007 0                  6D
0490                          35,2366  65552 0          SL1     ACOS
0491                          35,2367  77765 0          SIGN
0492                          35,2370  43225 0          DSU     DAD         ALPHA   PI
0493  REP  9  LAST  462       35,2371  15330 0                  DPHALF
0494  REP  8  LAST  462       35,2372  03744 0                  ELEV
0495                          35,2373  65525 0          PDDL    ACOS
0496                          35,2374  00035 1                  28D
0497                          35,2375  75221 1          BDSU    SIGN
0498  REP 10  LAST  463       35,2376  15330 0                  DPHALF
0499                          35,2377  00037 0                  30D         CONTAINS RP-RA
0500                          35,2400  77615 0          DAD
0501                          35,2401  56205 0          DMP     DDV
0502  REP  1                  35,2402  33134 1                  TWOPI
0503                          35,2403  77605 1          DMP
0504                          35,2404  41257 1          SL*     DMP
0505                          35,2405  20176 0                  0 -3,1
0506                          35,2406  51406 1          PUSH    ABS
0507                          35,2407  50025 0          DSU     BMN
0508  REP  3  LAST  461       35,2410  03454 1                  SECMAX
0509  REP  1                  35,2411  72415 1                  QKMAX
0510                          35,2412  75345 1          DLOAD   SIGN        REPLACE TIME WITH MAX TIME SIGNED
0511  REP  4  LAST  463       35,2413  03454 1                  SECMAX
0512                          35,2414  77606 1          PUSH
0513                          35,2415  51135 1  QKMAX   SLOAD   BPL         TEST FIRST ITERATION
0514  REP  5  LAST  462       35,2416  03665 1                  TITER
0515  REP  1                  35,2417  72425 1                  REPETE
0516                          35,2420  71331 0          SSP     DLOAD
0517  REP  6  LAST  463       35,2421  03665 1                  TITER
0518                          35,2422  37777 1          OCT     37777
0519                          35,2423  77650 1          GOTO
0520  REP  1                  35,2424  72463 0                  STORDELT
0521                          35,2425  41345 0  REPETE  DLOAD   DMP
0522  REP  4  LAST  461       35,2426  03452 1                  DELEL
0523  REP  2  LAST  461       35,2427  00033 1                  DELELO
0524                          35,2430  71244 0          BPL     DLOAD
0525  REP  1                  35,2431  72441 0                  NEXTES
0526  REP  5  LAST  463       35,2432  03454 1                  SECMAX
0527                          35,2433  77605 1          DMP
0528  REP  1                  35,2434  33140 1                  THIRD
0529  REP  6  LAST  463       35,2435  17454 1          STODL   SECMAX
```

```
0530                                35,2436  70446 0          ABS     SR1         CROSSED OVER SOLUTION
0531                                35,2437  52076 1          DCOMP   GOTO        DT=(-SIGN(DTO)//DT//)/2
0532  REF  1                       35,2440  72451 1                  RESIGN
0533                                35,2441  51545 1  NEXTES  DLOAD  ABS
0534  REF  5  LAST  463             35,2442  03452 1                  DELEL
0535                                35,2443  51525 1          PDDL    ABS
0536  REF  3  LAST  463             35,2444  00033 1                  DELELO
0537                                35,2445  77625 0          DSU
0538                                35,2446  71240 1          BMN     DLOAD
0539  REF  1                       35,2447  72454 1                  REVERS      WRONG DIRECTION
0540                                35,2450  77646 0          ABS
0541                                35,2451  52165 1  RESIGN  SIGN    GOTO
0542  REF  2  LAST  120             35,2452  03450 0                  DELTEEO
0543  REF  2  LAST  463             35,2453  72463 0                  STORDELT
0544                                35,2454  57545 1  REVERS  DLOAD  DCOMP
0545  REF  3  LAST  464             35,2455  03450 0                  DELTEEO
0546                                35,2456  70406 1          PUSH    SR1
0547  REF  4  LAST  464             35,2457  03450 0          STORE   DELTEEO
0548                                35,2460  77615 0          DAD
0549                                35,2461  77650 1          GOTO
0550  REF  1                       35,2462  72464 1                  ADTIME
0551  REF  5  LAST  464             35,2463  03450 0  STORDELT STORE  DELTEEO
0552                                35,2464  77615 0  ADTIME  DAD
0553  REF  3  LAST  456             35,2465  02364 1                  NOMTPI      SUM OF DELTA T'S
0554  REF  4  LAST  464             35,2466  02364 1          STORE   NOMTPI
0555                                35,2467  63375 0          VLOAD   PDVL
0556  REF  2  LAST  461             35,2470  03570 0                  VAPREC
0557  REF  2  LAST  461             35,2471  03576 0                  RAPREC
0558                                35,2472  77624 1          CALL
0559  REF  1                       35,2473  72702 1                  GOINT
0560                                35,2474  77624 1          CALL
0561  REF  1                       35,2475  45376 1                  ACTIVE      STORE NEW RACT3 VACT3
0562                                35,2476  63375 0          VLOAD   PDVL
0563  REF  2  LAST  461             35,2477  03612 1                  VPPREC
0564  REF  2  LAST  461             35,2500  03620 0                  RPPREC
0565                                35,2501  77624 1          CALL
0566  REF  2  LAST  464             35,2502  72702 1                  GOINT
0567                                35,2503  77624 1          CALL
0568  REF  1                       35,2504  45406 1                  PASSIVE     STORE NEW RPASS3 VPASS3
0569                                35,2505  77650 1          GOTO
0570  REF  1                       35,2506  72232 1                  ELCALC
0571                                35,2507  43345 1  ELEX    DLOAD  DAD
0572  REF  8  LAST  457             35,2510  03663 1                  TTPI
0573  REF  5  LAST  464             35,2511  02364 1                  NOMTPI
0574  REF  9  LAST  464             35,2512  17663 1          STODL   TTPI
0575                                35,2513  77614 1          BON
0576  REF  7  LAST  456             35,2514  01310 1                  ETPIFLAG
0577  REF  2  LAST  462             35,2515  72517 1                  TIMEX
0578  REF  9  LAST  463             35,2516  03744 0          STORE   ELEV
0579                                35,2517  52145 0  TIMEX   DLOAD  GOTO
```

```
0580  REF   3  LAST  455   35,2520   15332 1          ZEROVECS
0581  REF   5  LAST  462   35,2521   01340 1          NORMEX
```

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P0582   ..... S34/35.1 .....

R0583   COMPUTE UNIT NORMAL AND LINE OF SIGHT VECTORS GIVEN THE ACTIVE AND
R0584   PASSIVE POS AND VEL AT TIME T3
 0585                          35,2522   52375 1  S34/35.1 VLOAD  VSU
 0586   REF   5  LAST  462     35,2523   03554 0                   RPASS3
 0587   REF   9  LAST  462     35,2524   03540 0                   RACT3
 0588                          35,2525   41456 0           UNIT    PUSH
 0589   REF   5  LAST  461     35,2526   26625 1           STOVL   ULOS
 0590   REF  10  LAST  466     35,2527   03540 0                   RACT3
 0591                          35,2530   53435 0           VXV     UNIT
 0592   REF   4  LAST  462     35,2531   03546 0                   VACT3
 0593   REF   4  LAST  463     35,2532   02617 0           STORE   UNRM
 0594                          35,2533   77616 0           RVQ
```

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P0595   ..... S34/35.2 .....

R0596   ADVANCE PASSIVE VEH TO RENDEZVOUS TIME AND GET REQ VEL FROM LAMBERT
 0597                        35,2534   77220 1  S34/35.2 STQ    VLOAD
 0598   REP   6  LAST  455   35,2535   02370 1                   SUBEXIT
 0599   REP   6  LAST  462   35,2536   03562 0                   VPASS3
 0600                        35,2537   65315 0           PDVL    PDDL
 0601   REP   6  LAST  466   35,2540   03554 0                   RPASS3
 0602   REP   4  LAST  460   35,2541   03503 1                   INTIME
 0603                        35,2542   65325 0           PDDL    PDDL
 0604   REP   5  LAST  457   35,2543   03356 1                   TPASS4
 0605   REP   4  LAST  465   35,2544   15332 1                   ZEROVECS
 0606                        35,2545   45006 0           PUSH    CALL
 0607   REP   1               35,2546   72708 0                   INTINT          GET TARGET VECTOR
 0608   REP   4  LAST  171   35,2547   27415 1  S3435.25 STOVL   RTARG
 0609   REP   1               35,2550   00007 0                   VATT
 0610   REP   3  LAST  457   35,2551   27640 0           STOVL   VPASS4
 0611   REP   5  LAST  467   35,2552   03415 1                   RTARG
R0612   COMPUTE PHI = PI +(ACOS(UNIT RA_UNIT RP)-PI)SIGN(RA*RP_U)
 0613                        35,2553   63256 0           UNIT    PDVL            UNIT RP
 0614   REP  11  LAST  466   35,2554   03540 0                   RACT3
 0615                        35,2555   41456 0           UNIT    PUSH            UNIT RA
 0616                        35,2556   50235 0           VXV     DOT
 0617                        35,2557   00001 0                   0D
 0618   REP   5  LAST  466   35,2560   02617 0                   UNIT            RA*RP_U
 0619                        35,2561   77715 1           PDVL
 0620                        35,2562   72441 0           DOT     SL1             UNIT RA_UNIT RP
 0621                        35,2563   00001 0                   0D
 0622                        35,2564   75326 1           ACOS    SIGN
 0623                        35,2565   43244 1           BPL     DAD
 0624   REP   1               35,2566   72570 0                   NOPIE
 0625   REP   3  LAST  461   35,2567   15340 1                   DPPOSMAX        REASONABLE TWO PI
 0626   REP   3  LAST  275   35,2570   16633 0  NOPIE    STODL   ACTCENT
 0627   REP   6  LAST  467   35,2571   03656 1                   TPASS4
 0628                        35,2572   77625 0           DSU
 0629   REP   5  LAST  467   35,2573   03503 1                   INTIME
 0630   REP   4  LAST  171   35,2574   03423 1           STORE   DELLT4
 0631                        35,2575   40335 0           SLOAD   SETPD
 0632   REP   1               35,2576   33144 0                   DECTWO
 0633                        35,2577   00001 0                   0D
 06331                       35,2600   63325 0           PDDL    PDVL
 06332  REP   1               35,2601   33147 0                   EPSFOUR
 06333  REP  12  LAST  467   35,2602   03540 0                   RACT3
 06334  REP   3  LAST  121   35,2603   27570 0           STOVL   RINIT
 06335  REP   5  LAST  466   35,2604   03546 0                   VACT3
 06336  REP   3  LAST  121   35,2605   37576 1           STCALL  VINIT
 06337  REP   1               35,2606   22000 1                   INITVEL
 0634                        35,2607   77624 1           CALL
 0635   REP   1               35,2610   72667 0                   LOMAT
 0636                        35,2611   64375 1           VLOAD   MXV
```

```
0637   REF  5  LAST  457   35,2612   03646 0          DELVEET3
0638                       35,2613   00001 0          0D
0639                       35,2614   77772 0    VSL1
0640   REF  7  LAST  277   35,2615   37405 1    STCALL DELVLVC
0641   REF  7  LAST  467   35,2616   02370 1           SUBEXIT
```

L P34-P35, P74-P75

P0642 ..... S34/35.3 .....

```
0643                          35,2617  45020 1  S34/35.3 STQ     CALL
0644  REF  6  LAST  485       35,2620  01340 1           NORMEX
0645  REF  2  LAST  487       35,2621  72667 0           LOMAT     GET MATRIX IN PUSH LIST
0646                          35,2622  61375 1           VLOAD     VXM
0647  REF  8  LAST  488       35,2623  03405 0                     DELVLVC   NEW DEL V TPI
0648                          35,2624  00001 0                     0D
0649                          35,2625  77772 0           VSL1
0650  REF  6  LAST  488       35,2626  03646 0           STORE     DELVEET3  SAVE FOR TRANSFORM
0651                          35,2627  63255 0           VAD       PDVL
0652  REF  6  LAST  487       35,2630  03546 0                     VACT3     NEW V REQ
0653  REF 13  LAST  487       35,2631  03540 0                     RACT3
0654                          35,2632  65325 0           PDDL      PDDL
0655  REF 19  LAST  480       35,2633  03413 1                     TIG
0656  REF  7  LAST  487       35,2634  03656 1                     TPASS4
0657                          35,2635  41525 0           PDDL      PUSH
0658  REF  4  LAST  487       35,2636  15340 1                     DPPOSMAX
0659                          35,2637  77624 1           CALL      INTINT    INTEG. FOR NEW TARGET VEC
0660  REF  2  LAST  487       35,2640  72706 0
0661                          35,2641  77775 1           VLOAD
0662  REF  3  LAST  451       35,2642  00001 0                     RATT
0663  REF  6  LAST  487       35,2643  03415 1           STORE     RTARG
0664                          35,2644  41575 0  NOVRWRT  VLOAD     PUSH
0665  REF  6  LAST  486       35,2645  02625 1                     ULOS
0666                          35,2646  57435 1           VXV       VCOMP
0667  REF  6  LAST  487       35,2647  02617 0                     UNRM
0668                          35,2650  41456 0           UNIT      PUSH
0669                          35,2651  76435 1           VXV       VSL1
0670  REF  7  LAST  489       35,2652  02625 1                     ULOS
0671                          35,2653  77715 1           PDVL
0672                          35,2654  64315 1           PDVL      MXV
0673  REF  7  LAST  489       35,2655  03646 0                     DELVEET3
0674                          35,2656  00001 0                     0D
0675                          35,2657  77772 0           VSL1
0676  REF 10  LAST  275       35,2660  36611 1           STCALL    DVLOS
0677  REF  7  LAST  489       35,2661  01340 1                     NORMEX
```

P0678 ..... S34/35.4 .....

```
0679                        35,2662   40220 0  S34/35.4 STQ    SETPD
0680  REF   8  LAST  469    35,2663   01340 1                   NORMEX
0681                        35,2664   00001 0                   0D
0682                        35,2665   77650 1           GOTO
0683  REF   1               35,2666   72644 1                   NOVRWRT
```

NO ASTRONAUT OVERWRITE

P0684 ..... LOMAT .....

```
0685                          35,2667  57575 1  LOMAT   VLOAD   VCOMP
0686  REF  7  LAST  469       35,2670  02617 0          UNIT    UNIT
0687                          35,2671  24007 0          STOVL   6D              Y
0688  REF 14  LAST  469       35,2672  03540 0          RACT3
0689                          35,2673  57456 1          UNIT    VCOMP
0690                          35,2674  00015 0          STORE   12D
0691                          35,2675  76435 1          VXV     VSL1
0692  REF  8  LAST  471       35,2676  02617 0          UNIT    UNIT            Z*-Y
0693                          35,2677  00001 0          STORE   0D
0694                          35,2700  43401 0          SETPD   RVQ
0695                          35,2701  00023 0                  18D
0696                          35,2702  65325 0  GOINT   PDDL    PDDL            DO
0697  REF  5  LAST  467       35,2703  15332 1                  ZEROVECS          NOT
0698  REF  6  LAST  464       35,2704  02364 1                  NOMTPI
0699                          35,2705  41406 0          PUSH    PUSH                    ORDER OR INSERT BEFORE INTINT
0700                          35,2706  45020 1  INTINT  STQ     CALL
0701  REF  2  LAST   90       35,2707  02367 1                  RTRN
0702  REF  6  LAST  259       35,2710  27371 1                  INTSTALL
0703                          35,2711  71214 0          CLEAR   DLOAD
0704  REF  1                  35,2712  01673 1                  INTYPFLG
0705                          35,2713  43054 1          BZE     SET
0706                          35,2714  72716 1                  +2
0707  REF  2  LAST  471       35,2715  01473 0                  INTYPFLG
0708                          35,2716  45545 1          DLOAD   STADR
0709  REF  6  LAST  460       35,2717  63736 0          STODL   TDEC1
0710                          35,2720  73014 0          SET     LXA,2
0711  REF  1                  35,2721  00063 1                  MOONFLAG
0712  REF  2  LAST  124       35,2722  03746 1                  RIX2
0713                          35,2723  43014 0          BON     CLEAR
0714  REF  2  LAST   32       35,2724  04303 0                  CMOONFLG
0715  REF  1                  35,2725  72727 0                  ALLSET
0716  REF  2  LAST  471       35,2726  00263 0                  MOONFLAG
0717  REF  4  LAST  284       35,2727  25517 0  ALLSET  STOVL   TET
0718                          35,2730  77657 0          VSR*
0719                          35,2731  57176 0                  0,2
0720  REF  4  LAST  284       35,2732  25535 0          STOVL   RCV
0721                          35,2733  77657 0          VSR*
0722                          35,2734  57176 0                  0,2
0723  REF  4  LAST  285       35,2735  35543 0          STCALL  VCV
0724  REF  1                  35,2736  27066 1                  INTEGRVS
0725                          35,2737  52175 0          VLOAD   GOTO
0726  REF  4  LAST  469       35,2740  00001 0                  RATT
0727  REF  3  LAST  471       35,2741  02367 1                  RTRN
```

```
P0728   ..... S34/35.5 .....
R0729   SUBROUTINES USED

R0730           BANKCALL
R0731           GOFLASH
R0732           GOTOPOOH
R0733           S34/35.3
R0734           S34/35.4
R0735           VNPOOH

 0736                                  35,2742   43020 1  S34/35.5 STO    BON
 0737   REF   8  LAST  468             35,2743   02370 1                   SUBEXIT
 0738   REF   1                       35,2744   01311 0                   PINALPLG
 0739   REF   1                       35,2745   72751 1                   PLAGON
 0740                                  35,2746   52014 0           SET     GOTO
 0741   REF   2  LAST  253             35,2747   00470 1                   UPDATFLG
 0742   REF   1                       35,2750   72775 1                   PLAGOFF
 0743                                  35,2751   77414 0  PLAGON   CLEAR   EXIT
 0744   REF   1                       35,2752   03274 0                   NTARGPLG
 0745   REF   1                       35,2753   3 3131 1          CAF     V06N81
 0746   REF  88  LAST  456             35,2754   0 4555 0          TC      BANKCALL
 0747   REF  11  LAST  456             35,2755    20624 0          CADR    GOFLASH
 0748   REF   8  LAST  456             35,2756   0 4106 1          TC      GOTOPOOH
 0749                                  35,2757   0 2764 0          TC      +5
 0750   REF  44  LAST  460             35,2760   0 6006 1          TC      INTPRET
 0751                                  35,2761    77414 0          SET     EXIT
 0752   REF   2  LAST  472             35,2762    03074 1                   NTARGPLG
 0753   REF   2  LAST  472             35,2763   0 2753 1          TC      PLAGON +2
 0754   REF  45  LAST  472             35,2764   0 6006 1          TC      INTPRET
 0755                                  35,2765    45014 0          BOFF    CALL
 0756   REF   3  LAST  472             35,2766    03354 0                   NTARGPLG
 0757   REF   1                       35,2767    72771 0                   NOCHG
 0758   REF   1                       35,2770    72817 1                   S34/35.3
 0759                                  35,2771    77214 0  NOCHG    CLEAR   VLOAD
 0760   REF   1                       35,2772    01267 0                   XDELVFLG
 0761   REF   8  LAST  469             35,2773    03646 0                   DELVEET3
 0762   REF   3  LAST  121             35,2774    03646 0           STORE   DELVSIN
 0763                                  35,2775    77624 1  PLAGOFF  CALL
 0764   REF   1                       35,2776    72662 0                   S34/35.4
 0765                                  35,2777    77776 1           EXIT
 0766   REF   1                       35,3000   3 3130 0          CAF     V06N59
 0767   REF   4  LAST  457             35,3001   0 3114 0          TC      VNPOOH
 0768   REF  46  LAST  472             35,3002   0 6006 1          TC      INTPRET
 0769                                  35,3003    77650 1          GOTO
 0770   REF   9  LAST  472             35,3004    02370 1                   SUBEXIT
```

```
R0771   ..... VN1645 .....

R0772   SUBROUTINES USED

R0773       P3XORP7X
R0774       GET+MGA
R0775       BANKCALL
R0776       DELAYJOB
R0777       COMPTGO
R0778       GOFLASHR
R0779       GOTOPOOH
R0780       FLAGUP

 0781                          35,3005   71220 1  VN1645  STO     DLOAD
 0782  REF  10  LAST  472     35,3006   02370 1          SUBEXIT
 0783  REF   1               35,3007   33145 1          DP-.01
 0784  REF   4  LAST  274     35,3010   03626 0          STORE   +MGA          MGA = -.01
 0785                          35,3011   71214 0          BOFF    DLOAD
 0786  REF   2  LAST  472     35,3012   01351 1                  FINALFLG
 0787  REF   1               35,3013   73033 0                  GET45
 0788  REF   2  LAST  473     35,3014   33145 1                  DP-.01
 0789                          35,3015   77615 0          DAD
 0790  REF   3  LAST  473     35,3016   33145 1                  DP-.01
 0791  REF   5  LAST  473     35,3017   03626 0          STORE   +MGA          MGA = -.02
 0792                          35,3020   77414 0          BOFF    EXIT
 0793  REF   1               35,3021   01742 1                  REFSMFLG
 0794  REF   2  LAST  473     35,3022   73033 0                  GET45
 0795  REF   1               35,3023   0 3106 0         TC      P3XORP7X
 0796                          35,3024   0 3026 0         TC      +2            P3X
 0797  REF   3  LAST  473     35,3025   0 3034 0         TC      GET45 +1      P7X
 0798  REF  47  LAST  472     35,3026   0 6006 1         TC      INTPRET
 0799                          35,3027    41575 0       VLOAD   PUSH
 0800  REF   4  LAST  472     35,3030    03646 0                 DELVSIN
 0801                          35,3031    77624 1       CALL                  COMPUTE MGA
 0802  REF   1               35,3032    10660 0                 GET+MGA
 0803                          35,3033    77776 1  GET45   EXIT
 0804  REF   1               35,3034   0 3564 0         TC      COMPTGO       INITIATE TASK TO UPDATE TTOGO
 0805  REF  11  LAST  473     35,3035   3 1770 0         CA      SUBEXIT
 0806  REF   2  LAST   90     35,3036   55=766 0         TS      QSAVED
 0807  REF   2  LAST  424     35,3037   3 4734 0         CAF     1SEC
 0808  REF  89  LAST  472     35,3040   0 4555 0         TC      BANKCALL
 0809  REF   2  LAST  194     35,3041    01732 0         CADR    DELAYJOB
 0810  REF   1               35,3042   3 3132 1         CAF     V16N45        TRKMKCNT, TTOGO, +MGA
 0811  REF  90  LAST  473     35,3043   0 4555 0         TC      BANKCALL
 0812  REF  12  LAST  472     35,3044    20624 0         CADR    GOFLASH
 0813  REF   1               35,3045   0 3050 1         TC      KILCLOCK      TERMINATE
 0814  REF   1               35,3046   0 3053 1         TC      N45PROC       PROCEED
 0815  REF   1               35,3047   0 3063 1         TC      CLUPDATE      RECYCLE - RETURN FOR INITIAL COMPUTATION
 0816  REF  13  LAST  342     35,3050   3 0005 1  KILCLOCK CA     Z
 0817  REF   1               35,3051   54 000 0         TS      DISPDEX
```

0818	REF	9	LAST	472	35,3052	0 4106 1			TC	GOTOPOOH	
0819	REF	7	LAST	299	35,3053	4 0076 1	N45PROC		CS	FLAGWRD2	
0820	REF	30	LAST	383	35,3054	7 4705 0			MASK	BIT8	
0821					35,3055	0 0006 1			EXTEND		
0822	REF	2	LAST	473	35,3056	1 3050 0			BZF	KILCLOCK	FINALFLG IS SET-FLASH V37-AWAIT NEW PGM
0823	REF	20	LAST	447	35,3057	0 5301 0			TC	PHASCHNG	
0824					35,3060	04024 0			OCT	04024	
0825	REF	16	LAST	391	35,3061	0 5435 0			TC	UPFLAG	SET
0826	REF	3	LAST	473	35,3062	00047 1			ADRES	FINALFLG	FINALFLG
0827	REF	14	LAST	473	35,3063	3 0005 1	CLUPDATE		CA	Z	
0828	REF	2	LAST	473	35,3064	54 000 0			TS	DISPDEX	
0829	REF	21	LAST	474	35,3065	0 5301 0			TC	PHASCHNG	
0830					35,3066	04024 0			OCT	04024	
0831	REF	48	LAST	473	35,3067	0 6006 1			TC	INTPRET	
0832					35,3070	52014 0			CLEAR	GOTO	
0833	REF	3	LAST	472	35,3071	00670 0				UPDATFLG	
0834	REF	3	LAST	473	35,3072	02366 0				QSAVED	

```
P0835   ..... DISPLAYE .....

R0836   SUBROUTINES USED

R0837           BANKCALL
R0838           GOFLASHR
R0839           GOTOPOOH
R0840           BLANKET
R0841           ENDOPJOB

 0842                                35,3073  0 0006 1  DISPLAYE EXTEND
 0843   REF   9  LAST  470           35,3074  23#340 1          QXCH   NORMEX
 0844   REF   1                      35,3075  3 3126 1          CAF    V06N55
 0845   REF  91  LAST  473           35,3076  0 4555 0          TCR    BANKCALL
 0846   REF   1                      35,3077   20763 1          CADR   GOFLASHR
 0847   REF  10  LAST  474           35,3100  1 4106 0          TCF    GOTOPOOH
 0848   REF  10  LAST  475           35,3101  0 1340 1          TC     NORMEX
 0849                                35,3102  1 3075 1          TCF    -5
 0850   REF  35  LAST  442           35,3103  3 4712 1          CAF    BIT1        BLANK R1
 0851   REF   1                      35,3104  0 5415 1          TCR    BLANKET
 0852   REF  58  LAST  444           35,3105  1 5112 1          TCF    ENDOPJOB
```

```
P0853   ..... P3XORP7X .....

 0854   REF   1                 35,3106  3 7713 0  P3XORP7X CAF    HIGH9
 0855   REF   8  LAST  385      35,3107  7 1011 1           MASK   MODREG
 0856                           35,3110  0 0006 1           EXTEND
 0857                           35,3111  1 3113 0           BZF    +2
 0858   REF 151  LAST  439      35,3112 24 002 0           INCR   Q
 0859                           35,3113  0 0002 0           RETURN

R0860   ..... VNPOOH     .....

R0861   SUBROUTINES USED

R0862          BANKCALL
R0863          GOFLASH
R0864          GOTOPOOH

 0865                           35,3114  0 0006 1  VNPOOH   EXTEND
 0866   REF   4  LAST  471      35,3115  23"767 0           QXCH   RTRN
 0867   REF   2  LAST   89      35,3116  55"765 0           TS     VERBNOUN
 0868   REF   3  LAST  476      35,3117  3 1765 1           CA     VERBNOUN
 0869   REF  92  LAST  475      35,3120  0 4555 0           TCR    BANKCALL
 0870   REF  13  LAST  473      35,3121   20624 0           CADR   GOFLASH
 0871   REF  11  LAST  475      35,3122  1 4106 0           TCF    GOTOPOOH
 0872   REF   5  LAST  476      35,3123  0 1767 0           TC     RTRN
 0873                           35,3124  1 3117 1           TCF    -5
```

P0874 ..... CONSTANTS .....

```
0875                35,3125  01445 0  V06N37  ,VN    0637
0876                35,3126  01467 0  V06N55   VN    0655
0877                35,3127  01472 1  V06N58   VN    0658
0878                35,3130  01473 0  V06N59   VN    0659
0879                35,3131  01521 0  V06N81   VN    0681
0880                35,3132  04055 0  V16N45   VN    1645
0881                35,3133  14441 0  TWOPI    2DEC  6.283185307 B-4
0881                35,3134  37325 1
0882                35,3135  00001 0  MAX250   2DEC  25 B3
0882                35,3136  20650 0
0883                35,3137  12525 0  THIRD    2DEC  .333333333
0883                35,3140  12525 0
0884                35,3141  00004 0  ELEPS    2DEC  .27777777 E-3
0884                35,3142  21505 1
0885                35,3143  00002 0  DECTWO   OCT   2
0886                35,3144  77777 0  DP-.01   OCT   77777          CONSTANTS
0887                35,3145  61337 1           OCT   61337          ADJACENT      -.01 FOR MGA DSP
08871               35,3146  01252 0  EPSFOUR  2DEC  .0416666666
08871               35,3147  25253 1
```

```
P0888   ..... INITVEL .....

R0889   MOD NO -1       LOG SECTION - P34-P35, P74-P75
R0890   MOD BY WHITE.P  DATE  21NOV67

R0891   FUNCTIONAL DESCRIPTION

R0892         THIS SUBROUTINE COMPUTES THE REQUIRED INITIAL VELOCITY VECTOR FOR
R0893         A TRAJECTORY OF SPECIFIED TRANSFER TIME BETWEEN SPECIFIED INITIAL
R0894         AND TARGET POSITIONS.  THE TRAJECTORY MAY BE EITHER CONIC OR
R0895         PRECISION DEPENDING ON AN INPUT PARAMETER (NAMELY, NUMBER OF
R0896         OFFSETS).  IN ADDITION, IN THE PRECISION TRAJECTORY CASE, THE
R0897         SUBROUTINE ALSO COMPUTES AN OFFSET TARGET VECTOR, TO BE USED
R0898         DURING PURE-CONIC CROSS-PRODUCT STEERING.  THE OFFSET TARGET
R0899         VECTOR IS THE TERMINAL POSITION VECTOR OF A CONIC TRAJECTORY WHICH
R0900         HAS THE SAME INITIAL STATE AS A PRECISION TRAJECTORY WHOSE
R0901         TERMINAL POSITION VECTOR IS THE SPECIFIED TARGET VECTOR.

R0902         IN ORDER TO AVOID THE INHERENT SINGULARITIES IN THE 180 DEGREE
R0903         TRANSFER CASE WHEN THE (TRUE OR OFFSET) TARGET VECTOR MAY BE
R0904         SLIGHTLY OUT OF THE ORBITAL PLANE, THIS SUBROUTINE ROTATES THIS
R0905         VECTOR INTO A PLANE DEFINED BY THE INPUT INITIAL POSITION VECTOR
R0906         AND ANOTHER INPUT VECTOR (USUALLY THE INITIAL VELOCITY VECTOR),
R0907         WHENEVER THE INPUT TARGET VECTOR LIES INSIDE A CONE WHOSE VERTEX
R0908         IS THE ORIGIN OF COORDINATES, WHOSE AXIS IS THE 180 DEGREE
R0909         TRANSFER DIRECTION, AND WHOSE CONE ANGLE IS SPECIFIED BY THE USER.

R0910         THE LAMBERT SUBROUTINE IS UTILIZED FOR THE CONIC COMPUTATIONS AND
R0911         THE COASTING INTEGRATION SUBROUTINE IS UTILIZED FOR THE PRECISION
R0912         TRAJECTORY COMPUTATIONS.

R0913   CALLING SEQUENCE

R0914         L         CALL
R0915         L+1               INITVEL
R0916         L+2       (RETURN - ALWAYS)

R0917   INPUT

R0918         (1) RINIT    INITIAL POSITION RADIUS VECTOR
R0919         (2) VINIT    INITIAL POSITION VELOCITY VECTOR
R0920         (3) RTARG    TARGET POSITION RADIUS VECTOR
R0921         (4) DELLT4   DESIRED TIME OF FLIGHT FROM RINIT TO RTARG
R0922         (5) INTIME   TIME OF RINIT
R0923         (6) 0D       NUMBER OF ITERATIONS OF LAMBERT/INTEGRVS
R0924         (7) 2D       ANGLE TO 180 DEGREES WHEN ROTATION STARTS
R0925         (8) RTX1     -2 FOR EARTH, -10D FOR LUNAR
R09251        (9) RTX2     COORDINATE SYSTEM ORIGIN - 0 FOR EARTH, 2 FOR LUNAR
R0926        PUSHLOC SET AT 4D
```

```
R0927   OUTPUT

R0928         (1) RTARG    OFFSET TARGET POSITION VECTOR
R0929         (2) VIPRIME  MANEUVER VELOCITY REQUIRED
R0930         (3) VTPRIME  VELOCITY AT TARGET AFTER MANEUVER
R0931         (4) DELVEET3 DELTA VELOCITY REQUIRED FOR MANEUVER

R0932   SUBROUTINES USED

R0933         LAMBERT
R0934         INTSTALL
R0935         INTEGRVS

 0936   REF   1              11,2000                    SETLOC  INTVEL
 0937                       11,2000                    BANK

 0938   REF   1                                         COUNT   11/INITV

 0958                       11,2000   77614 1  INITVEL  SET             COGA GUESS NOT AVAILABLE
 0959   REF   1              11,2001   00475 1                   GUESSW
 0960                       11,2002   44175 1  HAVEGUES VLOAD   STQ
 0961   REF   7  LAST  469   11,2003   03415 1                   RTARG
 0962   REF  11  LAST  475   11,2004   01340 1                   NORMEX
 0963   REF   2  LAST  120   11,2005   03604 0           STORE   RTARG1
 0964                       11,2006   46135 1           SLOAD   BHIZ
 0965   REF   3  LAST  471   11,2007   03747 0                   RTX2
 0967   REF   1              11,2010   22022 1                   INITVEL1
 0968                       11,2011   72575 0           VLOAD   VSL2
 0969   REF   4  LAST  467   11,2012   03570 0                   RINIT     B29
 0970   REF   5  LAST  479   11,2013   27570 0           STOVL   RINIT     B27
 0971   REF   4  LAST  467   11,2014   03576 0                   VINIT     B7
 0972                       11,2015   77752 1           VSL2
 0973   REF   5  LAST  479   11,2016   27576 0           STOVL   VINIT     B5
 0974   REF   3  LAST  479   11,2017   03604 0                   RTARG1
 0975                       11,2020   77752 1           VSL2
 0976   REF   4  LAST  479   11,2021   03604 0           STORE   RTARG1
R0977         INITIALIZATION

 0978                       11,2022   71331 0  INITVEL1 SSP     DLOAD    SET ITCTR TO -1,LOAD MPAC WITH E4(PL 2D)
 0979   REF   1              11,2023   03505 1                   ITCTR
 0980                       11,2024   77776 1                   0 -1
 0981                       11,2025   70546 1           COSINE  SR1      CALCULATE COSINE (E4)  (+2)
 0982   REF   2  LAST  121   11,2026   17630 1           STODL   COZY4     SET COZY4 TO COSINE(E4)          (PL 0D)
 0983                       11,2027   67154 0           LXA,2   SXA,2
 0984   REF 236  LAST  462   11,2030   00154 1                   MPAC
 0985   REF   2  LAST   94   11,2031   02703 1                   VTARGTAG  SET VTARGTAG TO 0D (SP)
 0986                       11,2032   77775 1           VLOAD
 0987   REF   6  LAST  479   11,2033   03570 0                   RINIT
 0988   REF   3  LAST   94   11,2034   26657 1           STOVL   R1VEC     R1VEC EQ RINIT
 0989   REF   5  LAST  479   11,2035   03604 0                   RTARG1
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 0990   REF  2  LAST  94   11,2036   18665 0            STODL   R2VEC        R2VEC EQ RTARG
 0991   REF  5  LAST 467   11,2037   03423 1                    DELLT4
 0992   REF  2  LAST  94   11,2040   02673 1            STORE   TDESIRED     TDESIRED EQ DELLT4
 0993                      11,2041   77201 1            SETPD   VLOAD
 0994                      11,2042   00001 0                    0D          INITIALIZE PL TO 0D
 0995   REF  7  LAST 479   11,2043   03570 0                    RINIT       MPAC EQ RINIT (+29)
 0996                      11,2044   41456 0            UNIT    PUSH        UNIT(RI)  (+1)                  (PL 6D)
 0997                      11,2045   53435 0            VXV     UNIT
 0998   REF  6  LAST 479   11,2046   03576 0                    VINIT       MPAC EQ UNIT(RI) X VI   (+8)
 0999   REF  2  LAST  94   11,2047   26676 1            STOVL   UN
 1000   REF  6  LAST 479   11,2050   03604 0                    RTARG1
 1001                      11,2051   50256 0            UNIT    DOT         TEMP=URT.URI  (+2)               (PL 0D)
 1002                      11,2052   43015 1            DAD     CLEAR
 1003   REF  3  LAST 479   11,2053   03630 1                    COZY4
 1004   REF  1             11,2054   03665 1                    NORMSW
 1005   REF  4  LAST 480   11,2055   03630 1            STORE   COZY4
 1006                      11,2056   43044 0  INITVEL2  BPL     SET
 1007   REF  1             11,2057   22101 1                    INITVEL3    UN CALCULATED IN LAMBERT
 1008   REF  2  LAST 480   11,2060   03465 0                    NORMSW
R1009       ROTATE  RC INTO YC PLANE - SET UNIT NORMAL TO YC

 1010                      11,2061   41575 0            VLOAD   PUSH                                        (PL 6D)
 1011   REF  3  LAST 480   11,2062   02665 0                    R2VEC       RC TO 6D  (+29)
 1012                      11,2063   63246 1            ABVAL   PDVL        RC TO MPAC, ABVAL(RC) (+29) TO 0D(PL 2D)
 1013                      11,2064   46206 1            PUSH    VPROJ                                       (PL 8D)
 1014   REF  3  LAST 480   11,2065   02676 1                    UN
 1015                      11,2066   51352 1            VSL2    BVSU
 1016                      11,2067   74256 0            UNIT    VXSC                                        (PL 0D)
 1017                      11,2070   77772 0            VSL1
 1018   REF  4  LAST 480   11,2071   02665 0            STORE   R2VEC
 1019                      11,2072   67351 1            TLOAD   SLOAD
 1020   REF  2  LAST  31   11,2073   11456 0                    ZEROVEC
 1021   REF  2  LAST 479   11,2074   03505 1                    ITCTR
 1022                      11,2075   77244 0            BPL     VLOAD
 1023   REF  2  LAST 480   11,2076   22101 1                    INITVEL3
 1024   REF  5  LAST 480   11,2077   02665 0                    R2VEC
 1025   REF  7  LAST 480   11,2100   03604 0            STORE   RTARG1
 1026                      11,2101   63345 0  INITVEL3  DLOAD   PDVL                                        (PL 2D)
 1027   REF  1             11,2102   27736 0                    MUEARTH     POSITIVE VALUE
 1028   REF  6  LAST 480   11,2103   02665 0                    R2VEC
102802                     11,2104   63256 0            UNIT    PDVL        2D = UNIT(R2VEC)                (PL 8D)
102804 REF  4  LAST 479   11,2105   02657 1                    R1VEC
102806                     11,2106   41456 0            UNIT    PUSH        8D = UNIT(R1VEC)                (PL14D)
102808                     11,2107   57435 1            VXV     VCOMP       -N = UNIT(R2VEC) X UNIT(R1VEC)
10281                      11,2110   00003 1                    2D
10282                      11,2111   77606 1            PUSH                                                (PL20D)
10283                      11,2112   71350 1            LXA,1   DLOAD
10284  REF  3  LAST 456   11,2113   03745 1                    RTX1
10285                      11,2114   00023 0                    18D
10286                      11,2115   62040 1            BMN     INCR,1
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 10287                          11,2116   22120 1                 +2
 10288                          11,2117   77767 1          DEC    -8
 10289                          11,2120   67310 1          INCR,1 SLOAD
 1029                           11,2121   00012 1                 10D
 10291  REF  4  LAST  463       11,2122   00047 1                 X1
 10292                          11,2123   77230 0          BHIZ   VLOAD                    (PL14D)
 10293                          11,2124   22126 1                 +2
 10294                          11,2125   41476 1          VCOMP  PUSH                     (PL20D)
 10295                          11,2126   77775 1          VLOAD                           (PL14D)
 10296                          11,2127   50235 0          VXV    DOT                      (PL 2D)
 1032                           11,2130   71244 0          BPL    DLOAD                    (PL 0D)
 1033   REF  1                  11,2131   22133 0                 INITVEL4
 1034                           11,2132   41476 1          DCOMP  PUSH                     (PL 2D)
 1035                           11,2133   67154 0  INITVEL4 LXA,2  SXA,2
 1036                           11,2134   00000 1                 0D
 1037   REF  2  LAST   94       11,2135   02674 0                 GEOMSGN
R1038     SET INPUTS UP FOR LAMBERT

 1039                           11,2136   45150 1          LXA,1  CALL
 1040   REF  4  LAST  480       11,2137   03745 1                 RTX1
R1041      OPERATE THE LAMBERT CONIC ROUTINE (COASTFLT SUBROUTINE)

 1042   REF  1                  11,2140   25215 0                 LAMBERT

R1043          DELETE THRU 4521
R1044    ARRIVED AT SOLUTION IS GOOD ENOUGH ACCORDING TO SLIGHTLY WIDER BOUNDS.

 1045                           11,2141   77214 0          CLEAR  VLOAD
 1046   REF  2. LAST  479       11,2142   00675 0                 GUESSW
 1047   REF  3  LAST  456       11,2143   02746 0                 VVEC
R1048    STORE CALCULATED INITIAL VELOCITY REQUIRED IN VIPRIME
R1049
 1050   REF  4  LAST  457       11,2144   17612 1          STODL  VIPRIME        INITIAL VELOCITY REQUIRED  (+7)
R1051
R1052       IF NUMIT IS ZERO, CONTINUE AT INITVEL8, OTHERWISE
R1053    SET UP INPUTS FOR ENCKE INTEGRATION (INTEGRVS).

 1054   REF  3  LAST  479       11,2145   02704 0                 VTARGTAG
 1055                           11,2146   45030 0          BHIZ   CALL
 1056   REF  1                  11,2147   22224 0                 INITVEL7
 1057   REF  7  LAST  471       11,2150   27371 1                 INTSTALL
 1061                           11,2151   43135 1          SLOAD  CLEAR
 1062   REF  4  LAST  479       11,2152   03747 0                 RTX2
 1063   REF  3  LAST  471       11,2153   00263 0                 MOONFLAG
 1064                           11,2154   43030 0          BHIZ   SET
 1065   REF  1                  11,2155   22157 1                 INITVEL5
 1066   REF  4  LAST  481       11,2156   00063 1                 MOONFLAG
 1067                           11,2157   77775 1  INITVEL5 VLOAD
 1068   REF  8  LAST  480       11,2160   03570 0                 RINIT
 1069   REF  5  LAST  480       11,2161   02657 1          STORE  R1VEC
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 1070   REF   5  LAST  471   11,2162   25535 0            STOVL  RCV
 1071   REF   5  LAST  481   11,2163   03612 1                   VIPRIME
 1072   REF   5  LAST  471   11,2164   15543 1            STODL  VCV
 1073   REF   6  LAST  467   11,2165   03503 1                   INTIME
 1074   REF   5  LAST  471   11,2166   01517 0            STORE  TET
 1075                        11,2167   43015 1            DAD    CLEAR
 1076   REF   6  LAST  480   11,2170   03423 1                   DELLT4
 1077   REF   3  LAST  471   11,2171   01673 1                   INTYPFLG
 1078   REF   7  LAST  471   11,2172   34041 0            STCALL TDEC1
 1079   REF   2  LAST  471   11,2173   27066 1                   INTEGRVS
 1080                        11,2174   77775 1            VLOAD
 1081   REF   1              11,2175   00025 0                   VATT1
 1082   REF   2  LAST   94   11,2176   02705 1            STORE  VTARGET
R1083    IF ITERATION COUNTER (ITCTR) EQ NO. ITERATIONS (NUMIT), CONTINUE AT
R1084    INITVELC, OTHERWISE REITERATE LAMBERT AND ENCKE

 1085                        11,2177   63154 1            LXA,2  INCR,2
 1086   REF   3  LAST  480   11,2200   03504 0                   ITCTR
 1087                        11,2201   00001 0                   1D              INCREMENT ITCTR
 1088                        11,2202   55134 1            SXA,2  XSU,2
 1089   REF   4  LAST  482   11,2203   03504 0                   ITCTR
 1090   REF   4  LAST  481   11,2204   02703 1                   VTARGTAG
 1091                        11,2205   46135 1            SLOAD  BHIZ            IF SP(MPAC) EQ 0, CONTINUE AT INITVELC
 1092   REF   2  LAST  450   11,2206   00050 1                   X2
 1093   REF   1              11,2207   22221 0                   INITVEL6
R1094
R1095    OFFSET CONIC TARGET VECTOR

 1096                        11,2210   52375 1            VLOAD  VSU
 1097   REF   8  LAST  480   11,2211   03604 0                   RTARG1
 1098   REF   1              11,2212   00017 1                   RATT1
 1099                        11,2213   77655 1            VAD
 1100   REF   7  LAST  480   11,2214   02665 0                   R2VEC
 1101   REF   8  LAST  482   11,2215   16665 0            STODL  R2VEC
 1102   REF   5  LAST  480   11,2216   03630 1                   COZY4
 1103                        11,2217   77650 1            GOTO
 1104   REF   1              11,2220   22056 1                   INITVEL2        CONTINUE ITERATING AT INITVEL2
R1105    COMPUTE THE DELTA VELOCITY

 1106                        11,2221   77775 1  INITVEL6  VLOAD
 1107   REF   9  LAST  482   11,2222   02665 0                   R2VEC
 1108   REF   9  LAST  482   11,2223   03604 0            STORE  RTARG1
 1109                        11,2224   52375 1  INITVEL7  VLOAD  VSU
 1110   REF   6  LAST  482   11,2225   03612 1                   VIPRIME
 1111   REF   7  LAST  480   11,2226   03576 0                   VINIT
 1112   REF   9  LAST  472   11,2227   27646 0            STOVL  DELVEET3        DELVEET3 = VIPRIME-VINIT  (+7)
 1113   REF   3  LAST  482   11,2230   02705 1                   VTARGET
 1114   REF   4  LAST  457   11,2231   03620 0            STORE  VTPRIME
 1115                        11,2232   46135 1            SLOAD  BHIZ
 1116   REF   5  LAST  481   11,2233   03747 0                   RTX2
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 1117   REF   1              11,2234   22251 1                INITVELX
 11171                       11,2235   70575 1          VLOAD VSR2
 11172  REF   5  LAST  482   11,2236   03620 0                VTPRIME
 1118   REF   6  LAST  483   11,2237   27620 0          STOVL VTPRIME
 1119   REF   7  LAST  482   11,2240   03612 1                VIPRIME
 1120                        11,2241   77742 0          VSR2
 1121   REF   8  LAST  483   11,2242   27612 1          STOVL VIPRIME
 1122   REF  10  LAST  482   11,2243   03604 0                RTARG1
 1123                        11,2244   77742 0          VSR2
 1124   REF  11  LAST  483   11,2245   27604 0          STOVL RTARG1
 1125   REF  10  LAST  482   11,2246   03646 0                DELVEET3
 1126                        11,2247   77742 0          VSR2
 1127   REF  11  LAST  483   11,2250   03646 0          STORE DELVEET3
 1128                        11,2251   77201 1 INITVELX SETPD VLOAD
 1129                        11,2252   00001 0                0D
 1130   REF  12  LAST  483   11,2253   03604 0                RTARG1
 1131   REF   8  LAST  479   11,2254   37415 0          STCALL RTARG
 1134   REF  12  LAST  479   11,2255   01340 1                NORMEX
R1135
R1136    ..... END OF INITVEL ROUTINE .....
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P1137   ..... MIDGIM .....

R1138   MOD NO. 0, BY WILLMAN, SUBROUTINE RENDGUID, LOG P34-P35, P74-P75
R1139    REVISION 03, 17 FEB 67

R1140           IF THE ACTIVE VEHICLE IS DOING THE COMPUTATION, MIDGIM COMPUTES
R1141   THE POSITIVE MIDDLE GIMBAL ANGLE OF THE ACTIVE VEHICLE TO THE INPUT
R1142   DELTA VELOCITY VECTOR (0D IN PUSH LIST), OTHERWISE
R1143   MIDGIM CONVERTS THE INPUT DELTA VELOCITY VECTOR FROM INERTIAL COORDIN-
R1144   ATES TO LOCAL VERTICAL COORDINATES OF THE ACTIVE VEHICLE.

R1145     .. INPUTS ..

R1146      NAME        MEANING                                  UNITS/SCALING/MODE

R1147     AVFLAG  INT FLAG - 0 IS CSM ACTIVE, 1 IS LEM ACTIVE              BIT
R1148    COMPUTER INT FLAG - 0 IS LEM COMPUTER, 1 IS CSM COMPUTER          BIT
R1149     RINIT   ACTIVE VEHICLE RADIUS VECTOR          METERS/CSEC (+7) VT
R1150     VINIT   ACTIVE VEHICLE VELOCITY VECTOR        METERS/CSEC (+7) VT
R1151     0D (PL) ACTIVE VEHICLE DELTA VELOCITY VECTOR  METERS/CSEC (+7) VT

R1152     .. OUTPUTS ..

R1153      NAME        MEANING                                  UNITS/SCALING/MODE

R1154       +MGA  + MIDDLE GIMBAL ANGLE                 REVOLUTIONS (+0)  DP
R1155     DELVLVC DELTA VELOCITY VECTOR IN LV COORD.    METERS/CSEC (+7)  VT
R1156    MGLVFLAG INT FLAG - 0 IS +MGA COMPUTED, 1 IS DELVLVC COMP. -       BIT

R1157     .. CALLING SEQUENCE ..

R1158   L       CALL
R1159   L+1             MIDGIM
R1160   L+2     (RETURN - ALWAYS)

R1161     .. NO SUBROUTINES CALLED ..

R1162     .. DEBRIS - ERASEABLE TEMPORARY USAGE

R1163        A,Q,L, PUSH LIST, MPAC.

R1164     .. ALARMS - NONE ..
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P1165 MIDDLE GIMBAL ANGLE COMPUTATION.

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 1166  REF  1                04,2000                        SETLOC MIDDGIM
 1167                        04,2651                        BANK

 1168  REF  1                                               COUNT* $$/MIDG

 1169                        04,2651   20000 0  HALFREV     2DEC   1 B-1
 1169                        04,2652   00000 1
 1170                        04,2653   43014 0  MIDGIM     BCN    BOFF
 1171  REF  1                04,2654   01312 0             AVFLAG
 1172  REF  1                04,2655   10673 1             MIDGIM1
 1173  REF  1                04,2656   02747 1             COMPUTER
 1174  REF  1                04,2657   10676 1             GET.LVC
R1175  COMPUTE +MGA IF AVFLAG AND COMPUTER HAVE OPPOSITE VALUES.
 1176                        04,2660   53575 0  GET+MGA    VLOAD  UNIT       (PL 0D) V (+7) TO MPAC, UNITIZE  UV (+1)
 1177                        04,2661   72441 0             DOT    SL1        DOT UV WITH Y(STABLE MEMBER) AND RESCALE
 1178  REF  3 LAST 169       04,2662   01744 1             REFSMMAT +6       FROM +2 TO +1 FOR ASIN ROUTINE
 1179                        04,2663   51136 1             ARCSIN BPL
 1180  REF  1                04,2664   10670 1             SETMGA
 1181                        04,2665   43215 0             DAD    DAD        CONVERT -MGA TO +MGA BY
 1182  REF  1                04,2666   10652 1             HALFREV           ADDING ONE REVOLUTION
 1183  REF  2 LAST 485       04,2667   10652 1             HALFREV
 1184  REF  6 LAST 473       04,2670   03626 0  SETMGA     STORE  +MGA
 1185                        04,2671   43414 1             CLR    RVQ        CLEAR MGLVFLAG TO INDICATE +MGA CALC
 1186  REF  1                04,2672   02675 1             MGLVFLAG          AND EXIT
 1187                        04,2673   77614 1  MIDGIM1    BOFF
 1188  REF  2 LAST 485       04,2674   02747 1             COMPUTER
 1189  REF  2 LAST 473       04,2675   10660 0             GET+MGA
R1190  COMPUTE DELVLVC IF AVFLAG AND COMPUTER HAVE SAME VALUES.
 1191                        04,2676   53575 0  GET.LVC    VLOAD  UNIT       (PL 6D)   R (+29) IN MPAC, UNITIZE  UR
 1192  REF  9 LAST 481       04,2677   03570 0             RINIT
 1193                        04,2700   77676 0             VCOMP             U(-R)
 1194                        04,2701   00023 0             STORE  18D        U(-R) TO 18D
 1195                        04,2702   53435 0             VXV    UNIT       U(-R)*V EQ V*U(R), U(V*R)
 1196  REF  8 LAST 482       04,2703   03576 0             VINIT
 1197                        04,2704   00015 0             STORE  12D        U(V*R) TO 12D
 1198                        04,2705   53435 0             VXV    UNIT       U(V*R)*U(-R), U((V*R)*(-R))
 1199                        04,2706   00023 0             18D
 1200                        04,2707   24007 0             STOVL  6D         TRANSFORMATION MATRIX IS IN 6D (+1)
 1201                        04,2710   00001 0             0D                DELTA V (+7) IN 0D
 1202                        04,2711   76521 0             MXV    VSL1       CONVERT FROM INER COOR TO LV COOR (+8)
 1203                        04,2712   00007 0             6D                AND SCALE +7 IN MPAC
 1204  REF  9 LAST 469       04,2713   03405 0             STORE  DELVLVC    STORE IN DELVLVC (+7)
 1205                        04,2714   43414 1             SET    RVQ        SET MGLVFLAG TO INDICATE LVC CALC
 1206  REF  2 LAST 485       04,2715   02475 0                    MGLVFLAG          AND EXIT
R1207     ..... END OF MIDGIM ROUTINE .....
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P1208
 1209                                04,2716  77160 0  SELECTMU AXC,1  AXT,2
 1210                                04,2717  00002 0                   2D
 1211                                04,2720  00000 1                   0D
 1212                                04,2721  77614 1           BOFF
 1213  REF   3  LAST  471            04,2722  04343 1                   CMOONFLG
 1214  REF   1                       04,2723  10727 1                   SETMUER
 1215                                04,2724  77160 0           AXC,1   AXT,2
 1216                                04,2725  00012 1                   10D
 1217                                04,2726  00002 0                   2D
 1218                                04,2727  66143 1  SETMUER  DLOAD*  SXA,1
 1219  REF   1                       04,2730  11635 1                   MUTABLE +4,1
 1220  REF   5  LAST  481            04,2731  03745 1                   RTX1
 1221  REF   2  LAST  124            04,2732  23752 0           STODL*  RTSR1/MU
 1222  REF   2  LAST  486            04,2733  11627 1                   MUTABLE -2,1
 1223                                04,2734  54214 1           BOFF    SR
 1224  REF   4  LAST  486            04,2735  04343 1                   CMOONFLG
 1225  REF   1                       04,2736  10740 0                   RTRNMU
 1226                                04,2737  20607 1                   6D
 1227  REF   2  LAST  124            04,2740  03750 0  RTRNMU   STORE   RTMU
 1228                                04,2741  43134 0           SXA,2   CLEAR
 1229  REF   6  LAST  482            04,2742  03746 1                   RTX2
 1230  REF   4  LAST  474            04,2743  01271 1                   FINALFLG
 1234                                04,2744  77650 1           GOTO
 1235  REF   3  LAST  460            04,2745  73005 0                   VN1645
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P1236   ..... PERIAPO .....

R1237   MOD NO -1        LOG SECTION - P34-P35, P74-P75
R1238   MOD BY WHITE.P   DATE  18JAN68

R1239   FUNCTIONAL DESCRIPTION

R1240         THIS SUBROUTINE COMPUTES THE TWO BODY APOCENTER AND PERICENTER
R1241         ALTITUDES GIVEN THE POSITION AND VELOCITY VECTORS FOR A POINT ON
R1242         THE TRAJECTORY AND THE PRIMARY BODY.

R1243         SETRAD IS CALLED TO  DETERMINE THE RADIUS OF THE PRIMARY BODY.

R1244         APSIDES IS CALLED TO SOLVE FOR THE TWO BODY RADII OF APOCENTER AND
R1245         PERICENTER AND THE ECCENTRICITY OF THE TRAJECTORY.

R1246   CALLING SEQUENCE

R1247         L       CALL
R1248         L+1             PERIAPO
R1249         L+2     (RETURN - ALWAYS)

R1250   INPUT

R1251         (1) RVEC      POSITION VECTOR IN METERS
R1252                       SCALE FACTOR - EARTH +29, MOON +27
R1253         (2) VVEC      VELOCITY VECTOR IN METERS/CENTISECOND
R1254                       SCALE FACTOR - EARTH +7, MOON +5
R1255         (3) X1        PRIMARY BODY INDICATOR
R1256                       EARTH -2, MOON -10

R1257   OUTPUT

R1258         (1) 2D        APOCENTER RADIUS IN METERS
R1259                       SCALE FACTOR - EARTH +29, MOON +27
R1260         (2) 4D        APOCENTER ALTITUDE IN METERS
R1261                       SCALE FACTOR - EARTH +29, MOON P27
R1262         (3) 6D        PERICENTER RADIUS IN METERS
R1263                       SCALE FACTOR - EARTH +29, MOON +27
R1264         (4) 8D        PERICENTER ALTITUDE IN METERS
R1265                       SCALE FACTOR - EARTH +29, MOON +27
R1266         (5) ECC       ECCENTRICITY OF CONIC TRAJECTORY
R1267                       SCALE FACTOR - +3
R1268         (6) XXXALT    RADIUS OF THE PRIMARY BODY IN METERS
R1269                       SCALE FACTOR - EARTH +29, MOON +27
R1270         (7) PUSHLOC   EQUALS 10D

R1271   SUBROUTINES USED

R1272         SETRAD
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R1273          APSIDES

 1274  REF  1              22,2000                  SETLOC APOPERI
 1275                      22,3310                  BANK

 1276  REF  1                                       COUNT* $$/PERAP

 1277                      22,3310   00302 0  RPAD  2DEC  6373338 B-29   STANDARD RADIUS OF PAD 37-B.
 1277                      22,3311   17755 0
A1278                                                                   = 20 909 901.57 FT

 1279                      22,3312   53754 1  PERIAPO1 LXA,2  VSR*
 1280  REF  7  LAST  486   22,3313   03746 1           RTX2
 1281                      22,3314   57176 0           0,2
 1282  REF  4  LAST  481   22,3315   26746 0           STOVL VVEC
 1283                      22,3316   53750 0           LXA,1 VSR*
 1284  REF  6  LAST  486   22,3317   03745 1           RTX1
 1285                      22,3320   57176 0           0,2
 1286  REF  2  LAST  456   22,3321   02657 1           STORE RVEC
 1287                      22,3322   45020 1  PERIAPO  STQ   CALL
 1288  REF 13  LAST  483   22,3323   01340 1           NORMEX
 1289  REF  1              22,3324   45340 1           SETRAD
 1290  REF  2  LAST  120   22,3325   37456 1           STCALL XXXALT
 1291  REF  1              22,3326   25671 0           APSIDES
 1292                      22,3327   41401 1           SETPD  PUSH         2D = APOCENTER RADIUS   B29 OR B27
 1293                      22,3330   00003 1                  2D
 1294                      22,3331   65225 1           DSU    PDDL         4D = APOGEE ALTITUDE    B29 OR B27
 1295  REF  3  LAST  488   22,3332   03456 0                  XXXALT
 1296                      22,3333   00001 0                  0D
 1297                      22,3334   45206 1           PUSH   DSU          6D = PERICENTER RADIUS  B29 OR B27
 1298  REF  4  LAST  488   22,3335   03456 0                  XXXALT
 1299                      22,3336   52006 0           PUSH   GOTO         8D = PERIGEE ALTITUDE   B29 OR B27
 1300  REF 14  LAST  488   22,3337   01340 1                  NORMEX
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P1301   SETRAD
 1302                          22,3340   41545 0  SETRAD   DLOAD   PUSH
 1303   REF   1                22,3341   05311 1           RPAD
 1304                          22,3342   63130 0           SXA,1   INCR,2
 1305   REF   3  LAST  482     22,3343   00047 1           X2
 1306                          22,3344   00002 0           2D
 1307                          22,3345   46135 1           SLOAD   BHIZ
 1308   REF   4  LAST  489     22,3346   00050 1           X2
 1309   REF   1                22,3347   45353 0           SETRADX
 1310                          22,3350   51575 1           VLOAD   ABVAL
 1311   REF   2  LAST  175     22,3351   02026 1           RLS
 1312                          22,3352   77725 1           PDDL
 1313                          22,3353   43545 1  SETRADX  DLOAD   RVQ
```

```
P1314  PRECSET
 1315                          22,3354  77620 0  PRECSET  STQ
 1316  REF  15  LAST  488      22,3355  01340 1                  NORMEX
 1317  REF   1                 22,3356  36635 1           STCALL TDEC2
 1318  REF   2  LAST   32      22,3357  27036 1                  LEMPREC
 1319                          22,3360  77624 1           CALL
 1320  REF   1                 22,3361  45372 0                  LEMSTORE
 1321                          22,3362  77745 1           DLOAD
 1322  REF   2  LAST  490      22,3363  02635 0                  TDEC2
 1323  REF   8  LAST  482      22,3364  34041 0           STCALL TDEC1
 1324  REF   2  LAST   32      22,3365  27022 1                  CSMPREC
 1325                          22,3366  77624 1           CALL
 1326  REF   1                 22,3367  45402 0                  CSMSTORE
 1327                          22,3370  77650 1           GOTO
 1328  REF  16  LAST  490      22,3371  01340 1                  NORMEX
 1329                          22,3372  43175 0  LEMSTORE VLOAD  BOFF
 1330  REF   5  LAST  471      22,3373  00001 0                  RATT
 1331  REF   2  LAST  485      22,3374  01352 1                  AVFLAG
 1332  REF   2  LAST  464      22,3375  45406 1                  PASSIVE
 1333  REF  15  LAST  471      22,3376  27540 0  ACTIVE   STOVL  RACT3
 1334  REF   2  LAST  467      22,3377  00007 0                  VATT
 1335  REF   7  LAST  469      22,3400  03546 0           STORE  VACT3
 1336                          22,3401  77616 0           RVQ
 1337                          22,3402  43175 0  CSMSTORE VLOAD  BOFF
 1338  REF   6  LAST  490      22,3403  00001 0                  RATT
 1339  REF   3  LAST  490      22,3404  01352 1                  AVFLAG
 1340  REF   2  LAST  464      22,3405  45376 1                  ACTIVE
 1341  REF   7  LAST  467      22,3406  27554 0  PASSIVE  STOVL  RPASS3
 1342  REF   3  LAST  490      22,3407  00007 0                  VATT
 1343  REF   7  LAST  467      22,3410  03562 0           STORE  VPASS3
 1344                          22,3411  77616 0           RVQ
```

```
P1345  VECSHIFT
 1346                        22,3412   53754 1  VECSHIFT LXA,2  VSR*
 1347  REF   8  LAST  488    22,3413   03746 1                  RTX2
 1348                        22,3414   57176 0                  0,2
 1349                        22,3415   63350 1          LXA,1   PDVL
 1350  REF   7  LAST  488    22,3416   03745 1                  RTX1
 1351                        22,3417   63257 1          VSR*    PDVL
 1352                        22,3420   57176 0                  0,2
 1353                        22,3421   77616 0          RVQ
```

```
P1354  SHIFTR1
 1355                      22,3422   53754 1  SHIFTR1  LXA,2  SL*
 1356  REF   9  LAST  491  22,3423   03746 1                  RTX2
 1357                      22,3424   57576 1                  0,2
 1358                      22,3425   77616 0           RVQ
```

```
P1359  PROGRAM DESCRIPTION
R1360  SUBROUTINE NAME        R36  OUT-OF-PLANE RENDEZVOUS ROUTINE
R1361  MOD NO.  0                  DATE       22 DECEMBER 67
R1362  MOD BY   N.M.NEVILLE        LOG SECTION  EXTENDED VERBS
R1363  FUNCTIONAL DESCRIPTION

R1364  TO DISPLAY AT ASTRONAUT REQUEST LGC CALCULATED RENDEZVOUS
R1365  OUT-OF-PLANE PARAMETERS (Y , YDOT , PSI). (REQUESTED BY DSKY).

R1366  CALLING SEQUENCE

R1367  ASTRONAUT REQUEST THROUGH DSKY  V 90 E

R1368  SUBROUTINES CALLED

R1369  EXDSPRET
R1370  GOMARKF
R1371  CSMPREC
R1372  LEMPREC
R1373  SGNAGREE
R1374  LOADTIME

R1375  NORMAL EXIT MODES

R1376  ASTRONAUT REQUEST THROUGH DSKY TO TERMINATE PROGRAM V 34 E

R1377  ALARM OR ABORT EXIT MODES

R1378  NONE

R1379  OUTPUT

R1380  DECIMAL DISPLAY OF TIME , Y , YDOT AND PSI

R1381  DISPLAYED VALUES Y , YDOT , AND PSI , ARE STORED IN ERASABLE
R1382  REGISTERS RANGE , RRATE AND RTHETA RESPECTIVELY.

R1383  ERASABLE INITIALIZATION REQUIRED

R1384  CSM AND LEM STATE VECTORS

R1385  DEBRIS

R1386  CENTRALS A,Q,L

R1387  OTHER THOSE USED BY THE ABOVE LISTED SUBROUTINES

 1388                    20,2000                  BANK   20
 1389  REF  1            04,2000                  SETLOC R36LM
 1390                    04,2746                  BANK
```

```
1391  REF   3  LAST  260   E4,1726                          EBANK= RPASS36

1392  REF   1                                               COUNT* $$/R36

1393                       04,2746  22 007 0  R36     ZL
1394  REF 106  LAST  447   04,2747  3 4714 1          CAF   ZERO          SET TIME OF EVENT TO ZERO FOR FIRST
1395  REF   3  LAST  266   04,2750  53=052 0          DXCH  DSPTEMX       DISPLAY
1396  REF   1              04,2751  3 3101 1          CAF   V06N16N
1397  REF  93  LAST  476   04,2752  0 4555 0          TC    BANKCALL
1398  REF   2  LAST  240   04,2753   20465 1          CADR  GOMARKP
1399  REF  19  LAST  420   04,2754  1 5423 0          TCF   ENDEXT        TERMINATE
1400                       04,2755  1 2757 1          TCF   +2            PROCEED
1401                       04,2756  1 2751 1          TCF   -5            RECYCLE FOR ASTRONAUT INPUT TIME
1402  REF   4  LAST  494   04,2757  53=052 0          DXCH  DSPTEMX
1403                       04,2760  0 0006 1          EXTEND
1404  REF   1              04,2761  1 3070 1          BZF   LREGCHK       A-REG ZERO GOTO CHECK L-REG FOR ZERO
1405  REF 237  LAST  479   04,2762  52 155 1  ASTROTIM DXCH  MPAC          A-REG NON-ZERO, TIME = ASTRO INPUT TIME
1406  REF  49  LAST  474   04,2763  0 6006 1          TC    INTPRET
1407                       04,2764   77634 0          RTB
1408  REF   1              04,2765   45713 0                DPMODE
1409  REF   9  LAST  490   04,2766   34041 0  R36INT  STCALL TDEC1
1410  REF   2  LAST  450   04,2767   27036 1                OTHPREC
1411                       04,2770   63375 0          VLOAD  PDVL
1412  REF   4  LAST  490   04,2771   00007 0                 VATT
1413  REF   7  LAST  490   04,2772   00001 0                 RATT          -
1414  REF   4  LAST  494   04,2773   02327 0          STORE  RPASS36       R
1415                       04,2774   63256 0          UNIT   PDVL           P
1416                       04,2775   53435 0          VXV    UNIT          -
1417                       04,2776   77626 0          STADR
1418  REF   1              04,2777   61442 1          STODL  UNP36         U
1419  REF   2  LAST  451   04,3000   00015 0                 TAT
1420  REF  10  LAST  494   04,3001   34041 0          STCALL TDEC1
1421  REF   2  LAST  450   04,3002   27022 1                THISPREC
1422                       04,3003   63375 0          VLOAD  PDVL           -
1423  REF   5  LAST  494   04,3004   00007 0                 VATT          VELOCITY VECTOR  V                00D
1424  REF   8  LAST  494   04,3005   00001 0                 RATT                            A
1425                       04,3006   77725 1          PDDL
1426  REF   3  LAST  494   04,3007   00015 0                 TAT           SAVE TIME IN LOCATION 30D FOR REDISPLAY
1427                       04,3010   24037 0          STOVL  30D                    -
1428                       04,3011   41406 0          PUSH   PUSH          POSITION VECTOR  R    IN  06D AND 12D
1429                       04,3012   63245 1          BVSU   PDVL                       A  -   -
1430  REF   5  LAST  494   04,3013   02327 0                 RPASS36       LINE OF SIGHT VECTOR R - R        12D
1431                       04,3014   72441 0          DOT    SL1                              P   A
1432  REF   2  LAST  494   04,3015   02335 0                 UNP36             -  -
1433  REF   9  LAST  277   04,3016   26321 0          STOVL  RANGE         Y = U .R
1434                       04,3017   00001 0                 00D                 A
1435                       04,3020   72441 0          DOT    SL1
1436  REF   3  LAST  494   04,3021   02335 0                 UNP36             -  -
1437  REF   5  LAST  277   04,3022   26323 1          STOVL  RRATE         Y = U .V
1438                       04,3023   00007 0                 06D           -      A   -
```

```
1439                          04,3024  41456 0          UNIT   PUSH      U   = UNIT( R )                  18D
1440                          04,3025  47235 0          VXV    VXV        RA          A
1441                          04,3026  00001 0                 00D        -   -   -   -
1442                          04,3027  00023 0                 18D       (U  XV )XU    =U
1443                          04,3030  53552 0          VSL2   UNIT         RA  A   RA    A
144305                        04,3031  77656 1          UNIT
1444                          04,3032  24001 0          STOVL  00D       UNIT HORIZONTAL IN FORWARD DIR.  00D
1445                          04,3033  00023 0                 18D
1446                          04,3034  74241 0          DOT    VXSC      -
1447                          04,3035  00015 0                 12D       U
1448                          04,3036  77752 1          VSL2               L
1449                          04,3037  53445 1          BVSU   UNIT
144905                        04,3040  77656 1          UNIT
1450                          04,3041  50206 0          PUSH   DOT       LOS PROJECTED INTO HORIZONTAL    12D
1451                          04,3042  00001 0                 00D       PLANE
1452                          04,3043  65552 0          SL1    ARCCOS                 -   -
1453  REF   6  LAST  277     04,3044  26325 1          STOVL  RTHETA    PSI= ARCCOS(U .U )
1454                          04,3045  50235 0          VXV    DOT                   A   L
1455                          04,3046  00001 0                 00D
1456                          04,3047  71244 0          BPL    DLOAD
1457  REF   1                 04,3050  11055 1                 R36TAG2
1458  REF   1                 04,3051  11467 1                 LODPMAX
1459                          04,3052  77625 0          DSU
1460  REF   7  LAST  495      04,3053  02325 1                 RTHETA
1461  REF   8  LAST  495      04,3054  02325 1          STORE  RTHETA
1462                          04,3055  47145 1  R36TAG2 DLOAD  RTB
1463                          04,3056  00037 0                 30D
1464  REF   2  LAST  419      04,3057  45541 0                 SGNAGREE
1465  REF   5  LAST  494      04,3060  01052 1          STORE  DSPTEMX
1466                          04,3061  77776 1          EXIT
1467  REF   1                 04,3062  3 3102 1         CAF    V06N90N    DISPLAY Y , YDOT , AND PSI
1468  REF  94  LAST  494      04,3063  0 4555 0         TC     BANKCALL
1469  REF   3  LAST  494      04,3064   20465 1         CADR   GOMARKF
1470  REF  20  LAST  494      04,3065  1 5423 0         TCF    ENDEXT     TERMINATE
1471  REF  21  LAST  495      04,3066  1 5423 0         TCF    ENDEXT     PROCEED , END OF PROGRAM
1472  REF   2  LAST  260      04,3067  1 2751 1         TCF    R36 +3     REDISPLAY OUTPUT
1473  REF  56  LAST  442      04,3070  56 001 0 LREGCHK XCH    L
1474                          04,3071  0 0006 1         EXTEND
1475  REF   1                 04,3072  1 3075 1         BZF    ENTTIM2    L-REG ZERO ,SET TIME = PRESENT TIME
1476  REF  57  LAST  495      04,3073  56 001 0         XCH    L          L-REG NON ZERO, TIME = ASTRO INPUT TIME
1477  REF   1                 04,3074  1 2762 1         TCF    ASTROTIM
1478  REF  50  LAST  494      04,3075  0 6006 1 ENTTIM2 TC     INTPRET
1479                          04,3076   52034 1         RTB    GOTO
1480  REF   4  LAST  460      04,3077   45505 0                 LOADTIME
1481  REF   1                 04,3100   10766 1                 R36INT
1482                          04,3101   01420 0 V06N16N VN     00616
1483                          04,3102   01532 1 V06N90N VN     00690
```

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P3000
 3001                          34,2002                  BANK   34
 3002   REF   1                35,2000                  SETLOC R31
 3003                          35,3150                  BANK

 3004   REF   1                                         COUNT* $$/R31

 30041  REF   1                35,3150  3 4752 0  R31CALL  CAF    PRIO3
 30042  REF  17  LAST  430     35,3151  0 5042 1           TC     FINDVAC
 30043  REF  12  LAST  473     E4,1770                     EBANK= SUBEXIT
 30044  REF   2  LAST   32     35,3152   03204 1           2CADR  V83CALL
 30044                         35,3153   72064 0
 30045  REF   3  LAST  473     35,3154  3 4734 0  DSPDELAY CAF    1SEC
 30046  REF  95  LAST  495     35,3155  0 4555 0           TC     BANKCALL
 30047  REF   3  LAST  473     35,3156   01732 0           CADR   DELAYJOB
 30048  REF   9  LAST  231     35,3157  3 1044 0           CA     EXTVBACT
 300485 REF  21  LAST  385     35,3160  7 4677 1           MASK   BIT12
 30049                         35,3161  0 0006 1           EXTEND
 300495 REF   1                35,3162  1 3154 0           BZF    DSPDELAY

 3005   REF   7  LAST  260     35,3163  3 0105 0  DISPN5X  CA     FLAGWRD9      TEST R31FLAG (IN SUNDANCE R31FLAG WILL
 30051  REF  23  LAST  380     35,3164  7 4707 1           MASK   BIT4              ALWAYS BE SET AS R34 DOES NOT EXIST)
 300515                        35,3165  0 0006 1           EXTEND
 30052                         35,3166  1 3171 1           BZF    +3
 30053  REF   1                35,3167  3 3310 0           CAF    V16N54        R31    USE NOUN 54
 30054                         35,3170  0 3172 0           TC     +2
 30055  REF   1                35,3171  3 3311 1           CAF    V16N53        R34    USE NOUN 53
 3006   REF  98  LAST  496     35,3172  0 4555 0           TC     BANKCALL
 3007   REF   4  LAST  495     35,3173   20465 1           CADR   GOMARKF
 3008   REF   1                35,3174  0 5514 1           TC     B5OFF
 3009   REF   2  LAST  496     35,3175  0 5514 1           TC     B5OFF
 3010   REF   1                35,3176  1 3163 1           TCF    DISPN5X

 3014   REF  51  LAST  495     35,3177  0 6006 1  V83      TC     INTPRET
 3015                         35,3200   77624 1           CALL
 3016   REF   1                35,3201   73426 0                  REDOEXTP
 3017                         35,3202   77650 1           GOTO
 3018   REF   1                35,3203   73207 0                  COMPDISP
 3019   REF  52  LAST  496     35,3204  0 6006 1  V83CALL  TC     INTPRET
 3020                         35,3205   77624 1           CALL
 3021   REF   1                35,3206   73312 0                  STATEXTP      EXTRAPOLATE STATE VECTORS
 3022                         35,3207   52375 1  COMPDISP VLOAD  VSU
 3023   REF   9  LAST  494     35,3210   00001 0                  RATT
 3024   REF   3  LAST   89     35,3211   02327 0                  RONE
 3025                         35,3212   51406 1           PUSH   ABVAL         RATT-RONE TO 0D                PD= 6
 3029   REF  10  LAST  494     35,3213   02321 0           STORE  RANGE         METERS B-29
 3030                         35,3214   77301 0           NORM   VLOAD
 3031   REF   5  LAST  481     35,3215   00047 1                  X1           RATT-RONE                      PD= 0
 30315                        35,3216   77762 1           VSR1
 3032                         35,3217   53457 1           VSL*   UNIT
```

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3033                          35,3220  20201 0                  0,1
3034                          35,3221  52315 1          PDVL    VSU         UNIT(LOS) TO 0D                PD= 6
3035  REP   6  LAST  494      35,3222  00007 0                  VATT
3036  REP   2  LAST   89      35,3223  02335 0                  VONE
3037                          35,3224  77641 1          DOT                 (VATT-VONE).UNIT(LOS)          PD= 0
3039                          35,3225  77752 1          SL1
3040  REP   6  LAST  494      35,3226  36323 0          STCALL  RRATE       RANGE RATE M/CS B-7
3041  REP   1                 35,3227  47432 1                  CDUTRIG     TO INITIALIZE FOR *NBSM*
30411                         35,3230  77624 1          CALL
30412 REP   1                 35,3231  62000 0                  R34LOS      NOTE. PDL MUST = 0.
3042                          35,3232  53575 0  R34ANG  VLOAD   UNIT
3043  REP   4  LAST  498      35,3233  02327 0                  RONE
3044                          35,3234  77715 1          PDVL                UR TO 0D                       PD= 6
3045  REP   1                 35,3235  15330 0                  THISAXIS    UNITX FOR CM, UNITZ FOR LM
30452                         35,3236  77214 0          BON     VLOAD       CHK R31FLAG. ON=R31 THETA, OFF=R34 PHI
30454 REP   1                 35,3237  04713 0                  R31FLAG
30455                         35,3240  73242 1                  +2              R31-THETA
30456                         35,3241  00015 0                  12D
30458                         35,3242  77624 1          CALL
3046  REP   1                 35,3243  47601 0                  *NBSM*
3047                          35,3244  41505 1          VXM     PUSH        UXORZ TO 6D                    PD=12D
3048  REP   4  LAST  485      35,3245  01736 1                  REFSMMAT
3049                          35,3246  72431 1          VPROJ   VSL2
3050                          35,3247  00001 0                  0D
3051                          35,3250  53445 1          BVSU    UNIT
3052                          35,3251  00007 0                  6D
3053                          35,3252  47315 0          PDVL    VXV         UP/2 TO 12D                    PD=18D
3054  REP   5  LAST  497      35,3253  02327 0                  RONE
3055  REP   3  LAST  497      35,3254  02335 0                  VONE
3056                          35,3255  47256 0          UNIT    VXV
3057  REP   6  LAST  497      35,3256  02327 0                  RONE
3058                          35,3257  63241 0          DOT     PDVL        SIGN TO 12D, UP/2 TO MPAC      PD=18D
3059                          35,3260  00015 0                  12D
3060                          35,3261  50372 1          VSL1    DOT         UP.UXORZ
3061                          35,3262  00007 0                  6D
3062                          35,3263  72565 1          SIGN    SL1
3063                          35,3264  00015 0                  12D
3064                          35,3265  77726 1          ACOS
3065  REP   9  LAST  495      35,3266  26325 1          STOVL   RTHETA
3066  REP   7  LAST  497      35,3267  02327 0                  RONE
3067                          35,3270  51041 0          DOT     BPL
3068                          35,3271  00007 0                  6D
3069                          35,3272  73277 1                  +5
3070                          35,3273  44345 0          DLOAD   BDSU        IF UXORZ.R NEG, RTHETA = 1 - RTHETA
3071  REP  10  LAST  497      35,3274  02325 1                  RTHETA
3072  REP   5  LAST  469      35,3275  15340 1                  DPPOSMAX
3073  REP  11  LAST  497      35,3276  02325 1          STORE   RTHETA      RTHETA BETWEEN 0 AND 1 REV.
3074                          35,3277  77776 1          EXIT
3075  REP  26  LAST  439      35,3300  3 4706 1         CAF     BIT5        HAVE WE BEEN ANSWERED
30751 REP .10  LAST  498      35,3301  7 1044 1         MASK    EXTVBACT
```

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3076                          35,3302  0 0008 1            EXTEND
3077   REF  22  LAST  495     35,3303  1 5423 0            BZF    ENDEXT        YES, DIE

3078   REF  11  LAST  497     35,3304  4 1044 1            CS     EXTVBACT
3079   REF  22  LAST  498     35,3305  7 4677 1            MASK   BIT12
3080   REF  12  LAST  498     35,3306  27"044 1            ADS    EXTVBACT

30805  REF  1                 35,3307  1 3177 1            TCF    V83
3081                          35,3310   04066 0  V16N54    VN     1654
3082                          35,3311   04065 0  V16N53    VN     1653
```

```
P3083   THE STATEXTP SUBROUTINE DOES A PRECISION EXTRAPOLATION OF BOTH VEHICLES
R3084   STATE VECTORS TO PRESENT TIME AND SAVES THEM AS BASE VECTORS.
R3085   IF SERVICER IS OFF ---
R3086                   THIS VEHICLES BASE VECTOR IS CONIC EXTRAPOLATED TO
R3087                   PRESENT TIME AND SAVED AS RONE, VONE.
R3088                   THE OTHER VEHICLES BASE VECTOR IS CONIC EXTRAPOLATED
R3089                   TO THE SAME TIME; THE OUTPUT BEING LEFT IN RATT, VATT.
R3090   IF SERVICER IS ON  ---
R3091                   RONE, VONE ARE SET EQUAL TO RN, VN AND THE OTHER
R3092                   VEHICLES STATE VECTOR IS PREC. EXTRAPOLATED TO PIPTIME.
 3093                        35,3312  47020 0  STATEXTP STQ     RTB
 3094   REP  1               35,3313  00112 0                  STATEXIT
 3095   REP  5  LAST  495    35,3314  45505 0                  LOADTIME
 3096   REP  11 LAST  494    35,3315  34041 0           STCALL TDEC1
 3097   REP  3  LAST  494    35,3316  27036 1                  OTHPREC          GET BASE VECTORS
 3098                        35,3317  77775 1           VLOAD
 3099   REP  2  LAST  482    35,3320  00017 1                  RATT1
 3100   REP  1               35,3321  26225 0           STOVL  BASEOTP          OTHER POS.
 3101   REP  2  LAST  482    35,3322  00025 0                  VATT1
 3102   REP  1               35,3323  16241 1           STODL  BASEOTV          OTHER VEL.
 3103   REP  4  LAST  494    35,3324  00015 0                  TAT
 3104   REP  1               35,3325  02272 1           STORE  BASETIME
 3105   REP  12 LAST  499    35,3326  34041 0           STCALL TDEC1
 3106   REP  3  LAST  494    35,3327  27022 1                  THISPREC
 3107                        35,3330  77775 1           VLOAD
 3108   REP  3  LAST  499    35,3331  00017 1                  RATT1
 3109   REP  1               35,3332  26255 1           STOVL  BASETHP          THIS POS.
 3110   REP  3  LAST  499    35,3333  00025 0                  VATT1
 3111   REP  1               35,3334  02263 1           STORE  BASETHV          THIS VEL
 3112                        35,3335  47014 1  HAVEBASE BON    RTB
 3113   REP  1               35,3336  03711 0                  V37FLAG
 3114   REP  1               35,3337  73413 0                  GETRVN           IF AVG ON ,GET RN ETC.
 3115   REP  6  LAST  499    35,3340  45505 0                  LOADTIME
 3116   REP  13 LAST  499    35,3341  34041 0           STCALL TDEC1            BEGIN SET UP FOR CONIC EXTRAP. FOR THIS.
 3117   REP  8  LAST  481    35,3342  27371 1                  INTSTALL
 3118                        35,3343  43175 0           VLOAD  CLEAR
 3119   REP  2  LAST  499    35,3344  02255 1                  BASETHP
 3120   REP  5  LAST  481    35,3345  00263 0                  MOONFLAG
 3121   REP  6  LAST  482    35,3346  25535 0           STOVL  RCV
 3122   REP  2  LAST  499    35,3347  02263 1                  BASETHV
 3123   REP  6  LAST  482    35,3350  15543 1           STODL  VCV
 3124   REP  2  LAST  499    35,3351  02272 1                  BASETIME
 3125                        35,3352  43014 0           BOF    SET              GET APPROPRIATE MOONFLAG SETTING
 3126   REP  4  LAST  260    35,3353  04343 1                  MOONTHIS
 3127                        35,3354  73356 0                  +2
 3128   REP  6  LAST  499    35,3355  00063 1                  MOONFLAG
 3129                        35,3356  77614 1           SET
 3130   REP  4  LAST  482    35,3357  01473 0                  INTYPFLG         CONIC EXTRAP.
 3131   REP  6  LAST  482    35,3360  35517 1           STCALL TET
 3132   REP  3  LAST  482    35,3361  27066 1                  INTEGRVS         INTEGRATION --- AT LAST---
```

```
3133                          35,3362  77775 1          VLOAD
3134  REF  10  LAST  496      35,3363  00001 0                RATT
3135  REF   8  LAST  497      35,3364  26327 0          STOVL RONE
3136  REF   7  LAST  497      35,3365  00007 0                VATT
3137  REF   4  LAST  497      35,3366  36335 1          STCALL VONE          GET SET FOR CONIC EXTRAP.,OTHER.
3138  REF   9  LAST  499      35,3367  27371 1                INTSTALL
3139                          35,3370  71214 0          SET   DLOAD
3140  REF   5  LAST  499      35,3371  01473 0                INTYPFLG
3141  REF   5  LAST  499      35,3372  00015 0                DAT
3142  REF  14  LAST  499      35,3373  00041 1  OTHINT STORE  TDEC1
3143                          35,3374  43175 0          VLOAD CLEAR
3144  REF   2  LAST  499      35,3375  02225 0                BASEOTP
3145  REF   7  LAST  499      35,3376  00263 0                MOONFLAG
3146  REF   7  LAST  499      35,3377  25535 0          STOVL RCV
3147  REF   2  LAST  499      35,3400  02241 1                BASEOTV
3148  REF   7  LAST  499      35,3401  15543 1          STODL VCV
3149  REF   3  LAST  499      35,3402  02272 1                BASETIME
3150                          35,3403  43014 0          BOF   SET
3151  REF   5  LAST  499      35,3404  04343 1                MOONTHIS
3152                          35,3405  73407 0                +2
3153  REF   8  LAST  500      35,3406  00063 1                MOONFLAG
3154  REF   7  LAST  499      35,3407  35517 1          STCALL TET
3155  REF   4  LAST  499      35,3410  27066 1                INTEGRVS
3156                          35,3411  77650 1          GOTO
3157  REF   2  LAST  499      35,3412  00112 0                STATEXIT             THIS VEHICLES POS.,VEL. IN PUSHLIST.

3158                          35,3413  77775 1  GETRVN  VLOAD
3159  REF   5  LAST  284      35,3414  01171 1                RN
3160  REF   9  LAST  500      35,3415  26327 0          STOVL RONE
3161  REF   5  LAST  284      35,3416  01177 1                VN
3162  REF   5  LAST  500      35,3417  16335 0          STODL VONE
3163  REF   4  LAST  284      35,3420  01205 1                PIPTIME
3164                          35,3421  77624 1          CALL
3165  REF  10  LAST  500      35,3422  27371 1                INTSTALL
3166                          35,3423  52014 0          CLEAR GOTO
3167  REF   6  LAST  500      35,3424  01673 1                INTYPFLG             PREC EXTRAP FOR OTHER
3168  REF   1                 35,3425  73373 1                OTHINT

3169                          35,3426  52020 1  REDOEXTP STQ  GOTO.
3170  REF   3  LAST  500      35,3427  00112 0                STATEXIT
3171  REF   1                 35,3430  73335 0                HAVEBASE
3172  REF   1                 31,2000                 SETLOC R34
3173                          31,2000                 BANK
3174                          31,2000  77776 1  R34LOS EXIT
3175  REF   8  LAST  277      31,2001  3 0036 1       CA     CDUS
3176  REF   2  LAST  259      31,2002  50 120 1       INDEX  FIXLOC
3177                          31,2003  54 011 0       TS     9D
3178  REF   7  LAST  277      31,2004  3 0035 1       CA     CDUT
3179  REF   3  LAST  500      31,2005  50 120 1       INDEX  FIXLOC
3180                          31,2006  54 013 1       TS     11D
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3181	REF	4	LAST	500	31,2007	3 0120	1		CA	FIXLOC
3182	REF	17	LAST	444	31,2010	6 6211	0		AD	SIX
3183					31,2011	4 0000	0		COM	
3184	REF	5	LAST	501	31,2012	50 120	1		INDEX	FIXLOC
3185	REF	6	LAST	496	31,2013	54 046	1		TS	X1
3186	REF	53	LAST	496	31,2014	0 6006	1		TC	INTPRET
3187					31,2015	77624	1		CALL	
3188	REF	2	LAST	447	31,2016	46000	0			SXTNB
3189					31,2017	34015	1		STCALL	12D
3190	REF	1			31,2020	73232	0			R34ANG

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P5000  1) PROGRAM NAME - TARGET DELTA V PROGRAM (P76).
R5001  2) FUNCTIONAL DESCRIPTION - UPON ENTRY BY ASTRONAUT ACTION, P76 FLASHES DSKY REQUESTS TO THE ASTRONAUT
R5003           TO PROVIDE VIA DSKY (1) THE DELTA V TO BE APPLIED TO THE OTHER VEHICLE STATE VECTOR AND (2) THE
R5005           TIME (TIG) AT WHICH THE OTHER VEHICLE VELOCITY WAS CHANGED BY  EXECUTION OF A THRUSTING MANEUVER. THE
R5007           OTHER VEHICLE STATE VECTOR IS INTEGRATED TO TIG AND UPDATED BY THE ADDITION OF DELTA V (DELTA V HAVING
R5009           BEEN TRANSFORMED FROM LV TO REF COSYS). USING INTEGRVS, THE  PROGRAM THEN INTEGRATES THE OTHER
R5011  VEHICLE STATE VECTOR TO THE STATE VECTOR OF THIS VEHICLE, THUS INSURING THAT THE W-MATRIX AND BOTH VEHICLE
R5013  STATES CORRESPOND TO THE SAME TIME.
R5014  3) ERASABLE INITIALIZATION REQUIRED - NONE.
R5015  4) CALLING SEQUENCES AND EXIT MODES - CALLED BY ASTRONAUT REQUEST THRU DSKY V 37 E 76 E.
R5017           EXITS BY TCF ENDOFJOB.
R5018  5) OUTPUT - OTHER VEHICLE STATE VECTOR INTEGRATED TO TIG AND INCREMENTED BY DELTA V IN REF COSYS.
R5020           THE PUSHLIST CONTAINS THE MATRIX BY WHICH THE INPUT DELTA V MUST BE POST-MULTIPLIED TO CONVERT FROM LV
R5022           TO REF COSYS.
R5023  6) DEBRIS - OTHER VEHICLE STATE VECTOR.
R5024  7) SUBROUTINES CALLED - BANKCALL,GOXDSPF,CSMPREC (OR LEMPREC),ATOPCSM (OR ATOPLEM),INTSTALL,INTWAKE, PHASCHNG
R5026           INTPRET, INTEGRVS, AND MINIRECT.

R5027  8) FLAG USE - MOONFLAG,CMOONFLAG,INTYPFLG,RASFLAG, AND MARKCTR.

5028                          30,2000                    BANK   30
5029  REF  1                  13,2000                    SETLOC P76LOC
5030                          13,2036                    BANK

5031  REF  1                                             COUNT* $$/P76

5032  REF 20 LAST 469         E7,1412                    EBANK= TIG

5033  REF 17 LAST 474         13,2036  0 5435 0  P76     TC     UPFLAG
5034  REF  2 LAST 253         13,2037   00031 0          ADRES  TRACKFLG

5035  REF  1                  13,2040  3 2163 1          CAF    V06N84          FLASH LAST DELTA V,
5040  REF 97 LAST 496         13,2041  0 4555 0          TC     BANKCALL        AND WAIT FOR KEYBOARD ACTION.
5041  REF 14 LAST 476         13,2042   20624 0          CADR   GOFLASH
5042  REF  1                  13,2043  1 2155 0          TCF    ENDP76
5043                          13,2044  0 2046 1          TC     +2              PROCEED
5044                          13,2045  0 2040 1          TC     -5              STORE DATA AND REPEAT FLASHING
5045  REF  2 LAST 502         13,2046  3 2164 0          CAF    V06N84 +1       FLASH VERB 06 NOUN 33, DISPLAY LAST TIG,
5046  REF 98 LAST 502         13,2047  0 4555 0          TC     BANKCALL        AND WAIT FOR KEYBOARD ACTION.
5047  REF 15 LAST 502         13,2050   20624 0          CADR   GOFLASH
5048  REF  2 LAST 502         13,2051  1 2155 0          TCF    ENDP76
5049                          13,2052  0 2054 1.         TC     +2
5050                          13,2053  0 2046 1          TC     -5
5051  REF 54 LAST 501         13,2054  0 6006 1          TC     INTPRET         RETURN TO INTERPRETIVE CODE
5052                          13,2055   77745 1          DLOAD                  SET D(MPAC)=TIG IN CSEC B28
5053  REF 21 LAST 502         13,2056   03413 1                 TIG
5054  REF 15 LAST 500         13,2057   34041 0          STCALL TDEC1           SET TDEC1=TIG FOR ORBITAL INTEGRATION
5055  REF  4 LAST 499         13,2060   27036 1                 OTHPREC
5056                          13,2061   53575 0  COMPMAT VLOAD  UNIT
5057  REF 11 LAST 500         13,2062   00001 0                 RATT
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5058                          13,2063  77676 0          VCOMP                U(-R)
5059                          13,2064  00031 0          STORE   24D          U(-R) TO 24D
5060                          13,2065  53435 0          VXV     UNIT         U(-R)XV = U(VXR)
5061  REF   8  LAST  500      13,2066  00007 0                  VATT
5062                          13,2067  00023 0          STORE   18D
5063                          13,2070  53435 0          VXV     UNIT         U(VXR)XU(-R) = U((RXV)XR)
5064                          13,2071  00031 0                  24D
5065                          13,2072  24015 0          STOVL   12D
5066  REF   4  LAST  277      13,2073  03540 0                  DELVOV
5067                          13,2074  76505 0          VXM     VSL1         V(MPAC)=DELTA V IN REFCOSYS
5068                          13,2075  00015 0                  12D
5069                          13,2076  77655 1          VAD
5070  REF   9  LAST  503      13,2077  00007 0                  VATT
5071                          13,2100  00007 0          STORE   6            V(PD6)=VATT + DELTA V
5072                          13,2101  77624 1          CALL                 PREVENT WOULD-BE USER OF ORBITAL
5073  REF  11  LAST  500      13,2102  27371 1                  INTSTALL     INTEG FROM INTERFERING WITH UPDATING
5074                          13,2103  77624 1          CALL
5075  REF   1                 13,2104  26165 1                  P76SUB1
5076                          13,2105  53775 1          VLOAD   VSR*
5077                          13,2106  00007 0                  6
5078                          13,2107  57176 0                  0,2
5079  REF   8  LAST  500      13,2110  25543 1          STOVL   VCV
5080  REF  12  LAST  502      13,2111  00001 0                  RATT
5081                          13,2112  77657 0          VSR*
5082                          13,2113  57176 0                  0,2
5083  REF   8  LAST  500      13,2114  15535 0          STODL   RCV
5084  REF  22  LAST  502      13,2115  03413 1                  TIG
5085  REF   8  LAST  500      13,2116  01517 0          STORE   TET
5086                          13,2117  71214 0          CLEAR   DLOAD
5087  REF   7  LAST  500      13,2120  01673 1                  INTYPFLG
5088  REF   1                 13,2121  01571 0                  TETTHIS
5089  REF  16  LAST  502      13,2122  34041 0  INTOTHIS STCALL  TDEC1
5090  REF   5  LAST  500      13,2123  27066 1                  INTEGRVS
5091                          13,2124  77624 1          CALL
5093  REF  12  LAST  503      13,2125  27371 1                  INTSTALL
5094                          13,2126  77775 1          VLOAD
5095  REF   4  LAST  499      13,2127  00017 1                  RATT1
5096  REF   2  LAST   83      13,2130  01503 0          STORE   RRECT
5097  REF   9  LAST  503      13,2131  15535 0          STODL   RCV
5098  REF   6  LAST  500      13,2132  00015 0                  TAT
5099  REF   9  LAST  503      13,2133  25517 0          STOVL   TET
5100  REF   4  LAST  499      13,2134  00025 0                  VATT1
5101                          13,2135  77624 1          CALL
5102  REF   1                 13,2136  23360 0                  MINIRECT
5103                          13,2137  77776 1          EXIT
5104  REF  22  LAST  474      13,2140  0 5301 0         TC      PHASCHNG
5105                          13,2141   04024 0         OCT     04024

5106  REF  18  LAST  502      13,2142  0 5435 0         TC      UPFLAG
5107  REF   1                 13,2143   00236 0        ADRES   REINTFLG
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5109  REF  55  LAST  502   13,2144  0 6006 1            TC      INTPRET
5110                       13,2145   77624 1            CALL
5111  REF   1              13,2146   26711 1                    ATOPOTH
5116                       13,2147   77531 0            SSP     EXIT
5117  REF   9  LAST  446   13,2150   00053 1                    QPRET
5118  REF   1              13,2151   26154 0                    OUT
5119  REF  99  LAST  502   13,2152  0 4555 0            TC      BANKCALL    PERMIT USE OF ORBITAL INTEGRATION
5120  REF   1              13,2153   27426 1            CADR    INTWAKE1
5121                       13,2154   77776 1  OUT       EXIT
5125  REF 107  LAST  494   13,2155  3 4714 1  ENDP76    CAF     ZERO
5126  REF   1              13,2156  55"126 1            TS      MARKCTR     CLEAR RR TRACKING MARK COUNTER
51265 REF   4  LAST  274   13,2157  55"125 1            TS      VHFCNT

5127  REF  11  LAST  297   13,2160  3 7716 0            CAF     NEGONE
5128  REF   6  LAST  222   13,2161  55"734 1            TS      MRKBUF2     INVALIDATE MARK BUFFER

5129  REF  12  LAST  476   13,2162  1 4106 0            TCF     GOTOPOOH

5130                       13,2163   01524 0  V06N84    NV      0684
5131                       13,2164   01441 1            NV      0633
5132                       13,2165   43174 1  P76SUB1   AXT,2   SET
5133                       13,2166   00002 0                    2
5134  REF   9  LAST  500   13,2167   00063 1                    MOONFLAG    SET MEANS MOON IS SPHERE OF INFLUENCE.
5135                       13,2170   77014 1            BON     AXT,2
5136  REF   5  LAST  486   13,2171   04303 0                    CMOONFLG    SET MEANS PERM CM STATE IN LUNAR SPHERE.
5137  REF  10  LAST  504   13,2172   00052 0                    QPRET
5138                       13,2173   00000 1                    0
5139                       13,2174   43414 1            CLEAR   RVQ
5140  REF  10  LAST  504   13,2175   00263 0                    MOONFLAG
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P5200   SUBROUTINE NAME'     V82CALL
R5201   MOD NO'  0                                                    DATE'          16 FEB 67
R5203   MOD BY'  RR BAIRNSFATHER                                      LOG SECTION'   R30
R5205   MOD NO' 1          MOD BY' RR BAIRNSFATHER      DATE' 11 APR 67   SR30.1 CHANGED TO ALLOW MONITOR OPERN
R5208   MOD  NO' 2         MOD  BY ALONSO               DATE ' 11 DEC 67  V82 PROGRAM REWRITTEN
R52095  MOD NO' 3          MOD  BY ALONSO               DATE' 26 MAR 68   PROG MOD TO HANDLE DIF EARTH/MOON SCALE
R5210    NEW FUNCTIONAL DESCRIPTION'    CALLED BY VERB 82 ENTER.  PRIORITY 10
R5211     USED THROUGHOUT.              CALCULATE AND DISPLAY ORBITAL PARAMETERS

R5212   1. IF AVERAGE G IS OFF'
R5213            FLASH DISPLAY V04N06. R2 INDICATES WHICH SHIP'S STATE VECTOR IS
R5214             TO BE UPDATED. INITIAL CHOICE IS THIS SHIP (R2=1). ASTRONAUT
R5215             CAN CHANGE TO OTHER SHIP BY V22EXE, WHERE X NOT EQ 1.
R5216            SELECTED STATE VECTOR UPDATED BY THISPREC (OTHPREC).
R5217            CALLS SR30.1 (WHICH CALLS TFFCONMU + TFFRP/RA) TO CALCULATE
R5218             RPER (PERIGEE RADIUS), RAPO (APOGEE RADIUS), HPER (PERIGEE
R5219             HEIGHT ABOVE LAUNCH PAD OR LUNAR LANDING SITE), HAPO (APOGEE
R5220             HEIGHT AS ABOVE), TPER (TIME TO PERIGEE), TFF (TIME TO
R5221             INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R5222            FLASH MONITOR V16N44 (HAPO, HPER, TFF).TFF IS -59M59S IF IT WAS
R5223             NOT COMPUTABLE, OTHERWISE IT INCREMENTS ONCE PER SECOND.
R5224             ASTRONAUT HAS OPTION TO MONITOR TPER BY KEYING IN N 32 E.
R5225             DISPLAY IS IN HMS, IS NEGATIVE (AS WAS TFF), AND INCREMENTS
R5226             ONCE PER SECOND ONLY IF TFF DISPLAY WAS -59M59S.

R5227   2. IF AVERAGE G IS ON'
R5228            CALLS SR30.1 APPROX EVERY TWO SECS.  STATE VECTOR IS ALWAYS
R5229             FOR THIS VEHICLE. V82 DOES NOT DISTURB STATE VECTOR.  RESULTS
R5230             OF SR30.1 ARE RAPO, RPER, HAPO, HPER, TPER, TFF.
R5231            FLASH MONITOR V16N44 (HAPO, HPER, TFF).
R5232             IF MODE IS P11, THEN CALL DELRSPL SO ASTRONAUT CAN MONITOR
R5233             RESULTS BY N50E.  SPLASH COMPUTATION DONE ONCE PER TWO SECS.
R52331  ADDENDUM' HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R52332            ABOVE REMARKS.

R5234   CALLING SEQUENCE'  VERB 82 ENTER.
R5235   SUBROUTINES CALLED'  SR30.1, GOXDSPF
R5236                        MAYBE - THISPREC , OTHPREC, LOADTIME, DELRSPL
R5237   NORMAL EXIT MODES'  TC ENDEXT

R5238   ALARMS'  NONE

R5239   OUTPUT'  HAPOX    (-29) M
R5240            HPERX    (-29) M
R5241            RAPO     (-29) M EARTH
R52411                    (-27) M MOON
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R5242            RPER     (-29) M EARTH
R52421                    (-27) M MOON
R5243            TFF      (-28) CS      CONTAINS NEGATIVE QUANTITY
R5244            -TPER    (-28) CS      CONTAINS NEGATIVE QUANTITY
R5245            RSP-RREC (-29) M       IF DELRSPL CALLED

R5246  ERASABLE INITIALIZATION REQUIRED' STATE VECTOR.

R5247  DEBRIS'  QPRET, RONE, VONE,TFF/RTMU, HPERMIN, RPADTEM, V82EMFLG.
R5248           MAYBE' TSTART82, V82FLAGS, TDEC1.
 5249  REF   3  LAST  274   E4,1751                          EBANK= HAPOX
 5250                       31,2021                          BANK   31
 5251  REF   1              23,2000                          SETLOC R30LOC
 5252                       23,2332                          BANK
 5253  REF   1                                               COUNT* $$/R30

 5254  REF  56  LAST  504   23,2332  0 6006 1  V82CALL  TC     INTPRET
 5255                       23,2333   52014 0            BON    GOTO
 5256  REF   1              23,2334   00716 1                   AVEGFLAG
 5257  REF   1              23,2335   46566 0                   V82GON      IF AVERAGE G ON
 5258  REF   1              23,2336   46337 1                   V82GOFF     IF AVERAGE G OFF
 5259                       23,2337   77776 1  V82GOFF  EXIT                ALLOW ASTRONAUT TO SELECT VEHICLE
 5260  REF  28  LAST  444   23,2340  3 4711 1            CAF    TWO         DESIRED FOR ORBITAL PARAMETERS
 5261  REF   2  LAST  266   23,2341  55*051 0            TS     OPTIONX
 5262  REF  62  LAST  450   23,2342  3 4712 1            CAF    ONE
 5263  REF   3  LAST  506   23,2343  55*052 0            TS     OPTIONX +1
 5264  REF   1              23,2344  3 2406 1            CAF    OPTIONVN    V 04 N 06
 5265  REF 100  LAST  504   23,2345  0 4555 0            TC     BANKCALL
 5266  REF   9  LAST  257   23,2346   20465 1            CADR   GOXDSPF
 5267  REF  23  LAST  498   23,2347  0 5423 1            TC     ENDEXT      TERMINATE
 5268                       23,2350  0 2352 1            TC     +2          PROCEED
 5269                       23,2351  0 2344 0            TC     -5          DATA IN.  OPTIONX +1 = 1 FOR THIS VEHIC.
A5270                                                                                UNEQ 1 FOR OTHER VEHICLE.
 5271  REF  24  LAST  496   23,2352  3 4707 0            CAF    BIT4        80 MS
 5272  REF  18  LAST  409   23,2353  0 5140 1            TC     WAITLIST
 5273  REF   4  LAST  275   E4,1743                      EBANK= TFF
 5274  REF   1              23,2354   02531 1            2CADR  TICKTEST
 5274  REF   1              23,2355   46064 1
 5275                       23,2356  0 0003 1            RELINT
 5276  REF   1              23,2357  3 2410 0  V82GOFLP CAF    TFFBANK     MAJOR RECYCLE LOOP ENTRY
 5277  REF  19  LAST  434   23,2360  54 003 0            TS     EBANK
 5278  REF 108  LAST  504   23,2361  3 4714 1            CAF    ZERO
 5279  REF   3  LAST   89   23,2362  55*742 0            TS     V82FLAGS    ZERO FLAGS FOR TICKTEST. INHIBITS
A5280                                                                       DECREMENTING OF TFF AND -TPER.
 5281  REF   5  LAST  261   23,2363  3 4756 1            CAF    PRIO7
 5282  REF  18  LAST  496   23,2364  0 5042 1            TC     FINDVAC     V82GOFF1 WILL EXECUTE STATE VECTOR
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5283  REF  5  LAST  506  E4,1743                    EBANK=  TFF          UPDATE AND ORBIT CALCULATIONS FOR
5284  REF  1              23,2365   02411 1          2CADR   V82GOFF1     SELECTED VEHICLE ABOUT PROPER BODY.
5284  REF  1              23,2366   46064 1
5285                      23,2367   0 0003 1         RELINT
5286  REF 14  LAST  384   23,2370   3 6214 0 V82STALL CAF    THREE        STALL IN THIS LOOP AND WITHOLD V 16 N 44
5287  REF  4  LAST  506   23,2371   7 1742 0          MASK    V82FLAGS     UNTIL STATE VECTOR UPDATE SETS ONE OF
5288  REF 139 LAST  446   23,2372   10 000 0          CCS     A            OUR FLAG BITS.
5289  REF  1              23,2373   0 2400 1          TC      FLAGGON      EXIT FROM STALL LOOP.
5290  REF  4  LAST  496   23,2374   3 4734 0          CAF     1SEC
5291  REF 101 LAST  506   23,2375   0 4555 0          TC      BANKCALL
5292  REF  4  LAST  496   23,2376    01732 0          CADR    DELAYJOB
5293  REF  1              23,2377   0 2370 1          TC      V82STALL

5294  REF  1              23,2400   3 2407 0 FLAGGON  CAF     V16N44       MONITOR HAPO,HPER,TFF.
5295  REF 102 LAST  507   23,2401   0 4555 0          TC      BANKCALL
5296  REF 10  LAST  506   23,2402    20465 1          CADR    GOXDSPF
5297  REF  3  LAST  496   23,2403   0 5514 1          TC      B5OFF        TERM  THIS TELLS TICKTEST TO KILL ITSELF
5298  REF  4  LAST  507   23,2404   0 5514 1          TC      B5OFF        PROCEED  DITTO
5299  REF  1              23,2405   0 2357 1          TC      V82GOFLP     RECYCLE  RECOMPUTE STATE VECT + DISPLAY

5300                      23,2406    01014 0 OPTIONVN VN      0412
5301                      23,2407    04054 1 V16N44   VN      1644
5302  REF  6  LAST  507   23,2410    02343 1 TFFBANK  ECADR   TFF
5303  REF 57  LAST  506   23,2411   0 6006 1 V82GOFF1 TC      INTPRET
5304                      23,2412    77634 0          RTB
5305  REF  7  LAST  499   23,2413    45505 0                   LOADTIME
5306  REF 17  LAST  503   23,2414    00041 1          STORE   TDEC1        TIME FOR STATE VECTOR UPDATE.
5307  REF  1              23,2415    02325 1          STORE   TSTART82     TIME FOR INTERNAL USE.
5308                      23,2416    77776 1          EXIT
5309  REF  4  LAST  506   23,2417   4 1052 0          CS      OPTIONX +1   1 FOR THIS VEHICLE, NOT 1 FOR OTHER
5310  REF 63  LAST  506   23,2420   6 4712 1          AD      ONE
5311                      23,2421   0 0006 1          EXTEND
5312  REF  1              23,2422   1 2446 1          BZF     THISSHIP
5313  REF 58  LAST  507   23,2423   0 6006 1 OTHSHIP  TC      INTPRET
5314                      23,2424    77624 1          CALL                 CALL STATE VECTOR UPDATE FOR OTHER SHIP.
5315  REF  5  LAST  502   23,2425    27036 1                   OTHPREC
5316                      23,2426    77775 1 BOTHSHIP VLOAD               MOVE RESULTS INTO TFFCONIC STORAGE AREAS
5317  REF 13  LAST  503   23,2427    00001 0                   RATT         TO BE CALLED BY SR30.1.
5318  REF 10  LAST  500   23,2430    26327 0          STOVL   RONE         RATT AT (-29)M FOR EARTH OR MOON
5321  REF 10  LAST  503   23,2431    00007 0                   VATT
5322  REF  6  LAST  500   23,2432    02335 0          STORE   VONE         VATT AT (-7)M/CS FOR EARTH OR MOON
5323                      23,2433    77743 1          DLOAD*
5324  REF  1              23,2434    71321 1                   1/RTMUE,2    X2 IS 0 FOR EARTH CENTERED STATE VEC
5325  REF  1              23,2435    00037 0          STORE   TFF/RTMU     X2 IS 2 FOR MOON
5326                      23,2436    77743 1          DLOAD*               AS LEFT BY THISPREC OR OTHPREC.
5327  REF  1              23,2437    71315 0                   MINPERE,2
5328  REF  2  LAST  89    23,2440    02321 0          STORE   HPERMIN       TFFRTMU, HPERMIN AND RPADTEM ARE ALL
5329                      23,2441    46135 1          SLOAD   RHIZ         EARTH/MOON PARAMETERS AS SET HERE.
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5330  REF  5  LAST  489   23,2442   00050 1                    X2
5331  REF  1              23,2443   46463 1                    EARTHPAD
5332                      23,2444   77650 1          GOTO
5333  REF  1              23,2445   46467 0                    MOONPAD

5334  REF 59  LAST  507   23,2446   0 6006 1  THISSHIP TC      INTPRET
5335                      23,2447   77624 1          CALL                 CALL STATE VECTOR UPDATE FOR THIS SHIP.
5336  REF  4  LAST  499   23,2450   27022 1                    THISPREC
5337                      23,2451   77650 1          GOTO
5338  REF  1              23,2452   46426 0                    BOTHSHIP

R5339  THE FOLLOWING CONSTANTS ARE PAIRWISE INDEXED. DO NOT SEPARATE PAIRS.

5340                      23,2453   27533 1  1/RTMUM  2DEC*  .45162595 E-4 B14*
5340                      23,2454   07571 0
5341                      23,2455   25004 1  1/RTMUE  2DEC*  .50087529 E-5 B17*
5341                      23,2456   06702 1
5342                      23,2457   00001 0  MINPERM  2DEC   10668 B-27      35 KFT MIN PERIGEE HEIGHT FOR MOON(-27)M
5342                      23,2460   11530 1
5343                      23,2461   00002 0  MINPERE  2DEC   91440 B-29      300 KFT (-29)M FOR EARTH
5343                      23,2462   31230 1

5344                      23,2463   43145 0  EARTHPAD DLOAD   CLRGO          PAD 37-B RADIUS. SCALED AT (-29)M.
5345  REF  2  LAST  489   23,2464   05311 1                    RPAD
53455 REF  1              23,2465   04622 0                    V82EMFLG       INDICATE EARTH SCALING FOR SR30.1
5346  REF  1              23,2466   46473 0                    BOTHPAD

5347                      23,2467   51575 1  MOONPAD  VLOAD   ABVAL          COMPUTE MOON PAD RADIUS FROM RLS VECTOR.
5348  REF  3  LAST  489   23,2470   02026 1                    RLS            SCALED AT (-27)M.
5349                      23,2471   77614 1          SET
53491 REF  2  LAST  508   23,2472   04462 0                    V82EMFLG       INDICATE MOON SCALING FOR SR30.1
5350  REF  2  LAST   89   23,2473   38323 0  BOTHPAD  STCALL  RPADTEM
5352  REF  1              23,2474   46667 1                    SR30.1         CALCULATE ORBITAL PARAMETERS
53521                     23,2475   77776 1          EXIT
53522 REF  9  LAST  476   23,2476   3 1011 0         CA       MODREG         ARE WE IN POO
53523                     23,2477   0 0006 1         EXTEND
53524 REF  1              23,2500   1 2645 0         BZF      CANDEL         YES, DO DELRSPL
53525 REF 60  LAST  508   23,2501   0 6006 1  SPLRET1  TC      INTPRET
5353                      23,2502   45234 0          RTB      DSU
5354  REF  8  LAST  507   23,2503   45505 0                    LOADTIME
5356  REF  2  LAST  507   23,2504   02325 1                    TSTART82       PRESENT TIME - TIME V82GOFF1 BEGAN
5357  REF  3  LAST  508   23,2505   02325 1          STORE    TSTART82               SAVE IT
5358                      23,2506   53145 1          DLOAD    BZE            SR30.1 SETS -TPER=0 IF HPER L/
5359  REF  3  LAST  267   23,2507   02346 1                    -TPER           HPERMIN (300 OR 35) KFT.
5360  REF  1              23,2510   46521 0                    TICKTPF        (-TPER = 0)
5361                      23,2511   43345 1  TICKTPER DLOAD   DAD            (-TPER NON ZERO) TPF WAS NOT COMPUTED,
5362  REF  4  LAST  508   23,2512   02346 1                    -TPER          BUT WAS SET TO 59.59S.DONT TICK TPF, DO
5363  REF  4  LAST  508   23,2513   02325 1                    TSTART82       TICK -TPER. DISPLAY BOTH.
5364  REF  5  LAST  508   23,2514   02346 1          STORE    -TPER          -TPER CORRECTED FOR TIME SINCE V82GOFF1
5365                      23,2515   77776 1          EXIT                    BEGAN.
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5366  REF  36  LAST  475   23,2516  3 4712 1          CAF   BIT1
5367  REF   5  LAST  507   23,2517  55«742 0          TS    V82FLAGS      INFORMS TICKTEST TO INCREMENT ONLY -TPER
5368  REF  59  LAST  475   23,2520  0 5112 0          TC    ENDOFJOB

5369                        23,2521   43345 1  TICKTFF  DLOAD  DAD        (-TPER=0)  TFF WAS COMPUTED.TICK TFF.
5370  REF   7  LAST  507   23,2522   02344 0           DAD   TFF          DO NOT TICK -TPER.DISPLAY TFF, BUT NOT
5371  REF   5  LAST  508   23,2523   02325 1           DAD   TSTART82     -TPER.
5372  REF   8  LAST  509   23,2524   02344 0           STORE TFF          TFF CORRECTED FOR TIME SINCE V82GOFF1
5373                        23,2525   77776 1           EXIT               BEGAN.
5374  REF  22  LAST  450   23,2526  3 4711 1           CAF   BIT2
5375  REF   6  LAST  509   23,2527  55«742 0          TS    V82FLAGS      INFORMS TICKTEST TO INCREMENT ONLY TFF.
5376  REF  60  LAST  509   23,2530  0 5112 0          TC    ENDOFJOB
5377  REF  27  LAST  497   23,2531  3 4706 1  TICKTEST CAF   BIT5         THIS WAITLIST PROGRAM PERPETUATES ITSELF
5378  REF  13  LAST  498   23,2532  7 1044 1           MASK  EXTVBACT     ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
5379  REF 140  LAST  507   23,2533  10 000 0           CCS   A
5380  REF   1               23,2534  0 2542 0          TC    DOTICK
5381  REF   1               23,2535  3 7662 1          CAF   PRIO25
5382  REF  15  LAST  380   23,2536  0 5027 1          TC    NOVAC        TERMINATE V 82.CANT CALL ENDEXT IN RUPT.
5383  REF  14  LAST  509      1044                     EBANK= EXTVBACT
5384  REF  24  LAST  506   23,2537    05423 1         2CADR ENDEXT
5384                        23,2540    04062 1
5385  REF  21  LAST  430   23,2541  0 5213 1          TC    TASKOVER
5386  REF   5  LAST  507   23,2542  3 4734 0  DOTICK   CAF   1SEC         RE-REQUEST TICKTEST.
5387  REF  19  LAST  506   23,2543  0 5140 1          TC    WAITLIST
5388  REF   9  LAST  509   E4,1743                    EBANK= TFF
5389  REF   2  LAST  506   23,2544   02531 1         2CADR TICKTEST
5389                        23,2545   46064 1
5390  REF  15  LAST  507   23,2546  3 6214 0          CAF   THREE
5391  REF   7  LAST  509   23,2547  7 1742 0          MASK  V82FLAGS
5392  REF 141  LAST  509   23,2550  50 000 1          INDEX A
5393                        23,2551  0 2552 1          TC    +1
5394  REF  22  LAST  509   23,2552  0 5213 1          TC    TASKOVER     IF NO FLAGBITS SET DONT CHANGE TFF OR
A5395                                                                   -TPER, BUT CONTINUE LOOP.
5396  REF   1               23,2553  0 2561 1          TC    TPERTICK     ONLY BIT 1 SET. INCR -TPER BY 1 SEC.
5397  REF   6  LAST  509   23,2554  3 4734 0  TFFTICK  CAF   1SEC         ONLY BIT 2 SET. INCR TFF BY 1 SEC.
5398  REF  58  LAST  495   23,2555  54 001 1          TS    L
5399  REF 109  LAST  506   23,2556  3 4714 1          CAF   ZERO
5400  REF  10  LAST  509   23,2557  21«744 0          DAS   TFF
5401  REF  23  LAST  509   23,2560  0 5213 1          TC    TASKOVER
5402  REF   7  LAST  509   23,2561  3 4734 0  TPERTICK CAF   1SEC
5403  REF  59  LAST  509   23,2562  54 001 1          TS    L
5404  REF 110  LAST  509   23,2563  3 4714 1          CAF   ZERO
5405  REF   6  LAST  508   23,2564  21«746 1          DAS   -TPER
5406  REF  24  LAST  509   23,2565  0 5213 1          TC    TASKOVER
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 5407                          23,2566   77776 1  V82GON   EXIT
A5408
 5409  REF   6  LAST  506      23,2567   3 4756 1           CAF     PRIO7
 5410  REF  19  LAST  506      23,2570   0 5042 1           TC      FINDVAC
 5411  REF  11  LAST  509      E4,1743                      EBANK=  TPF
 5412  REF   1                 23,2571   02604 1            2CADR   V82GON1
 5412  REF   1                 23,2572   46064 1
 5413                          23,2573   0 0003 1           RELINT
 5414  REF   3  LAST  421      23,2574   10 067 1           CCS     NEWJOB
 5415  REF   2  LAST  421      23,2575   0 5057 0           TC      CHANG1
A5416
A54161
 5417  REF   2  LAST  507      23,2576   3 2407 0  V82REDSP CAF     V16N44
 5418  REF 103  LAST  507      23,2577   0 4555 0           TC      BANKCALL
 5419  REF  11  LAST  507      23,2600   20465 1            CADR    GOXDSPF
 5420  REF   5  LAST  507      23,2601   0 5514 1           TC      B5OFF
 5421  REF   6  LAST  510      23,2602   0 5514 1           TC      B5OFF
 5422  REF   1                 23,2603   0 2576 1           TC      V82REDSP

 5423  REF  61  LAST  508      23,2604   0 6006 1  V82GON1  TC      INTPRET
A5424
 5425                          23,2605   52175 0            VLOAD   GOTO
 5426  REF   6  LAST  500      23,2606   01171 1                    RN
 5427  REF   1                 23,2607   46610 1                    NEXTLINE
 5428  REF  11  LAST  507      23,2610   26327 0  NEXTLINE STOVL   RONE
 5429  REF   6  LAST  500      23,2611   01177 1                    VN
 5430  REF   7  LAST  507      23,2612   02335 0            STORE   VONE
 5431                          23,2613   52014 0            BON     GOTO
 5432  REF   6  LAST  500      23,2614   04303 0                    MOONTHIS
 5433  REF   1                 23,2615   46617 0                    MOONGON
 5434  REF   1                 23,2616   46630 0                    EARTHGON

 5435                          23,2617   71214 0  MOONGON  SET     DLOAD
 5436  REF   3  LAST  508      23,2620   04462 0                    V82EMFLG
54361  REF   1                 23,2621   06454 1                    1/RTMUM
 5437  REF   2  LAST  507      23,2622   14037 0            STODL   TPF/RTMU
 5438  REF   1                 23,2623   06460 0                    MINPERM
 5439  REF   3  LAST  507      23,2624   26321 0            STOVL   HPERMIN
 5441  REF   4  LAST  508      23,2625   02026 1                    RLS
 5443                          23,2626   52046 1            ABVAL   GOTO
 5444  REF   1                 23,2627   46637 1                    V82GON2
 5445                          23,2630   71214 0  EARTHGON CLEAR   DLOAD
 5446  REF   4  LAST  510      23,2631   04462 1                    V82EMFLG
54461  REF   2  LAST  507      23,2632   06456 0                    1/RTMUE
 5447  REF   3  LAST  510      23,2633   14037 0            STODL   TPF/RTMU
 5448  REF   2  LAST  507      23,2634   06462 1                    MINPERE
 5449  REF   4  LAST  510      23,2635   16321 0            STODL   HPERMIN
 5450  REF   3  LAST  508      23,2636   05311 1                    RPAD
 5451  REF   3  LAST  508      23,2637   36323 0  V82GON2  STCALL  RPADTEM
 5453  REF   2  LAST  508      23,2640   46667 1                    SR30.1
```

AVERAGE G ON. USE CURRENT STATE VECTOR FOR ORBITAL PARAMETER CALCULATIONS. LESS THAN LAMBERT
V82GON1 WILL PERFORM ORBIT CALCULATIONS ABOUT PROPER BODY APPROX ONCE PER SEC.

WITHOLD V16 N44 UNTIL FIRST ORBIT CALC IS DONE. NOTE' V82GON1 (PRIO7, FINDVAC JOB) IS COMPLETED BEFORE V82GON (PRIO7, NOVAC JOB).
MONITOR HAPO, HPER, TPF

TERM THIS TELLS V82GON1 TO KILL ITSELF.
PROC DITTO.
RECYCLE

THIS EXEC PROGRAM PERPETUATES ITSELF ONCE A SEC UNTIL BIT 5 OF EXTVBACT =0.
HOLDS OFF CCS NEWJOB BETWEEN RN AND VN FETCH SO RN , VN ARE FROM SAME STATE VECTOR UPDATE.
RN AT (-29)M FOR EARTH OR MOON

VN AT (-7)M/CS FOR EARTH OR MOON

FLAG INDICATES BODY ABOUT WHICH ORBITAL CALCULATIONS ARE TO BE PERFORMED.
IF SET - MOON , IF RESET - EARTH.

INDICATE MOON SCALING FOR SR30.1
LUNAR PARAMETERS LOADED HERE FOR SR30.1

SCALED AT (-27)M.

INDICATE EARTH SCALING FOR SR30.1
EARTH PARAMETERS LOADED HERE FOR SR30.1

COMMON CODE FOR EARTH d MOON.

```
L       R30

5454                          23,2641   77776 1                 EXIT
5455    REF   9  LAST  417    23,2642   0 5253 0                TC      CHECKMM
5456                          23,2643    00013 0                DEC     11
5457    REF   1                23,2644   0 2657 1                TC      V82GON3         NOT IN MODE 11.
5458    REF  62  LAST  510    23,2645   0 6006 1        CANDEL  TC      INTPRET         IN MODE 11 OR 00
54581                         23,2646    77624 1                CALL
54582   REF  13  LAST  503    23,2647    27371 1                        INTSTALL        DELRSPL DOES INTWAKE
5459                          23,2650    45145 0                DLOAD   CALL
5460    REF  12  LAST  510    23,2651    02344 0                        TPF
5461    REF   1                23,2652   64017 0                        DELRSPL         RETURN IS TO NEXT LINE ( SPLRET ).
5462                          23,2653    77776 1        SPLRET  EXIT

54621   REF  10  LAST  508    23,2654   3 1011 0                CA      MODREG
54622                         23,2655   0 0006 1                EXTEND
54623   REF   1                23,2656   1 2501 0                BZF     SPLRET1
5463    REF  28  LAST  509    23,2657   3 4706 1        V82GON3 CAF     BIT5
5464    REF  15  LAST  509    23,2660   7 1044 1                MASK    EXTVBACT        SEE IF ASTRONAUT HAS SIGNALLED TERMINATE
5465                          23,2661   0 0006 1                EXTEND
5466    REF  25  LAST  509    23,2662   1 5423 0                BZF     ENDEXT          YES, TERMINATE VB 82 LOOP
5468    REF   8  LAST  509    23,2663   3 4734 0                CAF     1SEC
5469    REF 104  LAST  510    23,2664   0 4555 0                TC      BANKCALL        WAIT ONE SECOND BEFORE REPEATING
5470    REF   5  LAST  507    23,2665    01732 0                CADR    DELAYJOB          ORBITAL PARAMETER COMPUTATION.
5471    REF   2  LAST  510    23,2666   0 2604 1                TC      V82GON1
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R5548  SUBROUTINE NAME'      SR30.1
R5549  MOD NO'  0                                                        DATE'          16 FEB 67
R5551  MOD BY'  RR BAIRNSFATHER                                          LOG SECTION'   R32
R5553  MOD NO'  1            MOD BY'  RR BAIRNSFATHER     DATE' 11 APR 67   SR30.1 CHANGED TO ALLOW MONITOR OPERN
R5555  MOD NO'  2            MOD BY'  RR BAIRNSFATHER     DATE'  14 APR 67  ADD OVFL CK FOR RAPO
R5557  MOD NO'  3            MOD BY ALONSO                DATE' 11 DEC 67   SUBROUTINE REWRITTEN
R55585 MOD NO'  4            MOD BY ALONSO                DATE' 26 MAR 68   PROG MOD TO HANDLE DIF EARTH/MOON SCALE
R5559  MOD NO'  5            MOD BY'  RR BAIRNSFATHER     DATE'  6 AUG 68   OVFL CK FOR HAPO d HPER.VOIDS MOD 12.
R5561

R5562  NEW FUNCTIONAL DESCRIPTION'     ORBITAL PARAMETERS DISPLAY FOR NOUNS 32  AND 44.
R5564  SR30.1 CALLS TFFCONMU AND TFFRP/RA TO CALCULATE RPER (PERIGEE RADIUS),
R5565  RAPO (APOGEE RADIUS), HPER (PERIGEE HEIGHT ABOVE LAUNCH PAD OR LUNAR
R5566  LANDING SITE), HAPO (APOGEE HEIGHT AS ABOVE), TPER (TIME TO PERIGEE),
R5567  TFF (TIME TO INTERSECT 300 KFT ABOVE PAD OR 35KFT ABOVE LANDING SITE).
R5568  IF HPER IS GREATER THAN OR EQUAL TO HPERMIN, CALCULATES TPER AND STORES
R5569  NEGATIVE    IN -TPER. OTHERWISE STORES +0 IN -TPER. WHENEVER TPER IS
R5570  CALCULATED, TFF IS NOT COMPUTABLE AND DEFAULTS TO -59MIN 59SEC. IF HAPO
R5571  WOULD EXCEED 9999.9 NM, IT IS LIMITED TO THAT VALUE FOR DISPLAY.

R5572  ADDENDUM' HAPO AND HPER SHOULD BE CHANGED TO READ HAPOX AND HPERX IN THE
R5573            ABOVE REMARKS.

R5574  CALLING SEQUENCE'          CALL
R5575                                SR30.1
R5576  SUBROUTINES CALLED'       TFFCONMU, TFFRP/RA, CALCTPER, CALCTFF
R5577  NORMAL EXIT MODE'         CALLING LINE +1 (STILL IN INTERPRETIVE MODE)
R5578  ALARMS'                   NONE
R5579  OUTPUT'  RAPO   (-29) M EARTH   APOGEE RADIUS   EARTH CENTERED COORD.
R5580                  (-27) M MOON                    MOON CENTERED COORD.
R5581           RPER   (-29) M EARTH   PERIGEE RADIUS  EARTH CENTERED COORD.
R5582                  (-27) M MOON                    MOON  CENTERED COORD.
R5583           HAPOX  (-29) M         APOGEE ALTITUDE ABOVE PAD OR LAND. SITE MAX VALUE LIMITED TO 9999.9 NM.
R5585           HPERX  (-29) M         PERIGEE ALT. ABOVE PAD OR LAND. SITE    MAX VALUE LIMITED TO 9999.9 NM.
R5587           TFF    (-28) CS        TIME TO 300KFT OR 35KFT ALTITUDE
R5588           -TPER  (-28) CS        TIME TO PERIGEE
R5589  ERASABLE INITIALIZATION REQUIRED-
R5590           TFF/RTMU (+17) EARTH   RECIPROCAL OF PROPER GRAV CONSTANT FOR
R5591                    (+14) MOON    EARTH OR MOON = 1/SQRT(MU).
R5592           RONE     (-29) M       STATE VECTOR
R5593           VONE     (-7)  M/CS    STATE VECTOR
R5594           RPADTEM (-29) M EARTH  RADIUS OF LAUNCH PAD OR LUNAR LANDING
R5595                   (-27) M MOON   SITE.
R5596           HPERMIN (-29) M EARTH  (300 OR 35)KFT MINIMUM PERIGEE ALTITUDE
R5597                   (-27) M MOON   ABOVE LAUNCH PAD OR LUNAR LANDING SITE.
R5598           V82EMFLG (INT SW BIT) RESET FOR EARTH, SET FOR MOON.

R5599  DEBRIS'  OPRET, PDL, S2
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 5600   REF   1                                          COUNT* $$/SR30S

 5601                        23,2667   44001 0  SR30.1   SETPD   STQ       INITIALIZE PUSHDOWN LIST.
 5602                        23,2670   00001 0           .       0
 5603   REF   4  LAST  442  23,2671   00051 0           .       S2
A5604                                                                     SR30.1 INPUT' RONE AT (-29)M EARTH/MOON
A5605                                                                                VONE AT (-7)M/CS
A5606                                                                      TPFCONMU,TPFRP/RA,CALCTPER AND CALCTPF
A5607                                                                      CALLS REQUIRE '
A5608                                                                      EARTH CENTERED (NO RESCALING REQUIRED)
A5609                                                                                  RONE SCALED TO B-29 M
A5610                                                                                  VONE SCALED TO B-7 M/CS
A5611                                                                      MOON CENTERED  (RESCALING REQUIRED)
A5612                                                                                  RONE SCALED TO B-27 M
A5613                                                                                  VONE SCALED TO B-5  M/CS
 5614                        23,2672   77214 0           BOFF    VLOAD
 5615   REF   5  LAST  510  23,2673   04742 1           .       V82EMFLG  OFF FOR EARTH , ON FOR MOON.
 5616   REF   1              23,2674   46703 1           .       TPFCALLS
 5617   REF  12  LAST  510  23,2675   02327 0           .       RONE
 5618                        23,2676   77752 1           VSL2
 5619   REF  13  LAST  513  23,2677   26327 0           STOVL   RONE
 5620   REF   8  LAST  510  23,2700   02335 0           .       VONE
 5621                        23,2701   77752 1           VSL2
 5622   REF   9  LAST  513  23,2702   02335 0           STORE   VONE
 5623                        23,2703   77624 1  TPFCALLS CALL
 5624   REF   1              23,2704   56751 1           .       TPFCONMU
 5625                        23,2705   77624 1           CALL
 5626   REF   1              23,2706   57017 0           .       TPFRP/RA  TPFRP/RA COMPUTES RAPO,RPER.
A5627                                                                      RETURNS WITH RAPO IN D(MPAC).
 5628                        23,2707   77625 0           DSU
 5629   REF   4  LAST  510  23,2710   02323 1           .       RPADTEM
 5630                        23,2711   64414 1           BOFF    SR2R      NEED HAPO AT (-29)M FOR DISPLAY.
A5631                                                                      IF MOON CENTERED, RESCALE FROM (-27)M.
A5632                                                                       IF EARTH CENTERED ALREADY AT (-29)M.
 5633   REF   6  LAST  513  23,2712   04742 1           .       V82EMFLG  OFF FOR EARTH , ON FOR MOON.
 5634                        23,2713   46714 1           .       +1
 5635                        23,2714   77624 1           CALL
 5636   REF   1              23,2715   46754 0           .       MAXCHK    IF HAPO & MAXNM, SET HAPO =9999.9 NM.
 5637   REF   4  LAST  506  23,2716   16352 1  STORHAPO STODL   HAPOX     OTHERWISE STORE (RAPO-RPADTEM) IN HAPO.
 5638   REF   1              23,2717   00017 1           .       RPER
 5639                        23,2720   77625 0           DSU
 5640   REF   5  LAST  513  23,2721   02323 1           .       RPADTEM   GIVES HPER AT (-29)M EARTH, (-27)M MOON.
 5641   REF 238  LAST  494  23,2722   00161 1           STORE   MPAC +4   SAVE THIS FOR COMPARISON TO HPERMIN.
 5642                        23,2723   64414 1           BOFF    SR2R      NEED HPER AT (-29)M FOR DISPLAY.
A5643                                                                      IF MOON CENTERED, RESCALE FROM (-27)M.
A5644                                                                      IF EARTH CENTERED ALREADY AT (-29)M.
 5645   REF   7  LAST  513  23,2724   04742 1           .       V82EMFLG  OFF FOR EARTH,  ON FOR MOON.
 5646                        23,2725   46726 0           .       +1
 5647                        23,2726   77624 1           CALL
 5648   REF   2  LAST  513  23,2727   46754 0           .       MAXCHK    IF HPER & MAXNM, SET HPER = 9999.9 NM.
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5649  REF   4  LAST  275   23,2730  16354 1  STORHPER STODL  HPERX          STORE (RPER - RPADTEM) INTO HPERX.
5650  REF 239  LAST  513   23,2731  00161 1                  MPAC +4
5651                       23,2732  51025 1           DSU    BPL           HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
5652  REF   5  LAST  510   23,2733  02321 0                  HPERMIN       IF HPER L/   HPERMIN (300 OR 35)KFT,
5653  REF   1               23,2734  46740 0                  DOTPER         THEN ZERO INTO -TPER.
5654                       23,2735  52145 0           DLOAD  GOTO           OTHERWISE CALCULATE TPER.
5655  REF   1               23,2736  15332 1                  HI6ZEROS
5656  REF   1               23,2737  46744 1                  SKIPTPER
5657                       23,2740  45145 0  DOTPER   DLOAD  CALL
5658  REF   2  LAST  513   23,2741  00017 1                  RPER
5659  REF   1               23,2742  57055 0                  CALCTPER
5660                       23,2743  77676 0           DCOMP
5661  REF   7  LAST  509   23,2744  16346 1  SKIPTPER STODL  -TPER          TPER IS PUT NEG INTO -TPER.
5662  REF   6  LAST  514   23,2745  02321 0                  HPERMIN       HPERMIN AT (-29)M FOR EARTH, (-27)M MOON
5663                       23,2746  45015 1           DAD    CALL
5664  REF   6  LAST  513   23,2747  02323 1                  RPADTEM       RPADTEM AT (-29)M FOR EARTH, (-27)M MOON
5665  REF   1               23,2750  57060 0                  CALCTPP       GIVES 59^59S FOR TPP IF RPER G/
5666                       23,2751  77676 0           DCOMP                  HPERMIN + RPADTEM. (TPER WAS NON ZERO)
5667  REF  13  LAST  511   23,2752  36344 1           STCALL TPP            OTHERWISE COMPUTES TPP.      (GOTO)
5668  REF   5  LAST  513   23,2753  00051 0                  S2

5669                       23,2754  51025 1  MAXCHK   DSU    BPL           IF C(MPAC) ≤ 9999.9 NM, MPAC = 9999.9 NM
5670  REF   1               23,2755  06764 1                  MAXNM
5671                       23,2756  46761 0                  +3            OTHERWISE C(MPAC) = B(MPAC).
5672                       23,2757  43415 0           DAD    RVQ
5673  REF   2  LAST  514   23,2760  06764 1                  MAXNM
5674                       23,2761  43545 1  +3       DLOAD  RVQ           (USED BY P30 - P37 ALSO)
5675  REF   3  LAST  514   23,2762  06764 1                  MAXNM

5676                       23,2763  01065 0  MAXNM    2OCT   01065 05603
5676                       23,2764  05603 1
```

L STABLE ORBIT - P38-P39 USER=S PAGE NO. 1 E0 S3

R0001 STABLE ORBIT RENDEZVOUS PROGRAMS (P38 AND P78)

R0002 MOD NO -1 LOG SECTION - STABLE ORBIT - P38-P39
R0003 MOD BY RUDNICKI.S DATE 25JAN68

R0004 FUNCTIONAL DESCRIPTION

R0005 P38 AND P78 CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL
R0006 CONDITIONS REQUIRED BY THE AGC TO (1) PUT THE ACTIVE VEHICLE
R0007 ON A TRANSFER TRAJECTORY THAT INTERCEPTS THE PASSIVE VEHICLE
R0008 ORBIT A GIVEN DISTANCE, DELTA R, EITHER AHEAD OF OR BEHIND THE
R0009 PASSIVE VEHICLE AND (2) ACTUALLY PLACE THE ACTIVE VEHICLE IN THE
R0010 PASSIVE VEHICLE ORBIT WITH A DELTA R SEPARATION BETWEEN THE TWO
R0011 VEHICLES

R0012 CALLING SEQUENCE

R0013 ASTRONAUT REQUEST THRU DSKY

R0014 V37E38E IF THIS VEHICLE IS ACTIVE VEHICLE
R0015 V37E78E IF OTHER VEHICLE IS ACTIVE VEHICLE

R0016 INPUT

R0017 (1) SOI MANEUVER

R0018 (A) TIG TIME OF SOI MANEUVER
R0019 (B) CENTANG ORBITAL CENTRAL ANGLE OF THE PASSIVE VEHICLE
R0020 DURING TRANSFER FROM TIG TO TIME OF INTERCEPT
R0021 (C) DELTAR THE DESIRED SEPARATION OF THE TWO VEHICLES
R0022 SPECIFIED AS A DISTANCE ALONG THE PASSIVE VEHICLE
R0023 ORBIT
R0024 (D) OPTION EQUALS 1 FOR SOI

R0025 (2) SOR MANEUVER

R0026 (A) TIG TIME OF SOR MANEUVER
R0027 (B) CENTANG AN OPTIONAL RESPECIFICATION OF 1 (B) ABOVE
R0028 (C) OPTION EQUALS 2 FOR SOR
R0029 (D) DELTTIME THE TIME REQUIRED TO TRAVERSE DELTA R WHEN
R0030 TRAVELING AT A VELOCITY EQUAL TO THE HORIZONTAL
R0031 VELOCITY OF THE PASSIVE VEHICLE - SAVED FROM
R0032 SOI PHASE
R0033 (E) TINT TIME OF INTERCEPT (SOI) - SAVED FROM SOI PHASE

R0034 OUTPUT

R0035 (1) TRKMKCNT NUMBER OF MARKS
R0036 (2) TTOGO TIME TO GO
R0037 (3) +MGA MIDDLE GIMBAL ANGLE

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R0038          (4) DSPTEM1   TIME OF INTERCEPT OF PASSIVE VEHICLE ORBIT
R0039                        (FOR SOI ONLY)
R0040          (5) POSTTPI   PERIGEE ALTITUDE OF ACTIVE VEHICLE ORBIT AFTER
R0041                        THE SOI (SOR) MANEUVER
R0042          (6) DELVTPI   MAGNITUDE OF DELTA V AT SOI (SOR) TIME
R0043          (7) DELVTPF   MAGNITUDE OF DELTA V AT INTERCEPT TIME
R0044          (8) DELVLVC   DELTA VELOCITY AT SOI (AND SOR) - LOCAL VERTICAL
R0045                        COORDINATES

R0046    SUBROUTINES USED

R0047          AVFLAGA
R0048          AVFLAGP
R0049          VNDSPLY
R0050          BANKCALL
R00502         GOFLASHR
R00504         GOTOPOOH
R00506         BLANKET
R00508         ENDOFJOB
R0051          PREC/TT
R0052          SELECTMU
R0053          INTRPVP
R0054          MAINRINE

 0055                                  04,3103                    BANK   04
 0056   REF   1                       04,2000                    SETLOC STBLEORB
 0057                                  04,3103                    BANK

 0058   REF  13  LAST  496   E4,1770                             EBANK= SUBEXIT
 0059   REF   1                                                  COUNT* $$/P3879

 0060   REF 105  LAST  511   04,3103  0 4555 0  P38             TC     BANKCALL
 0061   REF   3  LAST  460   04,3104   73726 0                  CADR   AVFLAGA      THIS VEHICLE ACTIVE
 0062                        04,3105  0 3110 1                  TC     +3
 0063   REF 106  LAST  517   04,3106  0 4555 0  P78             TC     BANKCALL
 0064   REF   3  LAST  460   04,3107   73741 1                  CADR   AVFLAGP      OTHER VEHICLE ACTIVE
 00645  REF 107  LAST  517   04,3110  0 4555 0                  TC     BANKCALL
 00646  REF   3  LAST  460   04,3111   73746 0                  CADR   P20FLGON     SET UPDATFLG, TRACKFLG
 0065   REF   1               04,3112  3 3440 1                 CAF    V06N33SR     DISPLAY TIG
 0066   REF   1               04,3113  0 3427 0                 TC     VNDSPLY
 0067   REF   1               04,3114  3 3441 0                 CAF    V06N55SR     DISPLAY CENTANG
 0068   REF 108  LAST  517   04,3115  0 4555 0                  TCR    BANKCALL
 0069   REF   2  LAST  475   04,3116   20763 1                  CADR   GOFLASHR
 00694  REF  13  LAST  504   04,3117  1 4106 0                  TCF    GOTOPOOH     TERMINATE
 00696                        04,3120  1 3125 0                 TCF    +5           PROCEED
 00698                        04,3121  1 3114 1                 TCF    -5           RECYCLE
 0070   REF  16  LAST  509   04,3122  3 6214 0                  CAF    THREE        IMMEDIATE RETURN - BLANK R1, R2
 00702  REF   2  LAST  475   04,3123  0 5415 1                  TCR    BLANKET
 00704  REF  61  LAST  509   04,3124  1 5112 1                  TCF    ENDOFJOB
 0071   REF   8  LAST  418   04,3125  3 4715 0                  CAF    FIVE
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0072   REF   2  LAST  266   04,3126  55«131 1        TS    OPTION1
0073   REF  64  LAST  507   04,3127   3 4712 1       CAF   ONE
0074   REF   4  LAST  450   04,3130  55«132 1        TS    OPTION2        OPTION CODE IS SET TO 1
00742  REF   1               04,3131   3 3442 0      CAF   V04N06SR      DISPLAY OPTION CODE - 1 = SOI, 2 = SOR
00744  REF 109  LAST  517   04,3132   0 4555 0       TCR   BANKCALL
00746  REF   3  LAST  517   04,3133    20763 1       CADR  GOFLASHR
00748  REF  14  LAST  517   04,3134   1 4106 0       TCF   GOTOPOOH       TERMINATE
0075                        04,3135   1 3142 1       TCF   +5             PROCEED
00752                       04,3136   1 3131 0       TCF   -5             RECYCLE
0076   REF  16  LAST  389   04,3137   3 4710 0       CAF   BIT3           IMMEDIATE RETURN - BLANK R3
0077   REF   3  LAST  517   04,3140   0 5415 1       TCR   BLANKET
0078   REF  62  LAST  517   04,3141   1 5112 1       TCF   ENDOFJOB
0079   REF  63  LAST  511   04,3142   0 6006 1       TC    INTPRET
0080                        04,3143    70535 0       SLOAD SR1
0081   REF   5  LAST  518   04,3144    01133 1              OPTION2
0082                        04,3145    71230 0       BHIZ  DLOAD
0083   REF   1               04,3146    11154 1              OPTN1
0084   REF   1               04,3147    03656 1              TINT
0085   REF   1               04,3150    02611 0       STORE TINTSOI        STORE FOR SOR PHASE
0086                        04,3151    77614 1       CLRGO
0087   REF   1               04,3152    01230 1              OPTNSW         OPTNSW
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0088    REF   1                  04,3153   11203 0                    JUNCTN1
0089                             04,3154   43014 0  OPTN1    SET      CLEAR      SOI
00895   REF   2   LAST  518      04,3155   01070 1                    OPTNSW
0090    REF   4   LAST  474      04,3156   00670 0                    UPDATFLG
00905                            04,3157   77624 1           CALL
0091    REF   1                  04,3160   11362 0                    PREC/TT
00915                            04,3161   43214 1           SET      DAD
0092    REF   5   LAST  518      04,3162   00470 1                    UPDATFLG
0093    REF  23   LAST  503      04,3163   03413 1                    TIG
0094    REF   2   LAST  518      04,3164   03656 1           STORE    TINT       TI = TIG + TF
0095    REF  31   LAST  451      04,3165   01046 1           STORE    DSPTEM1    FOR DISPLAY
0096                             04,3166   77776 1           EXIT
00962   REF   1                  04,3167   3 3443 1          CAF      V06N57SR   DISPLAY DELTA R
00964   REF 110   LAST  518      04,3170   0 4555 0          TCR      BANKCALL
00966   REF   4   LAST  518      04,3171    20763 1          CADR     GOFLASHR
00968   REF  15   LAST  518      04,3172   1 4106 0          TCF      GOTOPOOH   TERMINATE
0097                             04,3173   1 3200 1          TCF      +5         PROCEED
00972                            04,3174   1 3167 0          TCF      -5         RECYCLE
0098    REF  18   LAST  501      04,3175   3 6211 0          CAF      SIX        IMMEDIATE RETURN - BLANK R2, R3
0099    REF   4   LAST  518      04,3176   0 5415 1          TCR      BLANKET
0100    REF  63   LAST  518      04,3177   1 5112 1          TCF      ENDOFJOB
0101    REF   1                  04,3200   3 3444 0          CAF      V06N34SR   DISPLAY TIME OF INTERCEPT
0102    REF   2   LAST  517      04,3201   0 3427 0          TC       VNDSPLY
0103    REF  64   LAST  518      04,3202   0 6006 1          TC       INTPRET
0104                             04,3203    45014 0 JUNCTN1  CLEAR    CALL
0105    REF   1                  04,3204    04266 1                   P39/79SW
0106    REF   3   LAST  460      04,3205    10716 0                   SELECTMU   SELECT MU, CLEAR FINALFLG, GO TO VN1645
0107                             04,3206    77624 1 RECYCLE  CALL
0108    REF   2   LAST  518      04,3207    11362 0                   PREC/TT
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 0109                                  04,3210  71214 0            BOFF   DLOAD
 0110  REF   3  LAST  518              04,3211  01350 0                   OPTNSW
 0111  REF   1                        04,3212  11232 1                   OPTN2
 0112  REF   3  LAST  518              04,3213  03656 1                   TINT
 0113  REF  18  LAST  507              04,3214  34041 0            STCALL TDEC1          PRECISION UPDATE PASSIVE VEHICLE TO
 0114  REF   1                        04,3215  11413 1                   INTRPVP          INTERCEPT TIME
 0115                                  04,3216  53575 0            VLOAD  UNIT
 0116  REF  14  LAST  507              04,3217  00001 0                   RATT             RP/(RP)
 0117                                  04,3220  47315 0            PDVL   VXV
 0118  REF  11  LAST  507              04,3221  00007 0                   VATT
 0119                                  04,3222  60246 1            ABVAL  NORM             (VP X RP/(RP))
 0120  REF   7  LAST  501              04,3223  00047 1                   X1
 0121                                  04,3224  56325 0            PDDL   DDV
 0122  REF   5  LAST  275              04,3225  02611 0                   DELTAR
 0123                                  04,3226  77657 0            SL*                     DELTA R / (VP X RP/RP)
 0124                                  04,3227  20172 1                   0 -7,1
 0125  REF   1                        04,3230  36613 0            STCALL DELTTIME         DELTA T = (RP) DELTA R / (VP X RP)
 0126  REF   1                        04,3231  11236 0                   JUNCTN2
 0127                                  04,3232  43345 1 OPTN2      DLOAD  DAD
 0128  REF   2  LAST  518              04,3233  02611 0                   TINTSOI
 0129  REF   2  LAST  457              04,3234  00037 0                   T
 0130  REF   4  LAST  519              04,3235  03656 1            STORE  TINT             TI = TI + TF
 0131                                  04,3236  45345 1 JUNCTN2    DLOAD  DSU
 0132  REF   5  LAST  519              04,3237  03656 1                   TINT
 0133  REF   2  LAST  519              04,3240  02613 1                   DELTTIME
 0134  REF   1                        04,3241  02615 1            STORE  TARGTIME         TT = TI - DELTA T
R0135  .... MAINRTNE ....
R0136  SUBROUTINES USED

R0137        S3435.25
R0138        PERIAPO1
R0139        SHIFTR1
R0140        VNDSPLY
R0141        BANKCALL
R0142        GOFLASH
R0143        GOTOPOOH
R0145        VN1645

 0146  REF  19  LAST  519              04,3242  34041 0 MAINRTNE   STCALL TDEC1           PRECISION UPDATE PASSIVE VEHICLE TO
 0147  REF   2  LAST  519              04,3243  11413 1                   INTRPVP          TARGET TIME
 0148                                  04,3244  77745 1                   DLOAD
 0149  REF  24  LAST  518              04,3245  03413 1                   TIG
 0150  REF   7  LAST  482              04,3246  03503 1            STORE  INTIME
 0151                                  04,3247  77331 0            SSP    VLOAD
 0152  REF  14  LAST  517              04,3250  02371 0                   SUBEXIT
 0153  REF   1                        04,3251  11255 0                   TEST3979
 0154  REF  15  LAST  519              04,3252  00001 0                   RATT
 0155                                  04,3253  77624 1                   CALL
 0156  REF   1                        04,3254  72547 1                   S3435.25
 0157                                  04,3255  43014 0 TEST3979   BOFF   BON
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0158  REF  2  LAST  518   04,3256   04346 1                    P39/79SW
0159  REF  1              04,3257   11266 0                    MAINRTN1
0160  REF  5  LAST  486   04,3260   01311 0                    FINALFLG
0161  REF  1              04,3261   11264 1                    P39P79
0162                      04,3262   77614 1          SET
0163  REF  6  LAST  518   04,3263   00470 1                    UPDATFLG
0164                      04,3264   77776 1  P39P79  EXIT
01645 REF  1              04,3265   0 3313 0         TC        DSPLY81      FOR P39 AND P79
0165                      04,3266   51575 1  MAINRTN1 VLOAD   ABVAL
0166  REF 12  LAST  483   04,3267   03646 0                    DELVEET3
0167  REF  5  LAST  457   04,3270   26635 0          STOVL     DELVTPI      DELTA V
0168  REF  4  LAST  467   04,3271   03640 0                    VPASS4
0169                      04,3272   51451 0          VSU       ABVAL
0170  REF  7  LAST  483   04,3273   03620 0                    VTPRIME
0171  REF  5  LAST  457   04,3274   26637 1          STOVL     DELVTPF      DELTA V (FINAL) = V CIRCUMFLEX T - VT
0172  REF 16  LAST  490   04,3275   03540 0                    RACT3
0173                      04,3276   45115 0          PDVL      CALL
0174  REF  9  LAST  483   04,3277   03612 1                    VIPRIME
0175  REF  2  LAST  457   04,3300   45312 0                    PERIAPO1     GET PERIGEE ALTITUDE
0176                      04,3301   77624 1          CALL
0177  REF  2  LAST  457   04,3302   45422 1                    SHIFTR1
0178  REF  3  LAST  457   04,3303   02641 0          STORE     POSTIPI
0179                      04,3304   43014 0          BON       SET
0180  REF  6  LAST  520   04,3305   01311 0                    FINALFLG
0181  REF  1              04,3306   11310 0                    DSPLY58
0182  REF  7  LAST  520   04,3307   00470 1                    UPDATFLG
0183                      04,3310   77776 1  DSPLY58 EXIT
0184  REF  1              04,3311   3 3445 1         CAF       V06N58SR     DISPLAY HP, DELTA V, DELTA V (FINAL)
0185  REF  3  LAST  518   04,3312   0 3427 0         TC        VNDSPLY
0186  REF  1              04,3313   3 3446 1 DSPLY81 CAF       V06N81SR     DISPLAY DELTA V (LV)
0187  REF  4  LAST  520   04,3314   0 3427 0         TC        VNDSPLY
0188  REF 65  LAST  518   04,3315   0 6006 1         TC        INTPRET
0189                      04,3316   77214 0          CLEAR     VLOAD
0204  REF  2  LAST  472   04,3317   01267 0                    XDELVFLG
0205  REF 13  LAST  520   04,3320   03646 0                    DELVEET3
0206  REF  5  LAST  473   04,3321   37646 1          STCALL    DELVSIN
0207  REF  4  LAST  486   04,3322   73005 0                    VN1645       DISPLAY TRKMKCNT, TTOGO, +MGA
0208                      04,3323   52014 0          BON       GOTO
0209  REF  3  LAST  520   04,3324   04306 0                    P39/79SW
0210  REF  1              04,3325   11347 1                    P39/P79B
0211  REF  1              04,3326   11206 0                    RECYCLE
R0212  STABLE ORBIT MIDCOURSE PROGRAM (P39 AND P79)

R0213  MOD NO -1          LOG SECTION - STABLE ORBIT - P38-P39
R0214  MOD BY RUDNICKI.S  DATE 25JAN68

R0215  FUNCTIONAL DESCRIPTION

R0216        P39 AND P79 CALCULATE THE REQUIRED DELTA V AND OTHER INITIAL
R0217        CONDITIONS REQUIRED BY THE AGC TO MAKE A MIDCOURSE CORRECTION
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R0218          MANEUVER AFTER COMPLETING THE SOI MANEUVER BUT BEFORE MAKING
R0219          THE SOR MANEUVER

R0220    CALLING SEQUENCE

R0221          ASTRONAUT REQUEST THRU DSKY

R0222          V37E39E    IF THIS VEHICLE IS ACTIVE VEHICLE
R0223          V37E79E    IF OTHER VEHICLE IS ACTIVE VEHICLE

R0224    INPUT

R0225          (1) TPASS4    TIME OF INTERCEPT - SAVED FROM P38/P78
R0226          (2) TARGTIME  TIME THAT PASSIVE VEHICLE IS AT INTERCEPT POINT -
R0227                        SAVED FROM P38/P78

R0228    OUTPUT

R0229          (1) TRKMKCNT NUMBER OF MARKS
R0230          (2) TTOGO    TIME TO GO
R0231          (3) +MGA     MIDDLE GIMBAL ANGLE
R0232          (4) DELVLVC  DELTA VELOCITY AT MID - LOCAL VERTICAL COORDINATES

R0233    SUBROUTINES USED

R0234          AVFLAGA
R0235          AVFLAGP
R0236          LOADTIME
R0237          SELECTMU
R0238          PRECSET
R0239          S34/35.1
R0240          MAINRTNE

 0241   REF 111  LAST  518   04,3327  0 4555 0  P39       TC      BANKCALL
 0242   REF   4  LAST  517   04,3330   73726 0            CADR    AVFLAGA       THIS VEHICLE ACTIVE
 0243                        04,3331  0 0006 1            EXTEND
 0244   REF   2  LAST  460   04,3332  3 1422 1            DCA     ATIGINC
 0245   REF   1               04,3333  0 3340 0            TC      P39/P79A
 0246   REF 112  LAST  521   04,3334  0 4555 0  P79       TC      BANKCALL
 0247   REF   4  LAST  517   04,3335   73741 1            CADR    AVFLAGP       OTHER VEHICLE ACTIVE
 0248                        04,3336  0 0006 1            EXTEND
 0249   REF   2  LAST  460   04,3337  3 1424 1            DCA     PTIGINC
 0250   REF   9  LAST  460   04,3340  53∝764 1  P39/P79A  DXCH    KT            TIME TO PREPARE FOR BURN
02505   REF 113  LAST  521   04,3341  0 4555 0            TC      BANKCALL
02506   REF   4  LAST  517   04,3342   73746 0            CADR    P20FLGON      SET UPDATFLG, TRACKFLG
 0251   REF  66  LAST  520   04,3343  0 6006 1            TC      INTPRET
 0255                        04,3344   45014 0            SET     CALL
02555   REF   4  LAST  520   04,3345   04066 0                    P39/79SW
 0256   REF   4  LAST  518   04,3346   10716 0                    SELECTMU      SELECT MU, CLEAR FINALFLG, GO TO VN1645
 0257                        04,3347   43234 0  P39/P79B  RTB     DAD
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 0258  REF  9  LAST  508   04,3350   45505 0                LOADTIME
 0259  REF 10  LAST  521   04,3351   02364 1                KT
 02595 REF 25  LAST  519   04,3352   03413 1          STORE TIG          TIG = T (PRESENT) + PREPARATION TIME
 0260  REF 20  LAST  519   04,3353   34041 0          STCALL TDEC1       PRECISION UPDATE ACTIVE AND PASSIVE
 0261  REF  3  LAST  460   04,3354   45354 1                PRECSET        VEHICLES TO TIG
 0262                       04,3355   77624 1          CALL
 0263  REF  3  LAST  461   04,3356   72522 1                S34/35.1       GET UNIT NORMAL
 0264                       04,3357   52145 0          DLOAD GOTO
 0265  REF  2  LAST  519   04,3360   02615 1                TARGTIME
 0266  REF  1               04,3361   11242 0                MAINRINE       CALCULATE DELTA V AND DELTA V (LV)
R0272  .... PREC/TT ....
R0273  SUBROUTINES USED

R0274        PRECSET
R0275        TIMETHET
R0276        S34/35.1

 0277                       04,3362   71220 1 PREC/TT  STQ   DLOAD
 0278  REF  6  LAST  476   04,3363   02367 1                RTRN
 0279  REF 26  LAST  522   04,3364   03413 1                TIG
 0280  REF 21  LAST  522   04,3365   34041 0          STCALL TDEC1       PRECISION UPDATE ACTIVE AND PASSIVE
 0281  REF  4  LAST  522   04,3366   45354 1                PRECSET        VEHICLES TO TIG
 0282                       04,3367   53775 1          VLOAD VSR*
 0283  REF  8  LAST  490   04,3370   03554 0                RPASS3
 0284                       04,3371   57176 0                0,2
 0285  REF  3  LAST  488   04,3372   16657 1          STODL RVEC
 0286  REF  5  LAST  456   04,3373   03754 1                CENTANG
 0287                       04,3374   71406 0          PUSH  COS
 0288  REF  3  LAST  456   04,3375   16734 0          STODL CSTH
 0289                       04,3376   43156 1          SIN   SET
 0290  REF  2  LAST  456   04,3377   03466 0                RVSW
 0291  REF  3  LAST  456   04,3400   26732 0          STOVL SNTH
 0292  REF  8  LAST  490   04,3401   03562 0                VPASS3
 0293                       04,3402   77657 0          VSR*
 0294                       04,3403   57176 0                0,2
 0295  REF  5  LAST  488   04,3404   36746 1          STCALL VVEC        GET TRANSFER TIME BASED ON CENTANG OF
 0296  REF  2  LAST  456   04,3405   24737 1                TIMETHET       PASSIVE VEHICLE
 0297                       04,3406   77624 1          CALL
 0298  REF  4  LAST  522   04,3407   72522 1                S34/35.1       GET UNIT NORMAL
 0299                       04,3410   52145 0          DLOAD GOTO
 0300  REF  3  LAST  519   04,3411   00037 0                T
 0301  REF  7  LAST  522   04,3412   02367 1                RTRN
R0302  .... INTRPVP ....
R0303  SUBROUTINES USED

R0304        CSMPREC
R0305        LEMPREC

 0306                       04,3413   43020 1 INTRPVP  STQ   BOFF          PRECISION UPDATE PASSIVE VEHICLE TO
 0307  REF  8  LAST  522   04,3414   02367 1                RTRN           TDEC1
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 0308   REF   4  LAST  490    04,3415   01352 1                    AVFLAG
 0309   REF   1               04,3416   11423 1                    OTHERV
 0310                         04,3417   77624 1          CALL
 0311   REF   3  LAST  490    04,3420   27022 1                    CSMPREC
 0312                         04,3421   77650 1          GOTO
 0313   REF   9  LAST  522    04,3422   02367 1                    RTRN
 0314                         04,3423   77624 1  OTHERV  CALL
 0315   REF   3  LAST  490    04,3424   27036 1                    LEMPREC
 0316                         04,3425   77650 1          GOTO
 0317   REF  10  LAST  523    04,3426   02367 1                    RTRN
R0318   .... VNDSPLY ....
R0319   SUBROUTINES USED

R0320          BANKCALL
R0321          GOFLASH
R0322          GOTOPOOH

 0323                         04,3427   0 0006 1  VNDSPLY EXTEND                    FLASH DISPLAY
 0324   REF  11  LAST  523    04,3430   23"767 0          QXCH   RTRN
 0325   REF   4  LAST  476    04,3431   55"765 0          TS     VERBNOUN
 0326   REF   5  LAST  523    04,3432   3 1765 1          CA     VERBNOUN
 0327   REF 114  LAST  521    04,3433   0 4555 0          TCR    BANKCALL
 0328   REF  16  LAST  502    04,3434    20624 0          CADR   GOFLASH
 0329   REF  16  LAST  518    04,3435   1 4106 0          TCF    GOTOPOOH       TERMINATE
 0330   REF  12  LAST  523    04,3436   0 1767 0          TC     RTRN           PROCEED
 0331                         04,3437   1 3432 0          TCF    -5             RECYCLE
 0351                         04,3440    01441 1  V06N33SR VN    0633
 0352                         04,3441    01467 0  V06N55SR VN    0655
 0353                         04,3442    01006 0  V04N06SR VN    0406
 0354                         04,3443    01471 1  V06N57SR VN    0657
 0355                         04,3444    01442 1  V06N34SR VN    0634
 0356                         04,3445    01472 1  V06N58SR VN    0658
 0357                         04,3446    01521 0  V06N81SR VN    0681
*** END OF SMOOCH  .007 ***
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P0001   EARTH ORBIT INSERTION MONITOR PROGRAM
R0002   ************************************

R0003   PROGRAM DESCRIPTION -P11-

R0004       MOD NO. 1
R0005       MOD BY ELIASSEN

R0006   FUNCTIONAL DESCRIPTION

R0007       P11 IS INITIATED BY

R0008            A) GYROCOMPASS PRG P02 WHEN LIFTOFF DISCRETE IS RECEIVED OR
R0009            B) BACKUP THRU VERB 75 ENTER

R0010       PROGRAM WILL
R0011            1. ZERO CMC CLOCK AT LIFTOFF (OR UPON RECEIPT OF BACKUP)
R0012            2. UPDATE TEPHEM TO TIME CMC CLOCK WAS ZEROED
R0013            3. INITIATE SERVICER AT PREREAD1
R0014            4. CHANGE MAJOR MODE TO 11
R0015            5. CLEAR DSKY IN CASE OF V 75
R0016            6. STORE LIFTOFF IMU-CDU ANGLES FOR ATT. ERROR DISPLAY
R0017            7. TERMINATE GYROCOMPASSING - -
R0018            8. COMPUTE INITIAL VECTORS  RN, VN                 - - -
R0019            9. COMPUTE REFSMMAT FOR PRELAUNCH ALIGNMENT WHERE U ,U ,U  ARE
R0020                  -       -                                    X  Y  Z
R0021                  U =UNIT(-R) LOCAL VERTICAL AT TIME OF LIFTOFF
R0022                   Z
R0023                  -       -   -
R0024                  U =UNIT (A), A=HOR VECTOR AT LAUNCH AZIMUTH
R0025                   X
R0026                  -   -   -
R0027                  U =U * U
R0028                   U   Z   X

R0029           10. SET REFSMMAT KNOWN FLAG
R0030           11. SET AVGEXIT IN SERVICER TO VHHDOT TO
R0031               COMPUTE AND DISPLAY NOUN 62 EVERY 2 SECONDS

R0032                  R1  V1  - INTERTIAL VELOCITY MAGNITUDE IN FPS
R0033                  R2  HDOT - RATE OF CHANGE OF VEHICLE VEL IN FPS
R0034                  R3  H    - VEHICLE ALTITUDE ABOVE PAD IN NM

R0035           12. DISPLAY BODY AXES ATT. ERRORS ON FDAI NEEDLES

R0036               A) FROM L.O. TO RPSTART (APPROX. 0 TO +10SECS AFTER L.O.)
R0037                  DESIRED ATTITUDE IS AS STORED AT L.O.
R0038               B) FROM RPSTART TO POLYSTOP(APPROX.+10 TO +133SECS AFTER L.O)
R0039                  DESIRED ATTITUDE IS SPECIFIED BY CMC PITCH AND ROLL
R0040                  POLYNOMIALS  DURING SATURN ROLLOUT AND PITCHOVER
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R0041              THE DISPLAY IS RUN AS LOW PRIORITY JOB APPROX.
R0042              EVERY 1/2 SEC OR LESS AND IS DISABLED UPON OVFLO OF TIME1

R0057   SUBROUTINES CALLED

R0058          2PHSCHNG  BANKCALL  CALCGRA   CDUTRIG   CLEANDSP  DANZIG
R00581         DELAYJOB  EARTHR    ENDOFJOB  FINDVAC   IBNKCALL
R00582         INTPRET   LALOTORV  NEEDLER   NEWMODEX  PHASCHNG
R0059          POSTJUMP  POWRSERS  PREREAD1  REGODSPR  S11.1
R00591         SERVEXIT  TASKOVER  TCDANZIG  V1ST02S   WAITLIST

R0060   ASTRONAUT REQUESTS (IF ALTITUDE ABOVE 300,000 FT)

R0061       DSKY -
R0062            MONITOR DISPLAY OF TIME TO PERIGEE R1 HOURS
R0063                                               R2 MINUTES

R0064       DSKY -
R0065            MONITOR DISPLAY OF R1 APOGEE ALTITUDE IN NAUTICAL MILES
R0066                              R2 PERIGEE ALTITUDE IN NAUTICAL MILES
R0067                              R3 TFF IN MINUTES/SECS

R0068       IF ASTRONAUT HAS REQUESTED ANY OF THESE DISPLAYS HE MUST
R0069       HIT KEY RELEASE BUTTON TO RETURN TO NORMAL NOUN 62 DISPLAY

R0070   NORMAL EXIT MODE

R0071       ASTRONAUT  VERB 37 ENTER 00 ENTER

R0072   ALARM MODES - NONE

R00721  ABORT EXIT MODES -

R00722      EARLY BOOST ABORT FOLLOWED BY REENTRY   V 37 E 62 E
R00723      LATE  BOOST ABORT FOLLOWED BY REENTRY   V 37 E 61 E

R0073   OUTPUT

R0074       TLIFTOFF (DP)  TEPHEM (TP)
R0075       REFSMMAT
R0076       DSKY DISPLAY
R0077       FDAI DISPLAY

R0078   ERASABLE INITIALIZATION

R0079       AZO, AXO, -AYO
R0080       LATITUDE
R0081       PADLONG
R0082       TEPHEM
R0083       PGNCSALT
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R0084       POLYNUM THRU POLYNUM +14D)
R00841      RPSTART
R00842      POLYSTOP
R0085   FLAGS SET OR RESET

R0086       SET REPSMFLG
R0087       SET DVMON IDLE FLAG
R0088       CLEAR ERADFLAG

R0089   DEBRIS

R0090       LIFTTEMP
R0091       POLYNUM THRU POLYNUM +7
R0092       SPOLYARG
R0093       BODY1, BODY2, BODY3
R0094       VMAG2, ALTI, HDOT
R0095       CENTRALS, CORE SET AND VAC AREAS
 0096   REF   1                                              COUNT  34/P11

 0097   REF   1                 4730          BITS5-6  =     SUPER011
 0098                        42,3521                        BANK   42
 0099   REF   1              34,2000                        SETLOC P11ONE
 0100                        34,2002                        BANK

 0101   REF   6  LAST  213  E3,1706                         EBANK= TEPHEM
 0102   REF   2  LAST  184  34,2002  3 4744 1  P11          CA     EBANK3
 0103   REF  20  LAST  506  34,2003  54 003 0               TS     EBANK

 0104                       34,2004  0 0006 1               EXTEND
 0105   REF   1             34,2005  3 2273 0               DCA    REP11S      DIRECT RESTARTS TO REP11
 0106   REF   2  LAST  181  34,2006  52 757 0               DXCH   -PHASE3
 01061  REF 111  LAST  509  34,2007  4 4714 0               CS     ZERO
 01062                      34,2010  22 007 0               ZL
 0107   REF   2  LAST   78  34,2011  55«265 0               TS     LIFTTEMP
 0108   REF   2  LAST  181  34,2012  52 763 1               DXCH   -PHASE5     INACTIVE GROUP 5, PRELAUNCH PROTECTION
 0111                       34,2013  0 0006 1  P11+7        EXTEND
 0112   REF   1             34,2014  3 2275 0               DCA    REP11SA
 0113   REF   1             34,2015  53«337 0               DXCH   TLIFTOFF

 0114                       34,2016  0 0006 1               EXTEND
 0115   REF  13  LAST  408  34,2017  3 0025 0               DCA    TIME2
 0116   REF   3  LAST  526  34,2020  53«266 0               DXCH   LIFTTEMP    FOR RESTARTS

 0117   REF 112  LAST  526  34,2021  3 4714 1               CA     ZERO
 0118                       34,2022  22 007 0               ZL
 0119   REF  14  LAST  526  34,2023  52 025 1               DXCH   TIME2
 0120   REF   2  LAST  526  34,2024  53«337 0  REP11A-2     DXCH   TLIFTOFF
 0121   REF   3  LAST  526  34,2025  52 757 0  REP11A-1     DXCH   -PHASE3     RESET PHASE
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0122                          34,2026  0 0004 0  REP11A   INHINT
0123                          34,2027  0 0006 1            EXTEND
0124  REF   7  LAST  526      34,2030  3 1710 0            DCA     TEPHEM +1
0125  REF   2  LAST   78      34,2031  53∝271 0            DXCH    TEPHEM1 +1
0126  REF   8  LAST  527      34,2032  3 1706 1            CA      TEPHEM
0127  REF   3  LAST  527      34,2033  57∝267 0            XCH     TEPHEM1

0128                          34,2034  0 0006 1            EXTEND
0129  REF   3  LAST  526      34,2035  3 1337 1            DCA     TLIPTOFF
0130  REF   4  LAST  527      34,2036  21∝271 0            DAS     TEPHEM1 +1
0131  REF   5  LAST  527      34,2037  27∝267 1            ADS     TEPHEM1      CORRECTOFOR OVERFLOW

0132  REF  23  LAST  503      34,2040  0 5301 0            TC      PHASCHNG
0133                          34,2041   05023 0            OCT     05023
0134                          34,2042   22000 1            OCT     22000

0135                          34,2043  0 0004 0            INHINT
0136                          34,2044  0 0006 1            EXTEND
0137  REF   6  LAST  527      34,2045  3 1270 0            DCA     TEPHEM1
0138  REF   9  LAST  527      34,2046  53∝707 1            DXCH    TEPHEM
0139  REF   7  LAST  527      34,2047  3 1271 1            CA      TEPHEM1 +2
0140  REF  10  LAST  527      34,2050  57∝710 0            XCH     TEPHEM +2

0141  REF   1                 34,2051  3 2000 0            CAF     EBDVCNT
0142  REF  21  LAST  526      34,2052  54 003 0            TS      EBANK
01421 REF  10  LAST  212      E7,1431                      EBANK=  DVCNTR
0143  REF  19  LAST  248      34,2053  0 4633 0            TC      IBNKCALL
0144  REF   1                 34,2054   76625 1            CADR    PREREAD1     ZERO PIPS AND INITIALIZE AVERAGES

0145  REF  24  LAST  527      34,2055  0 5301 0            TC      PHASCHNG
0146                          34,2056   05023 0            OCT     05023        CONTINUE HERE ON RESTART
0147                          34,2057   22000 1            OCT     22000

0148  REF   4  LAST  440      34,2060  3 4731 0            CAF     .5SEC        START ATT ERROR DISPLAY
0150  REF  20  LAST  509      34,2061  0 5140 1            TC      WAITLIST     IN .5 SEC
0151  REF   3  LAST  210      E6,1704                      EBANK=  BODY3
0152  REF   2  LAST  210      34,2062   02314 0            2CADR   ATERTASK
0152                          34,2063   70066 0

0153  REF   6  LAST  444      34,2064  0 5243 1            TC      NEWMODEX     DISPLAY MM 11
0154                          34,2065   00013 0            MM      11

0155  REF 115  LAST  523      34,2066  0 4555 0            TC      BANKCALL
0156  REF   3  LAST  447      34,2067   20607 1            CADR    CLEANDSP     CLEAR DSKY IN CASE OF V75

0157  REF   3  LAST  427      34,2070  0 5261 1            TC      2PHSCHNG
0158                          34,2071   40514 0            OCT     40514        PROTECT ATERTASK
0159                          34,2072   00073 0            OCT     00073
0160  REF   1                 34,2073  3 2001 1            CAF     EBOPLACE
0161  REF  22  LAST  527      34,2074  54 003 0            TS      EBANK
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01611 REF  5 LAST 423  E5,1426                      EBANK= QPLACES
016111 REF  1          34,2075  3 2276 0            CA   P11XIT      SET EXIT FROM PROUT IN EARTHR
016112 REF  6 LAST 528 34,2076  55"426 1           TS   QPLACES
0162                   34,2077  22 007 0           ZL                STORE DP GIMBAL
01621 REF 10 LAST 434  34,2100  3 0032 0           CA   CDUX         ANGLES FOR ATTITUDE
016211 REF 12 LAST 444 34,2101  53"760 0           DXCH CGC          ERROR DISPLAY
016212                 34,2102  22 007 0           ZL                AFTER L.O.
016213 REF  3 LAST 411 34,2103  3 0033 1           CA   CDUY
016214 REF  2 LAST  93 34,2104  53"762 1           DXCH IGC
01622                  34,2105  22 007 0           ZL
016221 REF  7 LAST 411 34,2106  3 0034 0           CA   CDUZ
016222 REF  2 LAST  93 34,2107  53"764 1           DXCH MGC
016223 REF 67 LAST 521 34,2110  0 6006 1           TC   INTPRET
016224                 34,2111   74575 0           VLOAD VSR1        SCALE CGC B-1
016225 REF 13 LAST 528 34,2112   02760 1                 CGC
016226 REF 14 LAST 528 34,2113   02760 1           STORE CGC
0163                   34,2114   64375 1           VLOAD MXV
0164 REF  2 LAST  97   34,2115   02467 0                 THETAN
0165 REF 30 LAST 443   34,2116   02672 0                 XSM
0166                   34,2117   53372 1           VSL1  VAD
0167 REF  3 LAST 440   34,2120   02650 0                 ERCOMP
0168 REF  4 LAST 528   34,2121   16650 0           STODL ERCOMP
0169 REF  4 LAST 527   34,2122   01337 1                 TLIFTOFF
0170                   34,2123   52131 0           SSP   GOTO
0171 REF  6 LAST 514   34,2124   00052 0                 S2
0172 REF  1            34,2125   66424 0           CADR  PROUT       RETURN FROM EARTHR
0173 REF  2 LAST 423   34,2126   66373 0                 EARTHR +3
0174 REF 68 LAST 528   34,2127   0 6006 1  MATRXJOB TC   INTPRET
01741                  34,2130   77731 1           SSP               ZERO RTX2
01742 REF 10 LAST 492  34,2131   03747 0                 RTX2        FOR
01743                  34,2132   00000 1                 0           EARTH
0175                   34,2133   65345 0           DLOAD PDDL
0176 REF  1            34,2134   01273 0                 PGNCSALT    ALTITUDE OF PGNCS
0177 REF  2 LAST  78   34,2135   01264 0                 PADLONG     LONGITUDE
0178                   34,2136   55525 0           PDDL  VDEF
0179 REF  6 LAST 445   34,2137   02403 1                 LATITUDE    GEODETIC LATITUDE
0180 REF  6 LAST 276   34,2140   15104 0           STODL LAT         LAT,LONG,ALT ARE CONSECUTIVE
0181 REF  2 LAST 514   34,2141   15332 1                 HI6ZEROS    TIME = 0
0182                   34,2142   45014 0           CLEAR CALL
0183 REF  2 LAST 451   34,2143   00662 0                 ERADFLAG
0184 REF  1            34,2144   26373 1                 LALOTORV    CONVERT TO POSITION VECTOR IN REF.COORDS

0185 REF  4 LAST  77   34,2145   35232 1           STCALL RN1
01851 REF  1           34,2146   77256 0                 CALCGRAV    RETURN WITH GRAVITY
01852                  34,2147   77656 1           UNIT              IN MPAC
01853 REF  5 LAST 497  34,2150   25752 0           STOVL REFSMMAT +12D UNITZ = UNIT(GRAV)
01854 REF  5 LAST 528  34,2151   01232 0                 RN1
0186                   34,2152   74235 0           VXV   VXSC
0187 REF  5 LAST 289   34,2153   01714 1                 UNITW       SCALED AT 1
0188 REF  1            34,2154   30300 1                 -ERTHRAT    V = EARTHRATE X R
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0189                          34,2155   77712 0     VSL4                SCALE TO 2(7) M/CS
0190  REF   2  LAST   77      34,2156   25240 0     STOVL  VN1
0191  REF   6  LAST  528      34,2157   01752 0            REFSMMAT +12D
0209                          34,2160   53435 0     VXV    UNIT
0210  REF   6  LAST  528      34,2161   01714 1            UNITW          (REF3 X UNITW) = EAST
0211                          34,2162   47206 0     PUSH   VXV
0212  REF   7  LAST  529      34,2163   01752 0            REFSMMAT +12D   (EAST X REF3) = -SOUTH
0213                          34,2164   65256 0     UNIT   PDDL
0214  REF   5  LAST  447      34,2165   02634 1            LAUNCHAZ        COS(AZ)*SOUTH
0215                          34,2166   74346 0     COS    VXSC
0216                          34,2167   77626 0     STADR
0217  REF   8  LAST  529      34,2170   62041 0     STODL  REFSMMAT        TEMPORARY STORAGE
0218  REF   6  LAST  529      34,2171   02634 1            LAUNCHAZ
0219                          34,2172   74356 1     SIN    VXSC            SIN(AZ)*EAST
0220                          34,2173   53455 0     VAD    UNIT            SIN(AZ)*EAST - COS(AZ)*SOUTH = REF1
0221  REF   9  LAST  529      34,2174   01736 1            REFSMMAT
0222  REF  10  LAST  529      34,2175   01736 1     STORE  REFSMMAT

0223                          34,2176   53435 0     VXV    UNIT            (REF1 X REF3) = -REF3
0224  REF  11  LAST  529      34,2177   01752 0            REFSMMAT +12D
0225                          34,2200   77676 0     VCOMP
0226  REF  12  LAST  529      34,2201   01744 1     STORE  REFSMMAT +6
02261                         34,2202   45345 1     DLOAD  DSU
02262 REF  11  LAST  463      34,2203   15330 0            DPHALF          1/2 REV
02263 REF   7  LAST  529      34,2204   02634 1            LAUNCHAZ
02264                         34,2205   65215 1     DAD    PDDL
02265 REF   5  LAST  445      34,2206   02401 0            AZIMUTH
02266 REF   2  LAST  113      34,2207   03301 0            SATRLRT         SET  SATRLRT = -SATRLRT IF
02267                         34,2210   45565 0     SIGN   STADR           (1/2REV -LAVNCHAZ +AZIMUTH) IS NEGATIVE
02268 REF   3  LAST  529      34,2211   74476 1     STORE  SATRLRT         FOR ROLL CALC IN FDAI ATT. ERROR DISPLAY
0227                          34,2212   77414 0     SET    EXIT
0228  REF   2  LAST  473      34,2213   01462 0            REFSMFLG        SET REFSMMAT KNOWN FLAG

0229  REF  25  LAST  527      34,2214   0 5301 0    TC     PHASCHNG
0230                          34,2215    04023 1    OCT    04023

0231                          34,2216   0 0006 1    EXTEND
0232  REF   1                 34,2217   3 2302 1    DCA    P11SCADR
0233  REF   1                 34,2220   53«223 1    DXCH   AVGEXIT         SET AVGEXIT

0234  REF   2  LAST  301      34,2221   3 7665 0    CA     PRIO31          2 SECONDS AT 2(+8)
0235  REF   9  LAST  436      34,2222   55«074 1    TS     1/PIPADT

0236  REF   5  LAST  411      E6,1501             EBANK= RCSFLAGS
0237  REF   8  LAST  253      34,2223   3 4752 0  CA     EBANK6
0238  REF  23  LAST  527      34,2224   54 003 0  TS     EBANK

0239                          34,2225   0 0004 0    INHINT
0246  REF 113  LAST  526      34,2226   4 4714 0    CS     ZERO
0247  REF   1                 34,2227   55«063 1    TS     TBASE5          RESTART READACCS 2 SECONDS AFTER LIFTOFF
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0248  REF  10  LAST  430   34,2230  4 0025 1          CS    TIME1
0249  REF   1             34,2231  6 4735 1          AD    2SECS       DO READACCS 2 SECONDS AFTER LIFTOFF

0250  REF 142  LAST  509   34,2232  10 000 0          CCS   A           CHECK TO INSURE DT IS POSITIVE
0251                       34,2233  1 2236 0          TCF   +3          TIME POSITIVE
0252                       34,2234  1 2236 0          TCF   +2          CANNOT GET HERE
0253  REF 114  LAST  529   34,2235  3 4714 1          CA    ZERO        TIME NEGATIVE - SET TO 1
0254  REF  65  LAST  518   34,2236  6 4712 1          AD    ONE         RESTORE TIME  -  OR MAKE POSITIVE

0255  REF  21  LAST  527   34,2237  0 5140 1          TC    WAITLIST
0256  REF  14  LAST  212   E6,1661                    EBANK= ACC
0257  REF   1             34,2240   02647 0          2CADR READACCS
0257  REF   1             34,2241   76066 0
0258  REF   4  LAST  527   34,2242  0 5261 1          TC    2PHSCHNG
0259                       34,2243   00003 1          OCT   00003       TURN OFF GROUP 3
0260                       34,2244   00025 0          OCT   00025       PROTECT NORMLIZE AND READACCS

0261  REF  36  LAST  447   34,2245  0 4574 0          TC    POSTJUMP
0262  REF   2  LAST  211   34,2246   77141 0          CADR  NORMLIZE    DO NORMLIZE AND ENDOFJOB
0263  REF  11  LAST  527   E3,1706                    EBANK= TEPHEM
0264                       34,2247  0 0004 0  REP11   INHINT
0265  REF   1             34,2250  10 763 1          CCS   PHASE5
0266  REF  64  LAST  518   34,2251  0 5112 0          TC    ENDOFJOB

0267  REF   4  LAST  526   34,2252  11=265 0          CCS   LIFTTEMP
0268                       34,2253  1 2257 1          TCF   +4
0269                       34,2254  1 2257 1          TCF   +3
0270                       34,2255  1 2257 1          TCF   +2
0271  REF   1             34,2256  1 2013 0          TCF   P11+7

0272  REF   5  LAST  528   34,2257  4 1336 1          CS    TLIFTOFF
0273                       34,2260  0 0006 1          EXTEND
0274  REF   1             34,2261  6 2267 0          BZMF  ENDREP11

0275  REF  15  LAST  526   34,2262  10 024 0          CCS   TIME2       **TIME2 MUST BE NON-ZERO AT LIFTOFF**
0276  REF   2  LAST  207   34,2263  1 2021 1          TCF   REP11A -5   T2,T1 NOT YET ZEROED, GO AND DO IT

0277                       34,2264  0 0006 1          EXTEND            T2,T1 ZEROED, SET TLIFTOFF
0279  REF   5  LAST  530   34,2265  3 1266 1          DCA   LIFTTEMP
0280  REF   1             34,2266  1 2024 1          TCF   REP11A-2

0281                       34,2267  0 0006 1  ENDREP11 EXTEND
0282  REF   2  LAST  526   34,2270  3 2275 0          DCA   REP11SA
0283  REF   1             34,2271  1 2025 0          TCF   REP11A-1
0284                       34,2272   77766 0  REP11S   2OCT  77766 00011
0284                       34,2273   00011 1
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 0285                          34,2274   77764 1  REP11SA  2OCT   77764 00013
 0285                          34,2275   00013 0
 02851 REF   1                 34,2276   02451 0  P11XIT   GENADR P11OUT
 0286                          34,2277   71704 1  -ERTHRAT 2DEC*  -7.292115138 E-7 B18*   - EARTH RATE AT 2(18)
 0286                          34,2300   41735 0
 0288  REF   4  LAST  527      E6,1704                       EBANK= BODY3
 0289  REF   1                 34,2301   02303 0  P11SCADR 2CADR  VHHDOT
 0289  REF   1                 34,2302   70066 0
 0290  REF   5  LAST  531      E6,1704                       EBANK= BODY3
R0295  VHHDOT IS EXECUTED EVERY 2 SECONDS TO DISPLAY ON DSKY
R0296                        VI INERTIAL VELOCITY MAGNITUDE
R0297                        HDOT  RATE OF CHANGE OF ALT ABOVE L PAD RADIUS
R0298                        H   ALTITUDE ABOVE L PAD RADIUS

 0299  REF  69  LAST  528     34,2303   0 6006 1  VHHDOT   TC     INTPRET
 0300                          34,2304   77624 1            CALL                  LOAD VMAGI, ALTI,
 0301  REF   1                 34,2305   70436 1                  S11.1           HDOT FOR DISPLAY
 0302                          34,2306   77776 1            EXIT
 0303  REF   1                 34,2307   3 2511 0           CAF    V06N62         DISPLAY IN R1   R2    R3
 0304  REF 116  LAST  527      34,2310   0 4555 0           TC     BANKCALL                 VI   HDOT  H
 0305  REF   1                 34,2311    20621 0           CADR   REGODSPR        DISPLAY INTERFACE - IMMEDIATE RETURN
 0306  REF 117  LAST  531      34,2312   0 4555 0           TC     BANKCALL
 0307  REF   1                 34,2313    77132 1           CADR   SERVEXIT        END OF P11SERVE CYCLE
 0308  REF   1                 34,2314   3 4701 0  ATERTASK CAF    PRIO1          ESTABLISH JOB TO DISPLAY ATT ERRORS
 0309  REF  20  LAST  510      34,2315   0 5042 1           TC     FINDVAC        COMES HERE AT L.O. + .33 SEC
 0310  REF   6  LAST  531      E6,1704                       EBANK= BODY3
 0311  REF   1                 34,2316    02326 1          2CADR  ATERJOB
 0311  REF   1                 34,2317    70066 0
 03111 REF   6  LAST  529      34,2320   4 1501 0           CS     RCSFLAGS       SET BIT3 FOR
 03112 REF  17  LAST  518      34,2321   7 4710 1           MASK   BIT3           NEEDLER
 03113 REF   7  LAST  531      34,2322   27*501 0           ADS    RCSFLAGS       INITIALIZATION PASS
 03114 REF  20  LAST  527      34,2323   0 4633 0           TC     IBNKCALL       AND GO
 03115 REF   1                 34,2324    42404 1           CADR   NEEDLER        DO IT
 0312  REF  25  LAST  509      34,2325   0 5213 1           TC     TASKOVER
R0313  THIS SECTION PROVIDES ATTITUDE ERROR DISPLAYS TO THE FDAI DURING SONE BOOST

A0315                                  COMPUTE DESIRED PITCH W.R.T. LAUNCH SITE LOCAL VERTICAL.
A0316                                  PITCH = -.0000469184028+.00137571556*T+.0231502280*T*T-.0205929365*T*T*T
A0317                                        SCALED TO 32 REVOLUTIONS
A0318                                  IF TL = TIME FROM LAUNCH IN SECONDS, THEN   T = 100(TL-10SEC)/(2**14)
A0319                                  WHERE   TL GE  10 SEC
A0320                                          TL LE 133 SEC .

A0321                                  COMPUTE DESIRED ROLL WHERE ROLL EQUALS COUNTER-CLOCKWISE ANGLE FROM
A0322                                  LAUNCHAZ TO -Z(S/C) AS SEEN FROM X(S/C).
A0323                                  ROLL = LAUNCHAZ-AZIMUTH-.5 +SATRLRT*T      IN REV
A0324                                  SATRLRT = RATE OF ROLL IN REV/CENTI-SEC
A0325                                  T,IN CENTI-SEC,IS DEFINED AS ABOVE,INCLUSIVE OF TIME RESTRICTIONS
```

```
A0326                          FOR SIMPLICITY, LET   P = 2*PI*PITCH
A0327                                                R = 2*PI*ROLL

A0328                          CONSTRUCT THE TRANSFORMATION MATRIX, TSMV, GIVING DESIRED S/C AXES IN
A0329                          TERMS OF SM COORDINATES. LET THE RESULTING ROWS EQUAL THE VECTORS XDC,
A0330                          YDC,AND ZDC.

A0331                           *     (     SIN(P)          0          -COS(P)     )   (XDC)
A0332                          TSMV = (-SIN(R)*COS(P)    -COS(R)    -SIN(R)*SIN(P)) = (YDC)
A0333                                 (-COS(R)*COS(P)     SIN(R)    -COS(R)*SIN(P))   (ZDC)

A0334                          XDC,YDC,ZDC ARE USED AS INPUT TO CALCGTA FOR THE EXTRACTION OF THE
A0335                          EULER SET OF ANGLES WHICH WILL BRING THE SM INTO THE DESIRED
A0336                          ORIENTATION. THIS EULER SET, OGC, IGC, AND MGC, MAY BE IDENTIFIED
A0337                          AS THE DESIRED CDU ANGLES.

A0338                          (XDC)                    (OGC)
A0339                          (YDC) ---) CALCGTA ---) (IGC)
A0340                          (ZDC)                    (MGC)

A0341                                                    -
A0342                          DEFINE THE VECTOR DELTACDU.

A0343                           -          (OGC)   (CDUX)
A0344                          DELTACDU = (IGC) - (CDUY)
A0345                                     (MGC)   (CDUZ)

A0346                                                  -     -   *   -
A0347                          COMPUTE ATTITUDE ERRORS, A, WHERE   A = TGSC*DELTACDU

A0348                           *     (1        SIN(CDUZ)              0      )   THE GIMBAL ANGLES
A0349                          TGSC = (0   COS(CDUX)*COS(CDUZ)   SIN(CDUX)) = TO SPACECRAFT AXES
A0350                                 (0  -SIN(CDUX)*COS(CDUZ)   COS(CDUX))   CONVERSION MATRIX

A0351                                                    -
A0352                          THE ATTITUDE ERRORS, A, ARE STORED ONE HALF SINGLE PRECISION IN
A0353                          THE REGISTERS AK, AK1, AK2 AS INPUT TO NEEDLER, THE FDAI ATTITUDE
A0354                          ERROR DISPLAY ROUTINE.

 0355  REP  16  LAST  530   34,2326  30 024 1  ATERJOB  CAE     TIME2          CHECK IF MORE THAN
 0356                       34,2327  0 0006 1            EXTEND                 164 SECONDS FROM L.O.
 0357                       34,2330  6 2332 1            BZMF    +2
 0358  REP   1             34,2331  1 2424 0            TCF     SATCLEAR       YES - CLEAR ERROR COUNTER + EXIT
 0359  REP  10  LAST  255   34,2332  30 102 1            CAE     FLAGWRD6       CHECK FLAGWRD6
 0360  REP   8  LAST  255   34,2333  7 4105 0            MASK    OCT60000       BITS 14 + 15
 0361                       34,2334  0 0006 1            EXTEND
 0362  REP   1             34,2335  1 2337 0            BZF     ATTDISP        NO SATURN STICK ON
 0363  REP   1             34,2336  0 2420 0            TC      ATERSET        EXIT - SATURN STICK IN USE
 0364  REP   2  LAST  113   34,2337  4 1702 1  ATTDISP   CS      RPSTART        PITCH/ROLL START TIME
 0365  REP  11  LAST  530   34,2340  6 0025 0            AD      TIME1
```

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03651                          34,2341  0 0006 1          EXTEND
03652  REF   1                 34,2342  6 2504 1          BZMF    NOPOLY          IF MINUS THEN ATTITUDE HOLD
0366   REF 240  LAST  514      34,2343  54 154 0          TS      MPAC            MPAC = TIME1 - RPSTART
0367   REF   2  LAST  113      34,2344  55"707 1          TS      SPOLYARG        SAVE FOR USE IN ROLL CALCULATION
0368   REF   2  LAST  113      34,2345  6 1703 1          AD      POLYSTOP        NEG PITCHOVER TIME IN CSECS
0369                           34,2346  0 0006 1          EXTEND
0370                           34,2347  6 2351 1          BZMF    +2
0371   REF   1                 34,2350  1 2416 1          TCF     SATOUT          EXIT IF TIME1 GR THAN (RPSTART-POLYSTOP)
0372   REF   3  LAST  112      34,2351  31"661 1          CAE     POLYNUM
0373   REF  60  LAST  509      34,2352  54 001 1          TS      L
0374   REF   1                 34,2353  3 2510 1          CAF     COEFPOLY        EVALUATE PITCH POLYNOMIAL
0375   REF   1                 34,2354  0 7164 0          TC      POWRSERS        SCALED TO 32 REVOLUTIONS

A0376                                    THE FOLLOWING PAD LOADED COEFFICIENTS ARE
A0377                                    USED TO COMPUTE THE PITCH POLYNOMIAL

A03771                                   ----- SUNDISK SI COEFS -----
A0378                                    POLYNUM         FIVE                    POLYNOMIAL DEGREE -1
A0379                                           +1       2DEC    -.469184028 E-4 A0
A0380                                           +3       2DEC    .137571556 E-2  A1
A0381                                           +5       2DEC    .231502280 E-1  A2
A0382                                           +7       2DEC    -.205929365 E-1 A3
A0383                                           +9D      2DEC    0               A4
A0384                                           +11D     2DEC    0               A5
A0385                                           +13D     2DEC    0               A6
A0386                                    POLYLOC         =       POLYNUM +10D

0387   REF 115  LAST  530      34,2355  3 4714 1          CA      ZERO            RETURN WITH PITCH(32REV)
0388   REF   3  LAST  296      34,2356  54 163 1          TS      MODE            STORED IN MPAC, MPAC +1
0389   REF  70  LAST  531      34,2357  0 6006 1          TC      INTPRET
0390                           34,2360   54201 0          SETPD   SL              32(PITCH(32REV)) = PITCH(REV)
0391                           34,2361   00001 0                  0
0392                           34,2362   20206 1                  5
0393                           34,2363   77606 1          PUSH                    LET  P(RAD) = 2*PI*PITCH(REV)

0394                           34,2364   77650 1          GOTO
0395   REF   1                 34,2365   76103 1                  ATTDISP1        AROUND SETLOC
A0396                                                                    *
A0397                                    CONSTRUCT SM TO S/C MATRIX, TSM

0398   REF   1                 37,2000                    SETLOC  P11TWO
0399                           37,2103                    BANK                    36 IN COL., 34 IN DISK

0400   REF   1                                           COUNT   38/P11

0401                           37,2103   57546 1  ATTDISP1 COS     DCOMP
0402                           37,2104   14017 1          STODL   14D             -.5*COS(P)
0403                           37,2105   77756 0          SIN
0404                           37,2106   14013 0          STODL   10D             .5*SIN(P)
0405   REF   6  LAST  471      37,2107   15332 1                  ZEROVECS
```

```
 0406                          37,2110  00015 0          STORE  12D            0

A0407                                          EVALUATE ROLL = LAUNCHAZ-AZIMUTH-.5+SATRLRT*T
 0409                          37,2111  41335 1          SLOAD  DMP
 0410  REF   3  LAST  533      37,2112  03310 0                 SPOLYARG       TIME1 - RPSTART ,CSECS B-14.
 0411  REF   4  LAST  529      37,2113  03301 0                 SATRLRT
 0412                          37,2114  45231 0          SL     DSU
 0413                          37,2115  20217 1                 14D
 0414  REF  12  LAST  529      37,2116  15330 0                 DPHALF
 0415                          37,2117  45215 0          DAD    DSU            ASSUMING X(SM) ALONG LAUNCH AZIMUTH,
 0416  REF   8  LAST  529      37,2120  02634 1                 LAUNCHAZ       LAUNCHAZ = ANGLE FROM NORTH TO X(SM).
 0417  REF   6  LAST  529      37,2121  02401 0                 AZIMUTH        AZIMUTH = -ANGLE FROM NORTH TO Z(S/C)
 0418                          37,2122  77634 0          RTB                   DETERMINE IF ROLLOUT
 0419  REF   1                 37,2123  70473 0                 RLTST          IS COMPLETED
 0421                          37,2124  71406 0  ATTDISPR PUSH   COS            CONTINUE COMPUTING TSMV
 0422                          37,2125  77606 1          PUSH                  LET  R(RAD) = 2*PI*ROLL(REV)
 0423                          37,2126  72405 0          DMP    SL1
 0424                          37,2127  00017 1                 14D
 0425                          37,2130  14027 1          STODL  22D            -.5*COS(R)*COS(P)
 0426                          37,2131  77676 0          DCOMP
 0427                          37,2132  00023 0          STORE  18D            -.5*COS(R)
 0428                          37,2133  72405 0          DMP    SL1
 0429                          37,2134  00013 0                 10D
 0430                          37,2135  14033 1          STODL  26D            -.5*COS(R)*SIN(P)
 0431                          37,2136  41556 1          SIN    PUSH
 0432                          37,2137  00031 0          STORE  24D            .5*SIN(R)
 0433                          37,2140  72405 0          DMP    SL1
 0434                          37,2141  00017 1                 14D
 0435                          37,2142  14021 1          STODL  16D            -.5*SIN(R)*COS(P)
 0436                          37,2143  77676 0          DCOMP
 0437                          37,2144  72405 0          DMP    SL1
 0438                          37,2145  00013 0                 10D
 0439                          37,2146  24025 0          STOVL  20D            -.5*SIN(R)*SIN(P)
 0440                          37,2147  00013 0                 10D

A0441                                          FROM TSMV FIND THE HALF UNIT VECTORS  XDC,YDC,ZDC = INPUT TO CALCGTA

 0442                          37,2150  77656 1          UNIT
 0443  REF   3  LAST   93      37,2151  26714 1          STOVL  XDC            XDC = .5*UNIT(SIN(P),0,-COS(P))
 0444                          37,2152  00021 1                 16D
 0445                          37,2153  77656 1          UNIT
 0446  REF   3  LAST   93      37,2154  26722 1          STOVL  YDC            YDC = .5*UNIT(-SIN(R)*COS(P),-COS(R),
 0447                          37,2155  00027 1                 22D                                  -SIN(R)*SIN(P))
 0448                          37,2156  77656 1          UNIT
 0449  REF   3  LAST   93      37,2157  36730 0          STCALL ZDC            ZDC = .5*UNIT(-COS(R)*COS(P),SIN(R),
 0450  REF   2  LAST  444      37,2160  47140 1                 CALCGTA                              -COS(R)*SIN(P))

A0451                                          CALL CALCGTA TO COMPUTE DESIRED SM ORIENTATION  OGC,IGC,AND MGC
A0452                                                                                          _   _   _
A0453                                          FIND DIFFERENCE VECTOR  DELTACDU = OGC-CDUX
```

A04531 ENTER HERE IF ATTITUDE HOLD

```
0454                          37,2161  41575 0  NOPOLYM  VLOAD   PUSH
0455  REF  15  LAST  528      37,2162  02760 1           CGC
0456                          37,2163  45006 0           PUSH    CALL
0457  REF   2  LAST  497      37,2164  47432 1                   CDUTRIG
0458                          37,2165  47175 1           VLOAD   RTB
0459                          37,2166  00003 1                   2
0460  REF   3  LAST  407      37,2167  45547 0                   V1STO2S
0461  REF   1                 37,2170  27317 1           STOVL   BOOSTEMP
0462  REF   7  LAST  533      37,2171  15332 1                   ZEROVECS
0463                          37,2172  24001 0           STOVL   0
0464  REF   5  LAST  447      37,2173  00767 1                   CDUSPOT
0465                          37,2174  47034 0           RTB     RTB
0466  REF   4  LAST  535      37,2175  45547 0                   V1STO2S
0467  REF   1                 37,2176  70453 1                   DELSTOR
0468                          37,2177  14013 0           STODL   10D
0469  REF   1                 37,2200  00741 0                   SINCDUZ
0470                          37,2201  72405 0           DMP     SL1
0471                          37,2202  00001 0                   0
0472                          37,2203  60415 1           DAD     SR2
0473                          37,2204  00005 1                   4
0474                          37,2205  77650 1           GOTO
0475  REF   1                 37,2206  70366 0                   ATTDISP2

0476  REF   2  LAST  526      34,2000                    SETLOC  P11ONE
0477                          34,2366                    BANK
0478  REF   2 LAST  526 TO  533'   244   244*           COUNT   34/P11

0479                          34,2366  14021 1  ATTDISP2 STODL   16D
0480  REF   1                 34,2367  00747 0                   COSCDUZ
0481                          34,2370  41405 0           DMP     PUSH
0482                          34,2371  00001 0                   0
0483                          34,2372  72405 0           DMP     SL1
0484  REF   1                 34,2373  00751 1                   COSCDUX
0485                          34,2374  41325 0           PDDL    DMP
0486  REF   1                 34,2375  00743 1                   SINCDUX
0487                          34,2376  00003 1                   2
0488                          34,2377  72415 1           DAD     SL1
0489                          34,2400  77626 0           STADR
0490                          34,2401  63755 0           STODL   17D
0491                          34,2402  72405 0           DMP     SL1
0492  REF   2  LAST  535      34,2403  00743 1                   SINCDUX
0493                          34,2404  41325 0           PDDL    DMP
0494  REF   2  LAST  535      34,2405  00751 1                   COSCDUX
0495                          34,2406  00003 1                   2
0496                          34,2407  72425 1           DSU     SL1
0497                          34,2410  77626 0           STADR
0498                          34,2411  77754 1           STORE   18D
0499                          34,2412  77751 1           TLOAD
```

```
        CGC       IGC
CHANGE IGC   TO   MGC  FOR COMPATIBILITY
       MGC       CGC
WITH Y,Z,X ORDER OF CDUSPOT
 -          DPHI      CGC-CDUX ,PD4
DELTACDU = DTHETA  =  IGC-CDUY ,   0
           DPSI       MGC-CDUZ ,   2
```

```
CHANGE SCALE OF AK TO 2REVS
```

```
16D,  .5(DPHI + DTHETA*SIN(CDUZ))
```

```
17D,  .5(DTHETA*COS(CDUX)*COS(CDUZ)
                          +DPSI*SIN(CDUX))
```

```
18D,  .5(-DTHETA*SIN(CDUX)*COS(CDUZ)
                          +DPSI*COS(CDUX))
```

```
0500                          34,2413  00021 1                 16D
0501  REF   9  LAST  244      34,2414  03077 1          STORE  AK          STORE ATTITUDE ERRORS IN AK,AK1,AK2
0502                          34,2415  77776 1          EXIT

A0503                                  DISPLAY ATTITUDE ERRORS ON FDAI VIA NEEDLER

0504  REF 118  LAST  531      34,2416  0 4555 0 SATOUT  TC     BANKCALL
0505  REF   2  LAST  531      34,2417   42404 1         CADR   NEEDLER
0506  REF   2  LAST  348      34,2420  3 4113 0 ATERSET CAF    OCT31       DELAY .25 SEC
0507  REF 119  LAST  536      34,2421  0 4555 0         TC     BANKCALL    EXECUTION + DELAY =.56SEC APPROX
0508  REF   6  LAST  511      34,2422   01732 0         CADR   DELAYJOB
0509  REF   2  LAST  531      34,2423  0 2326 1         TC     ATERJOB     END OF ATT ERROR DISPLAY CYCLE

0510  REF  31  LAST  474      34,2424  4 4705 0 SATCLEAR CS    BIT8
0511                          34,2425  0 0006 1         EXTEND
0512  REF  24  LAST  380      34,2426  03 012 1         WAND   CHAN12       CLEAR IMU ERROR COUNTER
0513  REF  26  LAST  529      34,2427  0 5301 0         TC     PHASCHNG    TURN OFF PROTECTION
0514                          34,2430   00004 0         OCT    00004       FOR ATTITUDE ERROR DISPLAY
05141 REF 116  LAST  533      34,2431  3 4714 1         CAF    ZERO
05142 REF  10  LAST  536      34,2432  55∝476 1         TS     AK          ZERO OUT
05143 REF   1                 34,2433  55∝477 0         TS     AK1         AKS FOR
05144 REF   1                 34,2434  55∝500 1         TS     AK2         DOWNLINK
0515  REF  65  LAST  530      34,2435  0 5112 0         TC     ENDOFJOB

0516                          34,2436   51575 1 S11.1   VLOAD  ABVAL
0517  REF   7  LAST  510      34,2437   01177 1         VN
0518  REF   5  LAST  276      34,2440   27723 1         STOVL  VMAGI       VI     SCALED 2(7)  IN METERS/CSEC
0519  REF   7  LAST  510      34,2441   01171 1         RN
0520                          34,2442   45246 0         ABVAL  DSU
0521  REF   4  LAST  510      34,2443   05311 1         RPAD
0522  REF   3  LAST  275      34,2444   27735 0         STOVL  ALTI        H      SCALED 2(29) IN METERS
0523  REF   8  LAST  536      34,2445   01171 1         RN
0524                          34,2446   50256 0         UNIT   DOT
0525  REF   8  LAST  536      34,2447   01177 1         VN
0526                          34,2450   77752 1         SL1
0527  REF   2  LAST  275      34,2451   03737 1         STORE  HDOT        HDOT   SCALED 2(7)  IN METERS/CSEC
0528                          34,2452   77616 0         RVQ
0529  REF   2  LAST  535      34,2453  3 1716 0 DELSTOR CA     BOOSTEMP
0530                          34,2454  0 0006 1         EXTEND              STORE DELTACDU INTO PDL 0,2,4
0531  REF 241  LAST  533      34,2455  20 154 0         MSU    MPAC
0532  REF   6  LAST  501      34,2456  50 120 1         INDEX  FIXLOC
0533                          34,2457  54 000 0         TS     0
0534  REF   3  LAST  536      34,2460  3 1717 1         CA     BOOSTEMP +1
0535                          34,2461  0 0006 1         EXTEND
0536  REF 242  LAST  536      34,2462  20 155 1         MSU    MPAC +1
0537  REF   7  LAST  536      34,2463  50 120 1         INDEX  FIXLOC
0538                          34,2464  54 002 1         TS     2
0539  REF   4  LAST  536      34,2465  3 1720 0         CA     BOOSTEMP +2
0540                          34,2466  0 0006 1         EXTEND
0541  REF 243  LAST  536      34,2467  20 156 1         MSU    MPAC +2
```

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 0542   REF   6  LAST  536    34,2470  50 120 1          INDEX  FIXLOC
 0543                         34,2471  54 004 1          TS     4
 0544   REF   2  LAST  280    34,2472  1 6030 0          TCF    DANZIG
 0545   REF 244  LAST  536    34,2473  3 0154 1  RLTST   CA     MPAC          DETERMINE IF ROLLOUT
 05451                        34,2474  0 0006 1          EXTEND               IS COMPLETED
 05452  REF   5  LAST  534    34,2475  7 1701 1          MP     SATRLRT +1
 05453                        34,2476  0 0006 1          EXTEND
 05454  REF   3  LAST  537    34,2477  6 6030 1          BZMF   DANZIG        UNLIKE SIGNS  STILL ROLLING
 0546                         34,2500  0 0006 1          EXTEND               ROLLOUT COMPLETED
 05461  REF   1                34,2501  3 3561 0          DCA    MBDYTCTL +2   ZERO OUT ROLL CONTRIBUTION
 05462  REF 245  LAST  537    34,2502  52 155 1          DXCH   MPAC
 05463  REF   4  LAST  537    34,2503  0 6030 1          TC     DANZIG
 05464  REF  71  LAST  533    34,2504  0 6006 1  NOPOLY  TC     INTPRET       COMES HERE IF
 05465                        34,2505   52001 1          SETPD  GOTO          ATTITUDE HOLD
 05466                        34,2506   00001 0                 0
 05467  REF   1                34,2507   76161 0                 NOPOLYM
 0547   REF   1                34,2510   01673 1  COEFPOLY ADRES  POLYLOC
 0548                         34,2511   01476 0  V06N62  VN     0662
R0552   SATURN TAKEOVER FUNCTION
R0553   ************************

R0554   PROGRAM DESCRIPTION

R0555       MOD NUMBER 1
R0556       MOD BY ELIASSEN

R0557   FUNCTIONAL DESCRIPTION

R0558       DURING THE COASTING PHASE OF SIVB ATTACHED, THE
R0559       ASTRONAUT MAY REQUEST SATURN TAKEOVER THROUGH
R0560       EXTENDED VERB 46 (BITS 13,14 OF DAPDATR1 SET ).
R0561       THE CMC REGARDS RHC COMMANDS AS BODY-AXES RATE
R0562       COMMANDS AND IT TRANSMITS THESE TO SATURN AS DC
R0563       VOLTAGES. THE VALUE OF THE CONSTANT RATE COMMAND
R0564       IS 0.5 DEG/SEC. AN ABSENCE OF RHC ACTIVITY RE-
R0565       SULTS IN A ZERO RATE COMMAND.

R0566       THE FDAI ERROR NEEDLES WILL INDICATE THE VALUE
R0567       OF THE RATE COMMAND.

R0568   CALLING SEQUENCE

R0569       DAPFIG +9D  TC      POSTJUMP
R0570                   CADR    SATSTKON

R0571   SUBROUTINES CALLED

R0572       ENDEXT
R0573       IBNKCALL
R0574       STICKCHK
```

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R0575       NEEDLER
R0576       T5RUPT
R0577       RESUME.

R0578   ASTRONAUT REQUESTS

R0579       ENTRY -  VERB 46 ENTER
R0580                (CONDITION - BITS 13, 14 OF DAPDATR1 SET)

R0581       EXIT  -  VERB 48 ENTER  (FLASH V06N46)
R0582                VERB 21 ENTER  AXXXX ENTER WHERE  A=0 OR 1
R0583                VERB 34 ENTER
R0584                VERB 46 ENTER

R0585   NORMAL EXIT MODE

R0586                VERB 46 ENTER  (SEE ASTRONAUT ABOVE)

R0587   ALARM OR ABORT EXIT MODES

R0588       NONE

R0589   OUTPUT

R0590       SATURN RATES IN  CDUXCMD, CDUYCMD, CDUZCMD

R0591   ERASABLE INITIALIZATION

R0592       DAPDATR1  (BITS 13,14 MUST BE SET)

R0593   DEBRIS

R0594       CENTRALS
R0595       CDUXCMD, CDUYCMD, CDUZCMD

0596                          43,3211                    BANK    43
0597   REF  3  LAST  248      43,2000                    SETLOC  EXTVERBS
0598                          43,3211                    BANK

0599   REF  1                                            COUNT   23/STIKE
0600                          43,3211   0 0006 1  SATSTKON EXTEND
06001  REF  1                 43,3212   3 3227 0         DCA     2REDOSAT
06002                         43,3213   0 0004 0         INHINT
06003  REF  5  LAST  255      43,3214   53∝313 0         DXCH    T5LOC
06004  REF  12 LAST  424      43,3215   3 4672 0         CAF     POSMAX
0601   REF  3  LAST  186      43,3216   54 030 0         TS      TIME5
06011  REF  11 LAST  532      43,3217   4 0102 0         CS      FLAGWRD6    TURN ON BITS 15,14 OF
06012  REF  2  LAST  130      43,3220   7 4105 0         MASK    RELTAB11    FLAGWRD6
06013  REF  12 LAST  538      43,3221   26 102 0         ADS     FLAGWRD6        SATSTICK CONTROL OF T5
060132 REF  21 LAST  531      43,3222   0 4633 0         TC      IBNKCALL    ZERO JET CHANNELS IN 14 MS AND THEN
```

```
060134 REP  1                43,3223   42616 0            CADR   ZEROJET      LEAVE THE T6 CLOCK DISABLED
06014                        43,3224   0 0003 1           RELINT
06015  REP 27 LAST 261       43,3225   0 2121 1           TC     GOPIN        EXIT THUS BECAUSE WE CAME VIA V46

060151 REP  7 LAST 531       E6,1704                      EBANK= BODY3
06016  REP  2 LAST 188       43,3226   02765 1  2REDOSAT 2CADR  REDOSAT
06016                        43,3227   46106 1

060162                       32,2017                      BANK   32
060164 REP  1                23,2000                      SETLOC P11FOUR
060166                       23,2765                      BANK

0602   REP  3 LAST 219       23,2765   22 016 0 REDOSAT   LXCH   BANKRUPT     ALSO COMES HERE FOR RESTARTS
06021                        23,2766   0 0006 1           EXTEND
06022  REP  3 LAST 219       23,2767   22 012 1           QXCH   QRUPT
06023  REP  8 LAST 531       23,2770   4 1501 0           CS     RCSFLAGS     TURN ON BIT3 OF RCSFLAGX
06024  REP 18 LAST 531       23,2771   7 4710 1           MASK   BIT3         FOR
06025  REP  9 LAST 539       23,2772   27=501 0           ADS    RCSFLAGS     NEEDLER INITIALIZATION
0603   REP 22 LAST 538       23,2773   0 4633 0           TC     IBNKCALL
0604   REP  3 LAST 536       23,2774    42404 1           CADR   NEEDLER      DISABLE IMU ERR COUNTERS ETC.
0605   REP 18 LAST 251       23,2775   3 4702 0           CAF    BIT9         SIVB
0606                         23,2776   0 0006 1           EXTEND              TAKEOVER
0607   REP 25 LAST 536       23,2777   05 012 1           WOR    CHAN12       ENABLE
0608                         23,3000   0 0006 1           EXTEND              SET UP T5 CYCLE
0609   REP  1                23,3001   3 3046 0           DCA    2SATSTCK
0610   REP  6 LAST 538       23,3002   53=313 0           DXCH   T5LOC
0611   REP  1                23,3003   3 3044 1           CAF    100MST5      IN 100 MSECS
0612   REP  4 LAST 538       23,3004   54 030 0           TS     TIME5
0613   REP 25 LAST 228       23,3005   1 5222 1           TCF    RESUME       END OF SATURN STICK INITIALIZATION

A0614                                  THIS SECTION IS EXECUTED EVERY 100 MSECS

0615   REP  4 LAST 539       23,3006   22 016 0 SATSTICK  LXCH   BANKRUPT
0616                         23,3007   0 0006 1           EXTEND
0617   REP  4 LAST 539       23,3010   22 012 1           QXCH   QRUPT

0618   REP  2 LAST 539       23,3011   3 3045 0           CAF    2SATSTCK     SET UP RUPT
0619   REP  7 LAST 539       23,3012   55=312 1           TS     T5LOC        LO ORDER LOC SET
0620   REP  2 LAST 539       23,3013   3 3044 1           CAF    100MST5      100 MSECS
0621   REP  5 LAST 539       23,3014   54 030 0           TS     TIME5
0622   REP  1                23,3015   3.3043 0           CAF    STIKBITS
0623                         23,3016   0 0006 1           EXTEND
0624   REP  2 LAST 384       23,3017   06 031 0           RXOR   CHAN31       CHECK IF MAN ROT BITS SAME
0625   REP  2 LAST 539       23,3020   7 3043 1           MASK   STIKBITS
0626   REP 23 LAST 539       23,3021   0 4633 0           TC     IBNKCALL     SET RATE INDICES
0627   REP  1                23,3022    43114 1           CADR   STICKCHK     FOR PITCH YAW AND ROLL

0628   REP  2 LAST 108       23,3023   51=656 0           INDEX  RMANNDX      SET SATURN RATES
0629   REP  1                23,3024   3 3037 0           CA     SATRATE
0630   REP 11 LAST 536       23,3025   55=476 1           TS     AK                                ROLL
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0631  REF  2  LAST  108  23,3028  51'657 1          INDEX  PMANNDX
0632  REF  2  LAST  539  23,3027  3 3037 0          CA     SATRATE
0633  REF  2  LAST  538  23,3030  55'477 0          TS     AK1          PITCH
0634  REF  2  LAST  112  23,3031  51'660 0          INDEX  YMANNDX
0635  REF  3  LAST  540  23,3032  3 3037 0          CA     SATRATE
0636  REF  2  LAST  538  23,3033  55'500 1          TS     AK2          YAW

0637  REF 24  LAST  539  23,3034  0 4633 0          TC     IBNKCALL     FOR SATURN INTERFACE AND FDAI DISPLAY
0638  REF  4  LAST  539  23,3035   42404 1          CADR   NEEDLER
0639  REF 26  LAST  539  23,3036  1 5222 1          TCF    RESUME       END OF SATURN STICK CONTROL
0640                     23,3037   00000 1  SATRATE DEC    0            IN DETENT - ZERO RATE
0641                     23,3040   00476 1          DEC    +318         POS RATE .5D/S R, .3D/S P AND Y
0642                     23,3041   77301 0          DEC    -318         NEG RATE      DITTO
0643                     23,3042   00000 1          DEC    0            POS NEG BITS ON  ASSUME IN DETENT

0644                     23,3043   00077 1  STIKBITS OCT    00077
0645                     23,3044   37766 1  100MSTS  DEC    16374
0646  REF  8  LAST  539  E6,1704                    EBANK= BODY3
0647  REF  1             23,3045   03006 1  2SATSTCK 2CADR  SATSTICK
0647  REF  1             23,3046   46106 1
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