```
L       PINBALL NOUN TABLES

P1000   THE FOLLOWING REFERS TO THE NOUN TABLES
R1001   COMPONENT CODE NUMBER              INTERPRETATION

R1002   00000                             1 COMPONENT
R1003   00001                             2 COMPONENT
R1004   00010                             3 COMPONENT
R1005   X1XXX                             BIT4 = 1. DECIMAL ONLY
R1006   1XXXX                             BIT5 = 1. NO LOAD
R1007   END OF COMPONENT CODE NUMBERS
R1008   SF ROUTINE CODE NUMBER            INTERPRETATION

R1009   00000    OCTAL ONLY
R1010   00001    STRAIGHT FRACTIONAL
R1011   00010    CDU DEGREES (XXX.XX)
R1012   00011    ARITHMETIC SF
R1013   00100    ARITH DP1   OUT(MULT BY 2EXP14 AT END)     IN(STRAIGHT)
R1014   00101    ARITH DP2   OUT(STRAIGHT)                  IN(SL 7 AT END)
R1015   00110    Y OPTICS DEGREES (XX.XXX MAX 89.999)
R1016   00111    ARITH DP3   OUT ( SL 7 AT END)       IN ( STRAIGHT)
R1017   01000    WHOLE HOURS IN R1, WHOLE MINUTES (MOD 60) IN R2,
R1018               SECONDS (MOD 60) 0XX.XX IN R3. *** ALARMS IF USED WITH OCTAL
R1019   01001    MINUTES (MOD 60) IN D1D2, D3 BLANK, SECONDS (MOD 60) IN D4D5
R1020                          LIMITS TO 59B59 IF MAG EXCEEDS THIS VALUE.
R1021                          ALARMS IF USED WITH OCTAL  ********  IN (ALARM)
R1022   01010    ARITH DP4   OUT (STRAIGHT)                   IN (SL 3 AT END)
R10221  01011    ARITH1 SF   OUT(MULT BY 2EXP14 AT END)     IN(STRAIGHT)
R10222  01100    2 INTEGERS IN D1D2, D4D5, D3 BLANK.
R10223                         ALARMS IF USED WITH OCTAL  ********  IN (ALARM)
R1023   END OF SF ROUTINE CODE NUMBERS
R1024   SF CONSTANT CODE NUMBER           INTERPRETATION

R1025.  00000                             WHOLE                        USE ARITH
R1026   00000                             DP TIME SEC (XXX.XX SEC)     USE ARITHDP1
R1027   00001                             SPARE
R1028   00010                             CDU DEGREES                USE CDU DEGREES
R1029   00010                             Y OPTICS DEGREES     USE Y OPTICS DEGREES
R1030   00011                             DP DEGREES (90) XX.XXX DEG  USE ARITHDP3
R1031   00100                             DP DEGREES (360) XXX.XX DEG USE ARITHDP4
R1032   00101                             DEGREES (180) XXX.XX DEG     USE ARITH
R1034   00110                             WEIGHT2 (XXXXX. LBS)         USE ARITH1
R1035   00111                             POSITION5 (XXX.XX NAUTICAL MILES)
R10351                                                                 USE ARITHDP3
R1037   01000                             POSITION4 (XXXX.X NAUTICAL MILES)
R10371                                                                 USE ARITHDP3
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R1038   01001                   VELOCITY2 (XXXXX. FT/SEC)   USE ARITHDP4
R1039   01010                   VELOCITY3 (XXXX.X FT/SEC)   USE ARITHDP3
R1040   01011                   ELEVATION DEGREES(89.99$MAX) USE ARITH
R10401  01100                   TRIM DEGREES (XXX.XX DEG)   USE ARITH
R10402  01101                   INERTIA (XXXXXE5. SLUG FT FT)  USE ARITH
R104025 01101                   THRUST MOMENT (XXXXXE5 FT LBS) USE ARITH
R10403  01110                   VELOCITY/2VS (XXXXX. FT/SEC)USE ARITHDP4
R10404  01111                   POSITION6 (XXXX.X NAUT MI)  USE ARITHDP3
R10405  10000                   DRAG ACCELERATION (XXX.XX G)USE ARITHDP2
R10406  10001                   POSITION8 (XXXX.X NAUT MI)  USE ARITHDP3
R10407  10010                   POSITION9 (XXX.XX NAUT M1)  USE ARITHDP4
R10408  10011                   VELOCITY4 (XXXX.X FT/SEC)   USE ARITHDP2
R1041   END OF SF CONSTANT CODE NUMBERS
R1042   FOR GREATER THAN SINGLE PRECISION SCALES, PUT ADDRESS OF MAJOR PART INTO
R1043   NOUN TABLES.
R1044   OCTAL LOADS PLACE +0 INTO MAJOR PART, DATA INTO MINOR PART.
R1045   OCTAL DISPLAYS SHOW MINOR PART ONLY.
R1046   TO GET AT BOTH MAJOR AND MINOR PARTS(IN OCTAL), USE NOUN 01.
R1047   A NOUN MAY BE DECLARED 'DECIMAL ONLY' BY MAKING BIT4=1 OF ITS COMPONENT
R1048   CODE NUMBER. IF THIS NOUN IS USED WITH ANY OCTAL DISPLAY VERB, OR IF
R1049   DATA IS LOADED IN OCTAL, IT ALARMS.

R1050   IN LOADING AN 'HOURS, MINUTES, SECONDS' NOUN, ALL 3 WORDS MUST BE
R1051   LOADED, OR ALARM.
R1052   ALARM IF AN ATTEMPT IS MADE TO LOAD 'SPLIT MINUTES/SECONDS' (MMSS).
R1053   THIS IS USED FOR DISPLAY ONLY.
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L PINBALL NOUN TABLES

P1054 THE FOLLOWING ROUTINES ARE FOR READING THE NOUN TABLES AND THE SF TABLES
R1055 (WHICH ARE IN A SEPARATE BANK FROM THE REST OF PINBALL). THESE READING
R1056 ROUTINES ARE IN THE SAME BANK AS THE TABLES. THEY ARE CALLED BY DXCH Z.
R1057 LODNNTAB LOADS NNADTEM WITH THE NNADTAB ENTRY, NNTYPTEM WITH THE
R1058 NNTYPTAB ENTRY. IF THE NOUN IS MIXED, IDAD1TEM IS LOADED WITH THE FIRST
R1059 IDADDTAB ENTRY, IDAD2TEM THE SECOND IDADDTAB ENTRY, IDAD3TEM THE THIRD
R1060 IDADDTAB ENTRY, RUTMXTEM WITH THE RUTMXTAB ENTRY. MIXBR IS SET FOR
R1061 MIXED OR NORMAL NOUN.

```
1200                          06,3262                    BANK    06
120001 REF   1                42,2000                    SETLOC  PINBALL3
120002                        42,2062                    BANK

12001  REF   1                                          COUNT   42/NOUNS

1201   REF   1                42,2062  52 152 0  LODNNTAB DXCH   IDAD2TEM      SAVE RETURN INFO IN IDAD2TEM, IDAD3TEM.
1202   REF   3  LAST  233     42,2063  51=002 1           INDEX   NOUNREG
1203   REF   1                42,2064  3 2133 1           CAF     NNADTAB
1204   REF   1                42,2065  54 146 0           TS      NNADTEM
1205   REF   4  LAST  265     42,2066  51=002 1           INDEX   NOUNREG
1206   REF   1                42,2067  3 2277 1           CAF     NNTYPTAB
1207   REF   1                42,2070  54 147 1           TS      NNTYPTEM
1208   REF   5  LAST  265     42,2071  4 1002 0           CS      NOUNREG
1209   REF   1                42,2072  6 4726 0           AD      MIXCON
1210                          42,2073  0 0006 1           EXTEND
1211   REF   1                42,2074  6 2100 1           BZMF    LODMIXNN     NOUN NUMBER G/E FIRST MIXED NOUN
1212   REF  12  LAST  236     42,2075  3 4712 1           CAF     ONE          NOUN NUMBER L/ FIRST MIXED NOUN
1213   REF   1                42,2076  54 140 0           TS      MIXBR        NORMAL.  +1 INTO MIXBR.
1214   REF   1                42,2077  0 2116 0           TC      LODNLV
1215   REF   5  LAST  243     42,2100  3 4711 1  LODMIXNN CAF     TWO          MIXED.  +2 INTO MIXBR.
1216   REF   2  LAST  265     42,2101  54 140 0           TS      MIXBR
1217   REF   6  LAST  265     42,2102  51=002 1           INDEX   NOUNREG
1218   REF   1                42,2103  3 2777 1           CAF     RUTMXTAB -40D FIRST MIXED NOUN = 40.
1219   REF   1                42,2104  54 153 1           TS      RUTMXTEM
1220   REF   3  LAST  198     42,2105  3 4747 1           CAF     LOW10
1221   REF   2  LAST  265     42,2106  7 0146 0           MASK    NNADTEM
1222   REF  30  LAST  255     42,2107  54 002 1           TS      Q            TEMP
1223   REF  71  LAST  261     42,2110  50 000 1           INDEX   A
1224   REF   1                42,2111  3 2563 0           CAF     IDADDTAB
1225   REF   1                42,2112  54 150 1           TS      IDAD1TEM     LOAD IDAD1TEM WITH FIRST IDADDTAB ENTRY
1226                          42,2113  0 0006 1           EXTEND
1227   REF  31  LAST  265     42,2114  5 0002 0           INDEX   Q            LOAD IDAD2TEM WITH 2ND IDADDTAB ENTRY
1228   REF   2  LAST  265     42,2115  3 2565 0           DCA     IDADDTAB +1  LOAD IDAD3TEM WITH 3RD IDADDTAB ENTRY.
1229   REF   2  LAST  265     42,2116  52 152 0  LODNLV   DXCH    IDAD2TEM     PUT RETURN INFO INTO A, L.
1230   REF   1                42,2117  52 006 0           DXCH    Z

1231   REF   2  LAST  243      4726            MIXCON   =       OCT50        FIRST MIXED NOUN =40.  (DEC 40)
R1232  GTSFOUT LOADS SPTEMP1, SPTEMP2 WITH THE DP SFOUTAB ENTRIES.
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L PINBALL NOUN TABLES

```
 1233   REF  1                  42,2120  52 124 1  GTSFOUT  DXCH   SFTEMP1
 1234                           42,2121  0 0006 1           EXTEND
 1235   REF  72  LAST  265      42,2122  5 0000 1           INDEX  A
 1236   REF  1                  42,2123  3 2514 0           DCA    SFOUTAB
 1237   REF  2   LAST  266      42,2124  52 124 1  SFCOM    DXCH   SFTEMP1
 1238   REF  2   LAST  265      42,2125  52 006 0           DXCH   Z
R1239   GTSFIN LOADS SFTEMP1, SFTEMP2 WITH THE DP SFINTAB ENTRIES.

 1240   REF  3   LAST  266      42,2126  52 124 1  GTSFIN   DXCH   SFTEMP1
 1241                           42,2127  0 0006 1           EXTEND
 1242   REF  73  LAST  266      42,2130  5 0000 1           INDEX  A
 1243   REF  1                  42,2131  3 2444 1           DCA    SFINTAB
 1244   REF  1                  42,2132  1 2124 0           TCF    SFCOM
A1400
 1401                           42,2133  00000 1  NNADTAB   OCT    00000
 1402                           42,2134  40000 0            OCT    40000
 1403                           42,2135  40000 0            OCT    40000
 1404                           42,2136  40000 0            OCT    40000
 1405                           42,2137  00000 1            OCT    0
 1406   REF  3   LAST  227      42,2140  01045 1            ECADR  DSPTEM1
 1407   REF  1                  42,2141  01131 0            ECADR  OPTION1
 1408   REF  1                  42,2142  01003 0            ECADR  XREG
A14081
A14082
 1409   REF  2   LAST  80       42,2143  01363 0            ECADR  ALMCADR
 1410   REF  4   LAST  179      42,2144  00375 0            ECADR  FAILREG
 1411                           42,2145  77776 1            OCT    77776
 1412                           42,2146  00000 1            OCT    00000
 1413   REF  1                  42,2147  01051 1            ECADR  OPTIONX
A14131
 1414                           42,2150  00000 1            OCT    00000
 1415                           42,2151  00000 1            OCT    0
 1416                           42,2152  77777 0            OCT    77777
 1417   REF  2   LAST  74       42,2153  01051 1            ECADR  DSPTEMX
 1418   REF  3   LAST  238      42,2154  01333 0            ECADR  CPHIX
 1419   REF  7   LAST  244      42,2155  01155 1            ECADR  THETAD
 1420   REF  8   LAST  266      42,2156  01155 1            ECADR  THETAD
 1421   REF  5   LAST  238      42,2157  00032 0            ECADR  CDUX
 1422   REF  1                  42,2160  00037 0            ECADR  PIPAX
 1423   REF  9   LAST  266      42,2161  01155 1            ECADR  THETAD
 1424                           42,2162  00000 1            OCT    00000
 1425   REF  3   LAST  240      42,2163  01051 1            ECADR  DSPTEM2 +1
 1426   REF  4   LAST  266      42,2164  01045 1            ECADR  DSPTEM1
A14261
 1427   REF  5   LAST  266      42,2165  01045 1            ECADR  DSPTEM1
 1428   REF  4   LAST  257      42,2166  01362 1            ECADR  SMODE
```

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2X(SFCONUM) ARRIVES IN SFTEMP1.

2X(SFCONUM) ARRIVES IN SFTEMP1.

NN NORMAL NOUNS
00 NOT IN USE
01 SPECIFY MACHINE ADDRESS (FRACTIONAL)
02 SPECIFY MACHINE ADDRESS (WHOLE)
03 SPECIFY MACHINE ADDRESS (DEGREES)
04 SPARE
05 ANGULAR ERROR/DIFFERENCE
06 OPTION CODE
07 ECADR OF WORD TO BE MODIFIED
ONES FOR BITS TO BE MODIFIED
1 TO SET OR 0 TO RESET SELECTED BITS
08 ALARM DATA
09 ALARM CODES
10 CHANNEL TO BE SPECIFIED
11 SPARE
12 OPTION CODE
(USED BY EXTENDED VERBS ONLY)
13 SPARE
14 SPARE
15 INCREMENT MACHINE ADDRESS
16 TIME OF EVENT (HRS,MIN,SEC)
17 ASTRONAUT TOTAL ATTITUDE
18 AUTO MANEUVER BALL ANGLES
19 BYPASS ATTITUDE TRIM MANEUVER
20 ICDU ANGLES
21 PIPAS
22 NEW ICDU ANGLES
23 SPARE
24 DELTA TIME FOR AGC CLOCK(HRS,MIN,SEC)
25 CHECKLIST
(USED WITH PLEASE PERFORM ONLY)
26 PRIO/DELAY, ADRES, BRCON
27 SELF TEST ON/OFF SWITCH

L PINBALL NOUN TABLES

```
1429                                  42,2167  00000 1    OCT    0          28 SPARE
1430   REF   6  LAST  266             42,2170  01045 1    ECADR  DSPTEM1    29 XSM LAUNCH AZIMUTH
1431   REF   7  LAST  267             42,2171  01045 1    ECADR  DSPTEM1    30 TARGET CODES
1432   REF   8  LAST  267             42,2172  01045 1    ECADR  DSPTEM1    31 TIME OF LANDING SITE (HRS,MIN,SEC)
1433   REF   2  LAST   89             42,2173  02345 1    ECADR  -TPER      32 TIME TO PERIGEE (HRS,MIN,SEC)
1434   REF  15  LAST  213             42,2174  03412 0    ECADR  TIG        33 TIME OF IGNITION (HRS,MIN(SEC)
1435   REF   9  LAST  267             42,2175  01045 1    ECADR  DSPTEM1    34 TIME OF EVENT (HRS,MIN,SEC)
1436   REF   3  LAST  212             42,2176  03660 1    ECADR  TTOGO      35 TIME TO GO TO EVENT (HRS,MIN,SEC)
1437   REF   9  LAST  240             42,2177  00024 1    ECADR  TIME2      36 TIME OF AGC CLOCK (HRS,MIN,SEC)
1438   REF   3  LAST  171             42,2200  03662 0    ECADR  TTPI       37 TIG OF TPI (HRS,MIN,SEC)
1439   REF   2  LAST   83             42,2201  01516 1    ECADR  TET        38 TIME OF STATE VECTOR
1440   REF   1                        42,2202  02640 1    ECADR  T3TOT4     39 DELTA TIME TO TRANSFER (HRS,MIN,SEC)
R14401 END OF NNADTAB FOR NORMAL NOUNS
A14402                                                                     NN  MIXED NOUNS
1441                                  42,2203  64000 0    OCT    64000      40 TIME TO IGNITION/CUTOFF
A14411                                                                        VG
A14412                                                                        DELTA V (ACCUMULATED)
1442                                  42,2204  02003 0    OCT    02003      41 TARGET  AZIMUTH
A14421                                                                               ELEVATION
1443                                  42,2205  24006 1    OCT    24006      42 APOGEE
A14431                                                                        PERIGEE
A14432                                                                        DELTA V (REQUIRED)
1444                                  42,2206  24011 1    OCT    24011      43 LATITUDE
A14441                                                                        LONGITUDE
A14442                                                                        ALTITUDE
1445                                  42,2207  64014 0    OCT    64014      44 APOGEE
A14451                                                                        PERIGEE
A14452                                                                        TFF
1446                                  42,2210  64017 0    OCT    64017      45 MARKS (VHF - OPTICS)
A14461                                                                        TTI OF NEXT BURN
A14462                                                                        MGA
1447                                  42,2211  02022 0    OCT    02022      46 AUTOPILOT CONFIGURATION
1448                                  42,2212  22025 0    OCT    22025      47 THIS VEHICLE WEIGHT
A14481                                                                        OTHER VEHICLE WEIGHT
1449                                  42,2213  22030 1    OCT    22030      48 PITCH TRIM
A14491                                                                        YAW TRIM
1450                                  42,2214  24033 1    OCT    24033      49 DELTA R
A14501                                                                        DELTA V
A14502                                                                        VHF OR OPTICS CODE
1451                                  42,2215  64036 0    OCT    64036      50 SPLASH ERROR
A14511                                                                        PERIGEE
A14512                                                                        TFF
1452                                  42,2216  22041 1    OCT    22041      51 S-BAND ANTENNA PITCH
A14521                                                                               YAW
1453                                  42,2217  00044 1    OCT    00044      52 CENTRAL ANGLE OF ACTIVE VEHICLE
1454                                  42,2220  24047 1    OCT    24047      53 RANGE
A14541                                                                        RANGE RATE
A14542                                                                        PHI
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1455					
A14551	42,2221	24052 0	OCT	24052	
A14552					
1458					
A14581	42,2222	24055 1	OCT	24055	
A14582					
1459					
A14591	42,2223	22060 1	OCT	22060	
1460	42,2224	20063 0	OCT	20063	
1461	42,2225	24066 1	OCT	24066	
A14611					
A14612					
1462	42,2226	24071 1	OCT	24071	
1463	42,2227	24074 1	OCT	24074	
A14631					
A14632					
1464					
A14641	42,2230	24077 1	OCT	24077	
A14642					
1465					
A14651	42,2231	24102 1	OCT	24102	
A14652					
1466					
A14661	42,2232	64105 1	OCT	64105	
A14662					
1467					
A14671	42,2233	24110 1	OCT	24110	
A14672					
1468					
A14681	42,2234	24113 1	OCT	24113	
1470					
A14701	42,2235	24116 1	OCT	24116	
A14702					
1471					
A14711	42,2236	24121 0	OCT	24121	
A14712					
1472					
A14721	42,2237	24124 0	OCT	24124	
A14722					
1473					
A14731	42,2240	24127 0	OCT	24127	
A14732					
1474					
A14741	42,2241	04132 0	OCT	04132	
A14742					
1475					
A14751	42,2242	04135 1	OCT	04135	
A14752					
1476					
A14761	42,2243	24140 1	OCT	24140	

54 RANGE
RANGE RATE
THETA
55 PERIGEE CODE
ELEVATION ANGLE
CENTRAL ANGLE
56 REENTRY ANGLE,
DELTA V
57 DELTA R
58 PERIGEE ALT
DELTA V TPI
DELTA V TPF
59 DELTA VELOCITY LOS
60 GMAX
VPRED
GAMMA EI
61 IMPACT LATITUDE
IMPACT LONGITUDE
HEADS UP/DOWN
62 INERTIAL VEL MAG (VI)
ALT RATE CHANGE (HDOT)
ALT ABOVE PAD RADIUS (H)
63 RANGE 297,431 TO SPLASH (RTGO)
PREDICTED INERT VEL (VIO)
TIME TO GO TO 297,431 (TIE)
64 DRAG ACCELERATION
INERTIAL VELOCITY (VI)
RANGE TO SPLASH
65 SAMPLED AGC TIME (HRS,MIN,SEC)
(FETCHED IN INTERRUPT)
66 COMMAND BANK ANGLE (BETA)
CROSS RANGE ERROR
DOWN RANGE ERROR
67 RANGE TO TARGET
PRESENT LATITUDE
PRESENT LONGITUDE
68 COMMAND BANK ANGLE (BETA)
INERTIAL VELOCITY (VI)
ALT RATE CHANGE (RDOT)
69 BETA
DL
VL
70 STAR CODE
LANDMARK DATA
HORIZON DATA
71 STAR CODE
LANDMARK
HORIZON
72 DELT ANG
DELT ALT

L PINBALL NOUN TABLES

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A14762
 1477                42,2244   00000 1          OCT    0
 1478                42,2245   00000 1          OCT    0
 1479                42,2246   00000 1          OCT    0
 1480                42,2247   00000 1          OCT    0
 1481                42,2250   00000 1          OCT    0
 1482                42,2251   00000 1          OCT    0
 1483                42,2252   00000 1          OCT    0
 1484                42,2253   64170 0          OCT    64170
A14841
A14842
 1485                42,2254   24173 1          OCT    24173
 1486                42,2255   00000 1          OCT    00000
 1487                42,2256   24201 1          OCT    24201
 1488                42,2257   24204 1          OCT    24204
 1489                42,2260   24207 1          OCT    24207
 1490                42,2261   24212 0          OCT    24212
 1491                42,2262   02215 0          OCT    02215
A14911
 1492                42,2263   24220 1          OCT    24220
 1493                42,2264   24223 1          OCT    24223
A14931
A14932
 1494                42,2265   24226 1          OCT    24226
A14941
A14942
 1495                42,2266   02231 0          OCT    02231
A14951
 1496                42,2267   02234 0          OCT    02234
A14961
 1497                42,2270   04237 0          OCT    04237
 1498                42,2271   02242 1          OCT    02242
A14981
 1499                42,2272   04245 0          OCT    04245
 1500                42,2273   04250 1          OCT    04250
 1501                42,2274   04253 1          OCT    04253
 1502                42,2275   04256 1          OCT    04256
 1503                42,2276   24261 1          OCT    24261
A15031
A15032
R1504  END OF NNADTAB FOR MIXED NOUNS
A1800
 1801                42,2277   00000 1  NNTYPTAB OCT    00000
 1802                42,2300   04040 1          OCT    04040
 1803                42,2301   04140 0          OCT    04140
 1804                42,2302   04102 0          OCT    04102
 1805                42,2303   00000 1          OCT    0
 1806                42,2304   00504 0          OCT    00504
```

```
   SEARCH OPTION
73 SPARE
74 SPARE
75 SPARE
76 SPARE
77 SPARE
78 SPARE
79 SPARE
80 TIME TO IGNITION/CUTOFF
   VG
   DELTA V (ACCUMULATED)
81 DELTA V (LV)
82 SPARE
83 DELTA V (BODY)
84 DELTA V (OTHER VEHICLE)
85 VG (BODY)
86 DELTA V (LV)
87 MARK DATA  SHAFT
              TRUNION
88 HALF UNIT SUN OR PLANET VECTOR
89 LANDMARK  LATITUDE .
             LONGITUDE/2
             ALTITUDE
90 Y
   Y DOT
   PSI
91 CCDU ANGLES  SHAFT
                TRUNION
92 NEW OPTICS ANGLES  SHAFT
                      TRUNION
93 DELTA GYRO ANGLES
94 NEW OPTICS ANGLES  SHAFT
                      TRUNNION
95 PREFERRED ATTITUDE ICDU ANGLES
96 +X-AXIS ATTITUDE ICDU ANGLES
97 SYSTEM TEST INPUTS
98 SYSTEM TEST RESULTS
99 RMS IN POSITION
   RMS IN VELOCITY
   RMS OPTION

NN        NORMAL NOUNS
00 NOT IN USE
01 3CMP  FRACTIONAL
02 3CMP  WHOLE
03 3CMP  CDU DEGREES
04 SPARE
05 1CMP  DPDEG(360)
```

L PINBALL NOUN TABLES

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1807                    42,2305   02000 0       OCT   02000
1808                    42,2306   04000 0       OCT   04000
1809                    42,2307   04000 0       OCT   04000
1810                    42,2310   04000 0       OCT   04000
1811                    42,2311   00000 1       OCT   00000
1812                    42,2312   00000 1       OCT   00000
1813                    42,2313   02000 0       OCT   02000
1814                    42,2314   00000 1       OCT   00000
1815                    42,2315   00000 1       OCT   0
1816                    42,2316   00000 1       OCT   00000
1817                    42,2317   24400 0       OCT   24400
1818                    42,2320   04102 0       OCT   04102
1819                    42,2321   04102 0       OCT   04102
1820                    42,2322   04102 0       OCT   04102
1821                    42,2323   04102 0       OCT   04102
1822                    42,2324   04140 0       OCT   04140
1823                    42,2325   04102 0       OCT   04102
1824                    42,2326   00000 1       OCT   00000
1825                    42,2327   24400 0       OCT   24400
1826                    42,2330   04140 0       OCT   04140
1827                    42,2331   04000 0       OCT   04000
1828                    42,2332   00140 1       OCT   00140
1829                    42,2333   00000 1       OCT   0
1830                    42,2334   20102 0       OCT   20102
1831                    42,2335   04140 0       OCT   04140
1832                    42,2336   24400 0       OCT   24400
1833                    42,2337   24400 0       OCT   24400
1834                    42,2340   24400 0       OCT   24400
1835                    42,2341   24400 0       OCT   24400
1836                    42,2342   24400 0       OCT   24400
1837                    42,2343   24400 0       OCT   24400
1838                    42,2344   24400 0       OCT   24400
1839                    42,2345   24400 0       OCT   24400
1840                    42,2346   24400 0       OCT   24400
R18401  END OF NNTYPTAB FOR NORMAL NOUNS
A18402
1841                    42,2347   24500 1       OCT   24500
A18411
1842                    42,2350   00542 1       OCT   00542
1843                    42,2351   24410 1       OCT   24410
A18431
1844                    42,2352   20204 0       OCT   20204
A18441
1845                    42,2353   00410 1       OCT   00410
A18451
1846                    42,2354   10000 0       OCT   10000
A18461
1847                    42,2355   00000 1       OCT   00000
```

```
06 2COMP  OCTAL ONLY
07 3COMP  OCTAL ONLY
08 3COMP  OCTAL ONLY
09 3COMP  OCTAL ONLY
10 1COMP  OCTAL ONLY
11        SPARE
12 2COMP  OCTAL ONLY
13        SPARE
14 SPARE
15 1COMP  OCTAL ONLY
16 3COMP  HMS (DEC ONLY)
17 3COMP  CDU DEG
18 3COMP  CDU DEG
19 3COMP  CDU DEG
20 3COMP  CDU DEGREES
21 3COMP  WHOLE
22 3COMP  CDU DEGREES
23        SPARE
24 3COMP  HMS (DEC ONLY)
25 3COMP  WHOLE
26 3COMP  OCTAL ONLY
27 1COMP  WHOLE
28        SPARE
29 1COMP  CDU DEG (DEC ONLY)
30 3COMP  WHOLE
31 3COMP  HMS (DEC ONLY)
32 3COMP  HMS (DEC ONLY)
33 3COMP  HMS (DEC ONLY)
34 3COMP  HMS (DEC ONLY)
35 3COMP  HMS (DEC ONLY)
36 3COMP  HMS (DEC ONLY)
37 3COMP  HMS (DEC ONLY)
38 3COMP  HMS (DEC ONLY)
39 3COMP  HMS (DEC ONLY)

NN   MIXED NOUNS
40 3COMP  MIN/SEC, VEL3, VEL3
          (NO LOAD, DEC ONLY)
41 2COMP  CDU DEG, ELEV DEG
42 3COMP  POS4, POS4, VEL3
          (DEC ONLY)
43 3COMP  DPDEG(360), DPDEG(360), POS4
          (DEC ONLY)
44 3COMP  POS4, POS4, MIN/SEC
          (NO LOAD, DEC ONLY)
45 3COMP  2INT, MIN/SEC, DPDEG(360)
          (NO LOAD, DEC ONLY)
46 2COMP  OCTAL ONLY FOR EACH
```

1848		42,2356	00306 1	OCT	00306	47 2COMP	WEIGHT2 FOR EACH (DEC ONLY)
A18481							
1849		42,2357	00614 1	OCT	00614	48 2COMP	TRIM DEG, TRIM DEG (DEC ONLY)
A18491							
1850		42,2360	00510 0	OCT	00510	49 3COMP	POS4, VEL3, WHOLE (DEC ONLY)
A18501							
1851		42,2361	00417 0	OCT	00417	50 3COMP	POS8, POS4, MIN/SEC (NO LOAD, DEC ONLY)
A18511							
1852		42,2362	00204 1	OCT	00204	51 2COMP	DPDEG(360), DPDEG(360) (DEC ONLY)
A18521							
1853		42,2363	00004 0	OCT	00004	52 1COMP	DPDEG(360)
1854		42,2364	10507 1	OCT	10507	53 3COMP	POS5, VEL3, DPDEG(360) (DEC ONLY)
A18541							
1855		42,2365	10507 1	OCT	10507	54 3COMP	POS5, VEL3, DPDEG(360) (DEC ONLY)
A18551							
1856		42,2366	10200 1	OCT	10200	55 3COMP	WHOLE, DPDEG(360), DPDEG(360) (DEC ONLY)
A18581							
1859		42,2367	00444 0	OCT	00444	56 2COMP	DPDEG(360), VEL2 (DEC ONLY)
A18591							
1860		42,2370	00010 0	OCT	00010	57 1COMP	POS4 (DEC ONLY)
A18601							
1861		42,2371	24510 0	OCT	24510	58 3COMP	POS4, VEL3, VEL3 (DEC ONLY)
A18611							
1862		42,2372	24512 1	OCT	24512	59 3COMP	VEL3 FOR EACH (DEC ONLY)
A18621							
1863		42,2373	10440 0	OCT	10440	60 3COMP	WHOLE, VEL2, DPDEG(360) (DEC ONLY)
A18631							
1864		42,2374	00204 1	OCT	00204	61 3COMP	DPDEG(360), DPDEG(360), WHOLE (DEC ONLY)
A18641							
1865		42,2375	20451 0	OCT	20451	62 3COMP	VEL2, VEL2, POS4 (DEC ONLY)
A18651							
1866		42,2376	00457 1	OCT	00457	63 3COMP	POS6, VEL2, MIN/SEC (NO LOAD, DEC ONLY)
A18661							
1867		42,2377	36460 0	OCT	36460	64 3COMP	DRAG ACCEL, VEL2, POS6 (DEC ONLY)
A18671							
1868		42,2400	00000 1	OCT	00000	65 3COMP	HMS (DEC ONLY)
1869		42,2401	37044 0	OCT	37044	66 3COMP	DPDEG(360), POS8, POS8 (DEC ONLY)
A18691							
1870		42,2402	10217 1	OCT	10217	67 3COMP	POS6, DPDEG(360), DPDEG(360) (DEC ONLY)
A18701							
1871		42,2403	34444 1	OCT	34444	68 3COMP	DPDEG(360), VEL2, VEL/2VS (DEC ONLY)
A18711							
1872		42,2404	35004 0	OCT	35004	69 3COMP	DPDEG(360), DRAG ACCEL,VEL/2VS (DEC ONLY)
A18721							
1873		42,2405	00000 1	OCT	00000	70 3COMP	OCTAL ONLY FOR EACH
1874		42,2406	00000 1	OCT	0	71 3COMP	OCTAL ONLY FOR EACH
1875		42,2407	00404 1	OCT	00404	72 3COMP	DPDEG(360), POS4, WHOLE (DEC ONLY)
A18751							
1876		42,2410	00000 1	OCT	0	73	SPARE
1877		42,2411	00000 1	OCT	0	74	SPARE

L PINBALL NOUN TABLES

USER'S PAGE NO. 10 E0 S4

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1878
1879                42,2412  00000 1          OCT   0
1880                42,2413  00000 1          OCT   0
1881                42,2414  00000 1          OCT   0
1882                42,2415  00000 1          OCT   0
1883                42,2416  00000 1          OCT   0
A18831              42,2417  22440 1          OCT   22440
1884
A18841              42,2420  24512 1          OCT   24512
1885
1886                42,2421  00000 1          OCT   00000
A18861              42,2422  24512 1          OCT   24512
1887
A18871              42,2423  24512 1          OCT   24512
1888
A18881              42,2424  24512 1          OCT   24512
1889
A18891              42,2425  22451 1          OCT   22451
1890
1891                42,2426  00102 1          OCT   00102
A18912              42,2427  00000 1          OCT   0
1892
A18921              42,2430  16143 0          OCT   16143
1893
A18931              42,2431  10507 1          OCT   10507
1894
1895                42,2432  00102 1          OCT   00102
1896                42,2433  00102 1          OCT   00102
1897                42,2434  06143 1          OCT   06143
1898                42,2435  00102 1          OCT   00102
1899                42,2436  04102 0          OCT   04102
1900                42,2437  04102 0          OCT   04102
1901                42,2440  00000 1          OCT   00000
1902                42,2441  00000 1          OCT   00000
A19021              42,2442  01162 0          OCT   01162
R1903  END OF NNTYPTAB FOR MIXED NOUNS
2200                42,2443  00006 1  SFINTAB OCT   00006
2201                42,2444  03240 1          OCT   03240
2202                42,2445  00000 1          OCT   00000
2203                42,2446  00000 1          OCT   00000
2204                42,2447  00000 1          OCT   00000
2205                42,2450  00000 1          OCT   00000
2206                42,2451  10707 0          OCT   10707
2207                42,2452  03435 0          OCT   03435
2208                42,2453  13070 1          OCT   13070
2209                42,2454  34345 1          OCT   34345
2210                42,2455  00005 1          OCT   00005
2211                42,2456  21616 0          OCT   21616
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 75        SPARE
 76        SPARE
 77        SPARE
 78        SPARE
 79        SPARE
 80 3COMP  MIN/SEC, VEL2, VEL2
           (NO LOAD, DEC ONLY)
 81 3COMP  VEL3 FOR EACH
           (DEC ONLY)
 82        SPARE
 83 3COMP  VEL3 FOR EACH
           (DEC ONLY)
 84 3COMP  VEL3 FOR EACH
           (DEC ONLY)
 85 3COMP  VEL3 FOR EACH
           (DEC ONLY)
 86 3COMP  VEL2 FOR EACH
           (DEC ONLY)
 87 2COMP  CDU DEG, Y OPTICS DEG
 88 3COMP  FRAC FOR EACH
           (DEC ONLY)
 89 3COMP  DPDEG(90), DPDEG(90), POS5
           (DEC ONLY)
 90 3COMP  POS5, VEL3, DPDEG(360)
           (DEC ONLY)
 91 2COMP  CDU DEG, Y OPTICS DEG
 92 2COMP  CDU DEG, Y OPTICS DEG
 93 3COMP  DPDEG(90) FOR EACH
 94 2COMP  CDU DEG, Y OPTICS DEG
 95 3COMP  CDU DEG FOR EACH
 96 3COMP  CDU DEG FOR EACH
 97 3COMP  WHOLE FOR EACH
 98 3COMP  WHOLE, FRAC, WHOLE
 99 3COMP  POS9, VEL4, WHOLE
           (DEC ONLY)

WHOLE, DP TIME (SEC)

SPARE

CDU DEGREES, Y OPTICS DEGREES
   (SPCONS IN DEGINSF, OPTDEGIN)
DP DEGREES (90)
        UPPED BY 1
DP DEGREES (360)(POINT BETWN BITS 11-12)
        UPPED BY 1
DEGREES (180)
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L PINBALL NOUN TABLES

```
2212                    42,2457  26113 0        OCT   26113          WEIGHT2
2213                    42,2460  31713 0        OCT   31713
2214                    42,2461  00070 0        OCT   00070          POSITION5
2215                    42,2462  20460 1        OCT   20460
2216                    42,2463  01065 0        OCT   01065          POSITION4
2217                    42,2464  05740 1        OCT   05740
2218                    42,2465  11414 0        OCT   11414          VELOCITY2       (POINT BETWN BITS 11-12)
2219                    42,2466  31463 1        OCT   31463
2220                    42,2467  07475 0        OCT   07475          VELOCITY3
2221                    42,2470  16051 1        OCT   16051
2222                    42,2471  00001 0        OCT   00001          ELEVATION DEGREES
2223                    42,2472  03434 1        OCT   03434
2224                    42,2473  00002 0        OCT   00002          TRIM DEGREES
2225                    42,2474  22245 1        OCT   22245
2226                    42,2475  00014 1        OCT   00014          INERTIA, THRUST MOMENT
2227                    42,2476  35607 0        OCT   35607
2228                    42,2477  07606 0        OCT   07606          VELOCITY/2VS
2229                    42,2500  06300 1        OCT   06300
2230                    42,2501  16631 1        OCT   16631          POSITION 6
2231                    42,2502  11307 0        OCT   11307
2232                    42,2503  12000 1        OCT   12000          DRAG ACCELERATION (POINT BETWN BITS 7-8)
2233                    42,2504  00000 1        OCT   00000
2234                    42,2505  27176 1        OCT   27176          POSITION 8
2235                    42,2506  14235 0        OCT   14235
2236                    42,2507  16102 0        2DEC  1852 E3 B-22   POSITION9
2236                    42,2510  14000 1
2237                    42,2511  07475 0        2DEC  30.48 B-7      VELOCITY4
2237                    42,2512  16051 1
                                                                      END OF SFINTAB
A2290                   42,2513  05174 0  SFOUTAB OCT   05174        WHOLE, DP TIME (SEC)
2300                    42,2514  13261 0        OCT   13261
2301                    42,2515  00000 1        OCT   00000          SPARE
2302                    42,2516  00000 1        OCT   00000
2303                    42,2517  00000 1        OCT   00000          CDU DEGREES, Y OPTICS DEGREES
2304                    42,2520  00000 1        OCT   00000             (SFCONS IN DEGOUTSF, OPTDEGOUT)
2305                    42,2521  00714 0        OCT   00714          DP DEGREES (90) (POINT BETWN BITS 7-8)
2306                    42,2522  31463 1        OCT   31463
2307                    42,2523  13412 1        OCT   13412          DP DEGREES (360)
2308                    42,2524  07534 1        OCT   07534
2309                    42,2525  05605 1        OCT   05605          DEGREES (180)
2310                    42,2526  03656 1        OCT   03656
2311                    42,2527  00001 0        OCT   00001          WEIGHT2
2312                    42,2530  16170 0        OCT   16170
2313                    42,2531  00441 0        OCT   00441          POSITION5
2314                    42,2532  34306 0        OCT   34306
2315                    42,2533  07176 0        OCT   07176          POSITION4
2316                    42,2534  21603 1        OCT   21603
2317                    42,2535  15340 1        OCT   15340          VELOCITY2
2318
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L PINBALL NOUN TABLES

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2319
2320
2321
2322
2323
2324
2325
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2327
2328
2329
2330
2331
2332
2333
2334
2335
2336
2336
2337
2337
A2390
A2400
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                                42,2536  15340 1        OCT    15340
                                42,2537  01031 1        OCT    01031
                                42,2540  21032 0        OCT    21032
                                42,2541  34631 1        OCT    34631
                                42,2542  23146 0        OCT    23146
                                42,2543  14340 0        OCT    14340
                                42,2544  24145 1        OCT    24145
                                42,2545  02363 0        OCT    02363
                                42,2546  03721 0        OCT    03721
                                42,2547  20373 1        OCT    20373
                                42,2550  02122 1        OCT    02122
                                42,2551  00424 0        OCT    00424
                                42,2552  30446 1        OCT    30446
                                42,2553  00631 0        OCT    00631
                                42,2554  23146 0        OCT    23146
                                42,2555  00260 0        OCT    00260
                                42,2556  06213 1        OCT    06213
                                42,2557  11036 1        2DEC   .283092873
                                42,2560  06144 0
                                42,2561  01031 1        2DEC   .032808399
                                42,2562  21032 0
```

VELOCITY3 (POINT BETWN BITS 7-8)

ELEVATION DEGREES

TRIM DEGREES

INERTIA, THRUST MOMENT

VELOCITY/2VS

POSITION 6 (POINT BETWN BITS 7-8)

DRAG ACCELERATION

POSITION 8

POSITION9

VELOCITY4

END OF SFOUTAB

```
2401  REF   4  LAST  267    42,2563  03660 1  IDADDTAB ECADR  TTOGO
2402  REF   1               42,2564  03653 1           ECADR  VGDISP
2403  REF   2  LAST  115    42,2565  03425 1           ECADR  DVTOTAL
2404  REF  10  LAST  267    42,2566  01045 1           ECADR  DSPTEM1
2405  REF  11  LAST  274    42,2567  01046 1           ECADR  DSPTEM1 +1
2406                        42,2570  00000 1           OCT    0
2407  REF   3  LAST  169    42,2571  02363 0           ECADR  HAPO
2408  REF   1               42,2572  02365 0           ECADR  HPER
2409  REF   2  LAST  274    42,2573  03653 1           ECADR  VGDISP
2410  REF   4  LAST  176    42,2574  01103 1           ECADR  LAT
2411  REF   3  LAST  176    42,2575  01105 1           ECADR  LONG
2412  REF   3  LAST  176    42,2576  01107 0           ECADR  ALT
2413  REF   2  LAST   89    42,2577  02351 1           ECADR  HAPOX
2414  REF   2  LAST   89    42,2600  02353 0           ECADR  HPERX
2415  REF   2  LAST   89    42,2601  02343 1           ECADR  TFF
2416  REF   3  LAST  180    42,2602  01125 0           ECADR  VHFCNT
2417  REF   5  LAST  274    42,2603  03660 1           ECADR  TTOGO
2418  REF   3  LAST  202    42,2604  03625 0           ECADR  +MGA
2419  REF  13  LAST  248    42,2605  03066 1           ECADR  DAPDATR1
2420  REF   1               42,2606  03067 0           ECADR  DAPDATR2
2421                        42,2607  00000 1           OCT    0
2422  REF   3  LAST  210    42,2610  03074 1           ECADR  CSMMASS
2423  REF   4  LAST  173    42,2611  03073 0           ECADR  LEMMASS
2424                        42,2612  00000 1           OCT    00000
```

NN	SF CONSTANT	SF ROUTINE
40	MIN/SEC	M/S
40	VEL3	DP3
40	VEL3	DP3
41	CDU DEG	CDU
41	ELEV DEG	ARTH
41	SPARE COMPONENT	
42	POS4	DP3
42	POS4	DP3
42	VEL3	DP3
43	DPDEG(360)	DP4
43	DPDEG(360)	DP4
43	POS4	DP3
44	POS4	DP3
44	POS4	DP3
44	MIN/SEC	M/S
45	2INT	2INT
45	MIN/SEC	M/S
45	DPDEG(360)	DP4
46	OCTAL ONLY	OCT
46	OCTAL ONLY	OCT
46	SPARE COMPONENT	
47	WEIGHT2	ARTH1
47	WEIGHT2	ARTH1
47	SPARE COMPONENT	

L PINBALL NOUN TABLES

2425	REP	11	LAST	255	42,2613	03025	0
2426	REP	1			42,2614	03026	0
2427					42,2615	00000	1
2428	REP	1			42,2616	03501	0
2429	REP	2	LAST	275	42,2617	03503	1
2430	REP	3	LAST	275	42,2620	03505	1
2431	REP	2	LAST	169	42,2621	02355	0
2432	REP	3	LAST	274	42,2622	02353	0
2433	REP	3	LAST	274	42,2623	02343	1
2434	REP	3	LAST	244	42,2624	02320	1
2435	REP	1			42,2625	02322	0
2436					42,2626	00000	1
2437	REP	2	LAST	91	42,2627	02632	1
2438					42,2630	00000	1
2439					42,2631	00000	1
2440	REP	6	LAST	171	42,2632	02320	1
2441	REP	2	LAST	88	42,2633	02322	0
2442	REP	3	LAST	171	42,2634	02324	0
2443	REP	7	LAST	275	42,2635	02320	1
2444	REP	3	LAST	275	42,2636	02322	0
2445	REP	4	LAST	275	42,2637	02324	0
2446	REP	1			42,2640	03645	0
2447	REP	4	LAST	171	42,2641	03743	1
2448	REP	3	LAST	171	42,2642	03753	0
2449	REP	2	LAST	125	42,2643	03633	1
2450	REP	2	LAST	125	42,2644	03631	0
2451					42,2645	00000	1
2452	REP	4	LAST	171	42,2646	02610	1
2453					42,2647	00000	1
2454					42,2650	00000	1
2455	REP	1			42,2651	02640	1
2456	REP	3	LAST	91	42,2652	02634	1
2457	REP	3	LAST	171	42,2653	02636	0
2458	REP	7	LAST	92	42,2654	02610	1
2459	REP	8	LAST	275	42,2655	02612	0
2460	REP	9	LAST	275	42,2656	02614	0
2461	REP	2	LAST	117	42,2657	03721	0
2462	REP	5	LAST	174	42,2660	03766	0
2463	REP	4	LAST	173	42,2661	03770	1
2464	REP	4	LAST	173	42,2662	03400	0
2465	REP	2	LAST	115	42,2663	03402	1
2466	REP	2	LAST	110	42,2664	03326	0
2467	REP	2	LAST	117	42,2665	03722	0
2468	REP	1			42,2666	03736	0
2469	REP	2	LAST	118	42,2667	03734	1
2470	REP	4	LAST	118	42,2670	03713	1
2471	REP	4	LAST	174	42,2671	03724	0
2472	REP	4	LAST	174	42,2672	03726	1
2473	REP	2	LAST	116	42,2673	03637	0
2474	REP	3	LAST	275	42,2674	03722	0

ECADR	PACTOFF	48 TRIM DEG	ARTH
ECADR	YACTOFF	48 TRIM DEG	ARTH
OCT	00000	48 SPARE COMPONENT	
ECADR	N49DISP	49 POS4	DP3
ECADR	N49DISP +2	49 VEL3	DP3
ECADR	N49DISP +4	49 WHOLE	ARTH
ECADR	RSP-REC	50 POS6	DP3
ECADR	HPERX	50 POS4	DP3
ECADR	TFF	50 MIN/SEC	M/S
ECADR	RHOSB	51 DPDEG(360)	
ECADR	GAMMASB	51 DPDEG(360)	DP4
OCT	0	51 SPARE COMPONENT	
ECADR	ACTCENT	52 DPDEG(360)	DP4
OCT	00000	52 SPARE COMPONENT	
OCT	00000	52 SPARE COMPONENT	
ECADR	RANGE	53 POS5	DP1
ECADR	RRATE	53 VEL3	DP3
ECADR	RTHETA	53 DPDEG(360)	DP4
ECADR	RANGE	54 POS5	DP1
ECADR	RRATE	54 VEL3	DP3
ECADR	RTHETA	54 DPDEG(360)	DP4
ECADR	NN1	55 WHOLE	ARTH
ECADR	ELEV	55 DPDEG(360)	DP4
ECADR	CENTANG	55 DPDEG(360)	DP4
ECADR	RTEGAM2D	56 DPDEG(360)	DP4
ECADR	RTEDVD	56 VEL2	DP4
OCT	0	56 SPARE COMPONENT	
ECADR	DELTAR	57 POS4	DP3
OCT	0	57 SPARE COMPONENT	
OCT	0	57 SPARE COMPONENT	
ECADR	POSTTPI	58 POS4	DP3
ECADR	DELVTPI	58 VEL3	DP3
ECADR	DELVTPF	58 VEL3	DP3
ECADR	DVLOS	59 VEL3	DP3
ECADR	DVLOS +2	59 VEL3	DP3
ECADR	DVLOS +4	59 VEL3	DP3
ECADR	GMAX	60 WHOLE	ARTH
ECADR	VPRED	60 VEL2	DP4
ECADR	GAMMAEI	60 DPDEG(360)	DP4
ECADR	LAT(SPL)	61 DPDEG(360)	DP4
ECADR	LNG(SPL)	61 DPDEG(360)	DP4
ECADR	HEADSUP	61 WHOLE	ARTH
ECADR	VMAGI	62 VEL2	DP4
ECADR	HDOT	62 VEL2	DP4
ECADR	ALTI	62 POS4	DP3
ECADR	RTGO	63 POS6	DP3
ECADR	VIO	63 VEL2	DP4
ECADR	TTE	63 MIN/SEC	M/S
ECADR	D	64 DRAG ACCEL	DP2
ECADR	VMAGI	64 VEL2	DP4

L PINBALL NOUN TABLES

2475	REF	1			42,2675	03713	1	ECADR	RTGON64	64	POS6 DP3
2476	REF	2	LAST	219	42,2676	00013	0	ECADR	SAMPTIME	65	HMS (MIXED ONLY TO KEEP CODE 65) HMS
2477	REF	3	LAST	276	42,2677	00013	0	ECADR	SAMPTIME	65	HMS HMS
2478	REF	4	LAST	276	42,2700	00013	0	ECADR	SAMPTIME	65	HMS HMS
2479	REF	2	LAST	110	42,2701	03315	0	ECADR	ROLLC	66	DPDEG(360) DP4
2480	REF	1			42,2702	03675	0	ECADR	XINGERR	66	POS8 DP3
2481	REF	2	LAST	117	42,2703	03715	1	ECADR	DNRNGERR	66	POS6 DP3
2482	REF	1			42,2704	03713	1	ECADR	RTGON67	67	POS6 DP3
2483	REF	5	LAST	274	42,2705	01103	1	ECADR	LAT	67	DPDEG(360) DP4
2484	REF	4	LAST	274	42,2706	01105	1	ECADR	LONG	67	DPDEG(360) DP4
2485	REF	3	LAST	276	42,2707	03315	0	ECADR	ROLLC	68	DPDEG(360) DP4
2486	REF	4	LAST	275	42,2710	03722	0	ECADR	VMAGI	68	VEL2 DP4
2487	REF	2	LAST	117	42,2711	03677	1	ECADR	RDOT	68	VEL/2VS DP4
2488	REF	4	LAST	276	42,2712	03315	0	ECADR	ROLLC	69	DPDEG(360) DP4
2489	REF	1			42,2713	03174	0	ECADR	Q7	69	DRAG ACCEL DP2
2490	REF	1			42,2714	03766	0	ECADR	VL	69	VEL/2VS DP4
2491	REF	1			42,2715	00735	0	ECADR	STARCODE	70	OCTAL ONLY OCT
2492	REF	10	LAST	261	42,2716	02751	0	ECADR	LANDMARK	70	OCTAL ONLY OCT
2493	REF	2	LAST	95	42,2717	02752	0	ECADR	HORIZON	70	OCTAL ONLY OCT
2494	REF	2	LAST	276	42,2720	00735	0	ECADR	STARCODE	71	OCTAL ONLY OCT
2495	REF	11	LAST	276	42,2721	02751	0	ECADR	LANDMARK	71	OCTAL ONLY OCT
2496	REF	3	LAST	276	42,2722	02752	0	ECADR	HORIZON	71	OCTAL ONLY OCT
2497	REF	2	LAST	92	42,2723	02616	1	ECADR	THETZERO	72	DPDEG(360) DP4
2498	REF	1			42,2724	03753	0	ECADR	DELHITE	72	POS4 DP3
2499	REF	1			42,2725	01132	0	ECADR	OPTION2	72	WHOLE ARTH
2500					42,2726	00000	1	OCT	0	73	SPARE
2501					42,2727	00000	1	OCT	0	73	SPARE
2502					42,2730	00000	1	OCT	0	73	SPARE
2503					42,2731	00000	1	OCT	0	74	SPARE
2504					42,2732	00000	1	OCT	0	74	SPARE
2505					42,2733	00000	1	OCT	0	74	SPARE
2506					42,2734	00000	1	OCT	0	75	SPARE
2507					42,2735	00000	1	OCT	0	75	SPARE
2508					42,2736	00000	1	OCT	0	75	SPARE
2509					42,2737	00000	1	OCT	0	76	SPARE
2510					42,2740	00000	1	OCT	0	76	SPARE
2511					42,2741	00000	1	OCT	0	76	SPARE
2512					42,2742	00000	1	OCT	0	77	SPARE
2513					42,2743	00000	1	OCT	0	77	SPARE
2514					42,2744	00000	1	OCT	0	77	SPARE
2515					42,2745	00000	1	OCT	0	78	SPARE
2516					42,2746	00000	1	OCT	0	78	SPARE
2517					42,2747	00000	1	OCT	0	78	SPARE
2518					42,2750	00000	1	OCT	0	79	SPARE
2519					42,2751	00000	1	OCT	0	79	SPARE
2520					42,2752	00000	1	OCT	0	79	SPARE
2521	REF	6	LAST	274	42,2753	03660	1	ECADR	TTOGO	80	MIN/SEC M/S
2522	REF	3	LAST	274	42,2754	03653	1	ECADR	VGDISP	80	VEL2 DP4
2523	REF	3	LAST	274	42,2755	03425	1	ECADR	DVTOTAL	80	VEL2 DP4
2524	REF	1			42,2756	03404	1	ECADR	DELVLVC	81	VEL3 DP3

L . PINBALL NOUN TABLES

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2525  REF  2  LAST  276  42,2757  03406 0
2526  REF  3  LAST  277  42,2760  03410 1
2527                     42,2761  00000 1
2528                     42,2762  00000 1
2529                     42,2763  00000 1
2530  REF  3  LAST  208  42,2764  03374 1
2531  REF  4  LAST  277  42,2765  03676 0
2532  REF  5  LAST  277  42,2766  03700 0
2533  REF  1              42,2767  03537 0
2534  REF  2  LAST  277  42,2770  03541 1
2535  REF  3  LAST  277  42,2771  03543 0
2536  REF  3  LAST  122  42,2772  03664 0
2537  REF  4  LAST  277  42,2773  03666 1
2538  REF  5  LAST  277  42,2774  03670 0
2539  REF  4  LAST  277  42,2775  03404 1
2540  REF  5  LAST  277  42,2776  03406 0
2541  REF  6  LAST  277  42,2777  03410 1
2542  REF  16 LAST  252  42,3000  03730 0
2543  REF  17 LAST  277  42,3001  03732 1
2544                     42,3002  00000 1
2545  REF  3  LAST  209  42,3003  02765 1
2546  REF  4  LAST  277  42,3004  02767 0
2547  REF  5  LAST  277  42,3005  02771 1
2548  REF  1              42,3006  01103 1
2549  REF  2  LAST  89   42,3007  02357 1
2550  REF  2  LAST  89   42,3010  02361 1
2551  REF  8  LAST  275  42,3011  02320 1
2552  REF  4  LAST  275  42,3012  02322 0
2553  REF  5  LAST  275  42,3013  02324 0
2554  REF  7  LAST  219  42,3014  00036 1
2555  REF  6  LAST  219  42,3015  00035 1
2556                     42,3016  00000 1
2557  REF  3  LAST  236  42,3017  02773 0
2558  REF  3  LAST  236  42,3020  02775 0
2559                     42,3021  00000 1
2560  REF  6  LAST  237  42,3022  02757 0
2561  REF  7  LAST  277  42,3023  02761 0
2562  REF  8  LAST  277  42,3024  02763 1
2563  REF  18 LAST  277  42,3025  03730 0
2564  REF  19 LAST  277  42,3026  03732 1
2565                     42,3027  00000 1
2566  REF  2  LAST  124  42,3030  03722 0
2567  REF  3  LAST  277  42,3031  03723 1
2568  REF  4  LAST  277  42,3032  03724 0
2569  REF  4  LAST  266  42,3033  01333 0
2570  REF  5  LAST  277  42,3034  01334 1
2571  REF  6  LAST  277  42,3035  01335 0
2572  REF  12 LAST  274  42,3036  01045 1
2573  REF  13 LAST  277  42,3037  01046 1
2574  REF  14 LAST  277  42,3040  01047 0
```

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ECADR  DELVLVC +2      81 VEL3                DP3
ECADR  DELVLVC +4      81 VEL3                DP3
OCT    00000           82 SPARE
OCT    00000           82 SPARE
OCT    00000           82 SPARE
ECADR  DELVIMU         83 VEL3                DP3
ECADR  DELVIMU +2      83 VEL3                DP3
ECADR  DELVIMU +4      83 VEL3                DP3
ECADR  DELVOV          84 VEL3                DP3
ECADR  DELVOV  +2      84 VEL3                DP3
ECADR  DELVOV  +4      84 VEL3                DP3
ECADR  VGBODY          85 VEL3                DP3
ECADR  VGBODY +2       85 VEL3                DP3
ECADR  VGBODY +4       85 VEL3                DP3
ECADR  DELVLVC         86 VEL2                DP4
ECADR  DELVLVC +2      86 VEL2                DP4
ECADR  DELVLVC +4      86 VEL2                DP4
ECADR  MRKBUF1 +3      87 CDU DEG             CDU
ECADR  MRKBUF1 +5      87 Y OPTICS DEG        YOPT
OCT    0               87 SPARE COMPONENT
ECADR  STAR            88 FRAC                FRAC
ECADR  STAR +2         88 FRAC                FRAC
ECADR  STAR +4         88 FRAC                FRAC
ECADR  LANDLAT         89 DPDEG(90)           DP3
ECADR  LANDLONG        89 DPDEG(90)           DP3
ECADR  LANDALT         89 POS5                DP1
ECADR  RANGE           90 POS5                DP1
ECADR  RRATE           90 VEL3                DP3
ECADR  RTHETA          90 DPDEG(360)          DP4
ECADR  CDUS            91 CDU DEG             CDU
ECADR  CDUT            91 Y OPTICS DEG        YOPT
OCT    0               91 SPARE COMPONENT
ECADR  SAC             92 CDU DEG             CDU
ECADR  PAC             92 Y OPTICS DEG        YOPT
OCT    0               92 SPARE COMPONENT
ECADR  CGC             93 DPDEG(90)           DP3
ECADR  CGC     +2      93 DPDEG(90)           DP3
ECADR  CGC     +4      93 DPDEG(90)           DP3
ECADR  MRKBUF1 +3      94 CDU DEG             CDU
ECADR  MRKBUF1 +5      94 Y OPTICS DEG        YOPT
OCT    0               94 SPARE
ECADR  PRAXIS          95 CDU DEG             CDU
ECADR  PRAXIS +1       95 CDU DEG             CDU
ECADR  PRAXIS +2       95 CDU DEG             CDU
ECADR  CPHIX           96 CDU DEG             CDU
ECADR  CPHIX +1        96 CDU DEG             CDU
ECADR  CPHIX +2        96 CDU DEG             CDU
ECADR  DSPTEM1         97 WHOLE               ARTH
ECADR  DSPTEM1 +1      97 WHOLE               ARTH
ECADR  DSPTEM1 +2      97 WHOLE               ARTH
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2575  REF   4  LAST  266     42,3041   01050 0          ECADR  DSPTEM2
2576  REF   5  LAST  278     42,3042   01051 1          ECADR  DSPTEM2 +1
2577  REF   6  LAST  278     42,3043   01052 1          ECADR  DSPTEM2 +2
2578  REF   1                42,3044   02320 1          ECADR  WWPOS
2579  REF   1                42,3045   02322 0          ECADR  WWVEL
2580  REF   1                42,3046   02324 0          ECADR  WWOPT
R2600 END OF IDADDTAB
A2800
```

```
98 WHOLE                ARTH
98 FRAC                 FRAC
98 WHOLE                ARTH
99 POS9                 DP4
99 VEL4                 DP2
99 WHOLE                ARTH
```

NN SF ROUTINES

```
2801                    42,3047   16351 1  RUTMXTAB OCT   16351     40 M/S, DP3, DP3
2802                    42,3050   00142 0           OCT   00142     41 CDU, ARTH
2803                    42,3051   16347 0           OCT   16347     42 DP3, DP3, DP3
2804                    42,3052   16512 0           OCT   16512     43 DP4, DP4, DP3
2805                    42,3053   22347 1           OCT   22347     44 DP3, DP3, M/S
2806                    42,3054   24454 1           OCT   24454     45 2INT, M/S, DP4
2807                    42,3055   00000 1           OCT   00000     46 OCT, OCT
2808                    42,3056   00553 1           OCT   00553     47 ARITH1, ARITH1
2809                    42,3057   00143 1           OCT   00143     48 ARTH, ARTH
2810                    42,3060   06347 1           OCT   06347     49 DP3, DP3, ARTH
2811                    42,3061   22347 1           OCT   22347     50 DP3, DP3, M/S
2812                    42,3062   00512 1           OCT   00512     51 DP4, DP4
2813                    42,3063   00012 1           OCT   00012     52 DP4
2814                    42,3064   24344 1           OCT   24344     53 DP1, DP3, DP4
2815                    42,3065   24344 1           OCT   24344     54 DP1, DP3, DP4
2816                    42,3066   24503 1           OCT   24503     55 ARTH, DP4 , DP4
2817                    42,3067   00512 1           OCT   00512     56 DP4, DP4
2818                    42,3070   00007 0           OCT   00007     57 DP3
2819                    42,3071   16347 0           OCT   16347     58 DP3, DP3, DP3
2820                    42,3072   16347 0           OCT   16347     59 DP3, DP3, DP3
2821                    42,3073   24503 1           OCT   24503     60 ARTH, DP4, DP4
2822                    42,3074   06512 1           OCT   06512     61 DP4, DP4, ARTH
2823                    42,3075   16512 0           OCT   16512     62 DP4, DP4, DP3
2824                    42,3076   22507 0           OCT   22507     63 DP3, DP4, M/S
2825                    42,3077   16505 0           OCT   16505     64 DP2, DP4, DP3
2826                    42,3100   20410 0           OCT   20410     65 HMS, HMS, HMS
2827                    42,3101   16352 1           OCT   16352     66 DP4, DP3, DP3
2828                    42,3102   24507 0           OCT   24507     67 DP3, DP4, DP4
2829                    42,3103   24512 1           OCT   24512     68 DP4, DP4, DP4
2830                    42,3104   24252 1           OCT   24252     69 DP4, DP2, DP4
2831                    42,3105   00000 1           OCT   00000     70 OCT, OCT, OCT
2832                    42,3106   00000 1           OCT   0         71 OCT, OCT, OCT
2833                    42,3107   06352 0           OCT   06352     72 DP4, DP3, ARTH
2834                    42,3110   00000 1           OCT   0         73 SPARE
2835                    42,3111   00000 1           OCT   0         74 SPARE
2836                    42,3112   00000 1           OCT   0         75 SPARE
2837                    42,3113   00000 1           OCT   0         76 SPARE
2838                    42,3114   00000 1           OCT   0         77 SPARE
2839                    42,3115   00000 1           OCT   0         78 SPARE
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2840                    42,3116   00000 1     OCT   0            79 SPARE
2841                    42,3117   24511 1     OCT   24511        80 M/S, DP4, DP4
2842                    42,3120   16347 0     OCT   16347        81 DP3, DP3, DP3
2843                    42,3121   00000 1     OCT   00000        82 SPARE
2844                    42,3122   16347 0     OCT   16347        83 DP3, DP3, DP3
2845                    42,3123   16347 0     OCT   16347        84 DP3, DP3, DP3
2846                    42,3124   16347 0     OCT   16347        85 DP3, DP3, DP3
2847                    42,3125   24512 1     OCT   24512        86 DP4, DP4, DP4
2848                    42,3126   00302 0     OCT   00302        87 CDU, YOPT
2849                    42,3127   02041 0     OCT   02041        88 FRAC FOR EACH
2850                    42,3130   10347 0     OCT   10347        89 DP3, DP3, DP1
2851                    42,3131   24344 1     OCT   24344        90 DP1, DP3, DP4
2852                    42,3132   00302 0     OCT   00302        91 CDU, YOPT
2853                    42,3133   00302 0     OCT   00302        92 CDU, YOPT
2854                    42,3134   16347 0     OCT   16347        93 DP3, DP3, DP3
2855                    42,3135   00302 0     OCT   00302        94 CDU, YOPT
2856                    42,3136   04102 0     OCT   04102        95 CDU, CDU, CDU
2857                    42,3137   04102 0     OCT   04102        96 CDU, CDU, CDU
2858                    42,3140   06143 1     OCT   06143        97 ARTH, ARTH, ARTH
2859                    42,3141   06043 0     OCT   06043        98 ARTH, FRAC, ARTH
2860                    42,3142   06252 1     OCT   06252        99 DP4, DP2, ARTH
R2870   END OF RUTMXTAB
 2871   REP   2 LAST   32   30,2000                  SBANK= LOWSUPER
```

L CSM GEOMETRY

```
0001                        22,2000                 BANK    22
0002  REF  1                23,2000                 SETLOC  COMGEOM1
0003                        23,2000                 BANK
```

R0004 THIS ROUTINE TAKES THE SHAFT AND TRUNNION ANGLES AS READ BY THE CM OPTICAL SYSTEM AND CONVERTS THEM INTO A UNIT
R0006 VECTOR REFERENCED TO THE NAVIGATION BASE COORDINATE SYSTEM AND COINCIDENT WITH THE SEXTANT LINE OF SIGHT.

R0008 THE INPUTS ARE 1) THE SEXTANT SHAFT AND TRUNNION ANGLES ARE STORED SP IN LOCATIONS 3 AND 5 RESPECTIVELY OF THE
R0010 MARK VAC AREA. 2) THE COMPLEMENT OF THE BASE ADDRESS OF THE MARK VAC AREA IS STORED SP AT LOCATION X1 OF YOUR
R0012 JOB VAC AREA.

R0013 THE OUTPUT IS A HALF-UNIT VECTOR IN NAVIGATION BASE COORDINATES AND STORED AT LOCATION 32D OF THE VAC AREA. THE
R0015 OUTPUT IS ALSO AVAILABLE AT MPAC.

```
0016  REF  1                                       COUNT   23/GEOM

0017                        23,2000  47133 0  SXTNB  SLOAD*  RTB          PUSHDOWN  00,02,04,(17D-19D),32D-36D
0018                        23,2001  00006 1                 5,1          TRUNNION = TA
0019  REF  1                23,2002  45510 1                 CDULOGIC
0020                        23,2003  41434 1         RTB     PUSH
0021  REF  1                23,2004  46027 0                 SXTLOGIC
0022                        23,2005  72556 1         SIN     SL1
0023                        23,2006  66606 1         PUSH    SLOAD*       PD2 = SIN(TA)
0024                        23,2007  00004 0                 3,1          SHAFT = SA
0025                        23,2010  41434 1         RTB     PUSH         PD4 = SA
0026  REF  2  LAST  280     23,2011  45510 1                 CDULOGIC

0027                        23,2012  41346 0         COS     DMP
0028                        23,2013  00003 1                 2
0029  REF  1                23,2014  14041 1         STODL   STARM         COS(SA)SIN(TA)

0030                        23,2015  41356 1         SIN     DMP
0031                        23,2016  77626 0         STADR
0032  REF  2  LAST  280     23,2017  63734 1         STODL   STARM +2      SIN(SA)SIN(TA)

0033                        23,2020  77746 1         COS
0034  REF  3  LAST  280     23,2021  24045 0         STOVL   STARM +4
0035  REF  4  LAST  280     23,2022  00041 1                 STARM         STARM = 32D
0036                        23,2023  76521 0         MXV     VSL1
0037  REF  1                23,2024  06302 0                 NB1NB2
0038                        23,2025  00041 1         STORE   32D
0039                        23,2026  77616 0         RVQ
0040  REF  1                23,2027  3 2323 1 SXTLOGIC CAF   10DEGS-      CORRECT FOR 19.775 DEGREE OFFSET
0041  REF  33  LAST  257    23,2030  26 154 0        ADS     MPAC
0042  REF  1                23,2031  3 4676 1        CAF     QUARTER
0043  REF  1                23,2032  0 7256 1        TC      SHORTMP
0044  REF  1                23,2033  0 6030 1        TC      DANZIG
```

L CSM GEOMETRY

R0045 CALCSXA COMPUTES THE SEXTANT SHAFT AND TRUNNION ANGLES REQUIRED TO POSITION THE OPTICS SUCH THAT A STAR LINE-
R0047 OF-SIGHT LIES ALONG THE STAR VECTOR. THE ROUTINE TAKES THE GIVEN STAR VECTOR AND EXPRESSES IT AS A VECTOR REF-
R0049 ERENCED TO THE OPTICS COORDINATE SYSTEM. IN ADDITION IT SETS UP THREE UNIT VECTORS DEFINING THE X,Y, AND Z AXES
R0051 REFERENCED TO THE OPTICS COORDINATE SYSTEM.

R0052 THE INPUTS ARE 1) THE STAR VECTOR REFERRED TO PRESENT STABLE MEMBER COORDINATES STORED AT STAR. 2) SAME ANGLE
R0054 INPUT AS *SMNB*, I.E. SINES AND COSINES OF THE CDU ANGLES, IN THE ORDER Y Z X, AT SINCDU AND COSCDU. A CALL
R0056 TO CDUTRIG WILL PROVIDE THIS INPUT.

R0057 THE OUTPUTS ARE THE SEXTANT SHAFT AND TRUNNION ANGLES STORED DP AT SAC AND PAC RESPECTIVELY. (LOW ORDER PART
R0059 EQUAL TO ZERO).

```
0060                        23,2034  77220 1  CALCSXA  ITA     VLOAD          PUSHDOWN  00-26D,28D,30D,32D-36D
0061                        23,2035  00034 0           .       28D
0062  REF   6  LAST  277    23,2036  02766 1           .       STAR
0063                        23,2037  77624 1           CALL
0064  REF   1               23,2040  47577 1                   *SMNB*
0065                        23,2041  76521 0           MXV     VSL1
0066  REF   1               23,2042  06280 0                   NB2NB1
0067  REF   7  LAST  281    23,2043  26766 1           STOVL   STAR
0068  REF   1               23,2044  15330 0                   HIUNITX
0069  REF   2  LAST   91    23,2045  26555 0           STOVL   XNB1
0070  REF   1               23,2046  15326 1                   HIUNITY
0071  REF   2  LAST   91    23,2047  26563 0           STOVL   YNB1
0072  REF   1               23,2050  15324 0                   HIUNITZ
0073  REF   2  LAST   91    23,2051  36571 1           STCALL  ZNB1
0074  REF   1               23,2052  46076 1                   SXTANG1
```

L CSM GEOMETRY

R0075 SXTANG COMPUTES THE SEXTANT SHAFT AND TRUNNION ANGLES REQUIRED TO POSITION THE OPTICS SUCH THAT A STAR LINE-OF-
R0077 SIGHT LIES ALONG THE STAR VECTOR.

R0078 THE INPUTS ARE 1) THE STAR VECTOR REFERRED TO ANY COORDINATE SYSTEM STORED AT STAR. 2) THE NAVIGATION BASE
R0080 COORDINATES REFERRED TO THE SAME COORDINATE SYSTEM. THESE THREE HALF-UNIT VECTORS ARE STORED AT XNB, YNB, AND
R0082 ZNB.

R0083 THE OUTPUTS ARE THE SEXTANT SHAFT AND TRUNNION ANGLES STORED DP AT SAC AND PAC RESPECTIVELY. (LOW ORDER PART
R0085 EQUAL TO ZERO).

```
0086
0087                                  23,2053  47020 0  SXTANG   ITA      RTB          PUSHDOWN  16D,18D,22D-26D,28D
                                      23,2054  00034 0           28D
0088  REF  1                         23,2055  45657 1           TRANSP1  EREF WRT NB2
0089                                  23,2056  64375 1  VLOAD    MXV
0090  REF  1                         23,2057  02714 1           XNB
0091  REF  2  LAST  281               23,2060  06260 0           NB2NB1
0092                                  23,2061  77772 0  VSL1
0093  REF  3  LAST  281               23,2062  26555 0  STOVL    XNB1
0094  REF  1                         23,2063  02722 1           YNB
0095                                  23,2064  76521 0  MXV      VSL1
0096  REF  3  LAST  282               23,2065  06260 0           NB2NB1
0097  REF  3  LAST  281               23,2066  26563 0  STOVL    YNB1
0098  REF  1                         23,2067  02730 1           ZNB
0099                                  23,2070  76521 0  MXV      VSL1
0100  REF  4  LAST  282               23,2071  06260 0           NB2NB1
0101  REF  3  LAST  281               23,2072  02571 0  STORE    ZNB1
0102
                                      23,2073  47034 0  RTB      RTB
0103  REF  2  LAST  282               23,2074  45657 1           TRANSP1
0104  REF  1                         23,2075  45673 1           TRANSP2
0105
                                      23,2076  47375 0  SXTANG1  VLOAD    VXV
0106  REF  4  LAST  282               23,2077  02571 0           ZNB1
0107  REF  8  LAST  281               23,2100  02766 1           STAR
0108                                  23,2101  77600 1  BOV
0109                                  23,2102  46103 1           +1
0110                                  23,2103  40056 0  UNIT     BOV
0111  REF  1                         23,2104  46145 0           ZNB=S1
0112  REF  1                         23,2105  00027 1  STORE    PDA          PDA = UNIT(ZNB X S)
0113
                                      23,2106  57441 1  DOT      DCOMP
0114  REF  4  LAST  282               23,2107  02555 0           XNB1
0115  REF  1                         23,2110  24023 0  STOVL    SINTH        SIN(SA) = PDA . -XNB
0116  REF  2  LAST  282               23,2111  00027 1           PDA
0117
                                      23,2112  77641 1  DOT
0118  REF  4  LAST  282               23,2113  02563 0           YNB1
0119  REF  1                         23,2114  34021 0  STCALL   COSTH        COS(SA) = PDA . YNB
0120  REF  1                         23,2115  47211 0           ARCTRIG
```

L CSM GEOMETRY

```
0121
0122  REP  1                    23,2116  77634 0          RTB
0123  REP  4  LAST  277         23,2117  45543 1                   1STO2S
0124  REP  9  LAST  282         23,2120  26774 1          STOVL    SAC
0125                            23,2121  02766 1                   STAR
0126                            23,2122  77600 1          BOV
0127                            23,2123  46124 1                   +1
0128  REP  5  LAST  282         23,2124  72441 0          DOT      SL1
0129                            23,2125  02571 0                   ZNB1
0131                            23,2126  77726 1          ACOS
0132  REP  1                    23,2127  62440 0          BMN      SL2
0133                            23,2130  46142 1                   SXTALARM    TRUNNION ANGLE NEGATIVE
0134  REP  2  LAST  283         23,2131  45200 1          BOV      DSU
0135  REP  1                    23,2132  46142 1                   SXTALARM    TRUNNION ANGLE GREATER THAN 90 DEGREES
0136                            23,2133  06331 0                   20DEG-
0137  REP  2  LAST  283         23,2134  77634 0          RTB
0138  REP  4  LAST  277         23,2135  45543 1                   1STO2S
0139                            23,2136  02776 0          STORE    PAC         FOR FLIGHT USE, CULTFLAG IS ON IF
0140  REP  1                    23,2137  77614 1          CLRGO                TRUNION IS GREATER THAN 90 DEG
0141                            23,2140  01630 0                   CULTFLAG
0142                            23,2141  00034 0                   28D
0143  REP  2  LAST  283         23,2142  77614 1  SXTALARM SETGO               ALARM HAS BEEN REMOVED FROM THIS
0144                            23,2143  01430 1                   CULTFLAG
0145                            23,2144  00034 0                   28D         SUBROUTINE,ALARM WILL BE SET BY MPI
0146  REP  1                    23,2145  77745 1  ZNB=S1   DLOAD
0147  REP  5  LAST  283         23,2146  06325 0                   270DEG
0148  REP  1                    23,2147  16774 1          STODL    SAC
0149  REP  5  LAST  283         23,2150  06327 1                   20DEGS-
0150                            23,2151  02776 0          STORE    PAC
0151  REP  3  LAST  283         23,2152  77614 1          CLRGO
0152                            23,2153  01630 0                   CULTFLAG
                                23,2154  00034 0                   28D
```

```
P0153   THESE TWO ROUTINES COMPUTE THE ACTUAL STATE VECTOR FOR LM, CSM BY ADDING
R0154   THE CONIC R,V AND THE DEVIATIONSR,V. THE STATE VECTORS ARE CONVERTED TO
R0155   METERS B-29 AND METERS/CSEC B-7 AND STORED APPROPRIATELY IN RN,VN OR
R0156   R-OTHER , V-OTHER FOR DOWNLINK. THE ROUTINES NAMES ARE SWITCHED IN THE
R0157   OTHER VEHICLES COMPUTER.

R0158   INPUT
R0159     STATE VECTOR IN TEMPORARY STORAGE AREA
R0160     IF STATE VECTOR IS SCALED POS B27 AND VEL B5
R0161        SET X2 TO +2
R0162     IF STATE VECTOR IS SCALED POS B29 AND VEL B7
R0163        SET X2 TO 0

R0164   OUTPUT
R0165     R(T) IN RN, V(T) IN VN, T IN PIPTIME
R0166   OR
R0167     R(T) IN R-OTHER, V(T) IN V-OTHER   (T IS DEFINED BY T-OTHER)
 0168                        23,2155                    BANK    23
 0169   REF  1              10,2000                    SETLOC  COMGEOM2
 0170                       10,2237                    BANK
 0171   REF  1                                         COUNT   10/GEOM
 0172                       10,2237   43414 1  SVDWN1  BOF     RVQ          SW=1=AVETOMID DOING W-MATRIX INTEG
 01721  REF  1              10,2240   04756 1          AVEMIDSW
 01722                      10,2241   20242 1          +1
 01723                      10,2242   53775 1          VLOAD   VSL*
 0173   REF  2 LAST  83     10,2243   01521 0                  TDELTAV
 0174                       10,2244   57605 0                  0 -7,2
 0175                       10,2245   53655 1          VAD     VSL*
 0176   REF  2 LAST  83     10,2246   01535 0                  RCV
 0177                       10,2247   57576 1                  0,2
 0178   REF  4 LAST 168     10,2250   25171 1          STOVL   RN
 0179   REF  2 LAST  83     10,2251   01527 0                  INUV
 0180                       10,2252   53257 1          VSL*    VAD
 0181                       10,2253   57602 1                  0 -4,2
 0182   REF  2 LAST  83     10,2254   01543 1                  VCV
 0183                       10,2255   77657 0          VSL*
 0184                       10,2256   57576 1                  0,2
 0185   REF  4 LAST 168     10,2257   15177 1          STODL   VN
 0186   REF  3 LAST 267     10,2260   01517 0                  TET
 0187   REF  3 LAST 168     10,2261   01205 1          STORE   PIPTIME
 0188                       10,2262   77616 0          RVQ
 0189                       10,2263   53775 1  SVDWN2  VLOAD   VSL*
 0190   REF  3 LAST 284     10,2264   01521 0                  TDELTAV
 0191                       10,2265   57605 0                  0 -7,2
 0192                       10,2266   53655 1          VAD     VSL*
 0193   REF  3 LAST 284     10,2267   01535 0                  RCV
```

```
0194                          10,2270  57576 1          0,2
0195  REF  4 LAST  168        10,2271  25722 1  STOVL   R-OTHER
0196  REF  3 LAST  284        10,2272  01527 0          UNUV
0197                          10,2273  53257 1  VSL*    VAD
0198                          10,2274  57602 1          0 -4,2
0199  REF  3 LAST  284        10,2275  01543 1          VCV
0200                          10,2276  77657 0  VSL*
0201                          10,2277  57576 1          0,2
0202  REF  4 LAST  168        10,2300  01730 1  STORE   V-OTHER
0203                          10,2301  77616 0  RVQ
```

```
P0204   SUBROUTINE TO COMPUTE THE NATURAL LOG OF C(MPAC, MPAC +1).

R0205           ENTRY'      CALL
R0206                         LOG

R0207   SUBROUTINE RETURNS WITH  -LOG  IN DP MPAC.

R0208   EBANK IS ARBITRARY..
 0209                       14,2000                  BANK    14
 0210   REF   1             23,2000                  SETLOC  POWFLIT2
 0211                       23,2155                  BANK
 0212   REF   2 LAST 280 TO 284'   109   109*        COUNT   23/GEOM

 0213                       23,2155   44301 0  LOG    NORM    BDSU
 0214   REF  34  LAST 280   23,2156   00160 0          DAS     MPAC +3
 0215   REF   1             23,2157   06212 0          TC      NEARLY1
 0216                       23,2160   77776 1          EXIT

 0217   REF   1             23,2161   0 7171 1         TC      POLY

 0218                       23,2162    00002 0         DEC     2
 0219                       23,2163    00000 1         2DEC    0
 0219                       23,2164    00000 1
 0220                       23,2165    01001 1         2DEC    .031335467
 0220                       23,2166    14636 1
 0221                       23,2167    00325 0         2DEC    .0130145859
 0221                       23,2170    07310 1
 0222                       23,2171    00541 1         2DEC    .0215738898
 0222                       23,2172    16735 1

 0223   REF  24  LAST 261   23,2173   3 4714 1         CAF     ZERO
 0224   REF  35  LAST 286   23,2174   54 156 1         TS      MPAC +2
 0225                       23,2175   0 0006 1         EXTEND
 0226   REF   1             23,2176   3 2214 1         DCA     CLOG2/32
 0227   REF  36  LAST 286   23,2177   52 155 1         DXCH    MPAC
 0228   REF  37  LAST 286   23,2200   52 160 1         DXCH    MPAC +3
 0229                       23,2201   4 0000 0         COM
 0230   REF   2  LAST 280   23,2202   0 7256 1         TC      SHORTMP

 0231   REF  38  LAST 286   23,2203   52 156 1         DXCH    MPAC +1
 0232   REF  39  LAST 286   23,2204   52 155 1         DXCH    MPAC
 0233   REF  40  LAST 286   23,2205   52 160 1         DXCH    MPAC +3
 0234   REF  41  LAST 286   23,2206   20 155 1         DAS     MPAC
 0235   REF   8  LAST 259   23,2207   0 6006 1         TC      INTPRET

 0236                       23,2210   77616 0          RVQ

 0237                       23,2211   37777 1  NEARLY1 2DEC    .999999999
 0237                       23,2212   37777 1
```

GENERATES LOG BY SHIFTING ARG
UNTIL IT LIES BETWEEN .5 AND 1.
THE LOG OF THIS PART IS FOUND AND THE
LOG OF THE SHIFTED PART IS COMPUTED

AND ADDED IN. SHIFT COUNT STORED

(N-1, SUPPLIED BY SMERZH)
IN MPAC +3.

LOAD POSITIVE SHIFT COUNT IN A.
MULTIPLY BY SHIFT COUNT.

RESULT IN MPAC, MPAC +1

L CSM GEOMETRY

```
0238                    23,2213   00542 1  CLOG2/32 2DEC   .0216608494
0238                    23,2214   34414 1
```

L CSM GEOMETRY

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```
P0239  SUBROUTINE NAME'        EARTH ROTATOR     (EARROT1 OR EARROT2)          DATE'          15 FEB 67
R0241  MOD NO' N +1                                                            LOG SECTION'   POWERED FLIGHT SUBROS
R0243  MOD BY' ENTRY GROUP (BAIRNSFATHER)
R0244  FUNCTIONAL DESCRIPTION'        THIS ROUTINE PROJECTS THE INITIAL EARTH TARGET VECTOR  RTINIT  AHEAD THROUGH
R0246          THE ESTIMATED TIME OF FLIGHT. INITIAL CALL RESOLVES THE INITIAL TARGET VECTOR  RTINIT  INTO EASTERLY
R0248          AND NORMAL COMPONENTS  RTEAST  AND  RTNORM  . INITIAL AND SUBSEQUENT CALLS ROTATE THIS VECTOR
R0250          ABOUT THE (FULL) UNIT POLAR AXIS  UNITW  THROUGH THE ANGLE  WIE DTEAROT  TO OBTAIN THE ROTATED
R0252          TARGET VECTOR  RT  . ALL VECTORS EXCEPT  UNITW  ARE HALF UNIT.
R0254          THE EQUATIONS ARE
R0255
R0256                 - - - -
R0257          WHERE  RT = RTINIT + RTNORM (COS(WT) -1) + RTEAST SIN(WT)
R0258                 WT = WIE DTEAROT
R0259                 RTINIT = INITIAL TARGET VECTOR
R0260                 - - -
R0261                 RTEAST = UNITW*RTINIT
R0262                 - - -
                      RTNORM = RTEAST*UNITW

R0263          FOR CONTINUOUS UPDATING, ONLY ONE ENTRY TO EARROT1 IS REQUIRED, WITH SUBSEQUENT ENTRIES AT EARROT2.
R0265  CALLING SEQUENCE'  FIRST CALL                    SUBSEQUENT CALL
R0266                     STCALL DTEAROT                STCALL DTEAROT
R0267                          EARROT1                       EARROT2
R0268                     C(MPAC) UNSPECIFIED           C(MPAC) = DTEAROT
R0269          PUSHLOC = PDL+0, ARBITRARY.  6 LOCATIONS USED.

R0270  SUBROUTINES USED'  NONE
R0271  NORMAL EXIT MODES'  RVQ
R0272  ALARMS'  NONE
R0273  OUTPUT'  RTEAST (-1)          .5 UNIT VECTOR EAST, COMPNT OF RTINIT   LEFT BY FIRST CALL
R0275           RTNORM (-1)          .5 UNIT VECTOR NORML, COMPNT OF RTINIT  LEFT BY FIRST CALL
R0277           RT     (-1)          .5 UNIT TARGET VECTOR, ROTATED          LEFT BY ALL CALLS
R0279           DTEAROT  (-28) CS    MAY BE CHANGED BY EARROT2, IF OVER 1 DAY
R0280  ERASABLE INITIALIZATION REQUIRED'
R0281           UNITW  (0)           UNIT POLAR VECTOR                       PAD LOADED
R0283           RTINIT (-1)          .5 UNIT INITIAL TARGET VECTOR           LEFT BY ENTRY
R0285           DTEAROT  (-28) CS    TIME OF FLIGHT                          LEFT BY CALLER
R0287  DEBRIS'  QPRET,     PDL+0 ... PDL+5
```

L CSM GEOMETRY

```
P0288
 0289  REF  3 LAST  210  E7,1451                          EBANK= RTINIT

 0290                      23,2215  47375 0  EARROT1  VLOAD  VXV
 0291  REF  3 LAST   84   23,2216  01714 1           UNITW    FULL UNIT VECTOR
 0292  REF  4 LAST  289   23,2217  03452 1           RTINIT   .5 UNIT
 0293  REF  2 LAST  116   23,2220  03460 0           STORE    RTEAST   .5 UNIT

 0294                      23,2221  77635 1           VXV
 0295  REF  4 LAST  289   23,2222  01714 1           UNITW    FULL UNIT
 0296  REF  2 LAST  116   23,2223  17466 0           STODL    RTNORM   .5 UNIT
 0297  REF  2 LAST  116   23,2224  03606 1                    DTEAROT  (-28) CS

 0298                      23,2225  56204 1  EARROT2  BOVB   DDV
 0299  REF  1             23,2226  57343 1           TCDANZIG RESET OVFIND, IF ON
 0300  REF  1             23,2227  06256 0                    1/WIE
 0301                      23,2230  41400 0           BOV      PUSH
 0302  REF  1             23,2231  46245 0                    OVERADAY
 0303                      23,2232  45346 1           COS      DSU
 0304  REF  1             23,2233  15330 0                    HIDPHALF
 0305                      23,2234  65361 0           VXSC     PDDL     XCH W PUSH LIST
 0306  REF  3 LAST  289   23,2235  03466 0                    RTNORM   .5 UNIT
 0307                      23,2236  74356 1           SIN      VXSC
 0308  REF  3 LAST  289   23,2237  03460 0                    RTEAST   .5 UNIT
 0309                      23,2240  76455 1           VAD      VSL1
 0310                      23,2241  53455 0           VAD      UNIT     INSURE THAT RT IS «UNIT«.
 0311  REF  5 LAST  289   23,2242  03452 1                    RTINIT   .5 UNIT
 0312  REF  2 LAST  116   23,2243  03474 0           STORE    RT       .5 UNIT TARGET VECTOR

 0313                      23,2244  77616 0           RVQ

 0314                      23,2245  75345 1  OVERADAY DLOAD  SIGN
 0315  REF  2 LAST  289   23,2246  06256 0                    1/WIE
 0316  REF  3 LAST  289   23,2247  03606 1                    DTEAROT
 0317                      23,2250  77621 1           BDSU
 0318  REF  4 LAST  289   23,2251  03606 1                    DTEAROT
 0319  REF  5 LAST  289   23,2252  03606 1           STORE    DTEAROT

 0320                      23,2253  77650 1           GOTO
 0321  REF  1             23,2254  46225 0                    EARROT2

A0322                                         WIE      2DEC     .1901487997
 0323                      23,2255  01015 1  1/WIE     2DEC     8816410
 0323                      23,2256  34732 0
 1036                      23,2257  15373 1  NB2NB1    2DEC     +.8431756920 B-1
 1036                      23,2260  11346 0
 1037                      23,2261  00000 1           2DEC     0
 1037                      23,2262  00000 1
 1038                      23,2263  67313 1           2DEC     -.5376381241 B-1
 1038                      23,2264  65307 0
```

```
1039                23,2265  00000 1  ZERINFLT 2DEC  0
1039                23,2266  00000 1
1040                23,2267  20000 0  HALFNFLT 2DEC  .5
1040                23,2270  00000 1
1041                23,2271  00000 1          2DEC  0
1041                23,2272  00000 1

1042                23,2273  10464 0          2DEC  +.5376381241 B-1
1042                23,2274  12470 1
1043                23,2275  00000 1          2DEC  0
1043                23,2276  00000 1
1044                23,2277  15373 1          2DEC  +.8431756920 B-1
1044                23,2300  11346 0
1045                23,2301  15373 1  NB1NB2   2DEC  +.8431756920 B-1
1045                23,2302  11346 0
1046                23,2303  00000 1          2DEC  0
1046                23,2304  00000 1
1047                23,2305  10464 0          2DEC  +.5376381241 B-1
1047                23,2306  12470 1
1048                23,2307  00000 1          2DEC  0
1048                23,2310  00000 1
1049                23,2311  20000 0          2DEC  .5
1049                23,2312  00000 1
1050                23,2313  00000 1          2DEC  0
1050                23,2314  00000 1

1051                23,2315  67313 1          2DEC  -.5376381241 B-1
1051                23,2316  65307 0
1052                23,2317  00000 1          2DEC  0
1052                23,2320  00000 1
1053                23,2321  15373 1          2DEC  +.8431756920 B-1
1053                23,2322  11346 0
```

```
1054                    23,2323   07020 1  10DEGS-  DEC   3600

1055                    23,2324   60000 1  270DEG   OCT   60000      SHAFT  270 DEGREES  2S COMP.
1056                    23,2325   00000 1           OCT   00000

1057                    23,2326   61740 0  20DEGS-  DEC   -07199
1058                    23,2327   77777 0           DEC   -00000

1059                    23,2330   07020 1  20DEG-   DEC   03600
1060                    23,2331   00000 1           DEC   00000
```

```
0001                                07,2440                         BANK    7
000101 REF   1                      06,2000                         SETLOC  IMUCOMP
000102                              06,3262                         BANK
0002   REF   2  LAST   82           E3,1460                         EBANK=  NBDX

0100   REF   1                                                      COUNT   06/ICOMP

0112   REF   1                      06,3262  3 3516 0  1/PIPA      CAF     LGCOMP      SAVE EBANK OF CALLING PROGRAM
0113   REF  14  LAST  261           06,3263  56 003 1               XCH     EBANK
0114   REF   1                      06,3264  54 163 1               TS      MODE

0115   REF   1                      06,3265  11"477 0               CCS     GCOMPSW     BYPASS IF GCOMPSW NEGATIVE
0116                                06,3266  1 3271 1               TCF     +3
0117                                06,3267  1 3271 1               TCF     +2
0118   REF   1                      06,3270  1 3407 0               TCF     IRIG1       RETURN

01181                               06,3271  0 0004 0               INHINT
A01182                                                                      ASSURE COMPLETE COMPENSATION OF DELV"S
0119   REF   1                      06,3272  3 4710 0  1/PIPA1     CAF     FOUR        FOR DOWNLINK.
0120   REF   4  LAST   68           06,3273  54 132 0               TS      BUF +2      PIPAZ, PIPAY, PIPAX

0121   REF   5  LAST  292           06,3274  50 132 1               INDEX   BUF +2
0122   REF   1                      06,3275  3 1453 1               CA      PIPASCF     (P.P.M.) X 2(-9)
0123                                06,3276  0 0006 1               EXTEND
0124   REF   6  LAST  292           06,3277  5 0132 1               INDEX   BUF +2
0125   REF   1                      06,3300  7 1162 1               MP      DELVX       (PP) X 2(+14) NOW (PIPA PULSES) X 2(+5)
0126   REF  32  LAST  265           06,3301  54 002 1               TS      Q           SAVE MAJOR PART

0127   REF  20  LAST  240           06,3302  3 0001 0               CA      L           MINOR PART
0128                                06,3303  0 0006 1               EXTEND
0129   REF  24  LAST  219           06,3304  7 4705 0               MP      BIT6        SCALE 2(+9)   SHIFT RIGHT 9
0130   REF   7  LAST  292           06,3305  50 132 1               INDEX   BUF +2
0131   REF   2  LAST  292           06,3306  55"163 0               TS      DELVX +1    FRACTIONAL PIPA PULSES SCALED 2(+14)

0132   REF  33  LAST  292           06,3307  3 0002 0               CA      Q           MAJOR PART
0133                                06,3310  0 0006 1               EXTEND
0134   REF  25  LAST  292           06,3311  7 4705 0               MP      BIT6        SCALE 2(+9)   SHIFT RIGHT 9
0135   REF   8  LAST  292           06,3312  50 132 1               INDEX   BUF +2
0136   REF   3  LAST  292           06,3313  21"163 0               DAS     DELVX       (PIPAI) + (PIPAI)(SFE)

0137   REF   9  LAST  292           06,3314  50 132 1               INDEX   BUF +2
0138   REF   1                      06,3315  4 1452 1               CS      PIPABIAS    (PIPA PULSES)/(CS) X 2(-8)              *
0139                                06,3316  0 0006 1               EXTEND
0140   REF   2  LAST   75           06,3317  7 1074 1               MP      1/PIPADT    (CS) X 2(+8)  NOW (PIPA PULSES) X 2(+0)*
0141                                06,3320  0 0006 1               EXTEND
0142   REF  27  LAST  256           06,3321  7 4712 0               MP      BIT1        SCALE 2(+14)  SHIFT RIGHT 14           *
0143   REF  10  LAST  292           06,3322  50 132 1               INDEX   BUF +2
0144   REF   4  LAST  292           06,3323  21"163 0               DAS     DELVX       (PIPAI) + (PIPAI)(SFE) - (BIAS)(DELTAT)

0145   REF  11  LAST  292           06,3324  10 132 0               CCS     BUF +2      PIPAZ, PIPAY, PIPAX
```

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0146   REF   1          06,3325  6 7716 0      AD     NEG1
0147   REF   1          06,3326  1 3273 0      TCF    1/PIPA1 +1
0148                    06,3327  13 330 0      NOOP                  LESS THAN ZERO IMPOSSIBLE.
01481                   06,3330  0 0003 1      RELINT
```

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P01482
 0149   REF   2  LAST  292    06,3331  55#477 0  IRIGCOMP TS      GCOMPSW        INDICATE COMMANDS 2 PULSES OR LESS
 0150   REF  12  LAST  292    06,3332  54 130 1           TS      BUF            INDEX COUNTER - IRIGX, IRIGY, IRIGZ

 0151                         06,3333  0 0006 1  IRIGX    EXTEND
 0152   REF   5  LAST  292    06,3334  4 1163 0           DCS     DELVX          (PIPA PULSES) X 2(+14)
 0153   REF  42  LAST  286    06,3335  52 155 1           DXCH    MPAC
 0154   REF   1               06,3336  3 1463 1           CA      ADIAX          (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0155   REF   1               06,3337  0 3412 0           TC      GCOMPSUB       -(ADIAX)(PIPAX)   (GYRO PULSES) X 2(+14)

 0156                         06,3340  0 0006 1           EXTEND
 0157   REF   1               06,3341  4 1165 0           DCS     DELVY          (PIPA PULSES) X 2(+14)
 0158   REF  43  LAST  294    06,3342  52 155 1           DXCH    MPAC
 0159   REF   1               06,3343  4 1466 0           CS      ADSRAX         (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0160   REF   2  LAST  294    06,3344  0 3412 0           TC      GCOMPSUB       +(ADSRAX)(PIPAY)  (GYRO PULSES) X 2(+14)

A01603                                                   EXTEND          ***
A01604                                                   DCS     DELVZ   ***    (PIPA PULSES) X 2(+14)
A01605                                                   DXCH    MPAC    ***
A01606                                                   CA      ADOAX   ***    (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
A01607                                                   TC      GCOMPSUB ***   -(ADOAX)(PIPAZ)   (GYRO PULSES) X 2(+14)

 0161   REF   3  LAST  292    06,3345  4 1460 0           CS      NBDX           (GYRO PULSES)/(CS) X 2(-5)
 0162   REF   1               06,3346  0 3441 0           TC      DRIFTSUB       -(NBDX)(DELTAT)   (GYRO PULSES) X 2(+14)

 0163                         06,3347  0 0006 1  IRIGY    EXTEND
 0164   REF   2  LAST  294    06,3350  4 1165 0           DCS     DELVY          (PIPA PULSES) X 2(+14)
 0165   REF  44  LAST  294    06,3351  52 155 1           DXCH    MPAC
 0166   REF   1               06,3352  3 1464 0           CA      ADIAY          (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0167   REF   3  LAST  294    06,3353  0 3412 0           TC      GCOMPSUB       -(ADIAY)(PIPAY)   (GYRO PULSES) X 2(+14)

 0168                         06,3354  0 0006 1           EXTEND
 0169   REF   1               06,3355  4 1167 1           DCS     DELVZ          (PIPA PULSES) X 2(+14)
 0170   REF  45  LAST  294    06,3356  52 155 1           DXCH    MPAC
 0171   REF   1               06,3357  4 1467 1           CS      ADSRAY         (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0172   REF   4  LAST  294    06,3360  0 3412 0           TC      GCOMPSUB       +(ADSRAY)(PIPAZ)  (GYRO PULSES) X 2(+14)

A01723                                                   EXTEND          ***
A01724                                                   DCS     DELVX   ***    (PIPA PULSES) X 2(+14)
A01725                                                   DXCH    MPAC    ***
A01726                                                   CA      ADOAY   ***    (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
A01727                                                   TC      GCOMPSUB ***   -(ADOAY)(PIPAX)   (GYRO PULSES) X 2(+14)

 0173   REF   1               06,3361  4 1461 1           CS      NBDY           (GYRO PULSES)/(CS) X 2(-5)
 0174   REF   2  LAST  294    06,3362  0 3441 0           TC      DRIFTSUB       -(NBDY)(DELTAT)   (GYRO PULSES) X 2(+14)

 0175                         06,3363  0 0006 1  IRIGZ    EXTEND
 0176   REF   3  LAST  294    06,3364  4 1165 0           DCS     DELVY          (PIPA PULSES) X 2(+14)
 0177   REF  46  LAST  294    06,3365  52 155 1           DXCH    MPAC
 0178   REF   1               06,3366  3 1470 0           CA      ADSRAZ         (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
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 0179   REF   5  LAST  294    06,3367  0 3412 0        TC     GCOMPSUB       -(ADSRAZ)(PIPAY)   (GYRO PULSES) X 2(+14)

 0180                         06,3370  0 0006 1        EXTEND
 0181   REF   2  LAST  294    06,3371  4 1167 1        DCS    DELVZ          (PIPA PULSES) X 2(+14)
 0182   REF  47  LAST  294    06,3372  52 155 1        DXCH   MPAC
 0183   REF   1               06,3373  3 1465 1        CA     ADIAZ          (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
 0184   REF   6  LAST  295    06,3374  0 3412 0        TC     GCOMPSUB       -(ADIAZ)(PIPAZ)   (GYRO PULSES) X 2(+14)

A01843                                                EXTEND         ***
A01844                                                DCS    DELVX   ***    (PIPA PULSE) X 2(+14)
A01845                                                DXCH   MPAC    ***
A01846                                                CS     ADOAZ   ***    (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
A01847                                                TC     GCOMPSUB ***   +(ADOAZ)(PIPAX)   (GYRO PULSES) X 2(+14)

 0185   REF   1               06,3375  3 1462 0        CA     NBDZ           (GYRO PULSES)/(CS) X 2(-5)
 0186   REF   3  LAST  294    06,3376  0 3441 0        TC     DRIFTSUB       +(NBDZ)(DELTAT)   (GYRO PULSES) X 2(+14)
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0187  REF   3  LAST  294   06,3377  11000 0          CCS    GCOMPSW      ARE GYRO COMMANDS GREATER THAN 2 PULSES
0188                       06,3400  1 3402 0         TCF    +2           YES
0189  REF   2  LAST  292   06,3401  1 3407 0         TCF    IRIG1        NO

0191  REF   1              06,3402  3 4764 0         CAF    PRIO17       LEM PRIORITY HIGHER-THIS FOR PRELAUNCH
0192  REF  10  LAST  251   06,3403  0 5027 1         TC     NOVAC
0193  REF   4  LAST  294   E3,1460                   EBANK= NEDX
0194  REF   1              06,3404   03474 0        2CADR  1/GYRO
0194  REF   1              06,3405   14063 1

0195                       06,3406  0 0003 1         RELINT
0196  REF   2  LAST  292   06,3407  3 0163 0 IRIG1   CA     MODE         SET EBANK FOR RETURN
0197  REF  15  LAST  292   06,3410  54 003 0         TS     EBANK
0198  REF   5  LAST  218   06,3411  1 4570 0         TCF    SWRETURN
0199  REF  48  LAST  295   06,3412  56 154 1 GCOMPSUB XCH   MPAC         ADIA OR ADSRA COEFFICIENT ARRIVES IN A
0200                       06,3413  0 0006 1         EXTEND               C(MPAC) = (PIPA PULSES) X 2(+14)
0201  REF  49  LAST  296   06,3414  7 0154 0         MP     MPAC          (GYRO PULSES)/(PIPA PULSE) X 2(-3)     *
0202  REF  14  LAST   68   06,3415  52 123 0         DXCH   VBUF          NOW = (GYRO PULSES) X 2(+11)           *

0203  REF  50  LAST  296   06,3416  3 0155 0         CA     MPAC +1       MINOR PART PIPA PULSES
0204                       06,3417  0 0006 1         EXTEND
0205  REF  51  LAST  296   06,3420  7 0154 0         MP     MPAC          ADIA OR ADSRA
0206  REF  21  LAST  292   06,3421  54 001 1         TS     L
0207  REF  25  LAST  286   06,3422  3 4714 1         CAF    ZERO
0208  REF  15  LAST  296   06,3423  20 123 0         DAS    VBUF          NOW = (GYRO PULSES) X 2(+11)           *

0209  REF  16  LAST  296   06,3424  3 0122 0         CA     VBUF          PARTIAL RESULT - MAJOR
0210                       06,3425  0 0006 1         EXTEND
0211  REF  15  LAST  227   06,3426  7 4677 1         MP     BIT12         SCALE 2(+3)      SHIFT RIGHT 3         *
0212  REF  13  LAST  294   06,3427  50 130 0         INDEX  BUF           RESULT = (GYRO PULSES) X 2(+14)
0213  REF   3  LAST   83   06,3430  21000 0          DAS    GCOMP         HI(ADIA)(PIPAI)  OR  HI(ADSRA)(PIPAI)

0214  REF  17  LAST  296   06,3431  3 0123 1         CA     VBUF +1       PARTIAL RESULT - MINOR
0215                       06,3432  0 0006 1         EXTEND
0216  REF  16  LAST  296   06,3433  7 4677 1         MP     BIT12         SCALE 2(+3)      SHIFT RIGHT 3         *
0217  REF  22  LAST  296   06,3434  54 001 1         TS     L
0218  REF  26  LAST  296   06,3435  3 4714 1         CAF    ZERO
0219  REF  14  LAST  296   06,3436  50 130 0         INDEX  BUF           RESULT = (GYRO PULSES) X 2(+14)
0220  REF   4  LAST  296   06,3437  21000 0          DAS    GCOMP         (ADIA)(PIPAI)  OR  (ADSRA)(PIPAI)

0221  REF  34  LAST  292   06,3440  0 0002 0         TC     Q
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0222                          06,3441  0 0006 1  DRIFTSUB EXTEND
0223   REF  15  LAST  298     06,3442  22 131 1           QXCH   BUF +1

0224                          06,3443  0 0006 1           EXTEND          C(A) = NBD    (GYRO PULSES)/(CS) X 2(-5)
0225   REF   3  LAST  292     06,3444  7 1074 1           MP     1/PIPADT (CS) X 2(+8)  NOW (GYRO PULSES) X 2(+3)
0226   REF  52  LAST  296     06,3445  22 155 0           LXCH   MPAC +1  SAVE FOR FRACTIONAL COMPENSATION
0227                          06,3446  0 0006 1           EXTEND
0228   REF  20  LAST  250     06,3447  7 4707 1           MP     BIT4     SCALE 2(+11)     SHIFT RIGHT 11
0229   REF  16  LAST  297     06,3450  50 130 0           INDEX  BUF
0230   REF   5  LAST  296     06,3451  21,472 0           DAS    GCOMP    HI(NBD)(DELTAT)  (GYRO PULSES) X 2(+14)

0231   REF  53  LAST  297     06,3452  3 0155 0           CA     MPAC +1  NOW MINOR PART
0232                          06,3453  0 0006 1           EXTEND
0233   REF  21  LAST  297     06,3454  7 4707 1           MP     BIT4     SCALE 2(+11)     SHIFT RIGHT 11
0234   REF  23  LAST  296     06,3455  54 001 1           TS     L
0235   REF  27  LAST  296     06,3456  3 4714 1           CAF    ZERO
0236   REF  17  LAST  297     06,3457  50 130 0           INDEX  BUF      ADD IN FRACTIONAL COMPENSATION
0237   REF   6  LAST  297     06,3460  21,472 0           DAS    GCOMP    (NBD)(DELTAT)    (GYRO PULSES) X 2(+14)

0238   REF   6  LAST  265     06,3461  3 4711 1  DRFTSUB2 CAF    TWO      PIPAX, PIPAY, PIPAZ
0239   REF  18  LAST  297     06,3462  6 0130 0           AD     BUF
0240   REF  19  LAST  297     06,3463  56 130 0           XCH    BUF
0241   REF  74  LAST  266     06,3464  50 000 1           INDEX  A
0242   REF   7  LAST  297     06,3465  11,471 0           CCS    GCOMP    ARE GYRO COMMANDS 1 PULSE OR GREATER
0243                          06,3466  1 3470 0           TCF    +2       YES
0244   REF  20  LAST  297     06,3467  0 0131 1           TC     BUF +1   NO

0245   REF  10  LAST  253     06,3470  7 7716 1           MASK   NEGONE
0246   REF  75  LAST  297     06,3471  10 000 0           CCS    A        ARE GYRO COMMANDS GREATER THAN 2 PULSES
0247   REF   4  LAST  296     06,3472  55,477 0           TS     GCOMPSW  YES - SET GCOMPSW POSITIVE
0248   REF  21  LAST  297     06,3473  0 0131 1           TC     BUF +1   NO
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0249  REF  2  LAST 292   06,3474  3 4710 0  1/GYRO   CAF    FOUR      PIPAZ, PIPAY, PIPAX
0250  REF 22  LAST 297   06,3475  54 130 1           TS     BUF

0251  REF 23  LAST 298   06,3476  50 130 0           INDEX  BUF       SCALE GYRO COMMANDS FOR IMUPULSE
0252  REF  8  LAST 297   06,3477  3 1472 1           CA     GCOMP +1  FRACTIONAL PULSES
0253                     06,3500  0 0006 1           EXTEND
0254  REF 18  LAST 198   06,3501  7 4703 0           MP     BIT8      SHIFT RIGHT 7
0255  REF 24  LAST 298   06,3502  50 130 0           INDEX  BUF
0256  REF  9  LAST 298   06,3503  55∝472 0           TS     GCOMP +1  FRACTIONAL PULSES SCALED

0257  REF 28  LAST 297   06,3504  3 4714 1           CAF    ZERO      SET GCOMP = 0 FOR DAS INSTRUCTION
0258  REF 25  LAST 298   06,3505  50 130 0           INDEX  BUF
0259  REF 10  LAST 298   06,3506  57∝471 1           XCH    GCOMP     GYRO PULSES
0260                     06,3507  0 0006 1           EXTEND
0261  REF 19  LAST 298   06,3510  7 4703 0           MP     BIT8      SHIFT RIGHT 7
0262  REF 26  LAST 298   06,3511  50 130 0           INDEX  BUF
0263  REF 11  LAST 298   06,3512  21∝472 0           DAS    GCOMP     ADD THESE TO FRACTIONAL PULSES ABOVE

0264  REF 27  LAST 298   06,3513  10 130 1           CCS    BUF       PIPAZ, PIPAY, PIPAX
0265  REF  2  LAST 293   06,3514  6 7716 0           AD     NEG1
0266  REF  2  LAST 296   06,3515  1 3475 0           TCF    1/GYRO +1
0267  REF 12  LAST 298   06,3516   01471 1  LGCOMP   ECADR  GCOMP     LESS THAN ZERO IMPOSSIBLE

0268  REF  2  LAST 292   06,3517  3 3516 0           CAF    LGCOMP
0269  REF 35  LAST 257   06,3520  0 4555 0           TC     BANKCALL
0270  REF  2  LAST 237   06,3521   17125 1           CADR   IMUPULSE  CALL GYRO TORQUING ROUTINE
0271  REF 36  LAST 298   06,3522  0 4555 0           TC     BANKCALL
0272  REF  5  LAST 237   06,3523   17516 0           CADR   IMUSTALL  WAIT FOR PULSES TO GET OUT
0273  REF 14  LAST 261   06,3524  1 5112 1           TCF    ENDOFJOB  TEMPORARY

0274  REF  3  LAST 298   06,3525  3 4710 0  GCOMP1   CAF    FOUR      PIPAZ, PIPAY, PIPAX
0275  REF 28  LAST 298   06,3526  54 130 1           TS     BUF

0276  REF 29  LAST 298   06,3527  50 130 0           INDEX  BUF       RESCALE
0277  REF 13  LAST 298   06,3530  3 1472 1           CA     GCOMP +1
0278                     06,3531  0 0006 1           EXTEND
0279  REF 20  LAST 298   06,3532  7 4703 0           MP     BIT8      SHIFT MINOR PART LEFT 7 - MAJOR PART = 0
0280  REF 30  LAST 298   06,3533  50 130 0           INDEX  BUF
0281  REF 14  LAST 298   06,3534  23∝472 1           LXCH   GCOMP +1  BITS 8-14 OF MINOR PART WERE = 0

0282  REF 31  LAST 298   06,3535  10 130 1           CCS    BUF       PIPAZ, PIPAY, PIPAX
0283  REF  3  LAST 298   06,3536  6 7716 0           AD     NEG1
0284  REF  1             06,3537  1 3526 1           TCF    GCOMP1 +1
0285                     06,3540   01436 1  V06N30S  VN     0630
0286  REF 15  LAST 298   06,3541  1 5112 1           TCF    ENDOFJOB
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L IMU COMPENSATION PACKAGE

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0287  REF   5  LAST  297   06,3542  11=477 0  NBDONLY  CCS    GCOMPSW     BYPASS IF GCOMPSW NEGATIVE
0288                       06,3543  1 3546 1           TCF    +3
0289                       06,3544  1 3546 1           TCF    +2
0290  REF  16  LAST  298   06,3545  1 5112 1           TCF    ENDOFJOB

029005                     06,3546  0 0004 0           INHINT
02901 REF   6  LAST  196   06,3547  10 076 1           CCS    FLAGWRD2    PREREAD T3RUPT MAY COINCIDE
02902 REF  17  LAST  299   06,3550  1 5112 1           TCF    ENDOFJOB
02903 REF  18  LAST  299   06,3551  1 5112 1           TCF    ENDOFJOB
02904                      06,3552  1 3553 0           TCF    +1

0291  REF   4  LAST  215   06,3553  3 0025 0           CA     TIME1       (CS) X 2(+14)
0292  REF   4  LAST  297   06,3554  57=074 0           XCH    1/PIPADT    PREVIOUS TIME
02925                      06,3555  0 0003 1           RELINT
0293                       06,3556  4 0000 0           COM
0294  REF   5  LAST  299   06,3557  6 1074 0           AD     1/PIPADT
0295  REF  76  LAST  297   06,3560  10 000 0  NBD2     CCS    A           CALCULATE ELAPSED TIME
0296  REF  13  LAST  265   06,3561  6 4712 1           AD     ONE         NO TIME1 OVERFLOW
0297  REF   1               06,3562  1 3567 1           TCF    NBD3        RESTORE TIME DIFFERENCE AND JUMP
0298                       06,3563  1 3565 0           TCF    +2          TIME1 OVERFLOW
0299  REF  19  LAST  299   06,3564  1 5112 1           TCF    ENDOFJOB    IF ELAPSED TIME = 0  (DIFFERENCE = -0)

0300                       06,3565  4 0000 0           COM                CALCULATE ABSOLUTE DIFFERENCE
0301  REF   6  LAST  186   06,3566  6 4672 0           AD     POSMAX

0302                       06,3567  0 0006 1  NBD3     EXTEND             C(A) = DELTAT    (CS) X 2(+14)
0303  REF  19  LAST  225   06,3570  7 4701 1           MP     BIT10       SHIFT RIGHT 5
0304  REF  18  LAST  296   06,3571  52 123 0           DXCH   VBUF
0305                       06,3572  0 0006 1           EXTEND
0306  REF  19  LAST  299   06,3573  3 0123 1           DCA    VBUF
0307  REF  54  LAST  297   06,3574  52 155 1           DXCH   MPAC        DELTAT NOW SCALED (CS) X 2(+19)

0308  REF  29  LAST  298   06,3575  3 4714 1           CAF    ZERO
0309  REF   6  LAST  299   06,3576  55=477 0           TS     GCOMPSW     INDICATE COMMANDS 2 PULSES OR LESS
0310  REF  32  LAST  298   06,3577  54 130 1           TS     BUF         PIPAX, PIPAY, PIPAZ

0311  REF   5  LAST  296   06,3600  4 1460 0           CS     NBDX        (GYRO PULSES)/(CS) X 2(-5)
0312  REF   1               06,3601  0 3617 1           TC     FBIASSUB    -(NBDX)(DELTAT)   (GYRO PULSES) X 2(+14)

0313                       06,3602  0 0006 1           EXTEND
0314  REF  20  LAST  299   06,3603  4 0123 0           DCS    VBUF
0315  REF  55  LAST  299   06,3604  52 155 1           DXCH   MPAC        DELTAT SCALED (CS) X 2(+19)
0316  REF   2  LAST  294   06,3605  3 1461 0           CA     NBDY        (GYRO PULSES)/(CS) X 2(-5)
0317  REF   2  LAST  299   06,3606  0 3617 1           TC     FBIASSUB    -(NBDY)(DELTAT)   (GYRO PULSES) X 2(+14)

0318                       06,3607  0 0006 1           EXTEND
0319  REF  21  LAST  299   06,3610  4 0123 0           DCS    VBUF
0320  REF  56  LAST  299   06,3611  52 155 1           DXCH   MPAC        DELTAT SCALED (CS) X 2(+19)
0321  REF   2  LAST  295   06,3612  4 1462 1           CS     NBDZ        (GYRO PULSES)/(CS) X 2(-5)
0322  REF   3  LAST  299   06,3613  0 3617 1           TC     FBIASSUB    +(NBDZ)(DELTAT)   (GYRO PULSES) X 2(+14)
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L IMU COMPENSATION PACKAGE

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0323  REF   7  LAST  299   06,3614  11'477 0        CCS   GCOMPSW     ARE GYRO COMMANDS GREATER THAN 2 PULSES
0324  REF   3  LAST  298   06,3615  1 3474 1        TCF   1/GYRO      YES
0325  REF  20  LAST  299   06,3616  1 5112 1        TCF   ENDOPJOB    NO
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0326  REF  35  LAST  296  06,3617  56 002 0  FBIASSUB XCH   Q
0327  REF  33  LAST  299  06,3620  54 131 0            TS    BUF +1

0328  REF  36  LAST  301  06,3621  3 0002 0            CA    Q          NBD SCALED (GYRO PULSES)/(CS) X 2(-5)
0329                      06,3622  0 0006 1            EXTEND
0330  REF  57  LAST  299  06,3623  7 0154 0            MP    MPAC       DELTAT SCALED (CS) X 2(+19)
0331  REF  34  LAST  301  06,3624  50 130 0           INDEX BUF
0332  REF  15  LAST  298  06,3625  21"472 0           DAS   GCOMP      HI(NBD)(DELTAT)   (GYRO PULSES) X 2(+14)

0333  REF  37  LAST  301  06,3626  3 0002 0            CA    Q          NOW FRACTIONAL PART
0334                      06,3627  0 0006 1            EXTEND
0335  REF  58  LAST  301  06,3630  7 0155 1            MP    MPAC +1
0336  REF  24  LAST  297  06,3631  54 001 1            TS    L
0337  REF  30  LAST  299  06,3632  3 4714 1            CAF   ZERO
0338  REF  35  LAST  301  06,3633  50 130 0           INDEX BUF
0339  REF  16  LAST  301  06,3634  21"472 0           DAS   GCOMP      (NBD)(DELTAT)     (GYRO PULSES) X 2(+14)

0340  REF  1             06,3635  1 3461 0            TCF   DRFTSUB2   CHECK MAGNITUDE OF COMPENSATION
03401 REF  37  LAST  298  06,3636  0 4555 0  LASTBIAS  TC    BANKCALL
03402 REF  1             06,3637  17075 0             CADR  PIPUSE

0341  REF  8   LAST  300  06,3640  11"477 0            CCS   GCOMPSW    BYPASS IF GCOMPSW NEGATIVE
0342                      06,3641  1 3644 0            TCF   +3
0343                      06,3642  1 3644 0            TCF   +2
0344  REF  21  LAST  300  06,3643  1 5112 1            TCF   ENDOFJOB

0345  REF  1             06,3644  3 7665 0            CAF   PRIO31     2 SECONDS SCALED (CS) X 2(+8)
0346  REF  6   LAST  299  06,3645  57"074 0            XCH   1/PIPADT
0347                      06,3646  4 0000 0            COM
0348  REF  4   LAST  174  06,3647  6 1246 0            AD    PIPTIME1 +1  TIME AT PIPA1 =0
0349  REF  1             06,3650  1 3560 0            TCF   NBD2
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R0001   PROGRAM NAME - KEYBOARD AND DISPLAY PROGRAM
R0002   MOD NO - 4       DATE - 27 APRIL 1967      ASSEMBLY - PINDISK REV 17
R0003   MOD BY - FILENE
R0004   LOG SECTION - PINBALL GAME  BUTTONS AND LIGHTS

R0009   FUNCTIONAL DESCRIPTION-

R0010      THE KEYBOARD AND DISPLAY SYSTEM PROGRAM OPERATES UNDER EXECUTIVE
R0011   CONTROL AND PROCESSES INFORMATION EXCHANGED BETWEEN THE AGC AND THE
R0012   COMPUTER OPERATOR.  THE INPUTS TO THE PROGRAM ARE FROM THE KEYBOARD,
R0013   FROM INTERNAL PROGRAMS, AND FROM THE UPLINK.
R0014      THE LANGUAGE OF COMMUNICATION WITH THE PROGRAM IS A PAIR OF WORDS
R0015   KNOWN AS VERB AND NOUN.  EACH OF THESE IS REPRESENTED BY A 2 CHARACTER
R0016   DECIMAL NUMBER.  THE VERB CODE INDICATES WHAT ACTION IS TO BE TAKEN, THE
R0017   NOUN CODE INDICATES TO WHAT THIS ACTION IS APPLIED.  NOUNS USUALLY
R0018   REFER TO A GROUP OF ERASABLE REGISTERS.

R0020   VERBS ARE GROUPED INTO DISPLAYS, LOADS, MONITORS (DISPLAYS THAT ARE
R0021   UPDATED ONCE PER SECOND), SPECIAL FUNCTIONS, AND EXTENDED VERBS(THESE
R0022   ARE OUTSIDE OF THE DOMAIN OF PINBALL AND CAN BE FOUND UNDER LOG SECTION
R0023   'EXTENDED VERBS').
R0024   A LIST OF VERBS AND NOUNS IS GIVEN IN LOG SECTION 'ASSEMBLY AND
R0025   OPERATION INFORMATION'.
R0026   CALLING SEQUENCES-

R0027   KEYBOARD'
R0028      EACH DEPRESSION OF A MAIN (NAVIGATION) KEYBOARD BUTTON ACTIVATES
R0029   INTERRUPT KEYRUPT1 (KEYRUPT2) AND PLACES THE 5 BIT KEY CODE INTO
R00291  CHANNEL 15 (CHANNEL 16).  KEYRUPT1 (KEYRUPT2) PLACES THE KEY
R0030   CODE INTO MPAC, ENTERS AN EXECUTIVE REQUEST FOR THE KEYBOARD AND DISPLAY
R0031   PROGRAM (AT 'CHARIN'), AND EXECUTES A RESUME.

R0032   UPLINK'
R0033      EACH WORD RECEIVED BY THE UPLINK ACTIVATES INTERRUPT UPRUPT WHICH
R0034   PLACES THE 5 BIT KEY CODE INTO MPAC, ENTERS AN EXECUTIVE REQUEST FOR THE
R0035   KEYBOARD AND DISPLAY PROGRAM (AT'CHARIN') AND EXECUTES A RESUME.

R0036   INTERNAL PROGRAMS'
R0037      INTERNAL PROGRAMS CALL PINBALL AT 'NVSUB' WITH THE DESIRED VERB/NOUN
R0038   CODE IN A (LOW 7 BITS FOR NOUN, NEXT 7 BITS FOR VERB).  DETAILS
R0039   DESCRIBED ON REMARKS CARDS JUST BEFORE 'NVSUB' AND 'NVSBWAIT' (SEE
R0040   SYMBOL TABLE FOR PAGE NUMBERS).
R0045   NORMAL EXIT MODES-

R0046      IF PINBALL WAS CALLED BY EXTERNAL ACTION, THERE ARE FOUR EXITS'
R004605          1) ALL BUT (2), (3), AND (4) EXIT DIRECTLY TO ENDOFJOB.
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R00461          2) EXTENDED VERBS GO TO THE EXTENDED VERB FAN AS PART OF THE
R00462             PINBALL EXECUTIVE JOB WITH PRIORITY 30000.  IT IS THE
R00463             RESPONSIBILITY OF THE EXTENDED VERB CALLED TO EVENTUALLY
R00464             CHANGE PRIORITY (IF NECESSARY) AND DO AN ENDOFJOB.
R00465             ALSO PINBALL IS A NOVAC JOB. EBANK SET FOR COMMON.
R00466          3) VERB 37. CHANGE OF PROGRAM (MAJOR MODE) CALLS 'V37' IN THE
R00467             SERVICE ROUTINES AS PART OF THE PINBALL EXEC JOB WITH PRIO
R00468             30000.  THE NEW PROGRAM CODE (MAJOR MODE) IS LEFT IN A.
R00469          4) KEY RELEASE BUTTON CALLS 'PINBRNCH' IN THE DISPLAY INTERFACE
R00470             ROUTINES AS PART OF THE PINBALL EXEC JOB WITH PRIO 30000 IF
R00471             THE KEY RELEASE LIGHT IS OFF AND 'CADRSTOR' IS NOT +0.

R00472      IF PINBALL WAS CALLED BY INTERNAL PROGRAMS, EXIT FROM PINBALL IS BACK
R00473   TO CALLING ROUTINE.  DETAILS DESCRIBED IN REMARKS CARDS JUST BEFORE
R00474   'NVSUB' AND 'NVSBWAIT' (SEE SYMBOL TABLE FOR PAGE NUMBERS).
R00475   ALARM OR ABORT EXIT MODES-

R00476   EXTERNAL INITIATION'
R00477      IF SOME IMPROPER SEQUENCE OF KEY CODES IS DETECTED, THE OPERATOR
R00478   ERROR LIGHT IS TURNED ON AND EXIT IS TO 'ENDOFJOB'.

R00479   INTERNAL PROGRAM INITIATION'
R00480      IF AN ILLEGAL V/N COMBINATION IS ATTEMPTED, AN ABORT IS CAUSED
R00481   (WITH OCTAL 01501).
R00482      IF A SECOND ATTEMPT IS MADE TO GO TO SLEEP IN PINBALL, AN ABORT IS
R00483   CAUSED (WITH OCTAL 01206). THERE ARE TWO WAYS TO GO TO SLEEP IN PINBALL'
R00484           1) ENDIDLE OR DATAWAIT.
R00485           2) NVSBWAIT, PRENVBSY, OR NVSUBUSY.

R00486   CONDITIONS LEADING TO THE ABOVE ARE DESCRIBED IN FORTHCOMING MIT/IL
R00487   E-REPORT DESCRIBING KEYBOARD AND DISPLAY OPERATION FOR 278.
R00488   OUTPUT-

R00489      INFORMATION TO BE SENT TO THE DISPLAY PANEL IS LEFT IN THE 'DSPTAB'
R00490   BUFFERS REGISTERS (UNDER EXEC CONTROL).  'DSPOUT' (A PART OF T4RUPT)
R00491   HANDLES THE PLACING OF THE 'DSPTAB' INFORMATION INTO OUTPUT CHANNEL 10
R00492   IN INTERRUPT.
R00493   ERASABLE INITIALIZATION-

R00494      FRESH START AND RESTART INITIALIZE THE NECESSARY E REGISTERS FOR
R00495   PINBALL IN 'STARTSUB'.  REGISTERS ARE' DSPTAB BUFFER, CADRSTOR,
R00496   REQRET, CLPASS, DSPLOCK, MONSAVE, MONSAVE1, VERBREG, NOUNREG, DSPLIST,
R00497   DSPCOUNT, NOUT.
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R0069   A COMPLETE LIST OF ALL THE ERASABLES (BOTH RESERVED AND TEMPORARIES) FOR
R0070   PINBALL IS GIVEN BELOW.
R0071   THE FOLLOWING ARE OF GENERAL INTEREST-

R0072     REMARKS CARDS PRECEDE THE REFERENCED SYMBOL DEFINITION.  SEE SYMBOL
R0073   TABLE TO FIND APPROPRIATE PAGE NUMBERS.

R0074     NVSUB   CALLING POINT FOR INTERNAL USE OF PINBALL.
R0075               OF RELATED INTEREST  NVSBWAIT
R0076                                    NVSUBUSY
R0077                                    PRENVBSY

R0083     ENDIDLE   ROUTINE FOR INTERNAL PROGRAMS WISHING TO GO TO SLEEP WHILE
R0084               AWAITING OPERATORS RESPONSE.

R00851    DSPMM   ROUTINE BY WHICH AN INTERNAL PROGRAM MAY DISPLAY A DECIMAL
R00852            PROGRAM CODE (MAJOR MODE) IN THE PROGRAM (MAJOR MODE) LIGHTS.
R008525           (DSPMM DOES NOT DISPLAY DIRECTLY BUT ENTERS EXEC REQUEST
R008527           FOR DSPMMJB WITH PRIO 30000 AND RETURNS TO CALLER.)

R00853    BLANKSUB   ROUTINE BY WHICH AN INTERNAL PROGRAM MAY BLANK ANY
R00854               COMBINATION OF THE DISPLAY REGISTERS R1, R2, R3.

R00855    JAMTERM   ROUTINES BY WHICH AN INTERNAL PROGRAM MAY PERFORM THE
R00856    JAMPROC   TERMINATE (V 34) OR PROCEED (V 33) FUNCTION.

R0086     MONITOR   VERBS FOR PERIODIC ( 1 PER SEC) DISPLAY.

R00861    PLEASE PERFORM, PLEASE MARK SITUATIONS
R00862              REMARKS DESCRIBING HOW AN INTERNAL ROUTINE SHOULD HANDLE
R00863              THESE SITUATIONS CAN BE FOUND JUST BEFORE 'NVSUB' (SEE
R00864              SYMBOL TABLE FOR PAGE NUMBER).

R0087     THE NOUN TABLE FORMAT IS DESCRIBED ON A PAGE OF REMARKS CARDS JUST
R0088     BEFORE 'DSPABC' (SEE SYMBOL TABLE FOR PAGE NUMBER).

R0089     THE NOUN TABLES THEMSELVES ARE FOUND IN LOG SECTION 'PINBALL NOUN
R00891    TABLES'.
R0090   FOR FURTHER DETAILS ABOUT OPERATION OF THE KEYBOARD AND DISPLAY SYSTEM
R0091   PROGRAM, SEE THE MISSION PLAN AND/OR MIT/IL E-2129
R0092   DESCRIBING KEYBOARD AND DISPLAY OPERATION FOR 278.
R0150   THE FOLLOWING QUOTATION IS PROVIDED THROUGH THE COURTESY OF THE AUTHORS.

R0151       ''IT WILL BE PROVED TO THY FACE THAT THOU HAST MEN ABOUT THEE THAT
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R0152   USUALLY TALK OF A NOUN AND A VERB, AND SUCH ABOMINABLE WORDS AS NO
R0153   CHRISTIAN EAR CAN ENDURE TO HEAR.''

R0154                          HENRY 6, ACT 2, SCENE 4
R0155   THE FOLLOWING ASSIGNMENTS FOR PINBALL ARE MADE ELSEWHERE
R0156   RESERVED FOR PINBALL EXECUTIVE ACTION

R0157   DSPCOUNT ERASE                  DISPLAY POSITION INDICATOR
R0158   DECBRNCH ERASE                  +DEC, - DEC, OCT INDICATOR
R0159   VERBREG  ERASE                  VERB CODE
R0160   NOUNREG  ERASE                  NOUN CODE
R0161   XREG     ERASE                  R1 INPUT BUFFER
R0162   YREG     ERASE                  R2 INPUT BUFFER
R0163   ZREG     ERASE                  R3 INPUT BUFFER
R0164   XREGLP   ERASE                  LO PART OF XREG (FOR DEC CONV ONLY)
R0165   YREGLP   ERASE                  LO PART OF YREG (FOR DEC CONV ONLY)
R0166   HITEMOUT =      YREGLP          TEMP FOR DISPLAY OF HRS, MIN, SEC
R0167                                           MUST = LOTEMOUT-1.
R0168   ZREGLP   ERASE                  LO PART OF ZREG (FOR DEC CONV ONLY)
R0169   LOTEMOUT =      ZREGLP          TEMP FOR DISPLAY OF HRS, MIN, SEC
R0170                                           MUST = HITEMOUT+1.
R0171   MODREG   ERASE                  MODE CODE
R0172   DSPLOCK  ERASE                  KEYBOARD/SUBROUTINE CALL INTERLOCK
R0173   REQRET   ERASE                  RETURN REGISTER FOR LOAD
R0174   LOADSTAT ERASE                  STATUS INDICATOR FOR LOADTST
R0175   CLPASS   ERASE                  PASS INDICATOR CLEAR
R0176   NOUT     ERASE                  ACTIVITY COUNTER FOR DSPTAB
R0177   NOUNCADR ERASE                  MACHINE CADR FOR NOUN
R0178   MONSAVE  ERASE                  N/V CODE FOR MONITOR. (= MONSAVE1-1)
R0179   MONSAVE1 ERASE                  NOUNCADR FOR MONITOR(MATBS) =MONSAVE +1
R01795  MONSAVE2 ERASE                  NVMONOPT OPTIONS
R0180   DSPTAB   ERASE          +13D    0-10,DISPLAY PANEL BUFFER.11-13,C RELAYS
R0181   CADRSTOR ERASE                  ENDIDLE STORAGE
R0182   NVQTEM   ERASE                  NVSUB STORAGE FOR CALLING ADDRESS
R0183                                   MUST = NVBNKTEM-1
R0184   NVBNKTEM ERASE                  NVSUB STORAGE FOR CALLING BANK
R0185                                   MUST = NVQTEM+1
R0186   VERBSAVE ERASE                  NEEDED FOR RECYCLE
R0187   DSPLIST  ERASE                  WAITING REG FOR DSP SYST INTERNAL USE
R0188   EXTVBACT REASE                  EXTENDED VERB ACTIVITY INTERLOCK
R0189   DSPTEM1  ERASE          +2      BUFFER STORAGE AREA 1 (MOSTLY FOR TIME)
R0190   DSPTEM2  ERASE          +2      BUFFER STORAGE AREA 2 (MOSTLY FOR DEG)
R0191   END OF ERASABLES RESERVED FOR PINBALL EXECUTIVE ACTION
R0192   TEMPORARIES FOR PINBALL EXECUTIVE ACTION
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R0193   DSEXIT    =       INTB15+         RETURN FOR DSPIN
R0194   EXITEM    =       INTB15+         RETURN FOR SCALE FACTOR ROUTINE SELECT
R0195   BLANKRET  =       INTB15+         RETURN FOR 2BLANK

R0196   WRDRET    =       INTBIT15        RETURN FOR 5BLANK
R0197   WDRET     =       INTBIT15        RETURN FOR DSPWD
R0198   DECRET    =       INTBIT15        RETURN FOR PUTCOM(DEC LOAD)
R0199   21/22REG  =       INTBIT15        TEMP FOR CHARIN

R0200   UPDATRET  =       POLISH          RETURN FOR UPDATNN, UPDATVB
R0201   CHAR      =       POLISH          TEMP FOR CHARIN
R0202   ERCNT     =       POLISH          COUNTER FOR ERROR LIGHT RESET
R0203   DECOUNT   =       POLISH          COUNTER FOR SCALING AND DISPLAY (DEC)

R0204   SGNON     =       VBUF            TEMP FOR +,- ON
R0205   NOUNTEM   =       VBUF            COUNTER FOR MIXNOUN FETCH
R0206   DISTEM    =       VBUF            COUNTER FOR OCTAL DISPLAY VERBS
R0207   DECTEM    =       VBUF            COUNTER FOR FETCH (DEC DISPLAY VERBS)

R0208   SGNOFF    =       VBUF    +1      TEMP FOR +,- ON
R0209   NVTEMP    =       VBUF    +1      TEMP FOR NVSUB
R0210   SPTEMP1   =       VBUF    +1      STORAGE FOR SP CONST HI PART(=SPTEMP2-1)
R0211   HITEMIN   =       VBUF    +1      TEMP FOR LOAD OF HRS, MIN, SEC
R0212                                           MUST = LOTEMIN-1.
R0213   CODE      =       VBUF    +2      FOR DSPIN
R0214   SPTEMP2   =       VBUF    +2      STORAGE FOR SP CONST LO PART(=SPTEMP1+1)
R0215   LOTEMIN   =       VBUF    +2      TEMP FOR LOAD OF HRS, MIN, SEC
R0216                                           MUST = HITEMIN+1.
R0217   MIXTEMP   =       VBUF    +3      FOR MIXNOUN DATA
R0218   SIGNRET   =       VBUF    +3      RETURN FOR +,- ON

R0219   ALSO MIXTEMP+1 = VBUF+4, MIXTEMP+2 = VBUF+5.

R0220   ENTRET    =       DOTINC          EXIT FROM ENTER

R0221   WDCNT     =       DOTRET          CHAR COUNTER FOR DSPWD
R0222   INREL     =       DOTRET          INPUT BUFFER SELECTOR ( X,Y,Z, REG )

R0223   DSPMMTEM  =       MATINC          DSPCOUNT SAVE FOR DSPMM
R0224   MIXBR     =       MATINC          INDICATOR FOR MIXED OR NORMAL NOUN

R0225   TEM1      ERASE                   EXEC TEMP
R0226   DSREL     =       TEM1            REL ADDRESS FOR DSPIN

R0227   TEM2      ERASE                   EXEC TEMP
R0228   DSMAG     =       TEM2            MAGNITUDE STORE FOR DSPIN
R0229   IDADDTEM  =       TEM2            MIXNOUN INDIRECT ADDRESS STORAGE

R0230   TEM3      ERASE                   EXEC TEMP
R0231   COUNT     =       TEM3            FOR DSPIN
```

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R0232   TEM4     ERASE                   EXEC TEMP
R0233   LSTPTR   =       TEM4            LIST POINTER FOR GRABUSY
R0234   RELRET   =       TEM4            RETURN FOR RELDSP
R0235   FREERET  =       TEM4            RETURN FOR FREEDSP
R0236   DSPSIGRET =      TEM4            RETURN FOR DSPSIGN
R0237   SEPSCRET =       TEM4            RETURN FOR SEPSEC
R0238   SEPMNRET =       TEM4            RETURN FOR SEPMIN

R0239   TEM5     ERASE                   EXEC TEMP
R0240   NOUNADD  =       TEM5            TEMP STORAGE FOR NOUN ADDRESS

R0241   NNADTEM  ERASE                   TEMP FOR NOUN ADDRESS TABLE ENTRY
R0242   NNTYPTEM ERASE                   TEMP FOR NOUN TYPE TABLE ENTRY
R0243   IDAD1TEM ERASE                   TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0244                                    MUST = IDAD2TEM-1, = IDAD3TEM-2.
R0245   IDAD2TEM ERASE                   TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0246                                    MUST = IDAD1TEM+1, = IDAD3TEM-1.
R0247   IDAD3TEM ERASE                   TEMP FOR INDIR ADRESS TABLE ENTRY(MIXNN)
R0248                                    MUST = IDAD1TEM+2, = IDAD2TEM+1.
R0249   RUTMXTEM ERASE                   TEMP FOR SF ROUT TABLE ENTRY(MIXNN ONLY)
R0250   END OF TEMPORARIES FOR PINBALL EXECUTIVE ACTION
R02501  ADDITIONAL TEMPORARIES FOR PINBALL EXECUTIVE ACTION

R02502  MPAC, THRU MPAC +6
R02503  BUF, +1, +2
R02504  BUF2, +1, +2
R02506  MPTEMP
R02507  ADDRWD
R02509    END OF ADDITIONAL TEMPS FOR PINBALL EXEC ACTION
R0251   RESERVED FOR PINBALL INTERRUPT ACTION

R0252   DSPCNT   ERASE                   COUNTER FOR DSPOUT
R0253   UPLOCK   ERASE                   BIT1 = UPLINK INTERLOCK (ACTIVATED BY
A0254                                                    RECEPTION OF A BAD MESSAGE IN UPLINK)
R0255   END OF ERASABLES RESERVED FOR PINBALL INTERRUPT ACTION
R0256   TEMPORARIES FOR PINBALL INTERRUPT ACTION

R0257   KEYTEMP1 =      WAITEXIT        TEMP FOR KEYRUPT, UPRUPT
R0258   DSRUPTEM =      WAITEXIT        TEMP FOR DSPOUT
R0259   KEYTEMP2 =      RUPTAGN         TEMP FOR KEYRUPT, UPRUPT
R0260   END OF TEMPORARIES FOR PINBALL INTERRUPT ACTION
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L PINBALL GAME BUTTONS AND LIGHTS USER#S PAGE NO. 7 E0 S3

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P0261   THE INPUT CODES ASSUMED FOR THE KEYBOARD ARE,
R0262   0         10000
R0263   1         00001
R0264   9         01001
R0265   VERB      10001
R0266   ERROR RES10010
R0267   KEY RLSE 11001
R0268   +         11010
R0269   -         11011
R0270   ENTER     11100
R0271   CLEAR     11110
R0272   NOUN      11111
R0273   OUTPUT FORMAT FOR DISPLAY PANEL. SET OUT0 TO  AAAABCCCCCDDDDD.
R0274   A-S SELECT A RELAYWORD. THIS DETERMINES WHICH PAIR OF CHARACTERS ARE
R0275   ENERGIZED.
R0276   B FOR SPECIAL RELAYS SUCH AS SIGNS ETC.
R0277   C-S  5 BIT RELAY CODE FOR LEFT CHAR OF PAIR SELECTED BY RELAYWORD
R0278   D-S  5 BIT RELAY CODE FOR RIGHTCHAR OF PAIR SELECTED BY RELAYWORD.

R0279   THE PANEL APPEARS AS FOLLOWS,
R0280   MD1    MD2                              (MAJOR MODE)
R0281   VD1    VD2 (VERB)    ND1    ND2         (NOUN)
R0282   R1D1   R1D2   R1D3   R1D4   R1D5        (R1)
R0283   R2D1   R2D2   R2D3   R2D4   R2D5        (R2)
R0284   R3D1   R3D2   R3D3   R3D4   R3D5        (R3)

R0285   EACH OF THESE IS GIVEN A DSPCOUNT NUMBER FOR USE WITHIN COMPUTATION ONLY
R0286   MD1   25     R2D1  11        ALL ARE OCTAL
R0287   MD2   24     R2D2  10
R0288   VD1   23     R2D3   7
R0289   VD2   22     R2D4   6
R0290   ND1   21     R2D5   5
R0291   ND2   20     R3D1   4
R0292   R1D1  16     R3D2   3
R0293   R1D2  15     R3D3   2
R0294   R1D3  14     R3D4   1
R0295   R1D4  13     R3D5   0
R0296   R1D5  12
R0297   THERE IS AN 11 REGISTER TABLE (DSPTAB) FOR THE DISPLAY PANEL.

R0298   DSPTAB RELAYWD      BIT11     BITS 10-6     BITS 5-1
R0299   RELADD
R0300   10     1011                   MD1  (25)     MD2  (24)
R0301   9      1010                   VD1  (23)     VD2  (22)
R0302   8      1001                   ND1  (21)     ND2  (20)
R0303   7      1000                                 R1D1 (16)
```

```
R0304   6       0111            +R1         R1D2 (15)      R1D3 (14)
R0305   5       0110            -R1         R1D4 (13)      R1D5 (12)
R0306   4       0101            +R2         R2D1 (11)      R2D2 (10)
R0307   3       0100            -R2         R2D3 (7)       R2D4 (6)
R0308   2       0011                        R2D5 (5)       R3D1 (4)
R0309   1       0010            +R3         R3D2 (3)       R3D3 (2)
R0310   0       0001            -R3         R3D4 (1)       R3D5 (0)
R0311           0000    NO RELAYWORD
R0312   THE 5 BIT OUTPUT RELAY CODES ARE'
R0313   BLANK       00000
R0314   0           10101
R0315   1           00011
R0316   2           11001
R0317   3           11011
R0318   4           01111
R0319   5           11110
R0320   6           11100
R0321   7           10011
R0322   8           11101
R0323   9           11111
R03231  OUTPUT BITS USED BY PINBALL'

R03232              KEY RELEASE LIGHT     - BIT 5 OF CHANNEL 11
R03233              VERB/NOUN FLASH       - BIT 6 OF CHANNEL 11
R03234              OPERATOR ERROR LIGHT  - BIT 7 OF CHANNEL 11
```

L PINBALL GAME BUTTONS AND LIGHTS

```
P0324   START OF EXECUTIVE SECTION OF PINBALL
 0325                        40,2000                     BANK   40
032501 REF   1               40,2000                     SETLOC PINBALL1
032502                       40,2000                     BANK

 03255  REF   1                                         COUNT  40/PIN

 0330   REF  14  LAST  299   40,2000  3 4712 1  CHARIN   CAF    ONE
 0331   REF   2  LAST  188   40,2001  57=012 0           XCH    DSPLOCK
 0332   REF   1             40,2002  54 115 0           TS     21/22REG
 03321  REF   2  LAST  188   40,2003  11=042 1           CCS    CADRSTOR
 03322                       40,2004  0 2006 0           TC     +2
 03323  REF   1              40,2005  0 2013 1           TC     CHARIN2
 03324  REF   1              40,2006  4 2057 0           CS     ELRCODE1
 03325  REF  59  LAST  301   40,2007  6 0154 1           AD     MPAC
 03326                       40,2010  0 0006 1           EXTEND
 03327  REF   2  LAST  310   40,2011  1 2013 0           BZF    CHARIN2
 03328  REF   1              40,2012  0 4410 0           TC     RELDSPON
 0333   REF  60  LAST  310   40,2013  56 154 1  CHARIN2  XCH    MPAC
 0334   REF   1              40,2014  54 117 1           TS     CHAR
 0335   REF  77  LAST  299   40,2015  50 000 1           INDEX  A
 0336                        40,2016  0 2017 0           TC     +1
 0337   REF   1              40,2017  0 3335 1           TC     CHARALRM
 0338   REF   1              40,2020  0 2076 1           TC     NUM
 0339   REF   2  LAST  310   40,2021  0 2076 1           TC     NUM
 0340   REF   3  LAST  310   40,2022  0 2076 1           TC     NUM
 0341   REF   4  LAST  310   40,2023  0 2076 1           TC     NUM
 0342   REF   5  LAST  310   40,2024  0 2076 1           TC     NUM
 0343   REF   6  LAST  310   40,2025  0 2076 1           TC     NUM
 0344   REF   7  LAST  310   40,2026  0 2076 1           TC     NUM
 0345   REF   1              40,2027  0 2062 1           TC     89TEST
 0346   REF   2  LAST  310   40,2030  0 2062 1           TC     89TEST
 0347   REF   2  LAST  310   40,2031  0 3335 1           TC     CHARALRM
 0348   REF   3  LAST  310   40,2032  0 3335 1           TC     CHARALRM
 0349   REF   4  LAST  310   40,2033  0 3335 1           TC     CHARALRM
 0350   REF   5  LAST  310   40,2034  0 3335 1           TC     CHARALRM
 0351   REF   6  LAST  310   40,2035  0 3335 1           TC     CHARALRM
 0352   REF   7  LAST  310   40,2036  0 3335 1           TC     CHARALRM
 0353   REF   8  LAST  310   40,2037  0 2074 0           TC     NUM    -2
 0354   REF   1              40,2040  0 2255 1           TC     VERB
 0355   REF   1              40,2041  0 3504 0           TC     ERROR
 0356   REF   8  LAST  310   40,2042  0 3335 1           TC     CHARALRM
 0357   REF   9  LAST  310   40,2043  0 3335 1           TC     CHARALRM
 0358   REF  10  LAST  310   40,2044  0 3335 1           TC     CHARALRM
 0359   REF  11  LAST  310   40,2045  0 3335 1           TC     CHARALRM
 0360   REF  12  LAST  310   40,2046  0 3335 1           TC     CHARALRM
 0361   REF  13  LAST  310   40,2047  0 3335 1           TC     CHARALRM
 0362   REF   1              40,2050  0 3362 0           TC     VBRELDSP
```

BLOCK DISPLAY SYST
MAKE DSP SYST BUSY, BUT SAVE OLD
C(DSPLOCK) FOR ERROR LIGHT RESET.
ALL KEYS EXCEPT ER TURN ON KR LITE IF
CADRSTOR IS FULL. THIS REMINDS OPERATOR
TO RE-ESTABLISH A FLASHING DISPLAY
WHICH HE HAS OBSCURED WITH DISPLAYS OF
HIS OWN (SEE REMARKS PRECEDING ROUTINE
VBRELDSP).

INPUT CODE	FUNCTION
0	
1	
2	
3	
4	
5	
6	
7	
10	8
11	9
12	
13	
14	
15	
16	
17	
20	0
21	VERB
22	ERROR LIGHT RESET
23	
24	
25	
26	
27	
30	
31	KEY RELEASE

```
0363  REF   1                 40,2051  0 2310 1              TC     POSGN      32                  +
0364  REF   1                 40,2052  0 2275 0              TC     NEGSGN     33                  -
0365  REF   1                 40,2053  0 2060 0              TC     ENTERJMP   34                  ENTER
0366  REF  14  LAST  310      40,2054  0 3335 1              TC     CHARALRM   35
0367  REF   1                 40,2055  0 2370 1              TC     CLEAR      36                  CLEAR
0368  REF   1                 40,2056  0 2271 1              TC     NOUN       37                  NOUN
03685                         40,2057   00022 1  ELRCODE1    OCT    22
0369  REF  15  LAST  261      40,2060  0 4574 0  ENTERJMP    TC     POSTJUMP
0370  REF   1                 40,2061   62002 1              CADR   ENTER

0371  REF   3  LAST  188      40,2062  10 777 1  89TEST      CCS    DSPCOUNT
0372                          40,2063  0 2067 1              TC     +4         +
0373                          40,2064  0 2067 1              TC     +3         +0
0374  REF  22  LAST  301      40,2065  0 5112 0              TC     ENDOFJOB   - BLOCK DATA IN IF DSPCOUNT IS - OR -0
0375  REF  23  LAST  311      40,2066  0 5112 0              TC     ENDOFJOB   -0
0376  REF   2  LAST   32      40,2067  3 6214 0              CAF    THREE
0377  REF   1                 40,2070  7 1000 1              MASK   DECBRNCH
0378  REF  78  LAST  310      40,2071  10 000 0              CCS    A
0379  REF   9  LAST  310      40,2072  0 2076 1              TC     NUM        IF DECBRNCH IS +, 8 OR 9 OK
0380  REF  15  LAST  311      40,2073  0 3335 1              TC     CHARALRM   IF DECBRNCH IS +0, REJECT 8 OR 9
R0381  NUM ASSEMBLES OCTAL 3 BITS AT A TIME. FOR DECIMAL IT CONVERTS INCOMING
R0382  WORD AS A FRACTION, KEEPING RESULTS TO DP.
R0383  OCTAL RESULTS ARE LEFT IN XREG, YREG, OR ZREG. HI PART OF DEC IN XREG,
R0384  YREG, ZREG. THE LOW PARTS IN XREGLP, YREGLP, OR ZREGLP)
R0385  DECBRNCH IS LEFT AT +0 FOR OCT, +1 FOR + DEC, +2 FOR - DEC.
R0386  IF DSPCOUNT WAS LEFT -, NO MORE DATA IS ACCEPTED.

0387  REF  31  LAST  301      40,2074  3 4714 1              CAF    ZERO
0388  REF   2  LAST  310      40,2075  54 117 1              TS     CHAR
0389  REF   4  LAST  311      40,2076  10 777 1  NUM         CCS    DSPCOUNT
0390                          40,2077  0 2103 1              TC     +4         +
0391                          40,2100  0 2103 1              TC     +3         +0
0392                          40,2101  0 2102 0              TC     +1         -BLOCK DATA IN IF DSPCOUNT IS -
0393  REF  24  LAST  311      40,2102  0 5112 0              TC     ENDOFJOB   -0
0394  REF   1                 40,2103  0 2225 0              TC     GETINREL
0395  REF   2  LAST  188      40,2104  11"015 0              CCS    CLPASS     IF CLPASS IS + OR +0, MAKE IT +0.
0396  REF  32  LAST  311      40,2105  3 4714 1              CAF    ZERO
0397  REF   3  LAST  311      40,2106  55"015 0              TS     CLPASS
0398                          40,2107  0 2110 0              TC     +1
0399  REF   3  LAST  311      40,2110  50 117 0              INDEX  CHAR
0400  REF   2  LAST  131      40,2111  3 4072 0              CAF    RELTAB
0401  REF   2  LAST  227      40,2112  7 4362 0              MASK   LOW5
0402  REF   1                 40,2113  54 124 1              TS     CODE
0403  REF   5  LAST  311      40,2114  3 0777 0              CA     DSPCOUNT
0404  REF   1                 40,2115  54 143 0              TS     COUNT
0405  REF   1                 40,2116  0 3225 1              TC     DSPIN
```

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0406  REF   3  LAST  311   40,2117   3 6214 0          CAF   THREE
0407  REF   2  LAST  311   40,2120   7 1000 1          MASK  DECBRNCH
0408  REF  79  LAST  311   40,2121   10 000 0          CCS   A          +0, OCTAL.  +1, + DEC.  +2, - DEC.
0409  REF   1               40,2122   0 2133 1          TC    DECTOBIN   +
0410  REF   1               40,2123   50 137 1          INDEX INREL      +0 OCTAL
0411  REF   2  LAST  188   40,2124   57/001 1          XCH   VBRBREG
0412  REF   1               40,2125   54 022 0          TS    CYL
0413  REF   2  LAST  312   40,2126   4 0022 0          CS    CYL
0414  REF   3  LAST  312   40,2127   4 0022 0          CS    CYL
0415  REF   4  LAST  312   40,2130   56 022 1          XCH   CYL
0416  REF   4  LAST  311   40,2131   6 0117 0          AD    CHAR
0417  REF   1               40,2132   0 2150 1          TC    ENDNMTST
0418  REF   2  LAST  312   40,2133   50 137 1 DECTOBIN INDEX INREL
0419  REF   3  LAST  312   40,2134   57/001 1          XCH   VBRBREG
0420  REF  61  LAST  310   40,2135   54 154 0          TS    MPAC       SUM X 2EXP-14 IN MPAC
0421  REF  33  LAST  311   40,2136   3 4714 1          CAF   ZERO
0422  REF  62  LAST  312   40,2137   54 155 1          TS    MPAC  +1
0423  REF   2  LAST  187   40,2140   3 4377 0          CAF   TEN        10 X 2EXP-14
0424  REF   3  LAST  286   40,2141   0 7256 1          TC    SHORTMP    10SUM X 2EXP-28 IN MPAC, MPAC+1
0425  REF  63  LAST  312   40,2142   56 155 0          XCH   MPAC  +1
0426  REF   5  LAST  312   40,2143   6 0117 0          AD    CHAR
0427  REF  64  LAST  312   40,2144   54 155 1          TS    MPAC  +1
0428  REF   2  LAST  312   40,2145   0 2150 1          TC    ENDNMTST   NO OF
0429  REF  65  LAST  312   40,2146   26 154 0          ADS   MPAC       OF MUST BE 5TH CHAR
0430  REF   1               40,2147   0 2166 1          TC    DECEND
0431  REF   3  LAST  312   40,2150   50 137 1 ENDNMTST INDEX INREL
0432  REF   4  LAST  312   40,2151   55/001 0          TS    VBRBREG
0433  REF   6  LAST  311   40,2152   4 0777 1          CS    DSPCOUNT
0434  REF   4  LAST  312   40,2153   50 137 1          INDEX INREL
0435  REF   1               40,2154   6 2216 0          AD    CRITCON
0436                        40,2155   0 0006 1          EXTEND
0437  REF   1               40,2156   1 2160 0          BZF   ENDNUM     -0, DSPCOUNT = CRITCON
0438  REF   1               40,2157   0 2213 0          TC    MORNUM     - , DSPCOUNT G/ CRITCON
0439  REF   4  LAST  312   40,2160   3 6214 0 ENDNUM   CAF   THREE
0440  REF   3  LAST  312   40,2161   7 1000 1          MASK  DECBRNCH
0441  REF  80  LAST  312   40,2162   10 000 0          CCS   A
0442  REF   2  LAST  312   40,2163   0 2166 1          TC    DECEND
0443  REF   7  LAST  312   40,2164   4 0777 1 ENDALL   CS    DSPCOUNT   BLOCK NUMIN BY PLACING DSPCOUNT
0444  REF   2  LAST  312   40,2165   0 2214 1          TC    MORNUM  +1 NEGATIVELY
0445  REF  15  LAST  310   40,2166   4 4712 0 DECEND   CS    ONE
0446  REF   5  LAST  312   40,2167   6 0137 1          AD    INREL
0447                        40,2170   0 0006 1          EXTEND
0448  REF   1               40,2171   6 2164 0          BZMF  ENDALL     IF INREL=0,1(VBREG,NNREG), LEAVE WHOLE
0449  REF   1               40,2172   0 7052 1          TC    DMP        IF INREL=2,3,4(R1,R2,R3),CONVERT TO FRAC
A0450                                                                    MULT SUM X 2EXP-28 IN MPAC, MPAC+1 BY
0451  REF   1               40,2173    02223 0          ADRES DECON      2EXP14/10EXP5. GIVES(SUM/10EXP5)X2EXP-14
0452  REF   5  LAST  312   40,2174   3 6214 0          CAF   THREE        IN MPAC, +1, +2.
0453  REF   4  LAST  312   40,2175   7 1000 1          MASK  DECBRNCH
0454  REF  81  LAST  312   40,2176   50 000 1          INDEX A
0455                        40,2177   0 2177 1          TC    +0
```

```
0456  REF  1            40,2200  0 2204 0          TC      +DECSGN
0457                    40,2201  0 0006 1          EXTEND                  - CASE
0458  REF  66 LAST 312  40,2202  4 0156 1          DCS     MPAC    +1
0459  REF  67 LAST 313  40,2203  52 156 1          DXCH    MPAC    +1
0460  REF  68 LAST 313  40,2204  56 156 0  +DECSGN XCH     MPAC    +2
0461  REF  6  LAST 312  40,2205  50 137 1          INDEX   INREL
0462  REF  1            40,2206  55#004 0         TS      XREGLP  -2
0463  REF  69 LAST 313  40,2207  56 155 0          XCH     MPAC    +1
0464  REF  7  LAST 313  40,2210  50 137 1          INDEX   INREL
0465  REF  5  LAST 312  40,2211  55#001 0         TS      VERBREG
0466  REF  2  LAST 312  40,2212  0 2164 0          TC      ENDALL
0467  REF  8  LAST 312  40,2213  10 777 1  MORNUM  CCS     DSPCOUNT        DECREMENT DSPCOUNT
0468  REF  9  LAST 313  40,2214  54 777 1          TS      DSPCOUNT
0469  REF  25 LAST 311  40,2215  0 5112 0          TC      ENDOFJOB

0470                    40,2216   00022 1  CRITCON  OCT     22              (DEC 18)
0471                    40,2217   00020 0           OCT     20              (DEC 16)
0472                    40,2220   00012 1           OCT     12              (DEC 10)
0473                    40,2221   00005 1           OCT     5
0474                    40,2222   00000 1           OCT     0

0475                    40,2223   05174 0  DECON    2DEC    E-5 B14         2EXP14/10EXP5 = .16384 DEC
0475                    40,2224   13281 0
R0476  GETINREL GETS PROPER DATA REG REL ADDRESS FOR CURRENT C(DSPCOUNT) AND
R0477  PUTS IN INTO INREL. +0 VERBREG, 1 NOUNREG, 2 XREG, 3 YREG, 4 ZREG.

0478  REF  10 LAST 313  40,2225  50 777 0  GETINREL INDEX   DSPCOUNT
0479  REF  1            40,2226  3 2231 0           CAF     INRELTAB
0480  REF  8  LAST 313  40,2227  54 137 0          TS      INREL           (A TEMP, REG)
0481  REF  38 LAST 301  40,2230  0 0002 0          TC      Q

0482                    40,2231   00004 0  INRELTAB OCT     4               R3D5 (DSPCOUNT = 0)
0483                    40,2232   00004 0           OCT     4               R3D4        =(1)
0484                    40,2233   00004 0           OCT     4               R3D3        =(2)
0485                    40,2234   00004 0           OCT     4               R3D2        =(3)
0486                    40,2235   00004 0           OCT     4               R3D1        =(4)
0487                    40,2236   00003 1           OCT     3               R2D5        =(5)
0488                    40,2237   00003 1           OCT     3               R2D4        =(6)
0489                    40,2240   00003 1           OCT     3               R2D3        =(7)
0490                    40,2241   00003 1           OCT     3               R2D2        =(8D)
0491                    40,2242   00003 1           OCT     3               R2D1        =(9D)
0492                    40,2243   00002 0           OCT     2               R1D5        =(10D)
0493                    40,2244   00002 0           OCT     2               R1D4        =(11D)
0494                    40,2245   00002 0           OCT     2               R1D3        =(12D)
0495                    40,2246   00002 0           OCT     2               R1D2        =(13D)
0496                    40,2247   00002 0           OCT     2               R1D1        =(14D)
0497  REF  1            40,2250  0 5640 0          TC      CCSHOLE         NO DSPCOUNT NUMBER = 15D
0498                    40,2251   00001 0           OCT     1               ND2         =(16D)
```

```
0499                                  40,2252   00001 0                 OCT   1
0500                                  40,2253   00000 1                 OCT   0
0501                                  40,2254   00000 1                 OCT   0
0502  REP  34  LAST  312             40,2255   3 4714 1  VERB          CAP   ZERO
0503  REP   6  LAST  313             40,2256   55,001 0                TS    VERBREG
0504  REP   2  LAST  188             40,2257   3 4374 0                CAP   VD1
0505  REP  11  LAST  313             40,2260   54 777 1  NVCOM         TS    DSPCOUNT
0506  REP   1                       40,2261   0 2502 1                TC    2BLANK
0507  REP  16  LAST  312             40,2262   3 4712 1                CAP   ONE
0508  REP   5  LAST  312             40,2263   55,000 1                TS    DECBRNCH
0509  REP  35  LAST  314             40,2264   3 4714 1                CAP   ZERO
0510  REP   2  LAST  188             40,2265   55,013 0                TS    REQRET
0511  REP   1                       40,2266   3 4233 1                CAP   ENDINST
0512  REP   1                       40,2267   54 136 1                TS    ENTRET
A0513
0514  REP  26  LAST  313             40,2270   0 5112 0                TC    ENDOFJOB
0515  REP  36  LAST  314             40,2271   3 4714 1  NOUN          CAP   ZERO
0516  REP   7  LAST  265             40,2272   55,002 0                TS    NOUNREG
0517  REP   1                       40,2273   3 4375 1                CAP   ND1
0518  REP   1                       40,2274   0 2260 1                TC    NVCOM
0519  REP   1                       40,2275   0 2347 0  NEGSGN        TC    SIGNTEST
0520  REP   1                       40,2276   0 2334 1                TC    -ON
0521  REP   7  LAST  297             40,2277   3 4711 1                CAP   TWO
0522  REP   9  LAST  313             40,2300   50 137 1  BOTHSGN       INDEX INREL
0523  REP  26  LAST  253             40,2301   6 4704 0                AD    BIT7
0524  REP   6  LAST  314             40,2302   27,000 1                ADS   DECBRNCH
0525  REP   4  LAST  311             40,2303   11,015 0  FIXCLPAS      CCS   CLPASS
0526  REP  37  LAST  314             40,2304   3 4714 1                CAP   ZERO
0527  REP   5  LAST  314             40,2305   55,015 0                TS    CLPASS
0528                                  40,2306   0 2307 1                TC    +1
0529  REP  27  LAST  314             40,2307   0 5112 0                TC    ENDOFJOB

0530  REP   2  LAST  314             40,2310   0 2347 0  POSGN         TC    SIGNTEST
0531  REP   1                       40,2311   0 2314 0                TC    +ON
0532  REP  17  LAST  314             40,2312   3 4712 1                CAP   ONE
0533  REP   1                       40,2313   0 2300 0                TC    BOTHSGN

0534  REP  39  LAST  313             40,2314   22 002 0  +ON           LXCH  Q
0535  REP   2  LAST  311             40,2315   0 2225 0                TC    GETINREL
0536  REP  10  LAST  314             40,2316   50 137 1                INDEX INREL
0537  REP   1                       40,2317   3 2342 0                CAP   SGNTAB  -2
0538  REP   1                       40,2320   54 123 0                TS    SGNOFF
0539  REP  18  LAST  314             40,2321   6 4712 1                AD    ONE
0540  REP   1                       40,2322   54 122 1                TS    SGNON
0541  REP  38  LAST  314             40,2323   3 4714 1  SGNCOM        CAP   ZERO
0542  REP   2  LAST  311             40,2324   54 124 1                TS    CODE
```

```
ND1             =(17D)
VD2             =(18D)
VD1             =(19D)



SET FOR DEC V/N CODE

SET FOR ENTPAS0
IF DSPALARM OCCURS BEFORE FIRST ENTPAS0
OR NVSUB, ENTRET MUST ALREADY BE SET
TO TC ENDOFJOB


ND1, OCT 21 (DEC 17)


SET DEC COMP BIT TO 1 (IN DECBRNCH)
BIT 5 FOR R1,  BIT 4 FOR R2,
BIT 3 FOR R3.
IF CLPASS IS + OR +0, MAKE IT +0.
```

```
 0543   REF   2  LAST  314   40,2325  56 123 1          XCH   SGNOFF
 0544   REF   1               40,2326  0 3307 0         TC    11DSPIN
 0545   REF  14  LAST  260   40,2327  3 4700 1          CAF   BIT11
 0546   REF   3  LAST  314   40,2330  54 124 1          TS    CODE
 0547   REF   2  LAST  314   40,2331  56 122 0          XCH   SGNON
 0548   REF   2  LAST  315   40,2332  0 3307 0         TC    11DSPIN
 0549   REF  25  LAST  301   40,2333  0 0001 0         TC    L
 0550   REF  40  LAST  314   40,2334  22 002 0  -ON     LXCH  Q
 0551   REF   3  LAST  314   40,2335  0 2225 0         TC    GETINREL
 0552   REF  11  LAST  314   40,2336  50 137 1         INDEX INREL
 0553   REF   2  LAST  314   40,2337  3 2342 0         CAF   SGNTAB  -2
 0554   REF   3  LAST  315   40,2340  54 122 1         TS    SGNON
 0555   REF  19  LAST  314   40,2341  6 4712 1         AD    ONE
 0556   REF   3  LAST  315   40,2342  54 123 0         TS    SGNOFF
 0557   REF   1               40,2343  0 2323 1         TC    SGNCOM

 0558                        40,2344   00005 1  SGNTAB  OCT   5             -R1
 0559                        40,2345   00003 1          OCT   3             -R2
 0560                        40,2346   00000 1          OCT   0             -R3
 0561   REF  41  LAST  315   40,2347  22 002 0  SIGNTEST LXCH  Q             ALLOWS +,- ONLY WHEN DSPCOUNT=R1D1,
 0562   REF   6  LAST  312   40,2350  3 6214 0         CAF   THREE           R2D1, OR R3D1. ALLOWS ONLY FIRST OF
 0563   REF   7  LAST  314   40,2351  7 1000 1         MASK  DECBRNCH        CONSECUTIVE +/- CHARACTERS.
 0564   REF  82  LAST  312   40,2352  10 000 0         CCS   A               IF LOW2 BITS OF DECBRNCH NOT= 0, SIGN
 0565   REF  28  LAST  314   40,2353  0 5112 0         TC    ENDOFJOB        FOR THIS WORD ALREADY IN. REJECT.
 0566   REF   2  LAST  227   40,2354  4 4333 1         CS    R1D1
 0567   REF   1               40,2355  0 2363 0         TC    SGNTST1
 0568   REF   1               40,2356  4 4334 0         CS    R2D1
 0569   REF   2  LAST  315   40,2357  0 2363 0         TC    SGNTST1
 0570   REF   1               40,2360  4 4335 1         CS    R3D1
 0571   REF   3  LAST  315   40,2361  0 2363 0         TC    SGNTST1
 0572   REF  29  LAST  315   40,2362  0 5112 0         TC    ENDOFJOB        NO MATCH FOUND. SIGN ILLEGAL
 0573   REF  12  LAST  314   40,2363  6 0777 0  SGNTST1 AD    DSPCOUNT
 0574                        40,2364  0 0006 1          EXTEND
 0575                        40,2365  1 2367 0         BZF   +2              MATCH FOUND
 0576   REF  42  LAST  315   40,2366  0 0002 0         TC    Q
 0577   REF  26  LAST  315   40,2367  0 0001 0         TC    L               SIGN LEGAL
R0578   CLEAR BLANKS WHICH R1, R2, R3 IS CURRENT OR LAST TO BE DISPLAYED(PERTINE
R0579   NT XREG,YREG,ZREG IS CLEARED). SUCCESSIVE CLEARS TAKE CARE OF EACH RX
R0580   L/ RC UNTIL R1 IS DONE. THEN NO FURTHER ACTION

R0581   THE SINGLE COMPONENT LOAD VERBS ALLOW ONLY THE SINGLE RC THAT IS
R0582   APPROPRIATE TO BE CLEARED.

R0583   CLPASS    +0  PASS0, CAN BE BACKED UP
R0584             +NZ  HIPASS, CAN BE BACKED UP
R0585             -NZ  PASS0, CANNOT BE BACKED UP
```

```
0586  REF  13  LAST  315   40,2370  10 777 1  CLEAR   CCS    DSPCOUNT
0587  REF  20  LAST  315   40,2371  6 4712 1           AD     ONE
0588                       40,2372  0 2374 0           TC     +2
0589  REF  21  LAST  316   40,2373  6 4712 1           AD     ONE
0590  REF  83  LAST  315   40,2374  50 000 1           INDEX  A          DO NOT CHANGE DSPCOUNT BECAUSE MAY LATER
0591  REF   2  LAST  313   40,2375  3 2231 0           CAF    INRELTAB   FAIL LEGALTST.
0592  REF  12  LAST  315   40,2376  54 137 0           TS     INREL      MUST SET INREL, EVEN FOR HIPASS.
0593  REF   6  LAST  314   40,2377  11∝015 0           CCS    CLPASS
0594  REF   1             40,2400  0 2406 1           TC     CLPASHI    +
0595                       40,2401  0 2403 1           TC     +2         +0    IF CLPASS IS +0 OR -, IT IS PASS0
0596                       40,2402  0 2403 1           TC     +1         -
0597  REF  13  LAST  316   40,2403  3 0137 1           CA     INREL
0598  REF   1             40,2404  0 2430 1           TC     LEGALTST
0599  REF   1             40,2405  0 2423 0           TC     CLEAR1
0600  REF  14  LAST  316   40,2406  10 137 0  CLPASHI  CCS    INREL
0601  REF  15  LAST  316   40,2407  54 137 0           TS     INREL
0602  REF   2  LAST  316   40,2410  0 2430 1           TC     LEGALTST
0603  REF   1             40,2411  3 2500 0           CAF    DOUBLK +2  +3 TO - NUMBER. BACKS DATA REQUESTS.
0604  REF   3  LAST  314   40,2412  27∝013 0           ADS    REQRET
0605  REF  16  LAST  316   40,2413  3 0137 1           CA     INREL
0606  REF   1             40,2414  54 125 0           TS     MIXTEMP    TEMP STORAGE FOR INREL
0607                       40,2415  0 0006 1           EXTEND
0608  REF   7  LAST  314   40,2416  27∝001 0           DIM    VERBREG    DECREMENT VERB AND RE-DISPLAY
0609  REF  38  LAST  301   40,2417  0 4555 0           TC     BANKCALL
0610  REF   1             40,2420  62337 1            CADR   UPDATVB
0611  REF   2  LAST  316   40,2421  3 0125 1           CA     MIXTEMP
0612  REF  17  LAST  316   40,2422  54 137 0           TS     INREL      RESTORE INREL
0613  REF   1             40,2423  0 2426 0  CLEAR1   TC     CLR5
0614  REF   7  LAST  316   40,2424  25∝015 1           INCR   CLPASS     ONLY IF CLPASS IS + OR +0,
0615  REF  30  LAST  315   40,2425  0 5112 0           TC     ENDOFJOB   SET FOR HIGHER PASS.
0616  REF  43  LAST  315   40,2426  22 002 0  CLR5     LXCH   Q          USES 5BLANK  BUT AVOIDS ITS TC GETINREL
0617  REF   1             40,2427  0 2441 1           TC     5BLANK +2
0618  REF   2  LAST  229   40,2430  6 7715 0  LEGALTST AD     NEG2
0619  REF  84  LAST  316   40,2431  10 000 0           CCS    A
0620  REF  44  LAST  316   40,2432  0 0002 0           TC     Q          LEGAL  INREL G/ 2
0621  REF   2  LAST  313   40,2433  0 5640 0           TC     CCSHOLE
0622  REF  31  LAST  316   40,2434  0 5112 0           TC     ENDOFJOB   ILLEGAL   INREL= 0,1
0623  REF  45  LAST  316   40,2435  0 0002 0           TC     Q          LEGAL     INREL = 2
R0624 5BLANK BLANKS 5 CHAR DISPLAY WORD IN R1, R2, OR R3. IT ALSO ZEROES XREG,
R0625 YREG, OR ZREG.PLACE ANY + DSPCOUNT NUMBER FOR PERTINENT RC INTO DSPCOUNT
R0626 DSPCOUNT IS LEFT SET TO LEFT MOST DSP NUMB FOR RC JUST BLANKED.

0627  REF  14  LAST  316   40,2436  54 777 1           TS     DSPCOUNT   NEEDED FOR BLANKSUB
0628  REF  46  LAST  316   40,2437  22 002 0  5BLANK   LXCH   Q
0629  REF   4  LAST  315   40,2440  0 2225 0           TC     GETINREL
0630  REF  39  LAST  314   40,2441  3 4714 1           CAF    ZERO
0631  REF  18  LAST  316   40,2442  50 137 1           INDEX  INREL
0632  REF   8  LAST  316   40,2443  55∝001 0           TS     VERBREG    ZERO X, Y, Z REG.
```

```
0633  REF  19  LAST  316   40,2444  50 137 1          INDEX  INREL
0634  REF   2  LAST  313   40,2445  55∝004 0          TS     XREGLP  -2
0635  REF   4  LAST  315   40,2446  54 124 1          TS     CODE
0636  REF  20  LAST  317   40,2447  50 137 1          INDEX  INREL          ZERO PERTINENT DEC COMP BIT.
0637  REF  27  LAST  314   40,2450  4 4704 1          CS     BIT7           PROTECT OTHERS
0638  REF   8  LAST  315   40,2451  7 1000 1          MASK   DECBRNCH
0639  REF   1              40,2452  7 2501 0          MASK   BRNCHCON       ZERO LOW 2 BITS.
0640  REF   9  LAST  317   40,2453  55∝000 1          TS     DECBRNCH
0641  REF  21  LAST  317   40,2454  50 137 1          INDEX  INREL
0642  REF   1              40,2455  3 2471 1          CAF    SINBLANK -2    BLANK ISOLATED CHAR SEPARATELY
0643  REF   2  LAST  311   40,2456  54 143 0          TS     COUNT
0644  REF   2  LAST  311   40,2457  0 3225 1          TC     DSPIN
0645  REF  22  LAST  317   40,2460  50 137 1  5BLANK1 INDEX  INREL
0646  REF   2  LAST  316   40,2461  3 2474 1          CAF    DOUBLK  -2
0647  REF  15  LAST  316   40,2462  54 777 1          TS     DSPCOUNT
0648  REF   2  LAST  314   40,2463  0 2502 1          TC     2BLANK
0649  REF   8  LAST  314   40,2464  4 4711 0          CS     TWO
0650  REF  16  LAST  317   40,2465  26 777 1          ADS    DSPCOUNT
0651  REF   3  LAST  317   40,2466  0 2502 1          TC     2BLANK
0652  REF  23  LAST  317   40,2467  50 137 1          INDEX  INREL
0653  REF   3  LAST  315   40,2470  3 4331 1          CAF    R1D1    -2
0654  REF  17  LAST  317   40,2471  54 777 1          TS     DSPCOUNT       SET DSPCOUNT TO LEFT MOST DSP NUMBER
0655  REF  27  LAST  315   40,2472  0 0001 0          TC     L              OF REG. JUST BLANKED

0656                        40,2473   00016 0  SINBLANK OCT    16             DEC 14
0657                        40,2474   00005 1           OCT    5
0658                        40,2475   00004 0           OCT    4
0659                        40,2476   00015 0  DOUBLK   OCT    15             DEC 13
0660                        40,2477   00011 1           OCT    11             DEC 9
0661                        40,2500   00003 1           OCT    3

0662                        40,2501   77774 0  BRNCHCON OCT    77774

R0663  2BLANK BLANKS TWO CHAR. PLACE DSP NUMBER OF LEFT CHAR OF THE PAIR INTO
R0664  DSPCOUNT. THIS NUMBER IS LEFT IN DSPCOUNT

0665  REF  18  LAST  317   40,2502  3 0777 0  2BLANK  CA     DSPCOUNT
0666  REF   4  LAST  261   40,2503  54 021 0          TS     SR
0667  REF   1              40,2504  4 2515 0          CS     BLANKCON
0668                        40,2505  0 0004 0          INHINT
0669  REF   5  LAST  317   40,2506  50 021 1          INDEX  SR
0670  REF  25  LAST  187   40,2507  57∝023 1          XCH    DSPTAB
0671                        40,2510  0 0006 1          EXTEND
0672                        40,2511  6 2513 1          BZMF   +2             IF OLD CONTENTS -, NOUT OK
0673  REF   6  LAST  188   40,2512  25∝016 1          INCR   NOUT           IF OLD CONTENTS +, +1 TO NOUT
0674                        40,2513  0 0003 1          RELINT                IF -,NOUT OK
0675  REF  47  LAST  316   40,2514  0 0002 0          TC     Q
0676                        40,2515   04000 0  BLANKCON OCT    4000
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P0677   ENTER PASS 0 IS THE EXECUTE FUNCTION. HIGHER ORDER ENTERS ARE TO LOAD
R0678   DATA. THE SIGN OF REQRET DETERMINES THE PASS, + FOR PASS 0,- FOR HIGHER
R0679   PASSES.
R0680   MACHINE CADR TO BE SPECIFIED (MCTBS) NOUNS DESIRE AN ECADR TO BE LOADED
R0681   WHEN USED WITH LOAD VERBS, MONITOR VERBS, OR DISPLAY VERBS (EXCEPT
R0682   VERB = FIXED MEMORY DISPLAY, WHICH REQUIRES AN FCADR).
 0683                          41,2000                    BANK   41
 068301 REF   1                41,2000                    SETLOC PINBALL2
 068302                        41,2000                    BANK

 06835  REF   1                                          COUNT  41/PIN

 0684   REF   1                41,2000  0 3534 0 NVSUBB   TC     NVSUB1          STANDARD LEAD INS. DONT MOVE.
 0685   REF   1                41,2001  0 2771 1 LOADLV1  TC     LOADLV
A0686                                                                            END OF STANDARD LEAD INS.
 0687   REF  40 LAST  316       41,2002  3 4714 1 ENTER    CAF    ZERO
 0688   REF   8 LAST  316       41,2003 55*015 0          TS     CLPASS
 0689   REF   2 LAST  314       41,2004  3 4233 1          CAF    ENDINST
 0690   REF   2 LAST  314       41,2005 54 136 1          TS     ENTRET
 0691   REF   4 LAST  316       41,2006 11*013 0          CCS    REQRET
 0692   REF   1                 41,2007  0 2035 0          TC     ENTPAS0         IF +, PASS 0
 0693   REF   2 LAST  318       41,2010  0 2035 0          TC     ENTPAS0         IF +, PASS 0
 0694                           41,2011  0 2012 0          TC     +1              IF -, NOT PASS 0
 0695   REF   1                 41,2012  3 2033 0 ENTPASHI CAF    MMADREF
 0696   REF   5 LAST  318       41,2013  6 1013 1          AD     REQRET          IF L/ 2 CHAR IN FOR MM CODE, ALARM
 0697                           41,2014  0 0006 1          EXTEND                 AND RECYCLE(DECIDE AT MMCHANG+1).
 0698   REF   1                 41,2015  1 2027 1          BZF    ACCEPTWD
 0699   REF   7 LAST  315       41,2016  3 6214 0          CAF    THREE           IF DEC, ALARM IF L/ 5 CHAR IN FOR DATA,
 0700   REF  10 LAST  317       41,2017  7 1000 1          MASK   DECBRNCH        BUT LEAVE REQRET - AND FLASH ON, SO
 0701   REF  85 LAST  316       41,2020 10 000 0          CCS    A               OPERATOR CAN SUPPLY MISSING NUMERICAL
 0702                           41,2021  0 2023 1          TC     +2              CHARACTERS AND CONTINUE.
 0703   REF   2 LAST  318       41,2022  0 2027 0          TC     ACCEPTWD        OCTAL. ANY NUMBER OF CHAR OK.
 0704   REF  19 LAST  317       41,2023 10 777 1          CCS    DSPCOUNT
 0705   REF   1                 41,2024  0 2350 0          TC     GODSPALM        LESS THAN 5 CHAR DEC(DSPCOUNT IS +)
 0706   REF   2 LAST  318       41,2025  0 2350 0          TC     GODSPALM        LESS THAN 5 CHAR DEC(DSPCOUNT IS +)
 0707                           41,2026  0 2027 0          TC     +1              5 CHAR IN (DSPCOUNT IS -)
 0708   REF   6 LAST  318       41,2027  4 1013 0 ACCEPTWD CS     REQRET          5 CHAR IN (DSPCOUNT IS -)
 0709   REF   7 LAST  318       41,2030 55*013 0          TS     REQRET          SET REQRET +.
 0710   REF   2 LAST  238       41,2031  0 4447 1          TC     FLASHOFF
 0711   REF   8 LAST  318       41,2032  0 1013 1          TC     REQRET

 0712   REF   3 LAST  318         0136             ENTEXIT =      ENTRET

 0713   REF   1                 41,2033  03421 0 MMADREF  ADRES  MMCHANG +1      ASSUMES TC REQMM AT MMCHANG.
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0714                          41,2034   00034 0  LOWVERB  DEC    28          LOWER VERB THAT AVOIDS NOUN TEST.

0715  REF  41  LAST  318     41,2035   3 4714 1  ENTPAS0  CAF    ZERO        NOUN VERB SUB ENTERS HERE
0716  REF  11  LAST  318     41,2036   55=000 1           TS     DECBRNCH
0717  REF   3  LAST  314     41,2037   4 4374 1           CS     VD1         BLOCK FURTHER NUM CHAR, SO THAT STRAY
0718  REF  20  LAST  318     41,2040   54 777 1           TS     DSPCOUNT    CHAR DO NOT GET INTO VERB OR NOUN LTS.
0719  REF   9  LAST  316     41,2041   4 1001 0  TESTVB   CS     VERBREG     IF VERB IS G/E LOWVB, SKIP NOUN TEST.
0720  REF   1               41,2042   55=041 1           TS     VERBSAVE    SAVE VERB FOR POSSIBLE RECYCLE.
0721  REF   1               41,2043   6 2034 1           AD     LOWVERB     LOWVERB - VB
0722                        41,2044   0 0006 1           EXTEND
0723  REF   1               41,2045   6 2133 1           BZMF   VERBFAN     VERB G/E LOWVERB
0724                        41,2046   0 0006 1  TESTNN   EXTEND             VERB L/ LOWVERB
0725  REF   1               41,2047   3 2114 1           DCA    LODNNLOC    SWITCH BANKS TO NOUN TABLE READING
0726  REF   3  LAST  266     41,2050   52 006 0           DXCH   Z           ROUTINE.
0727  REF   3  LAST  265     41,2051   50 140 1           INDEX  MIXBR
0728                        41,2052   0 2052 1           TC     +0
0729                        41,2053   0 2055 0           TC     +2          NORMAL
0730  REF   1               41,2054   0 2221 1           TC     MIXNOUN     MIXED
0731  REF   3  LAST  265     41,2055   10 146 0           CCS    NNADTEM     NORMAL
0732  REF   2  LAST  319     41,2056   0 2131 0           TC     VERBFAN -2        NORMAL IF +
0733  REF   3  LAST  318     41,2057   0 2350 0           TC     GODSPALM    NOT IN USE    IF +0
0734  REF   1               41,2060   0 2064 1           TC     REQADD      SPECIFY MACHINE CADR IF -
0735  REF   1               41,2061   25=017 0           INCR   NOUNCADR    AUGMENT MACHINE CADR IF -0
0736  REF   1               41,2062   0 4325 1           TC     SETNADD     ECADR FROM NOUNCADR. SETS EB, NOUNADD.
0737  REF   1               41,2063   0 2120 0           TC     INTMCTBS +2
0738  REF  21  LAST  185     41,2064   3 4674 0  REQADD   CAF    BIT15       SET CLPASS FOR PASS0 ONLY
0739  REF   9  LAST  318     41,2065   55=015 0           TS     CLPASS
0740  REF   3  LAST  318     41,2066   4 4233 0           CS     ENDINST     TEST IF REACHED HERE FROM INTERNAL OR
0741  REF   1               41,2067   6 0136 0           AD     ENTEXIT           FROM EXTERNAL
0742                        41,2070   0 0006 1           EXTEND
0743                        41,2071   1 2073 0           BZF    +2          EXTERNAL MACH CADR TO BE SPECIFIED
0744  REF   2  LAST  319     41,2072   0 2116 0           TC     INTMCTBS
0745  REF   1               41,2073   0 2306 0           TC     REQDATZ     EXTERNAL MACH CADR TO BE SPECIFIED
0746  REF  12  LAST  319     41,2074   11=000 1           CCS    DECBRNCH    ALARM AND RECYCLE IF DECIMAL USED
0747  REF   1               41,2075   0 4161 0           TC     ALMCYCLE    FOR MCTBS.
0748  REF   4  LAST  319     41,2076   4 4374 1           CS     VD1         OCTAL USED  OK
0749  REF  21  LAST  319     41,2077   54 777 1           TS     DSPCOUNT    BLOCK NUM CHAR IN
0750  REF   3  LAST  310     41,2100   11=042 1           CCS    CADRSTOR
0751                        41,2101   0 2104 0           TC     +3          EXTERNAL MCTBS DISPLAY WILL LEAVE FLASH
0752  REF   1               41,2102   0 2105 1           TC     USEADD      ON IF ENDIDLE NOT = +0.
0753                        41,2103   0 2104 0           TC     +1
0754  REF   1               41,2104   0 4443 0           TC     FLASHON
0755  REF   1               41,2105   57=005 0  USEADD   XCH    ZREG
0756  REF   1               41,2106   0 4317 0           TC     SETNCADR    ECADR INTO NOUNCADR. SET EB, NOUNADD.
0757                        41,2107   0 0006 1           EXTEND
0758  REF   2  LAST  319     41,2110   3 2114 1           DCA    LODNNLOC    SWITCH BANKS TO NOUN TABLE READING
0759  REF   4  LAST  319     41,2111   52 006 0           DXCH   Z           ROUTINE.
0760  REF   3  LAST  319     41,2112   0 2133 1           TC     VERBFAN

0761  REF  22  LAST  319        0777                    EBANK= DSPCOUNT
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0762  REF   1                41,2113   02062 1  LODNNLOC 2CADR  LODNNTAB
0762  REF   1                41,2114   64101 0

0763                         41,2115   77772 0  NEG5     OCT    77772

0764  REF  70  LAST  313     41,2116   3 0156 0 INTMCTBS CA     MPAC    +2     INTERNAL MACH CADR TO BE SPECIFIED.
0765  REF   2  LAST  319     41,2117   0 4317 0         TC     SETNCADR       ECADR INTO NOUNCADR. SET EB, NOUNADD.
0766  REF   5  LAST  227     41,2120   4 4715 1         CS     FIVE           NVSUB CALL LEFT CADR IN MPAC+2 FOR MACH
0767  REF  10  LAST  319     41,2121   6 1001 1         AD     VERBREG        CADR TO BE SPECIFIED.
0768                         41,2122   0 0006 1         EXTEND
0769  REF   4  LAST  319     41,2123   1 2133 0         BZF    VERBFAN        DONT DISPLAY CADR IF VB = 05.
0770  REF   2  LAST  315     41,2124   3 4335 0         CAF    R3D1           VB NOT = 05. DISPLAY CADR.
0771  REF  23  LAST  319     41,2125   54 777 1         TS     DSPCOUNT
0772  REF   2  LAST  319     41,2126   3 1017 0         CA     NOUNCADR
0773  REF   1                41,2127   0 3353 1         TC     DSPOCTWD
0774  REF   5  LAST  320     41,2130   0 2133 1         TC     VERBFAN

0775  REF  22  LAST  316     41,2131   6 4712 1         AD     ONE
0776  REF   3  LAST  320     41,2132   0 4317 0         TC     SETNCADR       ECADR INTO NOUNCADR. SETS EB, NOUNADD.
0777  REF   1                41,2133   4 2145 1 VERBFAN CS     LST2CON        VERB-LST2CON
0778  REF  11  LAST  320     41,2134   6 1001 1         AD     VERBREG
0779  REF  86  LAST  318     41,2135   10 000 0         CCS    A              VERB G/ LST2CON
0780  REF  23  LAST  320     41,2136   6 4712 1         AD     ONE
0781                         41,2137   0 2141 1         TC     +2             VERB L/ LST2CON
0782  REF   1                41,2140   0 2146 0         TC     VBFANDIR
0783  REF  71  LAST  320     41,2141   54 154 0         TS     MPAC           RELEASE DISPLAY SYST
0784  REF   4  LAST  198     41,2142   0 4473 0         TC     RELDSP         GO TO GOEXTVB WITH VB-40 IN MPAC.
0785  REF  16  LAST  311     41,2143   0 4574 0         TC     POSTJUMP
0786  REF   1                41,2144    66000 1         CADR   GOEXTVB
0788                         41,2145    00050 1 LST2CON DEC    40             FIRST LIST2 VERB (EXTENDED VERB)

0790  REF  12  LAST  320     41,2146   51*001 1 VBFANDIR INDEX  VERBREG
0791  REF   1                41,2147   3 2151 0         CAF    VERBTAB
0792  REF   1                41,2150   0 4577 0         TC     BANKJUMP

0793  REF   4  LAST  319     41,2151    62350 0 VERBTAB CADR   GODSPALM       VB00 ILLEGAL
0794  REF   1                41,2152    62364 1         CADR   DSPA           VB01 DISPLAY OCT COMP 1 (R1)
0795  REF   1                41,2153    62372 0         CADR   DSPB           VB02 DISPLAY OCT COMP 2 (R1)
0796  REF   1                41,2154    62377 0         CADR   DSPC           VB03 DISPLAY OCT COMP 3 (R1)
0797  REF   1                41,2155    62357 1         CADR   DSPAB          VB04 DISPLAY OCT COMP 1,2 (R1,R2)
0798  REF   1                41,2156    62352 1         CADR   DSPABC         VB05 DISPLAY OCT COMP 1,2,3 (R1,R2,R3)
0799  REF   1                41,2157    62520 1         CADR   DECDSP         VB06 DECIMAL DISPLAY
0800  REF   1                41,2160    60675 0         CADR   DSPDPDEC       VB07 DP DECIMAL DISPLAY (R1,R2)
0801  REF   5  LAST  320     41,2161    62350 0         CADR   GODSPALM       VB08 SPARE
0802  REF   6  LAST  320     41,2162    62350 0         CADR   GODSPALM       VB09 SPARE
0803  REF   1                41,2163    61323 1         CADR   DSPALARM       VB10 SPARE
0804  REF   1                41,2164    63220 1         CADR   MONITOR        VB11 MONITOR OCT COMP 1 (R1)
0805  REF   2  LAST  320     41,2165    63220 1         CADR   MONITOR        VB12 MONITOR OCT COMP 2 (R1)
0806  REF   3  LAST  320     41,2166    63220 1         CADR   MONITOR        VB13 MONITOR OCT COMP 3 (R1)
0807  REF   4  LAST  320     41,2167    63220 1         CADR   MONITOR        VB14 MONITOR OCT COMP 1,2 (R1,R2)
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0808  REF  5  LAST  320  41,2170  63220 1        CADR  MONITOR     VB15 MONITOR OCT COMP 1,2,3 (R1,R2,R3)
0809  REF  6  LAST  321  41,2171  63220 1        CADR  MONITOR     VB16 MONITOR DECIMAL
0810  REF  7  LAST  321  41,2172  63220 1        CADR  MONITOR     VB17 MONITOR DP DEC  (R1,R2)
0811  REF  7  LAST  320  41,2173  62350 0        CADR  GODSPALM    VB18 SPARE
0812  REF  8  LAST  321  41,2174  62350 0        CADR  GODSPALM    VB19 SPARE
0813  REF  9  LAST  321  41,2175  62350 0        CADR  GODSPALM    VB20 SPARE
0814  REF  1              41,2176  62726 0        CADR  ALOAD       VB21 LOAD COMP 1 (R1)
0815  REF  1              41,2177  62737 0        CADR  BLOAD       VB22 LOAD COMP 2 (R2)
0816  REF  1              41,2200  62754 0        CADR  CLOAD       VB23 LOAD COMP 3 (R3)
0817  REF  1              41,2201  62677 0        CADR  ABLOAD      VB24 LOAD COMP 1,2 (R1,R2)
0818  REF  1              41,2202  62612 0        CADR  ABCLOAD     VB25 LOAD COMP 1,2,3 (R1,R2,R3)
0819  REF 10  LAST  321  41,2203  62350 0        CADR  GODSPALM    VB26 SPARE
0820  REF  1              41,2204  63343 0        CADR  DSPFMEM     VB27 FIXED MEMORY DISPLAY
A0821                                                              THE FOLLOWING VERBS MAKE NO NOUN TEST
0822  REF 11  LAST  321  41,2205  62350 0        CADR  GODSPALM    VB28 SPARE
0823  REF 12  LAST  321  41,2206  62350 0        CADR  GODSPALM    VB29 SPARE
0824  REF  1              41,2207  63456 0  REQEXLOC CADR  VBRQEXEC    VB30 REQUEST EXECUTIVE
0825  REF  1              41,2210  63502 0        CADR  VBRQWAIT    VB31 REQUEST WAITLIST
0826  REF  1              41,2211  61360 0        CADR  VBRESEQ     VB32 RESEQUENCE
0827  REF  1              41,2212  61343 1        CADR  VBPROC      VB33 PROCEED WITHOUT DATA
0828  REF  1              41,2213  61351 1        CADR  VBTERM      VB34 TERMINATE CURRENT TEST OR LOAD REQ
0829  REF  1              41,2214  63603 1        CADR  VBTSTLTS    VB35 TEST LIGHTS
0830  REF  1              41,2215  12347 1        CADR  SLAP1       VB36 FRESH START
0831  REF  2  LAST  318  41,2216  63420 1        CADR  MMCHANG     VB37 CHANGE MAJOR MODE
0832  REF 13  LAST  321  41,2217  62350 0        CADR  GODSPALM    VB38 SPARE
0833  REF 14  LAST  321  41,2220  62350 0        CADR  GODSPALM    VB39 SPARE
R0834  THE LIST2 VERBFAN IS LOCATED IN THE EXTENDED VERB BANK.
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P0835   NNADTAB CONTAINS A RELATIVE ADDRESS, IDADDREL(IN LOW 10 BITS), REFERRING
R0836   TO WHERE 3 CONSECUTIVE ADDRESSES ARE STORED (IN IDADDTAB).
R0837   MIXNOUN GETS DATA AND STORES IN MIXTEMP,+1,+2. IT SETS NOUNADD FOR
R0838    MIXTEMP.

 0839   REF   4  LAST  319   41,2221  10 146 0  MIXNOUN  CCS   NNADTEM
 0840                        41,2222  0 2226 0           TC    +4          +  IN USE
 0841   REF  15  LAST  321   41,2223  0 2350 0           TC    GODSPALM    +0  NOT IN USE
 0842                        41,2224  0 2226 0           TC    +2          -  IN USE
 0843                        41,2225  0 2226 0           TC    +1          -0  IN USE
 0844   REF  11  LAST  222   41,2226  4 6211 1           CS    SIX
 0845   REF  13  LAST  320   41,2227  6 1001 1           AD    VERBREG
 0846                        41,2230  0 0006 1           EXTEND
 0847                        41,2231  6 2233 1           BZMF  +2          VERB L/E 6
 0848   REF   6  LAST  320   41,2232  0 2133 1           TC    VERBFAN     AVOID MIXNOUN SWAP IF VB NOT = DISPLAY
 0849   REF   9  LAST  317   41,2233  3 4711 1           CAF   TWO
 0850   REF   1              41,2234  54 117 1  MIXNN1   TS    DECOUNT
 0851   REF   1              41,2235  6 2260 1           AD    MIXAD
 0852   REF   1              41,2236  54 145 0           TS    NOUNADD     SET NOUNADD TO MIXTEMP + K
 0853   REF   2  LAST  322   41,2237  50 117 0           INDEX DECOUNT     GET IDADDTAB ENTRY FOR COMPONENT K
 0854   REF   2  LAST  265   41,2240  3 0150 0           CA    IDAD1TEM    OF NOUN.
 0855   REF   1              41,2241  54 122 1           TS    NOUNTEM
A0856                                                                     TEST FOR DP(FOR OCT DISPLAY). IF SO, GET
A0857                                                                       MINOR PART ONLY.
 0858   REF   1              41,2242  0 3027 1           TC    SPRUTMIX    GET SF ROUT NUMBER IN A
 0859   REF   1              41,2243  0 2261 0           TC    DPTEST
 0860   REF   1              41,2244  0 2246 0           TC    MIXNN2      NO DP
 0861   REF   2  LAST  322   41,2245  24 122 0           INCR  NOUNTEM     DP  GET MINOR PART
 0862   REF   3  LAST  322   41,2246  3 0122 0  MIXNN2   CA    NOUNTEM
 0863   REF   3  LAST  131   41,2247  7 4372 1           MASK  LOW11       ESUBK (NO DP)  OR (ESUBK)+1    FOR DP
 0864   REF   1              41,2250  0 4327 0           TC    SETEBANK    SET EBANK, LEAVE EADRES IN A.
 0865   REF  87  LAST  320   41,2251  50 000 1           INDEX A           PICK UP C(ESUBK)  NOT DP
 0866                        41,2252  3 0000 1           CA    0           OR C((ESUBK)+1)  FOR DP MINOR PART
 0867   REF   2  LAST  322   41,2253  50 145 1           INDEX NOUNADD
 0868                        41,2254  56 000 1           XCH   0           STORE IN MIXTEM + K
 0869   REF   3  LAST  322   41,2255  10 117 1           CCS   DECOUNT
 0870   REF   1              41,2256  0 2234 0           TC    MIXNN1
 0871   REF   7  LAST  322   41,2257  0 2133 1           TC    VERBFAN

 0872   REF   3  LAST  316   41,2260  0 0125 1  MIXAD    TC    MIXTEMP
R0873   DPTEST   ENTER WITH SF ROUT NUMBER IN A.
R0874            RETURNS TO L+1 IF NO DP.
R0875            RETURNS TO L+2 IF DP.

 0876   REF  88  LAST  322   41,2261  50 000 1  DPTEST   INDEX A
 0877                        41,2262  1 2263 0           TCF   +1
 0878   REF  48  LAST  317   41,2263  0 0002 0           TC    Q           OCTAL ONLY  NO DP
 0879   REF  49  LAST  322   41,2264  0 0002 0           TC    Q           FRACT NO DP
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0880  REF  50  LAST  322   41,2265  0 0002 0            TC    Q          DEG  NO DP
0881  REF  51  LAST  323   41,2266  0 0002 0            TC    Q          ARITH  NO DP
0882  REF   1              41,2267  1 2300 1            TCF   DPTEST1    DP1OUT
0883  REF   2  LAST  323   41,2270  1 2300 1            TCF   DPTEST1    DP2OUT
0884  REF  52  LAST  323   41,2271  0 0002 0            TC    Q          OPDEG  NO DP
0885  REF   3  LAST  323   41,2272  1 2300 1            TCF   DPTEST1    DP3OUT
0886  REF  53  LAST  323   41,2273  0 0002 0            TC    Q          HMS  NO DP
0887  REF  54  LAST  323   41,2274  0 0002 0            TC    Q          M/S  NO DP
0888  REF   4  LAST  323   41,2275  1 2300 1            TCF   DPTEST1    DP4OUT
08881 REF  55  LAST  323   41,2276  0 0002 0            TC    Q          ARITH1  NO DP
08882 REF  56  LAST  323   41,2277  0 0002 0            TC    Q          2INTOUT  NO DP TO GET HI PART IN MPAC
0889  REF  57  LAST  323   41,2300  50 002 0  DPTEST1    INDEX Q
0890                       41,2301  0 0001 0            TC    1          RETURN TO L+2
0891  REF   4  LAST  317   41,2302  3 4333 0  REQDATX    CAF   R1D1
0892  REF   1              41,2303  1 2307 0            TCF   REQCOM
0893  REF   2  LAST  315   41,2304  3 4334 1  REQDATY    CAF   R2D1
0894  REF   2  LAST  323   41,2305  1 2307 0            TCF   REQCOM
0895  REF   3  LAST  320   41,2306  3 4335 0  REQDATZ    CAF   R3D1
0896  REF  24  LAST  320   41,2307  54 777 1  REQCOM     TS    DSPCOUNT
0897  REF  58  LAST  323   41,2310  4 0002 1            CS    Q
0898  REF   9  LAST  318   41,2311  55=013 0            TS    REQRET
0899  REF  39  LAST  316   41,2312  0 4555 0            TC    BANKCALL
0900  REF   2  LAST  316   41,2313   60437 1           CADR  5BLANK
0901  REF   2  LAST  319   41,2314  0 4443 0            TC    FLASHON
0902  REF   2  LAST  319   41,2315  0 0136 0  ENDREQDAT  TC    ENTEXIT

0903  REF   8  LAST  314   41,2316  55=002 0            TS    NOUNREG
0904  REF  59  LAST  323   41,2317  56 002 0  UPDATNN     XCH   Q
0905  REF   1              41,2320  54 117 1            TS    UPDATRET
0906                       41,2321  0 0006 1            EXTEND
0907  REF   3  LAST  319   41,2322  3 2114 1            DCA   LODNNLOC     SWITCH BANKS TO NOUN TABLE READING
0908  REF   5  LAST  319   41,2323  52 006 0            DXCH  Z            ROUTINE.
0909  REF   5  LAST  322   41,2324  10 146 0            CCS   NNADTEM
0910  REF  24  LAST  320   41,2325  6 4712 1            AD    ONE          NORMAL
0911  REF   1              41,2326  1 2331 0            TCF   PUTADD
0912  REF   2  LAST  323   41,2327  1 2332 0            TCF   PUTADD  +1   MCTBS  DONT CHANGE NOUNADD
0913  REF   3  LAST  323   41,2330  1 2332 0            TCF   PUTADD  +1   MCTBI  DONT CHANGE NOUNADD
0914  REF   4  LAST  320   41,2331  0 4317 0  PUTADD     TC    SETNCADR     ECADR INTO NOUNCADR. SETS EB, NOUNADD.
0915  REF   2  LAST  314   41,2332  3 4375 1            CAF   ND1
0916  REF  25  LAST  323   41,2333  54 777 1            TS    DSPCOUNT
0917  REF   9  LAST  323   41,2334  3 1002 1            CA    NOUNREG
0918  REF   1              41,2335  1 2344 1            TCF   UPDAT1

0919  REF  14  LAST  322   41,2336  55=001 0            TS    VERBREG
0920  REF  60  LAST  323   41,2337  56 002 0  UPDATVB     XCH   Q
0921  REF   2  LAST  323   41,2340  54 117 1            TS    UPDATRET
0922  REF   5  LAST  319   41,2341  3 4374 0            CAF   VD1
0923  REF  26  LAST  323   41,2342  54 777 1            TS    DSPCOUNT
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L PINBALL GAME BUTTONS AND LIGHTS

0924	REF	15	LAST	323	41,2343	3 1001 1		CA	VERBREG	
0925	REF	17	LAST	320	41,2344	0 4574 0	UPDAT1	TC	POSTJUMP	CANT USE SWCALL TO GO TO DSPDECVN, SINCE
0926	REF	1			41,2345	61222 1		CADR	GOVNUPDT	UPDATVB CAN ITSELF BE CALLED BY SWCALL.
0927	REF	3	LAST	323	41,2346	0 0117 0		TC	UPDATRET	
0928	REF	2	LAST	319	41,2347	0 4161 0	GOALMCYC	TC	ALMCYCLE	NEEDED BECAUSE BANKJUMP CANT HANDLE F/F.
0929	REF	18	LAST	324	41,2350	0 4574 0	GODSPALM	TC	POSTJUMP	
0930	REF	2	LAST	320	41,2351	61323 1		CADR	DSPALARM	

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P0931            NOUN   TABLES
R0932   NOUN CODE L/40, NORMAL NOUN CASE.  NOUN CODE G/E 40, MIXED NOUN CASE.
R0933   FOR NORMAL CASE, NNADTAB CONTAINS ONE        ECADR      FOR EACH NOUN.
R0934   +0 INDICATES NOUN NOT USED.   - ENTRY INDICATES MACHINE CADR(E OR F) TO
R0935   BE SPECIFIED. -1 INDICATES CHANNEL TO BE SPECIFIED. -0 INDICATES AUGMENT
R0936   OF LAST MACHINE CADR SUPPLIED.

R0937   FOR MIXED CASE, NNADTAB CONTAINS ONE INDIRECT ADDRESS(IDADDREL) IN LOW
R0938   10 BITS, AND THE COMPONENT CODE NUMBER IN THE HIGH 5 BITS.

R0939   NNTYPTAB IS A PACKED TABLE OF THE FORM MMMMMNNNNNPPPPP.

R0940   FOR THE NORMAL CASE, M-S ARE THE COMPONENT CODE NUMBER.
R0941                         N-S ARE THE SF ROUTINE CODE NUMBER.
R0942                         P-S ARE THE SF CONSTANT CODE NUMBER.

R0943   MIXED CASE,M-S ARE THE SF CONSTANT3 CODE NUMBER      3 COMPONENT CASE
R0944              N-S ARE THE SF CONSTANT2 CODE NUMBER
R0945              P-S ARE THE SF CONSTANT1 CODE NUMBER
R0946              N-S ARE THE SF CONSTANT2 CODE NUMBER      2 COMPONENT CASE
R0947              P-S ARE THE SF CONSTANT1 CODE NUMBER
R0948              P-S ARE THE SF CONSTANT1 CODE NUMBER       1 COMPONENT CASE

R0949   THERE IS ALSO AN INDIRECT ADDRESS TABLE(IDADDTAB) FOR MIXED CASE ONLY.
R0950   EACH ENTRY CONTAINS ONE ECADR.    IDADDREL IS THE RELATIVE ADDRESS OF
R0951   THE FIRST OF THESE ENTRIES.
R0952   THERE IS ONE ENTRY IN THIS TABLE FOR EACH COMPONENT OF A MIXED NOUN
R0953   THEY ARE LISTED IN ORDER OF ASCENDING K.

R0954   THERE IS ALSO A SCALE FACTOR ROUTINE NUMBER TABLE( RUTMXTAB ) FOR MIXED
R0955   CASE ONLY. THERE IS ONE ENTRY PER MIXED NOUN. THE FORM IS,
R0956         QQQQQRRRRRSSSSS
R0957   Q-S ARE THE SF ROUTINE 3 CODE NUMBER      3 COMPONENT CASE
R0958   R-S ARE THE SF ROUTINE 2 CODE NUMBER
R0959   S-S ARE THE SF ROUTINE 1 CODE NUMBER
R0960   R-S ARE THE SF ROUTINE 2 CODE NUMBER      2 COMPONENT CASE
R0961   S-S ARE THE SF ROUTINE 1 CODE NUMBER
R0962   IN OCTAL DISPLAY AND LOAD (OCT OR DEC) VERBS, EXCLUDE USE OF VERBS WHOSE
R0963   COMPONENT NUMBER IS GREATER THAN THE NUMBER OF COMPONENTS IN NOUN.
R0964   (ALL MACHINE ADDRESS TO BE SPECIFIED NOUNS ARE 3 COMPONENT.)
R0967   IN MULTI-COMPONENT LOAD VERBS, NO MIXING OF OCTAL AND DECIMAL DATA
R0968   COMPONENT WORDS IS ALLOWED. ALARM IF VIOLATION.

R0969   IN DECIMAL LOADS OF DATA, 5 NUMERICAL CHARACTERS MUST BE KEYED IN
R0970   BEFORE EACH ENTER. IF NOT, ALARM.
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P0971                DISPLAY VERBS
 0972   REF  10  LAST  322   41,2352  4 4711 0  DSPABC   CS    TWO
 0973   REF   1              41,2353  0 2423 0           TC    COMPTEST
 0974   REF   3  LAST  322   41,2354  50 145 1           INDEX NOUNADD
 0975                        41,2355  4 0002 1           CS    2
 0976   REF  36  LAST  301   41,2356  56 132 1           XCH   BUF      +2
 0977   REF  25  LAST  323   41,2357  4 4712 0  DSPAB    CS    ONE
 0978   REF   2  LAST  326   41,2360  0 2423 0           TC    COMPTEST
 0979   REF   4  LAST  326   41,2361  50 145 1           INDEX NOUNADD
 0980                        41,2362  4 0001 1           CS    1
 0981   REF  37  LAST  326   41,2363  56 131 1           XCH   BUF      +1
 0982   REF   1              41,2364  0 2442 1  DSPA     TC    DECTEST
 0983   REF   1              41,2365  0 2465 1           TC    TSTFORDP
 0984   REF   5  LAST  326   41,2366  50 145 1           INDEX NOUNADD
 0985                        41,2367  4 0000 0           CS    0
 0986   REF  38  LAST  326   41,2370  56 130 0  DSPCOM1  XCH   BUF
 0987   REF   1              41,2371  0 2404 0           TC    DSPCOM2
 0988   REF  26  LAST  326   41,2372  4 4712 0  DSPB     CS    ONE
 0989   REF   1              41,2373  0 2436 1           TC    DCOMPTST
 0990   REF   6  LAST  326   41,2374  50 145 1           INDEX NOUNADD
 0991                        41,2375  4 0001 1           CS    1
 0992   REF   1              41,2376  0 2370 1           TC    DSPCOM1
 0993   REF  11  LAST  326   41,2377  4 4711 0  DSPC     CS    TWO
 0994   REF   2  LAST  326   41,2400  0 2436 1           TC    DCOMPTST
 0995   REF   7  LAST  326   41,2401  50 145 1           INDEX NOUNADD
 0996                        41,2402  4 0002 1           CS    2
 0997   REF   2  LAST  326   41,2403  0 2370 1           TC    DSPCOM1
 0998   REF  12  LAST  326   41,2404  4 4711 0  DSPCOM2  CS    TWO          A  B  C  AB  ABC
 0999   REF  16  LAST  324   41,2405  6 1001 1           AD    VERBREG      -1 -0 +1 +2  +3   IN A
 1000   REF  89  LAST  322   41,2406  10 000 0           CCS   A            +0 +0 +0 +1  +2    IN A AFTER CCS
 1001   REF   1              41,2407  0 2412 1           TC    DSPCOM3
 1002   REF   3  LAST  323   41,2410  0 0136 0           TC    ENTEXIT
 1003                        41,2411  0 2412 1           TC    +1
 1004   REF   1              41,2412  54 122 1  DSPCOM3  TS    DISTEM       +0,+1,+2 INTO DISTEM
 1005   REF  90  LAST  326   41,2413  50 000 1           INDEX A
 1006   REF   5  LAST  323   41,2414  3 4333 0           CAF   R1D1
 1007   REF  27  LAST  323   41,2415  54 777 1           TS    DSPCOUNT
 1008   REF   2  LAST  326   41,2416  50 122 0           INDEX DISTEM
 1009   REF  39  LAST  326   41,2417  4 0130 1           CS    BUF
 1010   REF   2  LAST  320   41,2420  0 3353 1           TC    DSPOCTWD
 1011   REF   3  LAST  326   41,2421  56 122 0           XCH   DISTEM
 1012   REF   2  LAST  326   41,2422  0 2406 1           TC    DSPCOM2 +2

R1013   COMPTEST ALARMS IF COMPONENT NUMBER OF VERB(LOAD OR OCT DISPLAY) IS
R1014   GREATER THAN THE HIGHEST COMPONENT NUMBER OF NOUN.
 1016   REF   4  LAST  266   41,2423  54 123 0  COMPTEST TS    SPTEMP1      - VERB COMP
 1017   REF  61  LAST  323   41,2424  22 002 0           LXCH  Q
 1022   REF   1              41,2425  0 2512 0  COMPTST1 TC    GETCOMP
 1023   REF   1              41,2426  0 4345 1           TC    LEFT5
 1024   REF   8  LAST  318   41,2427  7 6214 1           MASK  THREE        NOUN COMP
```

```
 1025   REF   5  LAST  326   41,2430  6 0123 1           AD      SPTEMP1        NOUN COMP - VERB COMP
 1026   REF  91  LAST  326   41,2431  10 000 0           CCS     A
 1027   REF  28  LAST  317   41,2432  0 0001 0           TC      L              NOUN COMP G/ VERB COMP
 1028   REF   3  LAST  316   41,2433  0 5640 0           TC      CCSHOLE
 1029   REF  16  LAST  322   41,2434  0 2350 0           TC      GODSPALM       NOUN COMP L/ VERB COMP
 1030   REF  29  LAST  327   41,2435  0 0001 0 NDCMPTST  TC      L              NOUN COMP = VERB COMP
R1031   DCOMPTST ALARMS IF DECIMAL ONLY BIT (BIT4 OF COMP CODE NUMBER) = 1.
R1032   IF NOT, IT PERFORMS REGULAR COMPTEST.
 1033   REF   6  LAST  327   41,2436  54 123 0 DCOMPTST  TS      SPTEMP1        - VERB COMP
 1034   REF  62  LAST  326   41,2437  22 002 0           LXCH    Q
 1035   REF   2  LAST  326   41,2440  0 2442 1           TC      DECTEST
 1036   REF   1                41,2441  0 2425 0           TC      COMPTST1

 1037                          41,2442  0 0006 1 DECTEST   EXTEND                 ALARMS IF DEC ONLY BIT = 1 (BIT4 OF COMP
 1038   REF  72  LAST  320   41,2443  22 156 0           QXCH    MPAC    +2     CODE NUMBER). RETURNS IF NOT.
 1039   REF   2  LAST  326   41,2444  0 2512 0           TC      GETCOMP
 1040   REF  25  LAST  224   41,2445  7 4675 0           MASK    BIT14
 1041   REF  92  LAST  327   41,2446  10 000 0           CCS     A
 1042   REF  17  LAST  327   41,2447  0 2350 0           TC      GODSPALM
 1043   REF  73  LAST  327   41,2450  0 0156 0           TC      MPAC    +2
 1044   REF  63  LAST  327   41,2451  22 002 0 DCTSTCYC  LXCH    Q              ALARMS AND RECYCLES IF DEC ONLY BIT = 1
 1045   REF   3  LAST  327   41,2452  0 2512 0           TC      GETCOMP        ( BIT4 OF COMP CODE NUMBER). RETURNS
 1046   REF  26  LAST  327   41,2453  7 4675 0           MASK    BIT14          IF NOT. USED BY LOAD VERBS.
 1047   REF  93  LAST  327   41,2454  10 000 0           CCS     A
 1048   REF   3  LAST  324   41,2455  0 4161 0           TC      ALMCYCLE
 1049   REF  30  LAST  327   41,2456  0 0001 0           TC      L
R1050   NOUNTEST ALARMS IF NO-LOAD BIT (BIT5 OF COMP CODE NUMBER) = 1.
R1051   IF NOT, IT RETURNS.
 1052   REF  64  LAST  327   41,2457  22 002 0 NOUNTEST  LXCH    Q
 1053   REF   4  LAST  327   41,2460  0 2512 0           TC      GETCOMP
 1054   REF  94  LAST  327   41,2461  10 000 0           CCS     A
 1055   REF  31  LAST  327   41,2462  0 0001 0           TC      L
 1056   REF  32  LAST  327   41,2463  0 0001 0           TC      L
 1057   REF  18  LAST  327   41,2464  0 2350 0           TC      GODSPALM
 1058   REF  65  LAST  327   41,2465  22 002 0 TSTFORDP  LXCH    Q              TEST FOR DP. IF SO, GET MINOR PART ONLY.
 1059   REF   6  LAST  323   41,2466  3 0146 1           CA      NNADTEM
 1060   REF  27  LAST  326   41,2467  6 4712 1           AD      ONE            IF NNADTEM = -1, CHANNEL TO BE SPECIFIED
 1061                          41,2470  0 0006 1           EXTEND
 1062   REF   1                41,2471  1 2503 1           BZF     CHANDSP
 1063   REF   4  LAST  319   41,2472  50 140 1           INDEX   MIXBR
 1064                          41,2473  0 2473 0           TC      +0
 1065                          41,2474  0 2476 0           TC      +2             NORMAL
```

```
1066  REF  33  LAST  327   41,2475  0 0001 0          TC      L
1067  REF   1              41,2476  0 3021 1          TC      SPRUTINOR
1068  REF   2  LAST  322   41,2477  0 2261 0          TC      DPTEST
1069  REF  34  LAST  328   41,2500  0 0001 0          TC      L
1070  REF   8  LAST  326   41,2501  24 145 1          INCR    NOUNADD
1071  REF  35  LAST  328   41,2502  0 0001 0          TC      L
1072                       41,2503  0 0006 1  CHANDSP  EXTEND
1073  REF   3  LAST  320   41,2504  5 1017 0          INDEX   NOUNCADR
1074                       41,2505  00 000 1          READ    0
1075  REF  95  LAST  327   41,2506  4 0000 0          CS      A
1076  REF   3  LAST  326   41,2507  1 2370 0          TCF     DSPCOM1
1077  REF   2  LAST  265   41,2510   00147 0  COMPICK  ADRES   NNTYPTEM
1078  REF   7  LAST  327   41,2511   00146 1          ADRES   NNADTEM

1079  REF   5  LAST  327   41,2512  50 140 1  GETCOMP  INDEX   MIXBR
1080  REF   1              41,2513  3 2507 1          CAF     COMPICK -1
1081  REF  96  LAST  328   41,2514  50 000 1          INDEX   A
1082                       41,2515  3 0000 1          CA      0
1083  REF   4  LAST  198   41,2516  7 4364 0          MASK    HI5
1084  REF  66  LAST  327   41,2517  0 0002 0          TC      Q
1085  REF   5  LAST  327   41,2520  0 2512 0  DECDSP   TC      GETCOMP
1086  REF   2  LAST  326   41,2521  0 4345 1          TC      LEFT5
1087  REF   9  LAST  326   41,2522  7 6214 1          MASK    THREE
1088  REF   4  LAST  322   41,2523  54 117 1          TS      DECOUNT
1089  REF   1              41,2524  54 122 1  DSPDCGET TS      DECTEM
1090  REF   9  LAST  328   41,2525  6 0145 1          AD      NOUNADD
1091  REF  97  LAST  328   41,2526  50 000 1          INDEX   A
1092                       41,2527  4 0000 0          CS      0
1093  REF   2  LAST  328   41,2530  50 122 0          INDEX   DECTEM
1094  REF   2  LAST  266   41,2531  57∝003 0          XCH     XREG
1095  REF   3  LAST  328   41,2532  10 122 1          CCS     DECTEM
1096  REF   1              41,2533  0 2524 0          TC      DSPDCGET
1097  REF  42  LAST  319   41,2534  3 4714 1  DSPDCPUT CAF     ZERO
1098  REF  74  LAST  327   41,2535  54 155 1          TS      MPAC    +1
1099  REF  75  LAST  328   41,2536  54 156 1          TS      MPAC    +2
1100  REF   5  LAST  328   41,2537  50 117 0          INDEX   DECOUNT
1101  REF   6  LAST  326   41,2540  3 4333 0          CAF     R1D1
1102  REF  28  LAST  326   41,2541  54 777 1          TS      DSPCOUNT
1103  REF   6  LAST  328   41,2542  50 117 0          INDEX   DECOUNT
1104  REF   3  LAST  328   41,2543  4 1003 1          CS      XREG
1105  REF  76  LAST  328   41,2544  54 154 0          TS      MPAC
1106  REF   1              41,2545  0 3042 1          TC      SPCONUM
1107  REF   7  LAST  327   41,2546  54 123 0          TS      SPTEMP1
1108                       41,2547  0 0006 1          EXTEND
```

MIXED CASE ALREADY HANDLED IN MIXNOUN

NO DP
DP E+1 INTO NOUNADD FOR MINOR PART.

NORMAL	MIXED
ADRES NNTYPTEM	ADRES NNADTEM
C(NNTYPTEM)	C(NNADTEM)

GET HI5 OF NNTYPTAB(NORM)OF NNADTAB(MIX)

COMP NUMBER INTO DECOUNT
PICKS UP DATA
DECTEM 1COMP +0, 2COMP +1, 3COMP +2

CANT USE BUF SINCE DMP USES IT.

MORE TO GET
DISPLAYS DATA
DECOUNT 1COMP +0, 2COMP +1, 3COMP +2

2X(SF CON NUMB) IN A

SWITCH BANKS TO SF CONSTANT TABLE

```
 1109  REF  1                41,2550  3 2562 1          DCA     GTSPOUTL        READING ROUTINE.
 1110  REF  6  LAST  323     41,2551  52 006 0          DXCH    Z               LOADS SPTEMP1, SPTEMP2.
 1111  REF  6  LAST  328     41,2552  50 140 1          INDEX   MIXBR
 1112                        41,2553  0 2553 0          TC      +0
 1113  REF  1                41,2554  0 2557 1          TC      DSPSPNOR
 1114  REF  2  LAST  322     41,2555  0 3027 1          TC      SPRUTMIX
 1115  REF  1                41,2556  0 2572 0          TC      DECDSP3

 1116  REF  2  LAST  328     41,2557  0 3021 1  DSPSPNOR TC      SPRUTNOR
 1117  REF  2  LAST  329     41,2560  0 2572 0          TC      DECDSP3

 1118  REF  29 LAST  328        0777                    EBANK=  DSPCOUNT
 1119  REF  1                41,2561   02120 0  GTSPOUTL 2CADR  GTSPOUT
 1119  REF  1                41,2562   64101 0
 1120  REF  40 LAST  323     41,2563  0 4555 0  DSPDCEND TC      BANKCALL        ALL SPOUT ROUTINES END HERE
 1121  REF  1                41,2564   61131 0          CADR    DSPDECWD
 1122  REF  7  LAST  328     41,2565  10 117 1          CCS     DECOUNT
 1123                        41,2566  0 2570 1          TC      +2
 1124  REF  4  LAST  326     41,2567  0 0136 0          TC      ENTEXIT
 1125  REF  8  LAST  329     41,2570  54 117 1          TS      DECOUNT
 1126  REF  1                41,2571  0 2534 1          TC      DSPDCPUT        MORE TO DISPLAY
 1127  REF  98 LAST  328     41,2572  50 000 1  DECDSP3  INDEX   A
 1128  REF  1                41,2573  3 2575 1          CAF     SPOUTABR
 1129  REF  2  LAST  320     41,2574  0 4577 0          TC      BANKJUMP

 1130  REF  1                41,2575   61321 0  SPOUTABR CADR   PREDSPAL        ALARM IF DEC DISP WITH OCTAL ONLY NOUN
 1131  REF  1                41,2576   62563 0          CADR    DSPDCEND
 1132  REF  1                41,2577   60516 0          CADR    DECOUTSP
 1133  REF  1                41,2600   60603 1          CADR    ARTOUTSP
 1134  REF  1                41,2601   60614 1          CADR    DP1OUTSP
 1135  REF  1                41,2602   60621 1          CADR    DP2OUTSP
 1136  REF  1                41,2603   60524 1          CADR    OPDECOUT
 1137  REF  1                41,2604   60623 0          CADR    DP3OUTSP
 1138  REF  1                41,2605   65143 1          CADR    HMSOUT
 1139  REF  1                41,2606   65216 1          CADR    M/SOUT
 1140  REF  2  LAST  329     41,2607   60621 1          CADR    DP2OUTSP
11401  REF  1                41,2610   60610 0          CADR    AROUT1SP
11402  REF  1                41,2611   60636 1          CADR    2INTOUT
 1141                        41,2612              ENDRTOUT EQUALS
R1142           THE FOLLOWING IS ATYPICAL SP ROUTINE . IT USES MPAC. LEAVES RESU
R1143   LTS IN MPAC, MPAC+1. ENDS WITH TC DSPDCEND
 1144  REF  2  LAST  317     40,2516                    SETLOC  BLANKCON +1
```

11445 REF 2 LAST 310 TO 318' 334 334* COUNT 40/PIN

R1145 DEGOUTSP SCALES BY .18 THE LOW 14 BITS OF ANGLE , ADDING .18 FOR
R1146 NUMBERS IN THE NEGATIVE (AGC) RANGE.

```
1147  REF  43  LAST  328   40,2516  3 4714 1  DEGOUTSP CAF   ZERO
1148  REF  77  LAST  328   40,2517  54 156 1          TS    MPAC    +2     SET INDEX FOR FULL SCALE
1149  REF   1             40,2520  0 2555 0          TC    FIXRANGE
1150                      40,2521  0 2523 1          TC    +2             NO AUGMENT NEEDED (SPTEMP1 AND 2 ARE 0)
1151  REF   1             40,2522  0 2550 0          TC    SETAUG         SET AUGMENTER ACCORDING TO C(MPAC +2)
1152  REF   1             40,2523  0 2566 0          TC    DEGCOM
```

R1153 OPDEGOUT SCALES BY .45 (THE RANGE IS 90 DEGREES) AND ADDS A 20 DEG BIAS.

```
1154  REF  78  LAST  330   40,2524  10 154 0  OPDEGOUT CCS   MPAC           RANGE IS 90 DEG
1155  REF  79  LAST  330   40,2525  56 154 1          XCH   MPAC           IF POS OR POS 0 THEN ADD BIAS AND
1156                      40,2526  0 2531 1          TC    +3             CORRECT FOR POSSIBLE OVERFLOW
1157  REF   1             40,2527  0 2540 1          TC    NEGOPT         IF NEG NON ZERO
1158  REF   4  LAST  298   40,2530  6 7716 0          AD    NEG1           IF NEG ZERO SUBTRACT 1
1159  REF   1             40,2531  6 2602 1          AD    20BIAS
1160  REF  80  LAST  330   40,2532  54 154 0  BIASCOM  TS    MPAC           TEST FOR OVERFLOW
1161                      40,2533  0 2538 0          TC    +3             NO OVFLOW
1162  REF  22  LAST  319   40,2534  3 4674 0          CAF   BIT15          IF OVFLOW
1163  REF  81  LAST  330   40,2535  26 154 0          ADS   MPAC
1164  REF  13  LAST  326   40,2536  3 4711 1          CAF   TWO            SET MULTIPLIER TO .45
1165  REF   2  LAST  329   40,2537  0 2517 0          TC    DEGOUTSP +1

1166  REF  82  LAST  330   40,2540  56 154 1  NEGOPT   XCH   MPAC           NEGATIVE CASE
1167  REF   2  LAST  330   40,2541  6 2602 1          AD    20BIAS
1168  REF  99  LAST  329   40,2542  10 000 0          CCS   A
1169  REF   1             40,2543  0 2532 1          TC    BIASCOM        IF POS THEN SUBTRACT 1 BECAUSE OF 2SCOM
1170  REF   4  LAST  327   40,2544  0 5640 0          TC    CCSHOLE
1171  REF  28  LAST  327   40,2545  6 4712 1          AD    ONE            IF NEG RESTORE SUM
1172                      40,2546  4 0000 0          COM                  IF NEG 0 LEAVE NEG 0
1173  REF   2  LAST  330   40,2547  0 2532 1          TC    BIASCOM

1174                      40,2550  0 0006 1  SETAUG   EXTEND               LOADS SPTEMP1 AND SPTEMP2 WITH THE
1175  REF  83  LAST  330   40,2551  5 0156 0          INDEX MPAC    +2     DP AUGMENTER CONSTANT
1176  REF   1             40,2552  3 2577 0          DCA   DEGTAB
1177  REF   8  LAST  328   40,2553  52 124 1          DXCH  SPTEMP1
1178  REF  67  LAST  328   40,2554  0 0002 0          TC    Q

1179  REF  84  LAST  330   40,2555  10 154 0  FIXRANGE CCS   MPAC           IF MPAC IS + RETURN TO L+1
1180  REF  68  LAST  330   40,2556  0 0002 0          TC    Q              IF MPAC IS - RETURN TO L+2 AFTER
1181  REF  69  LAST  330   40,2557  0 0002 0          TC    Q              MASKING OUT THE SIGN BIT
1182                      40,2560  1 2561 0          TCF   +1
1183  REF  23  LAST  330   40,2561  4 4674 1          CS    BIT15
1184  REF  85  LAST  330   40,2562  7 0154 0          MASK  MPAC
1185  REF  86  LAST  330   40,2563  54 154 0          TS    MPAC
1186  REF  70  LAST  330   40,2564  50 002 0          INDEX Q
```

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1187                                40,2565  0 0001 0             TC      1

1188                                40,2566  0 0006 1  DEGCOM     EXTEND
1189  REF  87  LAST  330           40,2567  5 0156 0             INDEX   MPAC    +2      LOADS MULTIPLIER , DOES SHORTMP, AND
1190  REF   2  LAST  330           40,2570  3 2577 0             DCA     DEGTAB          ADDS AUGMENTER.
1191  REF  88  LAST  331           40,2571  52 155 1             DXCH    MPAC            ADJUSTED ANGLE IN A
1192  REF   4  LAST  312           40,2572  0 7256 1             TC      SHORTMP
1193  REF   9  LAST  330           40,2573  52 124 1             DXCH    SPTEMP1
1194  REF  89  LAST  331           40,2574  20 155 1             DAS     MPAC
1195  REF   1                     40,2575  0 2606 0             TC      SCOUTEND
1196                                40,2576   05605 1  DEGTAB     OCT     05605           HI PART OF      .18
1197                                40,2577   03656 1             OCT     03656           LOW PART OF     .18
1198                                40,2600   16314 0             OCT     16314           HI PART OF      .45
1199                                40,2601   31463 1             OCT     31463           LO PART OF      .45

1200                                40,2602   16040 1  20BIAS     OCT     16040           20 DEG BIAS FOR OPTICS

1201  REF  10  LAST  331           40,2603  52 124 1  ARTOUTSF   DXCH    SPTEMP1         ASSUMES POINT AT LEFT OF DP SPCON
1202  REF  90  LAST  331           40,2604  52 155 1             DXCH    MPAC
1203  REF   1                     40,2605  0 4431 0             TC      PRSHRTMP        IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
1204  REF  19  LAST  324           40,2606  0 4574 0  SCOUTEND   TC      POSTJUMP
1205  REF   2  LAST  329           40,2607   62563 0             CADR    DSPDCEND

12051 REF  11  LAST  331           40,2610  52 124 1  ARCUT1SF   DXCH    SPTEMP1         ASSUMES POINT BETWEEN HI AND LO PARTS OF
12052 REF  91  LAST  331           40,2611  52 155 1             DXCH    MPAC            DP SPCON. SHIFTS RESULTS LEFT 14, BY
12053 REF   2  LAST  331           40,2612  0 4431 0             TC      PRSHRTMP        TAKING RESULTS FROM MPAC+1, MPAC+2.
12054 REF   1                     40,2613  0 2615 1             TC      L14/OUT
1206  REF   1                     40,2614  0 2627 0  DP1OUTSF   TC      DPOUT           SCALES MPAC, MPAC +1 BY DP SCALE FACTOR
1207  REF  92  LAST  331           40,2615  56 156 0  L14/OUT    XCH     MPAC    +2      IN SPTEMP1, SPTEMP2. THEN SCALE RESULT
1208  REF  93  LAST  331           40,2616  56 155 0             XCH     MPAC    +1      BY B14.
1209  REF  94  LAST  331           40,2617  54 154 0             TS      MPAC
1210  REF   2  LAST  331           40,2620  0 2606 0             TC      SCOUTEND
1211  REF   2  LAST  331           40,2621  0 2627 0  DP2OUTSF   TC      DPOUT           SCALES MPAC , MPAC +1 BY DP SCALE FACTOR
1212  REF   3  LAST  331           40,2622  0 2606 0             TC      SCOUTEND
1213  REF   3  LAST  331           40,2623  0 2627 0  DP3OUTSF   TC      DPOUT           ASSUMES POINT BETWEEN BITS 7-8 OF HIGH
1214  REF  12  LAST  322           40,2624  3 6211 0             CAF     SIX             LEFT BY 7, ROUNDS MPAC+2 INTO MPAC+1.
1215  REF   1                     40,2625  0 3056 1             TC      TPLEFTN         SHIFT LEFT 7.
1216  REF   4  LAST  331           40,2626  0 2606 0             TC      SCOUTEND
12165 REF  95  LAST  331              0162          MPAC+6      =       MPAC +6         USE MPAC +6 INSTEAD OF OVFIND
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 1217   REF  71  LAST  330   40,2627  56 002 0  DPOUT    XCH    Q
 1218   REF   1               40,2630  54 162 0           TS     MPAC+6
 1219   REF   1               40,2631  0 2653 0           TC     READLO        GET FRESH DATA FOR BOTH HI AND LO.
 1220   REF   2  LAST  240   40,2632  0 7226 0           TC     TPAGREE       MAKE DP DATA AGREE
 1221   REF   2  LAST  312   40,2633  0 7052 1           TC     DMP
 1222   REF  12  LAST  331   40,2634   00123 1           ADRES  SFTEMP1
 1223   REF   2  LAST  332   40,2635  0 0162 1           TC     MPAC+6
R12231  THE FOLLOWING ROUTINE DISPLAYS TWO CONTIGUOUS SP POSITIVE INTEGERS
R12232  AS TWO POSITIVE DECIMAL INTEGERS IN RXD1-RXD2 AND RXD4-RXD5 (RXD3 IS
R12233  BLANKED). THE INTEGER IN THE LOWER NUMBERED ADDRESS IS DISPLAYED IN
R12234  RXD1-RXD2.

 12235  REF   3  LAST  323   40,2636  0 2437 0  2INTOUT  TC     5BLANK        TO BLANK RXD3
 122355 REF   2  LAST  314   40,2637  0 2314 0           TC     +ON           TURN ON + SIGN
 12236  REF  96  LAST  331   40,2640  3 0154 1           CA     MPAC
 12237  REF   1               40,2641  0 3211 0           TC     DSPDECVN      DISPLAY 1ST INTEGER (LIKE VERB AND NOUN)
 122371 REF  10  LAST  328   40,2642  4 6214 1           CS     THREE
 122372 REF   9  LAST  329   40,2643  50 117 0           INDEX  DECOUNT
 122373 REF   7  LAST  328   40,2644  6 4333 0           AD     R1D1          RXD4
 122374 REF  30  LAST  329   40,2645  54 777 1           TS     DSPCOUNT
 122375 REF   2  LAST  332   40,2646  0 2653 0           TC     READLO        GET 2ND INTEGER
 122376 REF  97  LAST  332   40,2647  3 0155 0           CA     MPAC +1
 122377 REF   2  LAST  332   40,2650  0 3211 0           TC     DSPDECVN      DISPLAY 2ND INTEGER (LIKE VERB AND NOUN)
 122378 REF  20  LAST  331   40,2651  0 4574 0           TC     POSTJUMP
 122379 REF   3  LAST  331   40,2652   62565 0           CADR   DSPDCEND +2
R1224   READLO PICKS UP FRESH DATA FOR BOTH HI AND LO AND LEAVES IT IN
R1225   MPAC, MPAC+1. THIS IS NEEDED FOR TIME DISPLAY. IT ZEROES MPAC+2, BUT
R1226   DOES NOT FORCE TPAGREE.

 1227   REF  72  LAST  332   40,2653  56 002 0  READLO   XCH    Q
 1228   REF   8  LAST   69   40,2654  54 144 1           TS     TEM4
 1229   REF   7  LAST  329   40,2655  50 140 1           INDEX  MIXBR
 1230                        40,2656  0 2656 0           TC     +0
 1231   REF   1               40,2657  0 2673 1           TC     RDLONOR
 1232   REF  10  LAST  332   40,2660  50 117 0           INDEX  DECOUNT
 1233   REF   3  LAST  322   40,2661  3 0150 0           CA     IDAD1TEM      GET IDADDTAB ENTRY FOR COMP K OF NOUN.
 1234   REF   4  LAST  322   40,2662  7 4372 1           MASK   LOW11         E SUBK
 1235   REF   2  LAST  322   40,2663  0 4327 0           TC     SETEBANK      SET EB, LEAVE EADRES IN A.
 1236                        40,2664  0 0006 1  READLO1  EXTEND                MIXED          NORMAL
 1237   REF 100  LAST  330   40,2665  5 0000 1           INDEX  A             C(ESUBK)       C(E)
 1238                        40,2666  3 0001 0           DCA    0             C((E SUBK)+1)  C(E+1)
 1239   REF  98  LAST  332   40,2667  52 155 1           DXCH   MPAC
 1240   REF  44  LAST  330   40,2670  3 4714 1           CAF    ZERO
 1241   REF  99  LAST  332   40,2671  54 156 1           TS     MPAC    +2
 1242   REF   9  LAST  332   40,2672  0 0144 0           TC     TEM4

 1243   REF  10  LAST  328   40,2673  3 0145 1  RDLONOR  CA     NOUNADD       E
 1244   REF   1               40,2674  0 2664 1  ENDRDLO  TC     READLO1
```

```
1245                          42,3143                    BANK   42
124501 REF   2  LAST  285     42,2000                    SETLOC PINBALL3
124502                        42,3143                    BANK

12455  REF   1                                           COUNT  42/PIN

1246   REF  41  LAST  329     42,3143  0 4555 0  HMSOUT  TC     BANKCALL    READ FRESH DATA FOR HI AND LO INTO MPAC,
1247   REF   3  LAST  332     42,3144   60853 1          CADR   READLO      MPAC+1.
1248   REF   3  LAST  332     42,3145  0 7226 0          TC     TPAGREE     MAKE DP DATA AGREE
1249   REF   1                42,3146  0 3332 0          TC     SEPSECNR    LEAVE FRACT SEC/60 IN MPAC, MPAC+1.LEAVE
A1250                                                                      WHOLE MIN IN BIT13 OF LOTEMOUT AND ABOVE
1251   REF   3  LAST  332     42,3147  0 7052 1          TC     DMP         USE ONLY FRACT SEC/60 MOD 60
1252   REF   1                42,3150   03204 1          ADRES  SECON2      MULT BY .06
1253   REF   4  LAST  323     42,3151  3 4335 0          CAF    R3D1        GIVES CENTI-SEC/10EXP5 MOD 60
1254   REF  31  LAST  332     42,3152  54 777 1          TS     DSPCOUNT
1255   REF  42  LAST  333     42,3153  0 4555 0          TC     BANKCALL    DISPLAY SEC MOD 60
1256   REF   2  LAST  329     42,3154   61131 0          CADR   DSPDECWD
1257   REF   1                42,3155  0 3350 1          TC     SEPMIN      REMOVE REST OF SECONDS
1258   REF   1                42,3156  3 3206 0          CAF    MINCON2     LEAVE FRACT MIN/60 IN MPAC+1. LEAVE
1259   REF 100  LAST  332     42,3157  56 154 1          XCH    MPAC        WHOLE HOURS IN MPAC.
1260   REF   1                42,3160  55=007 0          TS     HITEMOUT    SAVE WHOLE HOURS.
1261   REF   2  LAST  333     42,3161  3 3207 1          CAF    MINCON2 +1
1262   REF 101  LAST  333     42,3162  56 155 0          XCH    MPAC    +1  USE ONLY FRACT MIN/60 MOD 60
1263   REF   3  LAST  331     42,3163  0 4431 0          TC     PRSHRIMP    IF C(A) = -0, SHORTMP FAILS TO GIVE -0.
A1264                                                                      MULT BY .0008
1265   REF   3  LAST  323     42,3164  3 4334 1          CAF    R2D1        GIVES MIN/10EXP5 MOD 60
1266   REF  32  LAST  333     42,3165  54 777 1          TS     DSPCOUNT
1267   REF  43  LAST  333     42,3166  0 4555 0          TC     BANKCALL    DISPLAY MIN MOD 60
1268   REF   3  LAST  333     42,3167   61131 0          CADR   DSPDECWD
1269                          42,3170  0 0006 1          EXTEND             MINUTES, SECONDS HAVE BEEN REMOVED
1270   REF   1                42,3171  3 3213 1          DCA    HRCON1
1271   REF 102  LAST  333     42,3172  52 155 1          DXCH   MPAC
1272   REF   2  LAST  333     42,3173  3 1007 1          CA     HITEMOUT    USE WHOLE HOURS
1273   REF   4  LAST  333     42,3174  0 4431 0          TC     PRSHRIMP    IF C(A) = -0, SHORIMP FAILS TO GIVE -0.
A1274                                                                      MULT BY .16384
1275   REF   8  LAST  332     42,3175  3 4333 0          CAF    R1D1        GIVES HOURS/10EXP5
1276   REF  33  LAST  333     42,3176  54 777 1          TS     DSPCOUNT
1277   REF  44  LAST  333     42,3177  0 4555 0          TC     BANKCALL    USE REGULAR DSPDECWD, WITH ROUND OFF.
1278   REF   4  LAST  333     42,3200   61131 0          CADR   DSPDECWD
1279   REF   5  LAST  329     42,3201  0 0136 0          TC     ENTEXIT

1280                          42,3202   25660 0  SECON1  2DEC*  1.666666666 E-4 B12*  2EXP12/6000
1280                          42,3203   31742 1
1281                          42,3204   01727 1  SECON2  OCT    01727           .06 FOR SECONDS DISPLAY
1282                          42,3205   01217 1          OCT    01217
1283                          42,3206   00011 1  MINCON2 OCT    00011           .0006 FOR MINUTES DISLPAY
1284                          42,3207   32445 0          OCT    32445
1285                          42,3210   02104 0  MINCON1 OCT    02104           .066..66 UPPED BY 2EXP-28
1286                          42,3211   10422 1          OCT    10422
1287                          42,3212   05174 0  HRCON1  2DEC   .16384
1287                          42,3213   13261 0
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1288                                42,3214   00000 1                OCT   00000
1289                                42,3215   00082 0  RNDCON        OCT   00082
1290  REF  45  LAST  333            42,3216   0 4555 0  M/SCUT       TC    BANKCALL      .5 SEC
1291  REF   4  LAST  333            42,3217    60853 1               CADR  READLO        READ FRESH DATA FOR HI AND LO INTO MPAC,
1292  REF   4  LAST  333            42,3220    0 7226 0              TC    TPAGREE       MPAC+1.
1293  REF 103  LAST  333            42,3221   10 154 0               CCS   MPAC          MAKE DP DATA AGREE
1294                                42,3222   0 3224 0               TC    +2            IF MAG OF (MPAC, MPAC+1) G/ 59 M 59 S,
1295  REF   1                       42,3223   0 3255 0               TC    M/SNORM       DISPLAY 59B59, WITH PROPER SIGN.
1296  REF   1                       42,3224   6 3312 1               AD    M/SCON1       MPAC = +0. L/ 59M58.5S
1297  REF 101  LAST  332            42,3225   10 000 0               CCS   A             - HI PART OF (59M58.5S) +1  FOR CCS
1298  REF   1                       42,3226   0 3241 0               TC    M/SLIMIT      MAG OF MPAC - HI PART OF (59M58.5S)
1299  REF   2  LAST  334            42,3227   0 3255 0               TC    M/SNORM       G/ 59M58.5S
1300  REF   3  LAST  334            42,3230   0 3255 0               TC    M/SNORM       ORIGINAL MPAC = -0. L/ 59M58.5S
1301  REF 104  LAST  334            42,3231   10 155 1               CCS   MPAC    +1      L/ 59M58.5S
1302                                42,3232   0 3234 1               TC    +2            MAG OF MPAC = HI PART OF 59M58.5S
1303  REF   4  LAST  334            42,3233   0 3255 0               TC    M/SNORM
1304  REF   1                       42,3234   6 3313 0               AD    M/SCON2       MPAC+1 = +0. L/ 59M58.5S
1305  REF 102  LAST  334            42,3235   10 000 0               CCS   A             - LO PART OF (59M58.5S) +1  FOR CCS
1306  REF   2  LAST  334            42,3236   0 3241 0               TC    M/SLIMIT      MAG OF MPAC+1 - LO PART OF (59M58.5S)
1307  REF   5  LAST  334            42,3237   0 3255 0               TC    M/SNORM       G/ 59M58.5S
1308  REF   6  LAST  334            42,3240   0 3255 0               TC    M/SNORM       ORIGINAL MPAC+1 = -0. L/ 59M58.5S
1309  REF 105  LAST  334            42,3241   10 154 0  M/SLIMIT     CCS   MPAC          L/ 59M58.5S
1310  REF   1                       42,3242   3 3315 0               CAF   M/SCON3       = 59M58.5S    LIMIT
1311  REF   1                       42,3243   0 3252 1               TC    +LIMIT        MPAC CANNOT BE +/- 0 AT THIS POINT.
1312  REF   2  LAST  334            42,3244   4 3315 1               CS    M/SCON3       FORCE MPAC, MPAC+1 TO +/- 59M59.5S
1313  REF 106  LAST  334            42,3245   54 154 0               TS    MPAC
1314  REF   3  LAST  334            42,3246   4 3316 1               CS    M/SCON3 +1    WILL DISPLAY 59M59S IN DSPDECNR
1315  REF 107  LAST  334            42,3247   54 155 1  LIMITCOM     TS    MPAC    +1
1316  REF   1                       42,3250   3 3314 1               CAF   NORMADR       SET RETURN TO M/SNORM+1.
1317  REF   2  LAST  333            42,3251   0 3333 1               TC    SEPSECNR +1
1318  REF 108  LAST  334            42,3252   54 154 0  +LIMIT       TS    MPAC
1319  REF   4  LAST  334            42,3253   3 3316 0               CAF   M/SCON3 +1
1320  REF   1                       42,3254   0 3247 0               TC    LIMITCOM
1321  REF   1                       42,3255   0 3317 1  M/SNORM      TC    SEPSEC        LEAVE FRACT SEC/60 IN MPAC,MPAC+1. LEAVE
A1322                                                                     WHOLE MIN IN BIT13 OF LOTEMOUT AND ABOVE
1323  REF   1                       42,3256   3 3310 0               CAF   HISECON       USE ONLY FRACT SEC/60 MOD 60
1324  REF   5  LAST  331            42,3257   0 7256 1               TC    SHORTMP       MULT BY .6 + 2EXP-14
1325  REF  11  LAST  332            42,3260   4 6214 1               CS    THREE         GIVES SEC/100 MOD 60
1326  REF  34  LAST  333            42,3261   26 777 1               ADS   DSPCOUNT      DSPCOUNT ALREADY SET TO RXD1
1327  REF  46  LAST  334            42,3262   0 4555 0               TC    BANKCALL      DISPLAY SEC MOD 60 IN D4D5.
1328  REF   1                       42,3263    61171 1               CADR  DSPDC2NR
1329  REF  45  LAST  332            42,3264   3 4714 1               CAF   ZERO
1330  REF   5  LAST  317            42,3265   54 124 1               TS    CODE
1331  REF  14  LAST  330            42,3266   4 4711 0               CS    TWO
1332  REF  11  LAST  332            42,3267   50 117 0               INDEX DECOUNT
1333  REF   9  LAST  333            42,3270   6 4333 0               AD    R1D1          RXD3
1334  REF   3  LAST  317            42,3271   54 143 0               TS    COUNT
1335  REF  47  LAST  334            42,3272   0 4555 0               TC    BANKCALL      BLANK MIDDLE CHAR
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1336  REF   3  LAST  317   42,3273   61225 0            CADR   DSPIN
1337  REF   2  LAST  333   42,3274   0 3350 1           TC     SEPMIN      REMOVE REST OF SECONDS
1338  REF 109  LAST  334   42,3275   56 155 0           XCH    MPAC   +1   LEAVE FRACT MIN/60 IN MPAC+1
1339                       42,3276   0 0006 1           EXTEND             USE ONLY FRACT MIN/60 MOD 60
1340  REF   1              42,3277   7 3311 0           MP     HIMINCON    MULT BY .6 + 2EXP-7
1341  REF 110  LAST  335   42,3300   52 155 1           DXCH   MPAC        GIVES MIN/100 MOD 60
1342  REF  12  LAST  334   42,3301   50 117 0           INDEX  DECOUNT
1343  REF  10  LAST  334   42,3302   3 4333 0           CAF    R1D1        R1D1
1344  REF  35  LAST  334   42,3303   54 777 1           TS     DSPCOUNT
1345  REF  48  LAST  334   42,3304   0 4555 0           TC     BANKCALL    DISPLAY MIN MOD 60 IN D1D2.
1346  REF   2  LAST  334   42,3305    61171 1           CADR   DSPDC2NR
1347  REF  21  LAST  332   42,3306   0 4574 0           TC     POSTJUMP
1348  REF   4  LAST  332   42,3307    62565 0           CADR   DSPDCEND +2

1349                       42,3310    23147 1 HISECON   OCT    23147       .6 + 2EXP-14
1350                       42,3311    23346 1 HIMINCON  OCT    23346       .6 + 2EXP-7

1351                       42,3312    77753 0 M/SCON1   OCT    77753       - HI PART OF (59M58.5S) +1
1352                       42,3313    41126 1 M/SCON2   OCT    41126       - LO PART OF (59M58.5S) +1
1353  REF   7  LAST  334   42,3314    03256 0 NORMADR   ADRES  M/SNORM +1
1354                       42,3315    00025 0 M/SCON3   OCT    00025       59M 59.5S
1355                       42,3316    37016 1           OCT    37016
1356  REF 111  LAST  335   42,3317   10 155 1 SEPSEC    CCS    MPAC   +1   IF +, ROUND BY ADDING .5 SEC
1357  REF   1              42,3320   1 3327 0           TCF    POSEC       IF -, ROUND BY SUBTRACTING .5 SEC
1358  REF   2  LAST  335   42,3321   1 3327 0           TCF    POSEC       FINDS TIME IN MPAC, MPAC+1
1359                       42,3322   1 3323 1           TCF    +1          ROUNDS OFF BY +/- .5 SEC
1360                       42,3323   0 0006 1           EXTEND             LEAVES WHOLE MIN IN BIT13 OF
1361  REF   1              42,3324   4 3215 0           DCS    RNDCON  -1  LOTEMOUT AND ABOVE.
1362  REF 112  LAST  335   42,3325   20 155 1 SEPSEC1   DAS    MPAC        LEAVES FRACT SEC/60 IN MPAC, MPAC+1.
1363  REF   3  LAST  334   42,3326   1 3332 1           TCF    SEPSECNR
1364                       42,3327   0 0006 1 POSEC     EXTEND
1365  REF   2  LAST  335   42,3330   3 3215 1           DCA    RNDCON  -1
1366  REF   1              42,3331   1 3325 1           TCF    SEPSEC1
1367  REF  73  LAST  332   42,3332   56 002 0 SEPSECNR  XCH    Q           THIS ENTRY AVOIDS ROUNDING BY .5 SEC
1368  REF   1              42,3333   54 144 1           TS     SEPSCRET
1369  REF   4  LAST  333   42,3334   0 7052 1           TC     DMP         MULT BY 2EXP12/6000
1370  REF   1              42,3335    03202 1           ADRES  SECON1      GIVES FRACT SEC/60 IN BIT12 OF MPAC+1
1371                       42,3336   0 0006 1           EXTEND             AND BELOW.
1372  REF 113  LAST  335   42,3337   3 0155 0           DCA    MPAC        SAVE MINUTES AND HOURS
1373  REF   3  LAST  333   42,3340   53#010 0           DXCH   HITEMOUT
1374  REF   1              42,3341   0 4420 0           TC     TPSL1
1375  REF   2  LAST  335   42,3342   0 4420 0           TC     TPSL1       GIVES FRACT SEC/60 IN MPAC+1, MPAC+2.
1376  REF  46  LAST  334   42,3343   3 4714 1           CAF    ZERO
1377  REF 114  LAST  335   42,3344   56 156 0           XCH    MPAC   +2    LEAVE FRACT SEC/60 IN MPAC, MPAC+1.
1378  REF 115  LAST  335   42,3345   56 155 0           XCH    MPAC   +1
1379  REF 116  LAST  335   42,3346   56 154 1           XCH    MPAC
1380  REF   2  LAST  335   42,3347   0 0144 0           TC     SEPSCRET
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 1381  REF  74  LAST  335   42,3350  56 002 0  SEPMIN   XCH   Q          FINDS WHOLE MINUTES IN BIT13
 1382  REF   1              42,3351  54 144 1           TS    SEPMNRET   OF LOTEMOUT AND ABOVE.
 1383  REF   1              42,3352  3 1010 1           CA    LOTEMOUT   REMOVES REST OF SECONDS.
 1384                       42,3353  0 0006 1           EXTEND           LEAVES FRACT MIN/60 IN MPAC+1.
 1385  REF  13  LAST  183   42,3354  7 4710 1           MP    BIT3       LEAVES WHOLE HOURS IN MPAC.
 1386                       42,3355  0 0006 1           EXTEND           SR 12, THROW AWAY LP.
 1387  REF  17  LAST  193   42,3356  7 4678 0           MP    BIT13      SR 2, TAKE FROM LP. = SL 12.
 1388  REF 117  LAST  335   42,3357  22 155 0           LXCH  MPAC   +1   THIS FORCES BITS 12-1 TO 0 IF +,
A1389                                                                   FORCES BITS 12-1 TO 1 IF -.
 1390  REF   4  LAST  335   42,3360  3 1007 1           CA    HITEMOUT
 1391  REF 118  LAST  336   42,3361  54 154 0           TS    MPAC
 1392  REF   5  LAST  335   42,3362  0 7052 1           TC    DMP        MULT BY 1/15
 1393  REF   1              42,3363   03210 1          ADRES MINCON1    GIVES FRACT MIN/60 IN MPAC+1.
 1394  REF   2  LAST  336   42,3364  0 0144 0  ENDSPMIN TC    SEPMNRET   GIVES WHOLE HOURS IN MPAC.
R1395  THIS IS A SPECIAL PURPOSE VERB FOR DISPLAYING A DOUBLE PRECISION AGC
R1396  WORD AS 10 DECIMAL DIGITS ON THE AGC DISPLAY PANEL.  IT CAN BE USED WITH
R1397  ANY NOUN, EXCEPT MIXED NOUNS. IT DISPLAYS THE CONTENTS
R1398  OF THE REGISTER NOUNADD IS POINTING TO .  IF USED WITH NOUNS WHICH ARE
R1399  INHERENTLY NOT DP SUCH AS THE CDU COUNTERS THE DISPLAY WILL BE GARBAGE.
R1400  DISPLAY IS IN R1 AND R2 ONLY WITH THE SIGN IN R1.
 1401  REF   1              40,2675                    SETLOC ENDRDLO +1

14015  REF   3 LAST 330 TO 333'  111   445*           COUNT  40/PIN

 1402  REF   8  LAST  332   40,2675  50 140 1  DSPDPDEC INDEX  MIXBR
 1403                       40,2676  0 2676 1           TC    +0
 1404                       40,2677  0 2701 0           TC    +2           NORMAL NOUN
 1405  REF   3  LAST  324   40,2700  0 3323 0           TC    DSPALARM
 1406                       40,2701  0 0006 1           EXTEND
 1407  REF  11  LAST  332   40,2702  5 0145 1           INDEX NOUNADD
 1408                       40,2703  3 0001 0           DCA   0
 1409  REF 119  LAST  336   40,2704  52 155 1           DXCH  MPAC
 1410  REF  11  LAST  335   40,2705  3 4333 0           CAF   R1D1
 1411  REF  36  LAST  335   40,2706  54 777 1           TS    DSPCOUNT
 1412  REF  47  LAST  335   40,2707  3 4714 1           CAF   ZERO
 1413  REF 120  LAST  336   40,2710  54 156 1           TS    MPAC   +2
 1414  REF   5  LAST  334   40,2711  0 7226 0           TC    TPAGREE
 1415  REF   1              40,2712  0 3176 1           TC    DSP2DEC
 1416  REF   6  LAST  333   40,2713  0 0136 0  ENDDPDEC TC    ENTEXIT
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P1417   LOAD VERBS          IF ALARM CONDITION IS DETECTED DURING EXECUTE,
R1418   CHECK FAIL LIGHT IS TURNED ON AND ENDOFJOB. IF ALARM CONDITION IS
R1419   DETECTED DURING ENTER OF DATA, CHECK FAIL IS TURNED ON AND IT RECYCLES
R1420   TO EXECUTE OF ORIGINAL LOAD VERB. RECYCLE CAUSED BY 1) DECIMAL MACHINE
R1421   CADR 2) MIXTURE OF OCTAL/DECIMAL DATA 3) OCTAL DATA INTO DECIMAL
R1422   ONLY NOUN 4) DEC DATA INTO OCT ONLY NOUN 5) DATA TOO LARGE FOR SCALE
R1423   6) FEWER THAN 3 DATA WORDS LOADED FOR HRS, MIN, SEC NOUN.8(2)-(6) ALARM
R1424   AND RECYCLE OCCUR AT FINAL ENTER OF SET. (1) ALARM AND RECYCLE OCCUR AT
R1425   ENTER OF CADR.
 1426   REF   1                41,2612                          SETLOC ENDRTOUT

 14265  REF   2 LAST 318 TO 330'   394   394*                  COUNT  41/PIN

 1427   REF  15  LAST  334   41,2612  4 4711 0  ABCLOAD  CS     TWO
 1428   REF   3  LAST  326   41,2613  0 2423 0           TC     COMPTEST
 1429   REF   1               41,2614  0 2457 0           TC     NOUNTEST       TEST IF NOUN CAN BE LOADED.
 1430   REF   1               41,2615  3 3001 0           CAF    VBSP1LD
 1431   REF   2  LAST  316   41,2616  0 2336 0           TC     UPDATVB  -1
 1432   REF   1               41,2617  0 2302 1           TC     REQDATX
 1433   REF   1               41,2620  3 3002 0           CAF    VBSP2LD
 1434   REF   3  LAST  337   41,2621  0 2336 0           TC     UPDATVB  -1
 1435   REF   1               41,2622  0 2304 1           TC     REQDATY
 1436   REF   1               41,2623  3 3003 1           CAF    VBSP3LD
 1437   REF   4  LAST  337   41,2624  0 2336 0           TC     UPDATVB -1
 1438   REF   2  LAST  319   41,2625  0 2306 0           TC     REQDATZ
 1439   REF  13  LAST  331   41,2626  4 6211 1  PUTXYZ   CS     SIX            TEST THAT THE 3 DATA WORDS LOADED ARE
 1440   REF   1               41,2627  0 3004 0           TC     ALLDC/OC       ALL DEC OR ALL OCT.
 1441                         41,2630  0 0006 1           EXTEND
 1442   REF   4  LAST  323   41,2631  3 2114 1           DCA    LODNNLOC       SWITCH BANKS TO NOUN TABLE READING
 1443   REF   7  LAST  329   41,2632  52 008 0           DXCH   Z              ROUTINE.
 1444   REF  48  LAST  336   41,2633  3 4714 1           CAF    ZERO           X COMP
 1445   REF   1               41,2634  0 3070 0           TC     PUTCOM
 1446   REF  12  LAST  336   41,2635  50 145 1           INDEX  NOUNADD
 1447                         41,2636  54 000 0           TS     0
 1448   REF  29  LAST  330   41,2637  3 4712 1           CAF    ONE            Y COMP
 1449   REF   2  LAST  337   41,2640  0 3070 0           TC     PUTCOM
 1450   REF  13  LAST  337   41,2641  50 145 1           INDEX  NOUNADD
 1451                         41,2642  54 001 1           TS     1
 1452   REF  16  LAST  337   41,2643  3 4711 1           CAF    TWO            Z COMP
 1453   REF   3  LAST  337   41,2644  0 3070 0           TC     PUTCOM
 1454   REF  14  LAST  337   41,2645  50 145 1           INDEX  NOUNADD
 1455                         41,2646  54 002 1           TS     2
145501  REF   5  LAST  225   41,2647  4 4716 1           CS     SEVEN          IF NOUN 7 HAS JUST BEEN LOADED, SET
145502  REF  10  LAST  323   41,2650  6 1002 1           AD     NOUNREG        FLAG BITS AS SPECIFIED.
145503                        41,2651  0 0006 1           EXTEND
145504                        41,2652  1 2654 0           BZF    +2
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145505 REF   2 LAST 318  41,2653  0 2771 1          TC     LOADLV
145506 REF   4 LAST 328  41,2654  3 1003 0          CA     XREG          ECADR OF FLAG WORD.
145507 REF   5 LAST 323  41,2655  0 4320 1          TC     SETINCADR +1   SET EBANK, NOUNADD.
145508 REF   2 LAST 319  41,2656  3 1005 0          CA     ZREG          ZERO TO RESET BITS, NON-ZERO TO SET BITS
145509                   41,2657  0 0004 0          INHINT
14551                    41,2660  0 0006 1          EXTEND
145511 REF   1           41,2661  1 2670 0          BZF    BITSOFF
145512 REF  15 LAST 337  41,2662  50 145 1          INDEX  NOUNADD
145513                   41,2663  4 0000 0          CS     0
145514 REF   1           41,2664  7 1004 0          MASK   YREG          BITS TO BE PROCESSED.
145515 REF  16 LAST 338  41,2665  50 145 1          INDEX  NOUNADD
145516                   41,2666  26 000 0          ADS    0             SET BITS.
145517 REF   1           41,2667  0 2675 1          TC     BITSOFF1
145518 REF   2 LAST 338  41,2670  4 1004 0  BITSOFF  CS     YREG          BITS TO BE PROCESSED.
145519 REF  17 LAST 338  41,2671  50 145 1          INDEX  NOUNADD
14552                    41,2672  7 0000 0          MASK   0
145521 REF  18 LAST 338  41,2673  50 145 1          INDEX  NOUNADD
145522                   41,2674  54 000 0          TS     0             RESET BITS.
145523                   41,2675  0 0003 1  BITSOFF1 RELINT
1456   REF   3 LAST 338  41,2676  0 2771 1          TC     LOADLV

1457   REF  30 LAST 337  41,2677  4 4712 0  ABLOAD   CS     ONE
1458   REF   4 LAST 337  41,2700  0 2423 0          TC     COMPTEST
1459   REF   2 LAST 337  41,2701  0 2457 0          TC     NOUNTEST      TEST IF NOUN CAN BE LOADED.
1460   REF   2 LAST 337  41,2702  3 3001 0          CAF    VBSP1LD
1461   REF   5 LAST 337  41,2703  0 2336 0          TC     UPDATVB -1
1462   REF   2 LAST 337  41,2704  0 2302 1          TC     REQDATX
1463   REF   2 LAST 337  41,2705  3 3002 0          CAF    VBSP2LD
1464   REF   6 LAST 338  41,2706  0 2336 0          TC     UPDATVB -1
1465   REF   2 LAST 337  41,2707  0 2304 1          TC     REQDATY
1466   REF   6 LAST 320  41,2710  4 4715 1  PUTXY    CS     FIVE          TEST THAT THE 2 DATA WORDS LOADED ARE
1467   REF   2 LAST 337  41,2711  0 3004 0          TC     ALLDC/OC      ALL DEC OR ALL OCT.
1468                    41,2712  0 0006 1          EXTEND
1469   REF   5 LAST 337  41,2713  3 2114 1          DCA    LODNNLOC      SWITCH BANKS TO NOUN TABLE READING
1470   REF   8 LAST 337  41,2714  52 006 0          DXCH   Z             ROUTINE.
1471   REF  49 LAST 337  41,2715  3 4714 1          CAF    ZERO          X COMP
1472   REF   4 LAST 337  41,2716  0 3070 0          TC     PUTCOM
1473   REF  19 LAST 338  41,2717  50 145 1          INDEX  NOUNADD
1474                    41,2720  54 000 0          TS     0
1475   REF  31 LAST 338  41,2721  3 4712 1          CAF    ONE           Y COMP
1476   REF   5 LAST 338  41,2722  0 3070 0          TC     PUTCOM
1477   REF  20 LAST 338  41,2723  50 145 1          INDEX  NOUNADD
1478                    41,2724  54 001 1          TS     1
1479   REF   4 LAST 338  41,2725  0 2771 1          TC     LOADLV

1481   REF   3 LAST 338  41,2726  0 2302 1  ALOAD    TC     REQDATX
1482                    41,2727  0 0006 1          EXTEND
1483   REF   6 LAST 338  41,2730  3 2114 1          DCA    LODNNLOC      SWITCH BANKS TO NOUN TABLE READING
1484   REF   9 LAST 338  41,2731  52 006 0          DXCH   Z             ROUTINE.
1485   REF  50 LAST 338  41,2732  3 4714 1          CAF    ZERO          X COMP
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1486  REF   6  LAST  338   41,2733   0 3070 0          TC     PUTCOM
1487  REF  21  LAST  338   41,2734   50 145 1          INDEX  NOUNADD
1488                       41,2735   54 000 0          TS     0
1489  REF   5  LAST  338   41,2736   0 2771 1          TC     LOADLV

1490  REF  32  LAST  338   41,2737   4 4712 0  BLOAD   CS     ONE
1491  REF   5  LAST  338   41,2740   0 2423 0          TC     COMPTEST
1493  REF  24  LAST  330   41,2741   3 4674 0          CAF    BIT15        SET CLPASS FOR PASS0 ONLY
1494  REF  10  LAST  319   41,2742   55=015 0          TS     CLPASS
1495  REF   3  LAST  338   41,2743   0 2304 1          TC     REQDATY
1496                       41,2744   0 0006 1          EXTEND
1497  REF   7  LAST  338   41,2745   3 2114 1          DCA    LODNNLOC     SWITCH BANKS TO NOUN TABLE READING
1498  REF  10  LAST  338   41,2746   52 006 0          DXCH   Z            ROUTINE.
1499  REF  33  LAST  339   41,2747   3 4712 1          CAF    ONE
1500  REF   7  LAST  339   41,2750   0 3070 0          TC     PUTCOM
1501  REF  22  LAST  339   41,2751   50 145 1          INDEX  NOUNADD
1502                       41,2752   54 001 1          TS     1
1503  REF   6  LAST  339   41,2753   0 2771 1          TC     LOADLV

1504  REF  17  LAST  337   41,2754   4 4711 0  CLOAD   CS     TWO
1505  REF   6  LAST  339   41,2755   0 2423 0          TC     COMPTEST
1507  REF  25  LAST  339   41,2756   3 4674 0          CAF    BIT15        SET CLPASS FOR PASS0 ONLY
1508  REF  11  LAST  339   41,2757   55=015 0          TS     CLPASS
1509  REF   3  LAST  337   41,2760   0 2306 0          TC     REQDATZ
1510                       41,2761   0 0006 1          EXTEND
1511  REF   8  LAST  339   41,2762   3 2114 1          DCA    LODNNLOC     SWITCH BANKS TO NOUN TABLE READING
1512  REF  11  LAST  339   41,2763   52 006 0          DXCH   Z            ROUTINE.
1513  REF  18  LAST  339   41,2764   3 4711 1          CAF    TWO
1514  REF   8  LAST  339   41,2765   0 3070 0          TC     PUTCOM
1515  REF  23  LAST  339   41,2766   50 145 1          INDEX  NOUNADD
1516                       41,2767   54 002 1          TS     2
1517  REF   7  LAST  339   41,2770   0 2771 1          TC     LOADLV

1518  REF  51  LAST  338   41,2771   3 4714 1  LOADLV  CAF    ZERO
1519  REF  13  LAST  319   41,2772   55=000 1          TS     DECBRNCH
1520  REF  52  LAST  339   41,2773   4 4714 0          CS     ZERO
1521  REF   1               41,2774   55=014 1          TS     LOADSTAT
1522  REF   6  LAST  323   41,2775   4 4374 1          CS     VD1          TO BLOCK NUMERICAL CHARACTERS AND
1523  REF  37  LAST  336   41,2776   54 777 1          TS     DSPCOUNT     CLEARS AFTER A COMPLETED LOAD
1524  REF  22  LAST  335   41,2777   0 4574 0          TC     POSTJUMP     AFTER COMPLETED LOAD, GO TO RECALTST
1525  REF   1               41,3000    61450 1          CADR   RECALTST     TO SEE IF THERE IS RECALL FROM ENDIDLE.

1526                       41,3001    00025 0  VBSP1LD DEC    21           VB21 = ALOAD
1527                       41,3002    00026 0  VBSP2LD DEC    22           VB22 = BLOAD
1528                       41,3003    00027 1  VBSP3LD DEC    23           VB23 = CLOAD
1529  REF  13  LAST  335   41,3004   54 117 1  ALLDC/OC TS     DECOUNT      TESTS THAT DATA WORDS LOADED ARE EITHER
1530  REF  14  LAST  339   41,3005   4 1000 1          CS     DECBRNCH     ALL DEC OR ALL OCT. ALARMS IF NOT.
1531  REF   6  LAST  317   41,3006   54 021 0          TS     SR
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1532   REF   7  LAST  339   41,3007  4 0021 0            CS     SR
1533   REF   8  LAST  340   41,3010  4 0021 0            CS     SR          SHIFTED RIGHT 2
1534   REF 103  LAST  334   41,3011 10 000 0            CCS    A           DEC COMP BITS IN LOW 3
1535                        41,3012  1 3014 0            TCF    +2          SOME ONES IN LOW 3
1536   REF  75  LAST  336   41,3013  0 0002 0            TC     Q           ALL ZEROS. ALL OCTAL. OK
1537   REF  14  LAST  339   41,3014  6 0117 0            AD     DECOUNT     DEC COMP = 7 FOR 3COMP, =6 FOR 2COMP
1538                        41,3015  0 0006 1            EXTEND             (BUT IT HAS BEEN DECREMENTED BY CCS)
1539                        41,3016  1 3020 1            BZF    +2          MUST MATCH 6 FOR 3COMP, 5 FOR 2COMP.
1540   REF   4  LAST  327   41,3017  0 4161 0            TC     ALMCYCLE    ALARM AND RECYCLE.
1541   REF  76  LAST  340   41,3020  0 0002 0  GOO       TC     Q           ALL REQUIRED ARE DEC. OK
1542   REF  77  LAST  340   41,3021 56 002 0  SFRUTNOR  XCH    Q           GETS SF ROUTINE NUMBER FOR NORMAL CASE
1543   REF   1              41,3022 54 114 1            TS     EXITEM      CANT USE L FOR RETURN. TSTPORDP USES L.
1544   REF   1              41,3023  3 4363 0            CAF    MID5
1545   REF   3  LAST  328   41,3024  7 0147 1            MASK   NNTYPTEM
1546   REF   1              41,3025  0 4336 0            TC     RIGHT5
1547   REF   2  LAST  340   41,3026  0 0114 0            TC     EXITEM      SF ROUTINE NUMBER IN A

1548   REF  78  LAST  340   41,3027 56 002 0  SFRUTMIX  XCH    Q           GETS SF ROUTINE NUMBER FOR MIXED CASE
1549   REF   3  LAST  340   41,3030 54 114 1            TS     EXITEM
1550   REF  15  LAST  340   41,3031 50 117 0            INDEX  DECOUNT
1551   REF   1              41,3032  3 3061 0            CAF    DISPLACE    PUT TC GOO, TC RIGHT5, OR TC LEFT5 IN L
1552   REF  36  LAST  328   41,3033 54 001 1            TS     L
1553   REF  16  LAST  340   41,3034 50 117 0            INDEX  DECOUNT
1554   REF   3  LAST  311   41,3035  3 4362 1            CAF    LOW5        LOW5, MID5, OR HI5 IN A
1555   REF   2  LAST  265   41,3036  7 0153 1            MASK   RUTMXTEM    GET HI5, MID5, OR LOW5 OF RUTMXTAB ENTRY
1556   REF  37  LAST  340   41,3037 50 001 0            INDEX  L
1557                        41,3040  0 0000 1            TC     0
R1558  DO TC GOO(DECOUNT=0), DO TC RIGHT5(DECOUNT=1), DO TC LEFT5(DECOUNT=2).
1559   REF   4  LAST  340   41,3041  0 0114 0  SFRET1    TC     EXITEM      SF ROUTINE NUMBER IN A

1560   REF  79  LAST  340   41,3042 56 002 0  SFCONUM   XCH    Q           GETS 2X( SF CONSTANT NUMBER)
1561   REF   5  LAST  340   41,3043 54 114 1            TS     EXITEM
1562   REF   9  LAST  336   41,3044 50 140 1            INDEX  MIXBR
1563                        41,3045  0 3045 0            TC     +0
1564   REF   1              41,3046  0 3064 0            TC     CONUMNOR    NORMAL NOUN
1565   REF  17  LAST  340   41,3047 50 117 0            INDEX  DECOUNT     MIXED NOUN
1566   REF   2  LAST  340   41,3050  3 3061 0            CAF    DISPLACE
1567   REF  38  LAST  340   41,3051 54 001 1            TS     L           PUT TC GOO, TC RIGHT5, OR TC LEFT5 IN L
1568   REF  18  LAST  340   41,3052 50 117 0            INDEX  DECOUNT
1569   REF   4  LAST  340   41,3053  3 4362 1            CAF    LOW5
1570   REF   4  LAST  340   41,3054  7 0147 1            MASK   NNTYPTEM
1571   REF  39  LAST  340   41,3055 50 001 0            INDEX  L
1572                        41,3056  0 0000 1            TC     0
R1573  DO TC GOO(DECOUNT=0), DO TC RIGHT5(DECOUNT=1), DO TC LEFT5(DECOUNT=2).
1574                        41,3057  6 0000 1  SFRET     DOUBLE             2X(SF CONSTANT NUMBER ) IN A
1575   REF   6  LAST  340   41,3060  0 0114 0            TC     EXITEM

1576   REF   1              41,3061  0 3020 0  DISPLACE  TC     GOO
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 1577   REF   2  LAST  340   41,3062  0 4336 0          TC     RIGHT5
 1578   REF   3  LAST  328   41,3063  0 4345 1          TC     LEFT5

 1579   REF   5  LAST  340   41,3064  3 4362 1 CONUNNOR CAF    LOW5          NORMAL NOUN ALWAYS GETS LOW 5 OF
 1580   REF   5  LAST  340   41,3065  7 0147 1          MASK   NNTYPTEM      NNTYPTAB FOR SF CONUM.
 1581                        41,3066  6 0000 1          DOUBLE
 1582   REF   7  LAST  340   41,3067  0 0114 0          TC     EXITEM        2X( SF CONSTANT NUMBER) IN A
 1583   REF  19  LAST  340   41,3070  54 117 1 PUTCOM   TS     DECOUNT
 1584   REF  80  LAST  340   41,3071  56 002 0          XCH    Q
 1585   REF   1              41,3072  54 115 0          TS     DECRET
 1586   REF  53  LAST  339   41,3073  3 4714 1          CAF    ZERO
 1587   REF   3  LAST  332   41,3074  54 162 0          TS     MPAC+6
 1588   REF  20  LAST  341   41,3075  50 117 0          INDEX  DECOUNT
 1589   REF   3  LAST  317   41,3076  57∝006 0          XCH    XREGLP
 1590   REF 121  LAST  336   41,3077  54 155 1          TS     MPAC  +1
 1591   REF  21  LAST  341   41,3100  50 117 0          INDEX  DECOUNT
 1592   REF   5  LAST  338   41,3101  57∝003 0          XCH    XREG
 1593   REF 122  LAST  341   41,3102  54 154 0          TS     MPAC
 1594   REF  10  LAST  340   41,3103  50 140 1          INDEX  MIXBR
 1595                        41,3104  0 3104 1          TC     +0
 1596   REF   1              41,3105  0 3132 1          TC     PUTNORM       NORMAL NOUN
R1597   IF MIXNOUN, PLACE ADDRESS FOR COMPONENT K INTO NOUNADD, SET EBANK BITS.
 1598   REF  22  LAST  341   41,3106  50 117 0          INDEX  DECOUNT       GET IDADDTAB ENTRY FOR COMPONENT K
 1599   REF   4  LAST  332   41,3107  3 0150 0          CA     IDAD1TEM            OF NOUN.
 1600   REF   5  LAST  332   41,3110  7 4372 1          MASK   LOW11         (ECADR)SUBK FOR CURRENT COMP OF NOUN
 1601   REF   6  LAST  338   41,3111  0 4317 0          TC     SETNCADR      ECADR INTO NOUNCADR. SETS EB, NOUNADD.
 1602                        41,3112  0 0006 1          EXTEND               C(NOUNADD) IN A UPON RETURN
 1603   REF  23  LAST  341   41,3113  60 117 0          SU     DECOUNT       PLACE (ESUBK)-K INTO NOUNADD
 1604   REF  24  LAST  339   41,3114  54 145 0          TS     NOUNADD
 1605   REF  15  LAST  339   41,3115  11∝000 1          CCS    DECBRNCH
 1606   REF   1              41,3116  0 3165 0          TC     PUTDECSP      +  DEC
 1607   REF   1              41,3117  0 2451 0          TC     DCTSTCYC      +0 OCTAL
 1608   REF   3  LAST  329   41,3120  0 3027 1          TC     SPRUTMIX      TEST IF DEC ONLY BIT = 1. IF SO,
 1609   REF   3  LAST  328   41,3121  0 2261 0          TC     DPTEST        ALARM AND RECYCLE. IF NOT, CONTINUE.
 1610   REF   1.             41,3122  0 3150 0          TC     PUTCOM2       NO DP
A1611                                                                       TEST FOR DP SCALE FOR OCT LOAD. IF SO,
A1612                                                                       +0 INTO MAJOR PART. SET NOUNADD FOR
A1613                                                                       LOADING OCTAL WORD INTO MINOR PART.
 1614   REF  25  LAST  341   41,3123  24 145 1 PUTDPCOM INCR   NOUNADD       DP  (ESUBK)-K+1  OR  E+1
 1615   REF  26  LAST  341   41,3124  3 0145 1          CA     NOUNADD       NOUNADD NOW SET FOR MINOR PART
 1616   REF  24  LAST  341   41,3125  26 117 1          ADS    DECOUNT       (ESUBK)+1  OR  E+1  INTO DECOUNT
 1617   REF  54  LAST  341   41,3126  3 4714 1          CAF    ZERO          NOUNADD SET FOR MINOR PART
 1618   REF  25  LAST  341   41,3127  50 117 0          INDEX  DECOUNT
 1619                        41,3130  53∝777 0          TS     0       -1    ZERO MAJOR PART(ESUBK OR E)
 1620   REF   2  LAST  341   41,3131  0 3150 0          TC     PUTCOM2

 1621   REF   2  LAST  319   41,3132  0 4325 1 PUTNORM  TC     SETNADD       ECADR FROM NOUNCADR. SETS EB, NOUNADD.
 1622   REF  16  LAST  341   41,3133  11∝000 1          CCS    DECBRNCH
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1623  REF   2  LAST  341   41,3134   0 3165 0            TC     PUTDECSP      + DEC
1624  REF   2  LAST  341   41,3135   0 2451 0            TC     DCTSTCYC      +0 OCTAL
1625  REF   3  LAST  329   41,3136   0 3021 1            TC     SFRUTINOR     TEST IF DEC ONLY BIT = 1. IF SO,
1626  REF   4  LAST  341   41,3137   0 2261 0            TC     DPTEST        ALARM AND RECYCLE. IF NOT, CONTINUE.
1627  REF   3  LAST  341   41,3140   0 3144 0            TC     PUTCOM2 -4    NO DP
1628  REF  55  LAST  341   41,3141   3 4714 1            CAF    ZERO          DP
1629  REF  26  LAST  341   41,3142  54 117  1            TS     DECOUNT
1630  REF   1              41,3143   0 3123 1            TC     PUTDPCOM

1631  REF   8  LAST  328   41,3144   3 0146 1            CA     NNADTEM
1632  REF  34  LAST  339   41,3145   6 4712 1            AD     ONE           IF NNADTEM = -1, CHANNEL TO BE SPECIFIED
1633                       41,3146   0 0006 1            EXTEND
1634  REF   1              41,3147   1 3154 0            BZF    CHANLOAD
1635  REF 123  LAST  341   41,3150  56 154  1 PUTCOM2    XCH    MPAC
1636  REF   2  LAST  341   41,3151   0 0115 1            TC     DECRET

1637  REF  38  LAST  339      0777                      EBANK= DSPCOUNT
1638  REF   1              41,3152    02126 0 GTSFINLC  2CADR  GTSFIN
1638  REF   1              41,3153    64101 0
1639  REF   6  LAST  337   41,3154   4 4716 1 CHANLOAD   CS     SEVEN         DONT LOAD CHAN 7. (IT = SUPERBANK).
16391 REF   4  LAST  328   41,3155   6 1017 0            AD     NOUNCADR
16392                      41,3156   0 0006 1            EXTEND
16393 REF   8  LAST  339   41,3157   1 2771 0            BZF    LOADLV
16394 REF 124  LAST  342   41,3160   3 0154 1            CA     MPAC
1640                       41,3161   0 0006 1            EXTEND
1641  REF   5  LAST  342   41,3162   5 1017 0            INDEX  NOUNCADR
1642                       41,3163   01 000 0            WRITE  0
1643  REF   9  LAST  342   41,3164   0 2771 1            TC     LOADLV
R1644 PUTDECSP FINDS MIXBR AND DECOUNT STILL SET FROM PUTCOM

1645  REF   2  LAST  328   41,3165   0 3042 1 PUTDECSP   TC     SFCONUM       2X(SF CON NUMB) IN A
1646  REF  13  LAST  332   41,3166  54 123  0            TS     SFTEMP1
1647                       41,3167   0 0006 1            EXTEND        SWITCH BANKS TO SF CONSTANT TABLE
1648  REF   1              41,3170   3 3153 0            DCA    GTSFINLC      READING ROUTINE.
1649  REF  12  LAST  339   41,3171  52 006  0            DXCH   Z             LOADS SFTEMP1, SFTEMP2.
1650  REF  11  LAST  341   41,3172  50 140  1            INDEX  MIXBR
1651                       41,3173   0 3173 1            TC     +0
1652  REF   1              41,3174   0 3177 0            TC     PUTSFNOR
1653  REF   4  LAST  341   41,3175   0 3027 1            TC     SFRUTMIX
1654  REF   1              41,3176   0 3200 0            TC     PUTDCSF2
1655  REF   4  LAST  342   41,3177   0 3021 1 PUTSFNOR   TC     SFRUTINOR

1656  REF 104  LAST  340   41,3200  50 000  1 PUTDCSF2   INDEX  A
1657  REF   1              41,3201   3 3203 0            CAF    SFINTABR
1658  REF   3  LAST  329   41,3202   0 4577 0            TC     BANKJUMP      SWITCH BANKS FOR EXPANSHION ROOM
1659  REF   1              41,3203    62347 0 SFINTABR   CADR   GOALMCYC      ALARM AND RECYCLE IF DEC LOAD .
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A1660                                                                   WITH OCTAL ONLY NOUN.
 1661   REF   1              41,3204   60774 0          CADR   BINROUND
 1662   REF   1              41,3205   60714 0          CADR   DEGINSP
 1663   REF   1              41,3206   60784 1          CADR   ARTHINSP
 1664   REF   1              41,3207   61017 0          CADR   DPINSP
 1665   REF   1              41,3210   61044 0          CADR   DPINSP2
 1666   REF   1              41,3211   61002 1          CADR   OPTDEGIN
 1667   REF   2 LAST  343    41,3212   61017 0          CADR   DPINSP          SAME AS ARITHDP1
 1668   REF   1              41,3213   65365 1          CADR   HMSIN
 1669   REF   4 LAST  336    41,3214   61323 1          CADR   DSPALARM        MIN/SEC CANT BE LOADED.
 1671   REF   1              41,3215   61051 1          CADR   DPINSP4
16711   REF   1              41,3216   60777 0          CADR   ARTIN1SP
16712   REF   5 LAST  343    41,3217   61323 1          CADR   DSPALARM        2INTOUT CANT BE LOADED.
 1672                        41,3220                ENDRUTIN EQUALS
R1673   SCALE FACTORS FOR THOSE ROUTINES NEEDING THEM ARE AVAILABLE IN SPTEMP1.
R1674   ALL SPIN ROUTINES USE MPAC MPAC+1. LEAVE RESULT IN A. END WITH TC DECRET
 1675   REF   1              40,2714                  SETLOC ENDDPDEC +1

16755   REF   4 LAST  336 TO  337'    15   460*      COUNT  40/PIN

R1676   DEGINSP APPLIES 1000/180 =5.55555(10) = 5.43434(8)

 1677   REF   6 LAST  336    40,2714   0 7052 1 DEGINSP  TC     DMP           SP ROUTINE FOR DEC DEGREES
 1678   REF   1              40,2715    02757 0         ADRES  DEGCON1       MULT BY 5.5  5(10)X2EXP-3
 1679   REF 125 LAST  342    40,2716   10 155 1         CCS    MPAC    +1    THIS ROUNDS OFF MPAC+1 BEFORE SHIFT
 1680   REF  15 LAST  315    40,2717   3 4700 1         CAF    BIT11         LEFT 3, AND CAUSES 360.00 TO OF/UF
 1681                        40,2720   0 2722 1         TC     +2            WHEN SHIFTED LEFT AND ALARM.
 1682   REF  16 LAST  343    40,2721   4 4700 0         CS     BIT11
 1683   REF 126 LAST  343    40,2722   6 0155 0         AD     MPAC    +1
 1684   REF   1              40,2723   0 3070 0         TC     2ROUND  +2
 1685   REF   3 LAST  335    40,2724   0 4420 0         TC     TPSL1         LEFT 1
 1686   REF   4 LAST  343    40,2725   0 4420 0 DEGINSP2 TC     TPSL1         LEFT 2
 1687   REF   1              40,2726   0 3077 1         TC     TESTOFUF
 1688   REF   5 LAST  343    40,2727   0 4420 0         TC     TPSL1         RETURNS IF NO OF/UF (LEFT3)
 1689   REF 127 LAST  343    40,2730   10 154 0         CCS    MPAC
 1690   REF   1              40,2731   0 2735 1         TC     SIGNFIX       IF+, GO TO SIGNFIX
 1691   REF   2 LAST  343    40,2732   0 2735 1         TC     SIGNFIX       IF +0, GO TO SIGNFIX
 1692                        40,2733   4 0000 0         COM                  IF - , USE -MAGNITUDE +1
 1693   REF 128 LAST  343    40,2734   54 154 0         TS     MPAC          IF -0, USE +0
 1694   REF   4 LAST  341    40,2735   10 162 0 SIGNFIX  CCS    MPAC+6
 1695   REF   1              40,2736   0 2753 1         TC     SGNTO1        IF OVERFLOW
 1696   REF   1              40,2737   0 2747 1         TC     ENDSCALE      NO OVERFLOW/UNDERFLOW
 1697   REF 129 LAST  343    40,2740   10 154 0         CCS    MPAC          IF UF FORCE SIGN TO 0 EXCEPT -180
 1698   REF   5 LAST  330    40,2741   0 5640 0         TC     CCSHOLE
 1699   REF   1              40,2742   0 2751 0         TC     NEG180
 1700                        40,2743   0 2744 1         TC     +1
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1701  REF 130  LAST 343   40,2744  56 154 1          XCH   MPAC
1702  REF   7  LAST 299   40,2745  7 4672 1          MASK  POSMAX
1703  REF 131  LAST 344   40,2746  54 154 0          TS    MPAC
1704  REF  23  LAST 339   40,2747  0 4574 0 ENDSCALE TC    POSTJUMP
1705  REF   4  LAST 342   40,2750   63150 0          CADR  PUTCOM2

1706  REF   8  LAST 344   40,2751  4 4672 1 NEG180   CS    POSMAX
1707  REF   2  LAST 343   40,2752  0 2746 0          TC    ENDSCALE -1

1708  REF 132  LAST 344   40,2753  4 0154 0 SGNTO1   CS    MPAC          IF OF FORCE SIGN TO 1
1709  REF   9  LAST 344   40,2754  7 4672 1          MASK  POSMAX
1710  REF 105  LAST 342   40,2755  4 0000 0          CS    A
1711  REF   3  LAST 344   40,2756  0 2746 0          TC    ENDSCALE -1

1712                      40,2757   26161 0 DEGCON1 2DEC  5.555555555 B-3
1712                      40,2760   30707 1

1713                      40,2761   21616 0 DEGCON2 2DEC  2.222222222 B-2
1713                      40,2762   07071 0
1714                      40,2763   71527 1 NEG.2   OCT   -06250       = .197753906  I.E. THE BIAS SCALED

1715  REF   7  LAST 343   40,2764  0 7052 1 ARTHINSF TC    DMP           SCALES MPAC, +1 BY SFTEMP1, SFTEMP2.
1716  REF  14  LAST 342   40,2765   00123 1          ADRES SFTEMP1       ASSUMES POINT BETWEEN HI AND LO PARTS
1717  REF 133  LAST 344   40,2766  56 156 0          XCH   MPAC    +2    OF SFCON. SHIFTS RESULTS LEFT BY 14.
1718  REF 134  LAST 344   40,2767  56 155 0          XCH   MPAC    +1    (BY TAKING RESULTS FROM MPAC+1, MPAC+2)
1719  REF 135  LAST 344   40,2770  56 154 1          XCH   MPAC
1720                      40,2771  0 0006 1          EXTEND
1721  REF   2  LAST 343   40,2772  1 2774 0          BZF   BINROUND
1722  REF   5  LAST 340   40,2773  0 4161 0          TC    ALMCYCLE      TOO LARGE A LOAD. ALARM AND RECYCLE.
1723  REF   2  LAST 343   40,2774  0 3066 1 BINROUND TC    2ROUND
1724  REF   2  LAST 343   40,2775  0 3077 1          TC    TESTOFUF
1725  REF   4  LAST 344   40,2776  0 2747 1          TC    ENDSCALE      RETURNS IF NO OF/UF
17251 REF   8  LAST 344   40,2777  0 7052 1 ARTIN1SF TC    DMP           SCALES MPAC, +1 BY SFTEMP1, SFTEMP2.
17252 REF  15  LAST 344   40,3000   00123 1          ADRES SFTEMP1       ROUNDS MPAC+1 INTO MPAC.
17253 REF   3  LAST 344   40,3001  0 2774 1          TC    BINROUND
1726  REF 136  LAST 344   40,3002  10 154 0 OPTDEGIN CCS   MPAC          OPTICS SCALING ROUTINE
1727                      40,3003  0 3007 0          TC    +4
1728                      40,3004  0 3007 0          TC    +3
1729  REF   6  LAST 344   40,3005  0 4161 0          TC    ALMCYCLE      REJECT - INPUT. ALARM AND RECYCLE.
1730  REF   7  LAST 344   40,3006  0 4161 0          TC    ALMCYCLE      REJECT - INPUT. ALARM AND RECYCLE.
1731  REF   1             40,3007  3 2763 1 OPDEGIN2 CAF   NEG.2         RANGE IS 90 DEG
1732  REF 137  LAST 344   40,3010  26 154 0          ADS   MPAC          SUBTRACT BIAS
1733  REF   9  LAST 344   40,3011  0 7052 1          TC    DMP           MULT BY 100 / 45  B-2
1734  REF   1             40,3012   02761 0          ADRES DEGCON2
1735  REF  17  LAST 296   40,3013  3 4677 0          CAF   BIT12         ROUND AS IN DEGINSF
1736  REF 138  LAST 344   40,3014  6 0155 0          AD    MPAC    +1
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1737  BNK   3  LAST  344   40,3015  0 3070 0          TC     2ROUND  +2
1738  BNK   1               40,3016  0 2725 0          TC     DEGINSF2

1739  BNK  10  LAST  344   40,3017  0 7052 1 DPINSF   TC     DMP             SCALES MPAC, MPAC +1 BY SFTEMP1,
1740  BNK  16  LAST  344   40,3020   00123 1          ADRES  SFTEMP1         SFTEMP2.  STORES LOW PART OF RESULT
1741  BNK 139  LAST  344   40,3021  56 156 0          XCH    MPAC    +2      IN (E SUBK) +1 OR E+1
1742                       40,3022  6 0000 1          DOUBLE
1743  BNK 140  LAST  345   40,3023  54 156 1          TS     MPAC    +2
1744  BNK  56  LAST  342   40,3024  3 4714 1          CAF    ZERO
1745  BNK 141  LAST  345   40,3025  6 0155 0          AD     MPAC    +1
1746  BNK   4  LAST  345   40,3026  0 3070 0          TC     2ROUND  +2
1747  BNK   3  LAST  344   40,3027  0 3077 1          TC     TESTOFUF
1748  BNK  12  LAST  342   40,3030  50 140 1          INDEX  MIXBR           RETURNS IF NO OF/UF
1749                       40,3031  0 3031 0          TC     +0
1750  BNK   1               40,3032  0 3042 1          TC     DPINORM
1751  BNK  27  LAST  342   40,3033  3 0117 0          CA     DECOUNT         MIXEDNOUN
1752  BNK  27  LAST  341   40,3034  6 0145 1 DPINCOM  AD     NOUNADD            MIXED              NORMAL
1753  BNK  81  LAST  341   40,3035  54 002 1          TS     Q                E SUBK             E
1754  BNK 142  LAST  345   40,3036  56 155 0          XCH    MPAC    +1
1755  BNK  82  LAST  345   40,3037  50 002 0          INDEX  Q
1756                       40,3040  54 001 1          TS     1               PLACE LOW PART IN
1757  BNK   5  LAST  344   40,3041  0 2747 1          TC     ENDSCALE        (E SUBK) +1    MIXED
1758  BNK  57  LAST  345   40,3042  3 4714 1 DPINORM  CAF    ZERO            E +1           NORMAL
1759  BNK   1               40,3043  0 3034 0          TC     DPINCOM
1760  BNK  11  LAST  345   40,3044  0 7052 1 DPINSF2  TC     DMP             ASSUMES POINT BETWEEN BITS 7-8 OF HIGH
1761  BNK  17  LAST  345   40,3045   00123 1          ADRES  SFTEMP1         PART OF SF CONST. DPINSF2 SHIFTS RESULTS
1762  BNK  14  LAST  337   40,3046  3 6211 0          CAF    SIX             LEFT BY 7, ROUNDS MPAC+2 INTO MPAC+1
1763  BNK   2  LAST  331   40,3047  0 3056 1          TC     TPLEFTN         SHIFT LEFT 7.
1764  BNK   3  LAST  343   40,3050  0 3021 1          TC     DPINSF  +2
1765  BNK  12  LAST  345   40,3051  0 7052 1 DPINSF4  TC     DMP             ASSUMES POINT BETWEEN BITS 11-12 OF HIGH
1766  BNK  18  LAST  345   40,3052   00123 1          ADRES  SFTEMP1         PART OF SF CONST. DPINSF2 SHIFTS RESULTS
1767  BNK  19  LAST  339   40,3053  3 4711 1          CAF    TWO             LEFT BY 3, ROUNDS MPAC+2 INTO MPAC+1.
1768  BNK   3  LAST  345   40,3054  0 3056 1          TC     TPLEFTN         SHIFT LEFT 3.
1769  BNK   4  LAST  345   40,3055  0 3021 1          TC     DPINSF  +2
1770  BNK  83  LAST  345   40,3056  56 002 0 TPLEFTN  XCH    Q               SHIFTS MPAC, +1, +2 LEFT N. SETS OVFIND
1771  BNK   1               40,3057  54 124 1          TS     SFTEMP2         TO +1 FOR OF, -1 FOR UF.
1772  BNK  84  LAST  345   40,3060  56 002 0          XCH    Q               CALL WITH N-1 IN A.
1773  BNK  19  LAST  345   40,3061  54 123 0 LEFTNCOM TS     SFTEMP1            LOOP TIME .37 MSEC.
1774  BNK   6  LAST  343   40,3062  0 4420 0          TC     TPSL1
1775  BNK  20  LAST  345   40,3063  10 123 0          CCS    SFTEMP1
1776  BNK   1               40,3064  0 3061 0          TC     LEFTNCOM
1777  BNK   2  LAST  345   40,3065  0 0124 0          TC     SFTEMP2
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1778  REF 143  LAST  345   40,3066  56 155 0  2ROUND   XCH    MPAC    +1
1779                       40,3067  6 0000 1           DOUBLE
1780  REF 144  LAST  346   40,3070  54 155 1           TS     MPAC    +1
1781  REF  85  LAST  345   40,3071  0 0002 0           TC     Q              IF MPAC+1 DOES NOT OF/UF
1782  REF 145  LAST  346   40,3072  6 0154 1           AD     MPAC
1783  REF 146  LAST  346   40,3073  54 154 0           TS     MPAC
1784  REF  86  LAST  346   40,3074  0 0002 0           TC     Q              IF MPAC DOES NOT OF/UF
1785  REF   5  LAST  343   40,3075  54 162 0           TS     MPAC+6
1786  REF  87  LAST  346   40,3076  0 0002 0  2RNDEND  TC     Q
1787  REF   6  LAST  346   40,3077  10 162 0  TESTOFUF CCS    MPAC+6         RETURNS IF NO OF/UF
1788  REF   8  LAST  344   40,3100  0 4161 0           TC     ALMCYCLE       OF   ALARM AND RECYCLE.
1789  REF  88  LAST  346   40,3101  0 0002 0           TC     Q
1790  REF   9  LAST  346   40,3102  0 4161 0           TC     ALMCYCLE       UF   ALARM AND RECYCLE.
1791  REF   1              42,3365                    SETLOC ENDSPMIN +1

17915 REF   2 LAST 333 TO 336'   146   146*           COUNT  42/PIN

1792  REF   1              42,3365  0 3506 1  HMSIN    TC     ALL3DEC        IF ALL 3 WORDS WERE NOT LOADED, ALARM.
1793  REF  13  LAST  345   42,3366  0 7052 1           TC     DMP            XREG, XREGLP (=HOURS) WERE ALREADY PUT
1794  REF   1              42,3367   03447 0           ADRES  WHOLECON       INTO MPAC, MPAC+1.
1795  REF   1              42,3370  0 3456 0           TC     RND/TST        ROUND OFF TO WHOLE HRS IN MPAC+1.
1796  REF  58  LAST  345   42,3371  3 4714 1           CAF    ZERO           ALARM IF MPAC NON ZERO (G/ 16383 ).
1797  REF 147  LAST  346   42,3372  54 156 1           TS     MPAC    +2
1798  REF   1              42,3373  3 3451 1           CAF    HRCON
1799  REF 148  LAST  346   42,3374  54 154 0           TS     MPAC
1800  REF   2  LAST  346   42,3375  3 3452 1           CAF    HRCON   +1
1801  REF 149  LAST  346   42,3376  56 155 0           XCH    MPAC    +1
1802  REF   6  LAST  334   42,3377  0 7256 1           TC     SHORTMP
1803  REF   1              42,3400  0 3467 1           TC     MPACTST        ALARM IF MPAC NON ZERO (G/ 745)
1804  REF 150  LAST  346   42,3401  52 156 1           DXCH   MPAC    +1      STORE HOURS CONTRIBUTION
1805  REF   1              42,3402  52 124 1           DXCH   HITEMIN
1806  REF   3  LAST  338   42,3403  3 1004 1           CA     YREG           PUT YREG, YREGLP INTO MPAC, +1.
1807  REF   2  LAST   73   42,3404  23=007 1           LXCH   YREGLP
1808  REF 151  LAST  346   42,3405  52 155 1           DXCH   MPAC
1809  REF  14  LAST  346   42,3406  0 7052 1           TC     DMP
1810  REF   2  LAST  346   42,3407   03447 0           ADRES  WHOLECON
1811  REF   2  LAST  346   42,3410  0 3456 0           TC     RND/TST        ROUND OFF TO WHOLE MIN IN MPAC+1
1812  REF   1              42,3411  4 3454 0           CS     59MIN          ALARM IF MPAC NON ZERO (G/16383)
1813  REF   1              42,3412  0 3474 0           TC     SIZETST        ALARM IF MPAC+1 G/ 59MIN
1814  REF 152  LAST  346   42,3413  56 155 0           XCH    MPAC    +1
1815                       42,3414  0 0006 1           EXTEND
1816  REF   1              42,3415  7 3453 1           MP     MINCON         LEAVES MINUTES CONTRIBUTION IN A,L
1817  REF   2  LAST  346   42,3416  20 124 1           DAS    HITEMIN        ADD IN MINUTES CONTRIBUTION
1818                       42,3417  0 0006 1           EXTEND                IF THIS DAS OVERFLOWS, G/ 745HR,39MIN
1819                       42,3420  1 3422 1           BZF    +2
1820  REF  10  LAST  346   42,3421  0 4161 0           TC     ALMCYCLE
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1821  REF   3  LAST  338   42,3422  3 1005 0          CA     ZREG          PUT ZREG, ZREGLP INTO MPAC, +1.
1822  REF   2  LAST   73   42,3423  23"010 1          LXCH   ZREGLP
1823  REF 153  LAST  346   42,3424  52 155 1          DXCH   MPAC
1824  REF  15  LAST  346   42,3425  0 7052 1          TC     DMP
1825  REF   3  LAST  346   42,3426   03447 0          ADRES  WHOLECON
1826  REF   3  LAST  346   42,3427  0 3456 0          TC     RND/TST       ROUND OFF TO WHOLE CENTI-SEC IN MPAC+1
1827  REF   1                42,3430  4 3455 1          CS     59.99SEC      ALARM IF MPAC NON ZERO (G/163.83 SEC)
1828  REF   2  LAST  346   42,3431  0 3474 0          TC     SIZETST       ALARM IF MPAC+1 G/59.99 SEC
1829  REF   3  LAST  346   42,3432  52 124 1          DXCH   HITEMIN       ADD IN SECONDS CONTRIBUTION
1830  REF 154  LAST  347   42,3433  20 155 1          DAS    MPAC          IF THIS DAS OVERFLOWS,
1831                        42,3434  0 0006 1          EXTEND               G/ 745 HR, 39 MIN, 14.55 SEC.
1832                        42,3435  1 3437 0          BZF    +2
1833  REF  11  LAST  346   42,3436  0 4161 0          TC     ALMCYCLE      ALARM AND RECYCLE
1834  REF  59  LAST  346   42,3437  3 4714 1          CAF    ZERO
1835  REF 155  LAST  347   42,3440  54 156 1          TS     MPAC    +2
1836  REF   6  LAST  336   42,3441  0 7226 0          TC     TPAGREE
1837  REF 156  LAST  347   42,3442  52 155 1          DXCH   MPAC
1838  REF  28  LAST  345   42,3443  50 145 1          INDEX  NOUNADD
1839                        42,3444  52 001 1          DXCH   0
1840  REF  24  LAST  344   42,3445  0 4574 0          TC     POSTJUMP
1841  REF  10  LAST  342   42,3446   62771 1          CADR   LOADLV

1842                        42,3447   00006 1 WHOLECON OCT    00006         (10EXP5/2EXP14)2EXP14
1843                        42,3450   03240 1         OCT    03240
1844                        42,3451   00025 0 HRCON   OCT    00025         1 HOUR IN CENTI-SEC
1845                        42,3452   37100 1         OCT    37100
1846                        42,3453   13560 0 MINCON  OCT    13560         1 MINUTE IN CENTI-SEC
1847                        42,3454   00073 0 59MIN   OCT    00073         59 AS WHOLE
1848                        42,3455   13557 1 59.99SEC OCT   13557         5999 CENTI-SEC
1849  REF 157  LAST  347   42,3456  56 156 0 RND/TST  XCH    MPAC    +2    ROUNDS MPAC+2 INTO MPAC+1.
1850                        42,3457  6 0000 1          DOUBLE               ALARMS IF MPAC NOT 0
1851  REF 158  LAST  347   42,3460  54 156 1          TS     MPAC    +2
1852  REF  60  LAST  347   42,3461  3 4714 1          CAF    ZERO
1853  REF 159  LAST  347   42,3462  6 0155 0          AD     MPAC    +1
1854  REF 160  LAST  347   42,3463  54 155 1          TS     MPAC    +1
1855  REF  61  LAST  347   42,3464  3 4714 1          CAF    ZERO
1856  REF 161  LAST  347   42,3465  6 0154 1          AD     MPAC          CANT OVFLOW
1857  REF 162  LAST  347   42,3466  56 154 1          XCH    MPAC
1858  REF 163  LAST  347   42,3467  10 154 0 MPACTST  CCS    MPAC          ALARM IF MPAC NON ZERO
1859  REF  12  LAST  347   42,3470  0 4161 0          TC     ALMCYCLE      ALARM AND RECYCLE.
1860  REF  89  LAST  346   42,3471  0 0002 0          TC     Q
1861  REF  13  LAST  347   42,3472  0 4161 0          TC     ALMCYCLE      ALARM AND RECYCLE.
1862  REF  90  LAST  347   42,3473  0 0002 0          TC     Q

1863  REF 164  LAST  347   42,3474  54 156 1 SIZETST  TS     MPAC    +2    CALLED WITH - CON IN A
1864  REF 165  LAST  347   42,3475  10 155 1          CCS    MPAC    +1    GET MAG OF MPAC+1
1865  REF  35  LAST  342   42,3476  6 4712 1          AD     ONE
1866                        42,3477  1 3501 1          TCF    +2
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L PINBALL GAME BUTTONS AND LIGHTS

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 1867   REF  38  LAST  347    42,3500  6 4712 1          AD      ONE
 1868   REF 166  LAST  347    42,3501  6 0156 0          AD      MPAC      +2
 1869                         42,3502  0 0006 1          EXTEND
 1870                         42,3503  6 3505 1          BZMF    +2
 1871   REF  14  LAST  347    42,3504  0 4161 0          TC      ALMCYCLE
 1872   REF  91  LAST  347    42,3505  0 0002 0          TC      Q
R1873   ALL3DEC TESTS THAT ALL 3 WORDS ARE LOADED IN DEC (FOR RMSIN).
R1874   ALARM IF NOT.( TEST THAT BITS 3,4,5 OF DECBRNCH ARE ALL = 1)
 1875   REF   1                42,3506  4 3513 1  ALL3DEC  CS      OCT34BAR
 1876   REF  17  LAST  341    42,3507  7 1000 1          MASK    DECBRNCH
 1877   REF   2  LAST  348    42,3510  6 3513 0          AD      OCT34BAR
 1878   REF 106  LAST  344    42,3511  10 000 0          CCS     A
 1879   REF   1                42,3512  0 3516 0          TC      FORCEV25
 1880                         42,3513   77743 1  OCT34BAR OCT     77743
 1881   REF   2  LAST  348    42,3514  0 3516 0          TC      FORCEV25
 1882   REF  92  LAST  348    42,3515  0 0002 0          TC      Q
18825   REF   1                42,3516  4 4113 1  FORCEV25 CS      OCT31
18826   REF   2  LAST  319    42,3517  55∝041 1          TS      VERBSAVE
18827   REF  15  LAST  348    42,3520  0 4161 0          TC      ALMCYCLE
 1883                         42,3521           ENDHMSS  EQUALS
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MAG OF MPAC+1 - CON

MAG OF MPAC+1 G/ CON. ALARM AND RECYCLE.
MAG OF MPAC+1 L/= CON

GET BITS 3,4,5 IN A
GET BITS 3,4,5 OF DECBRNCH IN A
BITS 3,4,5 OF DECBRNCH MUST ALL = 1

FORCE VERB 25 TO BE EXECUTED BY RECYCLE IN CASE OPERATOR EXECUTED A LOWER LOAD VERB. ALARM AND RECYCLE.

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P1884   MONITOR ALLOWS OTHER KEYBOARD ACTIVITY. IT IS ENDED BY VERB TERMINATE,
R1885   VERB PROCEED WITHOUT DATA, VERB RESEQUENCE,
R1886   ANOTHER MONITOR, OR ANY NVSUB CALL THAT PASSES THE DSPLOCK (PROVIDED
R18861  THAT THE OPERATOR HAS SOMEHOW ALLOWED THE ENDING OF A MONITOR WHICH
R18862  HE HAS INITIATED THROUGH THE KEYBOARD).

R1887   MONITOR ACTION IS SUSPENDED, BUT NOT ENDED, BY ANY KEYBOARD ACTION,
R1888   EXCEPT ERROR LIGHT RESET. IT BEGINS AGAIN WHEN KEY RELEASE IS PERFORMED.
R1889   MONITOR SAVES THE NOUN AND APPROPRIATE DISPLAY VERB IN MONSAVE. IT SAVES
R1890   NOUNCADR IN MONSAVE1, IF NOUN = MACHINE CADR TO BE SPECIFIED. BIT 15 OF
R1891   MONSAVE1 IS THE KILL MONITOR SIGNAL (KILLER BIT). BIT 14 OF MONSAVE1
R18911  INDICATES THE CURRENT MONITOR WAS EXTERNALLY INITIATED (EXTERNAL
R18912  MONITOR BIT). IT IS TURNED OFF BY RELDSP AND KILMONON.

R1892   MONSAVE INDICATES IF MONITOR IS ON(+=ON, +0=OFF)
R1893   IF MONSAVE IS +, MONITOR ENTERS NO REQUEST, BUT TURNS KILLER BIT OFF.
R1894   IF MONSAVE IS +0, MONITOR ENTERS REQUEST AND TURNS KILLER BIT OFF.

R1895   NVSUB (IF EXTERNAL MONITOR BIT IS OFF), VB=PROCEED WITHOUT DATA,
R1896   VB=RESEQUENCE, AND VB=TERMINATE TURN KILL MONITOR BIT ON.

R1897   IF KILLER BIT IS ON, MONREQ ENTERS NO FURTHER REQUESTS, ZEROS MONSAVE
R1898   AND MONSAVE1 (TURNING OFF KILLER BIT AND EXTERNAL MONITOR BIT).

R1899   MONITOR DOSENT TEST FOR MATBS SINCE NVSUB CAN HANDLE INTERNAL MATBS NOW
 1900   REF   1                41,3220                          SETLOC ENDRUTIN

19005   REF   3 LAST  337 TO  343'   262   656*                COUNT  41/PIN

 1901   REF   1                41,3220  4 3227 1  MONITOR  CS     BIT15/14
 1902   REF   6  LAST  342     41,3221  7 1017 1           MASK   NOUNCADR
 1903   REF 167  LAST  348     41,3222  54 155 1  MONIT1   TS     MPAC    +1     TEMP STORAGE
19031   REF   7  LAST  336     41,3223  4 0136 1           CS     ENTEXIT
19032   REF   4  LAST  319     41,3224  6 4233 1           AD     ENDINST
19033   REF 107  LAST  348     41,3225  10 000 0           CCS    A
19034   REF   1                41,3226  0 3235 0           TC     MONIT2
19035                          41,3227   60000 1  BIT15/14 OCT    60000
19036   REF   2  LAST  349     41,3230  0 3235 0           TC     MONIT2
19037   REF  27  LAST  327     41,3231  3 4675 1           CAF    BIT14          EXTERNALLY INITIATED MONITOR,
19038   REF 168  LAST  349     41,3232  26 155 1           ADS    MPAC +1        SET BIT 14 FOR MONSAVE1.
190381  REF  62  LAST  347     41,3233  3 4714 1           CAF    ZERO
190382  REF   1                41,3234  55=022 1           TS     MONSAVE2       ZERO NVMONOPT OPTIONS
 1904   REF   3  LAST  198     41,3235  3 6043 0  MONIT2   CAF    LOW7
 1905   REF  17  LAST  326     41,3236  7 1001 0           MASK   VERBREG
 1906   REF   4  LAST  341     41,3237  0 4345 1           TC     LEFTS
 1907   REF   5  LAST  312     41,3240  54 022 0           TS     CYL
 1908   REF   6  LAST  349     41,3241  4 0022 0           CS     CYL
 1909   REF   7  LAST  349     41,3242  56 022 1           XCH    CYL
 1910   REF  11  LAST  337     41,3243  6 1002 1           AD     NOUNREG
 1911   REF 169  LAST  349     41,3244  54 154 0           TS     MPAC           TEMP STORAGE
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1912  REF  63  LAST  349   41,3245   3 4714 1          CAF    ZERO
1913  REF   3  LAST  310   41,3246   55=012 1          TS     DSPLOCK      +0 INTO DSPLOCK SO MONITOR CAN RUN.
1914  REF   4  LAST  319   41,3247   11=042 1          CCS    CADRSTOR     TURN OFF KR LITE IF CADRSTOR AND DSPLIST
1915                       41,3250   0 3252 1          TC     +2           ARE BOTH EMPTY. (LITE COMES ON IF NEW
1916  REF   1              41,3251   0 4516 1          TC     RELDSP1      MONITOR IS KEYED IN OVER OLD MONITOR.)
1917                       41,3252   0 0004 0          INHINT
1918  REF   2  LAST  188   41,3253   11=020 0          CCS    MONSAVE
1919                       41,3254   0 3261 1          TC     +5           IF MONSAVE WAS +, NO REQUEST
1920  REF  37  LAST  348   41,3255   3 4712 1          CAF    ONE          IF MONSAVE WAS 0, REQUEST MONREQ
1921  REF  11  LAST  243   41,3256   0 5140 1          TC     WAITLIST
1922  REF  39  LAST  342     0777                      EBANK= DSPCOUNT
1923  REF   1              41,3257     03265 0         2CADR  MONREQ
1923  REF   1              41,3260     62101 0
1924  REF 170  LAST  349   41,3261   52 155 1          DXCH   MPAC         PLACE MONITOR VERB AND NOUN INTO MONSAVE
1925  REF   3  LAST  350   41,3262   53=021 1          DXCH   MONSAVE      ZERO THE KILL MONITOR BIT
1926                       41,3263   0 0003 1          RELINT              SET UP EXTERNAL MONITOR BIT
1927  REF   4  LAST  318   41,3264   0 0136 0          TC     ENTRET
1928  REF   1              41,3265   0 4414 1  MONREQ  TC     LODSAMPT     CALLED BY WAITLIST
1929  REF   2  LAST  188   41,3266   11=021 1          CCS    MONSAVE1     TIME IS SNATCHED IN RUPT FOR NOUN 65
1930                       41,3267   0 3273 1          TC     +4           IF KILLER BIT = 0, ENTER REQUESTS
1931                       41,3270   0 3273 1          TC     +3           IF KILLER BIT = 0, ENTER REQUESTS
1932  REF   1              41,3271   0 3304 0          TC     KILLMON      IF KILLER BIT = 1, NO REQUESTS
1933  REF   2  LAST  350   41,3272   0 3304 0          TC     KILLMON      IF KILLER BIT = 1, NO REQUESTS
1934  REF   1              41,3273   3 3310 0          CAF    MONDEL
1935  REF  12  LAST  350   41,3274   0 5140 1          TC     WAITLIST     ENTER WAITLIST REQUEST FOR MONREQ
1936  REF  40  LAST  350     0777                      EBANK= DSPCOUNT
1937  REF   2  LAST  350   41,3275     03265 0         2CADR  MONREQ
1937                       41,3276     62101 0
1938  REF   2  LAST  132   41,3277   3 4371 0          CAF    CHRPRIO
1939  REF  11  LAST  296   41,3300   0 5027 1          TC     NOVAC        ENTER EXEC REQUEST FOR MONDO
1940  REF  41  LAST  350     0777                      EBANK= DSPCOUNT
1941  REF   1              41,3301     03311 1         2CADR  MONDO
1941  REF   1              41,3302     62101 0
1942  REF  12  LAST  244   41,3303   0 5213 1          TC     TASKOVER

1943  REF  64  LAST  350   41,3304   3 4714 1  KILLMON CAF    ZERO         ZERO MONSAVE AND TURN KILLER BIT OFF
1944  REF   4  LAST  350   41,3305   55=020 0          TS     MONSAVE
1945  REF   3  LAST  350   41,3306   55=021 1          TS     MONSAVE1     TURN OFF KILL MONITOR BIT.
1946  REF  13  LAST  350   41,3307   0 5213 1          TC     TASKOVER     TURN OFF EXTERNAL MONITOR BIT.
1947                       41,3310    00144 0  MONDEL  OCT    144          FOR 1 SEC MONITOR INTERVALS
1948  REF   4  LAST  350   41,3311   11=021 1  MONDO   CCS    MONSAVE1     CALLED BY EXEC
1949                       41,3312   0 3316 0          TC     +4           IF KILLER BIT = 0, CONTINUE
1950                       41,3313   0 3316 0          TC     +3           IF KILLER BIT = 0, CONTINUE
1951  REF  32  LAST  316   41,3314   0 5112 0          TC     ENDOFJOB     IN CASE TERMINATE CAME SINCE LAST MONREQ
1952  REF  33  LAST  350   41,3315   0 5112 0          TC     ENDOFJOB     IN CASE TERMINATE CAME SINCE LAST MONREQ
1953  REF   4  LAST  350   41,3316   11=012 1          CCS    DSPLOCK
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1954   REF   1                  41,3317  0 3341 1            TC     MONBUSY        NVSUB IS BUSY
1955   REF   4  LAST  349       41,3320  3 6043 0            CAF    LOW7
1956   REF   5  LAST  350       41,3321  7 1020 0            MASK   MONSAVE
1958   REF   1                  41,3322  0 2316 1            TC     UPDATNN -1     PLACE NOUN INTO NOUNREG AND DISPLAY IT
1960   REF   1                  41,3323  3 4160 1            CAF    MID7
1961   REF   6  LAST  351       41,3324  7 1020 0            MASK   MONSAVE        CHANGE MONITOR VERB TO DISPLAY VERB
1962   REF   1                  41,3325  6 3337 0            AD     MONREF         -DEC10, STARTING IN BIT8
1963   REF   1                  41,3326 54 023 1            TS     EDOP           RIGHT 7
1964   REF   2  LAST  351       41,3327  3 0023 0            CA     EDOP
1965   REF  18  LAST  349       41,3330 55<001 0            TS     VERBREG
1966   REF   1                  41,3331  3 3340 0            CAF    MONBACK        SET RETURN TO PASTEVB AFTER DATA DISPLAY
1967   REF   5  LAST  350       41,3332 54 136 1            TS     ENTRET
1968   REF   2  LAST  349       41,3333  4 3227 1            CS     BIT15/14
1969   REF   5  LAST  350       41,3334  7 1021 1            MASK   MONSAVE1       PUT ECADR INTO MPAC +2. INTMCTBS WILL
1970   REF 171  LAST  350       41,3335 54 156 1            TS     MPAC     +2    DISPLAY IT AND SET NOUNCADR, NOUNADD,
1971   REF   1                  41,3336  0 2046 1 ENDMONDO  TC     TESTNN         EBANK.

1972                              4140                      BLOCK  2

197201 REF   1                    4000                     SETLOC FFTAG8
197202                            4140                     BANK

19725  REF   1                                             COUNT  02/PIN

1973   REF   2  LAST  351         4140  3 4160 1 PASTEVB   CAF    MID7
1974   REF   2  LAST  349         4141  7 1022 1            MASK   MONSAVE2       NVMONOPT PASTE OPTION
1975                              4142  0 0006 1            EXTEND
1976                              4143  1 4145 1            BZF    +2
1977   REF   1                    4144  0 4146 0            TC     PASTEOPT       PASTE PLEASE VERB FOR NVMONOPT
1978   REF   7  LAST  351         4145  3 1020 1            CA     MONSAVE        PASTE MONITOR VERB - PASTE OPTION IS 0
19782  REF   3  LAST  351         4146 54 023 1 PASTEOPT    TS     EDOP           RIGHT 7
19783  REF   4  LAST  351         4147  3 0023 0            CA     EDOP           PLACE MONITOR VERB OR PLEASE VERB INTO
197832 REF  49  LAST  335         4150  0 4555 0            TC     BANKCALL        VERBREG AND DISPLAY IT.
197833 REF   7  LAST  338         4151   62336 0            CADR   UPDATVB -1
197835 REF  65  LAST  350         4152  3 4714 1            CAF    ZERO           ZERO REQRET SO THAT PASTED VERBS CAN
197838 REF  10  LAST  323         4153 55<013 0            TS     REQRET          BE EXECUTED BY OPERATOR.
19784  REF   3  LAST  351         4154  3 1022 0            CA     MONSAVE2
19785  REF   1                    4155  0 4271 1            TC     BLANKSUB       PROCESS NVMONOPT BLANK OPTION IF ANY
19786                             4156  0 4157 0            TC     +1
19787  REF  34  LAST  350         4157  0 5112 0 ENDPASTE   TC     ENDOFJOB

1979                              4160   37600 0 MID7       OCT    37600
1980   REF   1                  41,3337                     SETLOC ENDMONDO +1
19805  REF   4 LAST  349 TO 351'   79   735*                COUNT  41/PIN

1981                           41,3337   75377 0 MONREF     OCT    75377          -DEC10, STARTING IN BIT8
1982   REF   1                 41,3340   04140 0 MONBACK    ADRES  PASTEVB
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L PINBALL GAME BUTTONS AND LIGHTS

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 1983   REF   2 LAST 310   41,3341  0 4410 0  MONBUSY  TC      RELDSPON        TURN KEY RELEASE LIGHT
 1984   REF  35 LAST 351   41,3342  0 5112 0            TC      ENDOFJOB
R1985   DSPFMEM IS USED TO DISPLAY (IN OCTAL) ANY FIXED REGISTER.
R1986   IT IS USED WITH NOUN = MACHINE CADR TO BE SPECIFIED. THE FCADR OF THE
R1987   DESIRED LOCATION IS THEN PUNCHED IN. IT HANDLES F/F ( FCADR 4000-7777)

R19871  FOR BANKS L/E 27, THIS IS ENOUGH.

R19872  FOR BANKS G/E 30, THE THIRD COMPONENT OF NOUN 26 (PRIO, ADRES, BBCON)
R19873  MUST BE PRELOADED WITH THE DESIRED SUPERBANK BITS (BITS 5,6,7).
R19874          V23N26 SHOULD BE USED.

R19875  SUMMARY
R19876  FOR BANKS L/E 27,                          V27N01E(FCADR)E
R19877  FOR BANKS G/E 30,   V23N26E(SUPERBITS)E    V27N01E(FCADR)E

 1988   REF  12 LAST 336   41,3343  3 4333 0  DSPFMEM  CAF     R1D1            IF F/F, DATACALL USES BANK 02 OR 03.
 1989   REF  42 LAST 350   41,3344 54 777  1            TS      DSPCOUNT
19891   REF  15 LAST 277   41,3345  3 1047 0            CA      DSPTEM1 +2      SUPERBANK BITS WERE PRELOADED INTO
19892   REF  40 LAST 340   41,3346 54 001  1            TS      L               3RD COMPONENT OF NOUN 26.
 1990   REF   7 LAST 349   41,3347  3 1017 0            CA      NOUNCADR        ORIGINAL FCADR LOADED STILL IN NOUNCADR.
 1991   REF   1            41,3350  0 4610 1            TC      SUPDACAL        CALL WITH FCADR IN A, SUPERBITS IN L.
 1992   REF   3 LAST 326   41,3351  0 3353 1            TC      DSPCOUNT
 1993   REF  36 LAST 352   41,3352  0 5112 0  ENDSPF    TC      ENDOFJOB
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P1994   WORD DISPLAY ROUTINES

 1995   REF    4  LAST  345   40,3103                        SETLOC  TESTOPUP +4
19955   REF    5  LAST  343 TO  346'   119   579*            COUNT   40/PIN

 1996   REF   93  LAST  348   40,3103  56 002 0  DSPSIGN     XCH     Q
 1997   REF    1               40,3104  54 144 1            TS      DSPWDRET
 1998   REF  172  LAST  351   40,3105  10 154 0            CCS     MPAC
 1999                         40,3106  0 3116 1            TC      +8D
 2000                         40,3107  0 3116 1            TC      +7
 2001   REF   38  LAST  350   40,3110  6 4712 1            AD      ONE
 2002   REF  173  LAST  353   40,3111  54 154 0            TS      MPAC
 2003   REF    2  LAST  314   40,3112  0 2334 1            TC      -ON
 2004   REF  174  LAST  353   40,3113  4 0155 1            CS      MPAC   +1
 2005   REF  175  LAST  353   40,3114  54 155 1            TS      MPAC   +1
 2006   REF    2  LAST  353   40,3115  0 0144 0            TC      DSPWDRET
 2007   REF    3  LAST  332   40,3116  0 2314 0            TC      +ON
 2008   REF    3  LAST  353   40,3117  0 0144 0            TC      DSPWDRET

 2009                         40,3120  0 0006 1  DSPRND     EXTEND                  ROUND BY 5 EXP-6
 2010   REF    1               40,3121  3 3164 1            DCA     DECROUND -1
 2011   REF  176  LAST  353   40,3122  20 155 1            DAS     MPAC
 2012                         40,3123  0 0006 1            EXTEND
 2013                         40,3124  1 3130 1            BZF     +4
 2014                         40,3125  0 0006 1            EXTEND
 2015   REF    1               40,3126  3 4672 0            DCA     DPOSMAX
 2016   REF  177  LAST  353   40,3127  52 155 1            DXCH    MPAC
 2017   REF   94  LAST  353   40,3130  0 0002 0            TC      Q

R2018   DSPDECWD CONVERTS C( MPAC, MPAC+1) INTO A SIGN AND 5 CHAR DECIMAL
R2019   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT ROUNDS BY 5 EXP-6.

 2020   REF   95  LAST  353   40,3131  56 002 0  DSPDECWD   XCH     Q
 2021   REF    1               40,3132  54 115 0            TS      WDRET
 2022   REF    1               40,3133  0 3103 0            TC      DSPSIGN
 2023   REF    1               40,3134  0 3120 1            TC      DSPRND
 2024   REF    4  LAST  298   40,3135  3 4710 0            CAF     FOUR
 2025   REF    1               40,3136  54 137 0  DSPDCWD1  TS      WDCNT
 2026   REF    1               40,3137  3 4377 0            CAF     BINCON
 2027   REF    7  LAST  346   40,3140  0 7256 1            TC      SHORTMP
 2028   REF  178  LAST  353   40,3141  50 154 1  TRACE1     INDEX   MPAC
 2029   REF    3  LAST  311   40,3142  3 4072 0            CAF     RELTAB
 2030   REF    6  LAST  341   40,3143  7 4362 0            MASK    LOW5
 2031   REF    6  LAST  334   40,3144  54 124 1            TS      CODE
 2032   REF   66  LAST  351   40,3145  3 4714 1            CAF     ZERO
 2033   REF  179  LAST  353   40,3146  56 156 0            XCH     MPAC   +2
 2034   REF  180  LAST  353   40,3147  56 155 0            XCH     MPAC   +1
 2035   REF  181  LAST  353   40,3150  54 154 0            TS      MPAC
 2036   REF   43  LAST  352   40,3151  56 777 0            XCH     DSPCOUNT
 2037   REF    4  LAST  334   40,3152  54 143 0  TRACE1S    TS      COUNT
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 2038   REF 108  LAST  349   40,3153  10 000 0            CCS   A          DECREMENT DSPCOUNT EXCEPT AT +0
 2039   REF  44  LAST  353   40,3154  54 777 1            TS    DSPCOUNT
 2040   REF   4  LAST  335   40,3155  0 3225 1            TC    DSPIN
 2041   REF   2  LAST  353   40,3156  10 137 0            CCS   WDCNT
 2042   REF   1               40,3157  0 3136 0            TC    DSPDCWD1
 2043   REF   7  LAST  339   40,3160  4 4374 1            CS    VD1
 2044   REF  45  LAST  354   40,3161  54 777 1            TS    DSPCOUNT
 2045   REF   2  LAST  353   40,3162  0 0115 1            TC    WDRET

 2046                        40,3163   00000 1            OCT   00000
 2047                        40,3164   02476 0  DECROUND  OCT   02476

R2048   DSPDECNR CONVERTS C( MPAC,MPAC+1) INTO A SIGN AND 5 CHAR DECIMAL
R2049   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT DOES NOT ROUND

 2050   REF  98  LAST  353   40,3165  56 002 0  DSPDECNR XCH   Q
 2051   REF   3  LAST  354   40,3166  54 115 0            TS    WDRET
 2052   REF   2  LAST  353   40,3167  0 3103 0            TC    DSPSIGN
 2053   REF   2  LAST  354   40,3170  0 3135 0            TC    DSPDCWD1 -1

R2054   DSPDC2NR CONVERTS C( MPAC,MPAC+1) INTO A SIGN AND 2 CHAR DECIMAL
R2055   STARTING IN LOC SPECIFIED IN DSPCOUNT. IT DOES NOT ROUND

 2056   REF  97  LAST  354   40,3171  56 002 0  DSPDC2NR XCH   Q
 2057   REF   4  LAST  354   40,3172  54 115 0            TS    WDRET
 2058   REF   3  LAST  354   40,3173  0 3103 0            TC    DSPSIGN
 2059   REF  39  LAST  353   40,3174  3 4712 1            CAF   ONE
 2060   REF   3  LAST  354   40,3175  0 3136 0            TC    DSPDCWD1
R2061   DSP2DEC CONVERTS C(MPAC) AND C(MPAC+1) INTO A SIGN AND 10 CHAR DECIMAL
R2062   STARTING IN THE LOC SPECIFIED IN DSPCOUNT.

 2063   REF  98  LAST  354   40,3176  56 002 0  DSP2DEC  XCH   Q
 2064   REF   5  LAST  354   40,3177  54 115 0            TS    WDRET
 2065   REF  67  LAST  353   40,3200  3 4714 1            CAF   ZERO
 2066   REF   7  LAST  353   40,3201  54 124 1            TS    CODE
 2067   REF  12  LAST  334   40,3202  3 6214 0            CAF   THREE
 2068   REF   3  LAST  315   40,3203  0 3307 0            TC    11DSPIN      -R2 OFF
 2069   REF   5  LAST  353   40,3204  3 4710 0            CAF   FOUR
 2070   REF   4  LAST  354   40,3205  0 3307 0            TC    11DSPIN      +R2 OFF
 2071   REF   4  LAST  354   40,3206  0 3103 0            TC    DSPSIGN
 2072   REF   4  LAST  333   40,3207  3 4334 1            CAF   R2D1
 2073   REF   4  LAST  354   40,3210  0 3136 0  END2DEC  TC    DSPDCWD1
R2074   DSPDECVN DISPLAYS C(A) UPON ENTRY AS A 2 CHAR DECIMAL BEGINNING IN THE
R2075   DSP LOC SPECIFIED IN DSPCOUNT.
R2076   C(A) SHOULD BE IN FORM N X 2EXP-14. THIS IS SCALED TO FORM N/100 BEFORE
R2077   DISPLAY CONVERSION.
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2078                        40,3211  0 0006 1  DSPDECVN EXTEND
2079  REF   1               40,3212  7 3221 1          MP      VNDSPCON        MULT BY .01
2080  REF 182 LAST  353     40,3213  22 154 1          LXCH    MPAC            TAKE RESULTS FROM L.(MULT BY 2EXP14).
2081  REF  68 LAST  354     40,3214  3 4714 1          CAF     ZERO
2082  REF 183 LAST  355     40,3215  54 155 1          TS      MPAC     +1
2083  REF  99 LAST  354     40,3216  56 002 0          XCH     Q
2084  REF   6 LAST  354     40,3217  54 115 0          TS      WDRET
2085  REF   3 LAST  335     40,3220  0 3174 0          TC      DSPDC2NR +3     NO SIGN, NO ROUND, 2 CHAR

2086                        40,3221   00244 0  VNDSPCON OCT     00244           .01 ROUNDED UP
2087  REF   3 LAST  332     40,3222  0 3211 0  GOVNUPDT TC      DSPDECVN        THIS IS NOT FOR GENERAL USE. REALLY PART
2088  REF  25 LAST  347     40,3223  0 4574 0          TC      POSTJUMP        OF UPDATVB.
2089  REF   2 LAST  323     40,3224   62346 1          CADR    UPDAT1   +2

2090                        40,3225           ENDECVN EQUALS
2091  REF   1               41,3353                   SETLOC  ENDSPF   +1
20915 REF   5 LAST  351 TO  353'    12   747*         COUNT   41/PIN

R2092 DSPOCTWD DISPLAYS C(A) UPON ENTRY AS A 5 CHAR OCT STARTING IN THE DSP
R2093 CHAR SPECIFIED IN DSPCOUNT. IT STOPS AFTER 5 CHAR HAVE BEEN DISPLAYED.

2094  REF   8 LAST  349     41,3353  54 022 0  DSPOCTWD TS      CYL
2095  REF 100 LAST  355     41,3354  56 002 0          XCH     Q
2096  REF   7 LAST  355     41,3355  54 115 0          TS      WDRET           MUST USE SAME RETURN AS DSP2BIT.
2097  REF  28 LAST  349     41,3356  3 4675 1          CAF     BIT14           TO BLANK SIGNS
2098  REF  46 LAST  354     41,3357  26 777 1          ADS     DSPCOUNT
2099  REF   6 LAST  354     41,3360  3 4710 0          CAF     FOUR
2100  REF   3 LAST  354     41,3361  54 137 0  WDAGAIN  TS      WDCNT
2101  REF   9 LAST  355     41,3362  4 0022 0          CS      CYL
2102  REF  10 LAST  355     41,3363  4 0022 0          CS      CYL
2103  REF  11 LAST  355     41,3364  4 0022 0          CS      CYL
2104  REF 109 LAST  354     41,3365  4 0000 0          CS      A
2105  REF   1               41,3366  7 4716 1          MASK    DSPMSK
2106  REF 110 LAST  355     41,3367  50 000 1          INDEX   A
2107  REF   4 LAST  353     41,3370  3 4072 0          CAF     RELTAB
2108  REF   7 LAST  353     41,3371  7 4362 0          MASK    LOW5
2109  REF   8 LAST  354     41,3372  54 124 1          TS      CODE
2110  REF  47 LAST  355     41,3373  56 777 0          XCH     DSPCOUNT
2111  REF   5 LAST  353     41,3374  54 143 0          TS      COUNT
2112  REF 111 LAST  355     41,3375  10 000 0          CCS     A               DECREMENT DSPCOUNT EXCEPT AT +0
2113  REF  48 LAST  355     41,3376  54 777 1          TS      DSPCOUNT
2114  REF  26 LAST  355     41,3377  0 4574 0          TC      POSTJUMP
2115  REF   1               41,3400   61315 1          CADR    DSPOCTIN
2116  REF   4 LAST  355     41,3401  10 137 0  OCTBACK  CCS     WDCNT
2117  REF   1               41,3402  0 3361 0          TC      WDAGAIN         +
2118  REF   8 LAST  354     41,3403  4 4374 1  DSPLY    CS      VD1             TO BLOCK NUMERICAL CHARACTERS, CLEARS,
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2119  REF  49  LAST  355   41,3404  54 777 1            TS    DSPCOUNT      AND SIGNS AFTER A COMPLETED DISPLAY.
2120  REF   8  LAST  355   41,3405  0 0115 1             TC    WDRET

2121  REF   7  LAST  342        4716                DSPMSK  =     SEVEN
R2122 DSP2BIT DISPLAYS C(A) UPON ENTRY AS A 2 CHAR OCT BEGINNING IN THE DSP
R2123 LOC SPECIFIED IN DSPCOUNT BY PRE CYCLING RIGHT C(A) AND USING THE LOGIC
R2124 OF THE 5 CHAR OCTAL DISPLAY

2125  REF   3  LAST  198   41,3406  54 020 1  DSP2BIT  TS    CYR
2126  REF 101  LAST  355   41,3407  56 002 0            XCH   Q
2127  REF   9  LAST  356   41,3410  54 115 0            TS    WDRET
2128  REF  40  LAST  354   41,3411  3 4712 1            CAF   ONE
2129  REF   5  LAST  355   41,3412  54 137 0            TS    WDCNT
2130  REF   4  LAST  356   41,3413  4 0020 1            CS    CYR
2131  REF   5  LAST  356   41,3414  4 0020 1            CS    CYR
2132  REF   6  LAST  356   41,3415  56 020 0            XCH   CYR
2133  REF  12  LAST  355   41,3416  54 022 0            TS    CYL
2134  REF   2  LAST  355   41,3417  0 3386 1            TC    WDAGAIN +5
R2135 FOR DSPIN PLACE 0/25 OCT INTO COUNT, 5 BIT RELAY CODE INTO CODE. BOTH
R2136 ARE DESTROYED. IF BIT14 OF COUNT IS 1, SIGN IS BLANKED WITH LEFT CHAR.
R2137 FOR DSPIN1 PLACE 0,1 INTO BIT11 OF CODE, 2 INTO COUNT, REL ADDRESS OF
R2138 DSPTAB ENTRY INTO DSREL.

2139  REF   1              40,3225                      SETLOC  ENDECVN

21395 REF   6 LAST 353 TO 355'    82   661*            COUNT   40/PIN

2140  REF 102  LAST  356   40,3225  56 002 0  DSPIN    XCH   Q             CANT USE L FOR RETURN, SINCE MANY OF THE
2141  REF   1              40,3226  54 114 1            TS    DSEXIT        ROUTINES CALLING DSPIN USE L AS RETURN.
2142  REF   8  LAST  355   40,3227  3 4362 1            CAF   LOW5
2143  REF   6  LAST  355   40,3230  7 0143 0            MASK  COUNT
2144  REF   9  LAST  340   40,3231  54 021 0            TS    SR
2145  REF  10  LAST  356   40,3232  56 021 1            XCH   SR
2146  REF   1              40,3233  54 141 1            TS    DSREL
2147  REF  28  LAST  292   40,3234  3 4712 1            CAF   BIT1
2148  REF   7  LAST  356   40,3235  7 0143 0            MASK  COUNT
2149  REF 112  LAST  355   40,3236  10 000 0            CCS   A
2150                       40,3237  0 3241 0            TC    +2            LEFT IF COUNT IS ODD
2151  REF   1              40,3240  0 3251 1            TC    DSPIN1  -1    RIGHT IF COUNT IS EVEN
2152  REF   9  LAST  355   40,3241  56 124 0            XCH   CODE
2153  REF   1              40,3242  0 4354 1            TC    SLEFT5        DOES NOT USE CYL
2154  REF  10  LAST  356   40,3243  54 124 1            TS    CODE
2155  REF  29  LAST  355   40,3244  3 4675 1            CAF   BIT14
2156  REF   8  LAST  356   40,3245  7 0143 0            MASK  COUNT
2157  REF 113  LAST  356   40,3246  10 000 0            CCS   A
2158  REF  20  LAST  345   40,3247  3 4711 1            CAF   TWO           BIT14 = 1, BLANK SIGN
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 2159   REF  41  LAST  356   40,3250  6 4712 1          AD      ONE          BIT14 = 0, LEAVE SIGN ALONE
 2160   REF   9  LAST  356   40,3251  54 143 0          TS      COUNT        +0 INTO COUNT FOR RIGHT
A2161                                                                       +1 INTO COUNT FOR LEFT(SIGN LEFT ALONE)
A2162                                                                       +3 INTO COUNT FOR LEFT(TO BLANK SIGN)
 2163                         40,3252  0 0004 0  DSPIN1   INHINT
 2164   REF   2  LAST  356   40,3253  50 141 0          INDEX   DSREL
 2165   REF  26  LAST  317   40,3254  11«023 0          CCS     DSPTAB
 2166                         40,3255  0 3257 1          TC      +2           IF +
 2167   REF   6  LAST  343   40,3256  0 5640 0          TC      CCSHOLE
 2168   REF  42  LAST  357   40,3257  6 4712 1          AD      ONE          IF-
 2169   REF   1               40,3260  54 142 1          TS      DSMAG
 2170   REF  10  LAST  357   40,3261  50 143 1          INDEX   COUNT
 2171   REF   1               40,3262  7 3303 0          MASK    DSMSK
 2172                         40,3263  0 0006 1          EXTEND
 2173   REF  11  LAST  356   40,3264  60 124 0          SU      CODE
 2174                         40,3265  0 0006 1          EXTEND
 2175   REF   1               40,3266  1 3301 1          BZF     DSLV         SAME
 2176   REF  11  LAST  357   40,3267  50 143 1  DPRNT    INDEX   COUNT
 2177   REF   2  LAST  357   40,3270  4 3303 0          CS      DSMSK        MASK WITH 77740,76037,75777, OR 74037
 2178   REF   2  LAST  357   40,3271  7 0142 1          MASK    DSMAG
 2179   REF  12  LAST  357   40,3272  6 0124 0          AD      CODE
 2180   REF 114  LAST  356   40,3273  4 0000 0          CS      A
 2181   REF   3  LAST  357   40,3274  50 141 0          INDEX   DSREL
 2182   REF  27  LAST  357   40,3275  57«023 1          XCH     DSPTAB
 2183                         40,3276  0 0006 1          EXTEND
 2184   REF   2  LAST  357   40,3277  6 3301 0          BZMF    DSLV         DSPTAB ENTRY WAS -
 2185   REF   7  LAST  317   40,3300  25«016 1          INCR    NOUT         DSPTAB ENTRY WAS +
 2186                         40,3301  0 0003 1  DSLV     RELINT
 2187   REF   2  LAST  356   40,3302  0 0114 0          TC      DSEXIT

 2188                         40,3303   00037 0  DSMSK    OCT     37
 2189                         40,3304   01740 0           OCT     1740
 2190                         40,3305   02000 0           OCT     2000
 2191                         40,3306   03740 1           OCT     3740
R2192   FOR 11DSPIN, PUT REL ADDRESSS OF DSPTAB ENTRY INTO A, 1 IN BIT11 OR 0 IN'
R2193   BIT11 OF CODE.

 2194   REF   4  LAST  357   40,3307  54 141 1  11DSPIN  TS      DSREL
 2195   REF  21  LAST  356   40,3310  3 4711 1          CAF     TWO
 2196   REF  12  LAST  357   40,3311  54 143 0          TS      COUNT
 2197   REF 103  LAST  356   40,3312  56 002 0          XCH     Q            MUST USE SAME RETURN AS DSPIN
 2198   REF   3  LAST  357   40,3313  54 114 1          TS      DSEXIT
 2199   REF   2  LAST  356   40,3314  0 3252 1          TC      DSPIN1
 2200   REF   5  LAST  354   40,3315  0 3225 1  DSPOCTIN TC      DSPIN        SO DSPOCTWD DOESNT USE SWCALL
 2201                         40,3316  3 3320 0          CAF     +2
 2202   REF   4  LAST  342   40,3317  0 4577 0          TC      BANKJUMP
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 2203   REF   1              40,3320   63401 1  ENDSPOCT CADR   OCTBACK
R2204   DSPALARM FINDS TC NVSUBEND IN ENTRET FOR NVSUB INITIATED ROUTINES.
R2205   ABORT WITH 01501.
R2206   DSPALARM FINDS TC ENDOFJOB IN ENTRET FOR KEYBOARD INITIATED ROUTINES.
R2207   DO TC ENTRET.

 22075  REF   9  LAST  355   40,3321  4 4374 1  PREDSPAL CS     VD1
 22076  REF  50  LAST  356   40,3322  54 777 1            TS     DSPCOUNT
 2208   REF   1              40,3323  4 3342 0  DSPALARM CS     NVSBENDL
 2209   REF   8  LAST  349   40,3324  6 0136 0            AD     ENTEXIT
 2210                        40,3325  0 0006 1            EXTEND
 2211   REF  16  LAST  311   40,3326  1 3337 1            BZF    CHARALRM +2
 22111  REF   1              40,3327  4 3341 0            CS     MONADR          IF THIS IS A MONITOR, KILL IT
 22112  REF   9  LAST  358   40,3330  6 0136 0            AD     ENTEXIT
 22113                       40,3331  0 0006 1            EXTEND
 22114                       40,3332  1 3334 1            BZF    +2
 22115                       40,3333  0 3335 1            TC     +2
 22116  REF   1              40,3334  0 4220 0            TC     KILMONON
 2212   REF   5  LAST  236   40,3335  0 4400 1  CHARALRM  TC     FALTON          NOT NVSUB INITIATED. TURN ON OPR ERROR
 2213   REF  37  LAST  352   40,3336  0 5112 0            TC     ENDOFJOB
 2214   REF   1              40,3337  0 5622 1            TC     POODOO
 2217                        40,3340   01501 1            OCT    01501
 22171  REF   2  LAST  351   40,3341   04140 0  MONADR    GENADR PASTEVB
 2218   REF   1              40,3342  0 4216 0  NVSBENDL  TC     NVSUBEND
R2219   ALMCYCLE TURNS ON CHECK FAIL LIGHT, REDISPLAYS THE ORIGINAL VERB THAT
R2220   WAS EXECUTED, AND RECYCLES TO EXECUTE THE ORIGINAL VERB/NOUN COMBINATION
R2221   THAT WAS LAST EXECUTED. USED FOR BAD DATA DURING LOAD VERBS AND BY
R2222   MCTBS. ALSO BY MMCHANG IF 2 NUMERICAL CHARACTERS WERE NOT PUNCHED IN
R2223   FOR MM CODE.

 2224   REF   3  LAST  351     4161                      SETLOC MID7    +1
 22245  REF   2  LAST  351 TO  351'    17    17*        COUNT  02/PIN

 2225   REF   6  LAST  358     4161  0 4400 1  ALMCYCLE  TC     FALTON          TURN ON CHECK FAIL LIGHT.
 2228   REF   3  LAST  348     4162  4 1041 1            CS     VERBSAVE        GET ORIGINAL VERB THAT WAS EXECUTED
 2229   REF  11  LAST  351     4163  55+013 0            TS     REQRET          SET FOR ENTPASO
 2230   REF  50  LAST  351     4164  0 4555 0            TC     BANKCALL        PUTS ORIGINAL VERB INTO VERBREG AND
 2231   REF   8  LAST  351     4165   62336 0            CADR   UPDATVB -1      DISPLAYS IT IN VERB LIGHTS.
 2232   REF  27  LAST  355     4166  0 4574 0            TC     POSTJUMP
 2233   REF   2  LAST  311     4167   62002 1  ENDALM    CADR   ENTER
R2234   MMCHANG USES NOUN DISPLAY UNTIL ENTER. THEN IT USES MODE DISP.
R2235   IT GOES TO MODROUT WITH THE NEW M M CODE IN A, BUT NOT DISPLAYED IN
R2236   MM LIGHTS.
R2237   IT DEMANDS 2 NUMERICAL CHARACTERS BE PUNCHED IN FOR NEW MM CODE.
```

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R2238   IF NOT, IT RECYCLES.

 2239   REF   1              41,3420                        SETLOC DSP2BIT +10D

22395   REF   6 LAST 355 TO 356'    37   784*              COUNT  41/PIN

 2240   REF   1              41,3420  0 3442 0 MMCHANG      TC     REQMM          ENTPASHI ASSUMES THE TC REQMM AT MMCHANG
A2241                                                                             IF THIS MOVES AT ALL, MUST CHANGE
A2242                                                                             MMADREF AT ENTPASHI.
 2243   REF  16 LAST 253    41,3421  3 4706 1              CAF    BIT5           OCT20 = ND2.
 2244   REF  51 LAST 358    41,3422  6 0777 0              AD     DSPCOUNT       DSPCOUNT MUST = -ND2.
 2245                       41,3423  0 0006 1              EXTEND                DEMAND THAT 2 NUM CHAR WERE PUNCHED IN.
 2246                       41,3424  1 3426 0              BZF    +2
 2247   REF  16 LAST 348    41,3425  0 4161 0              TC     ALMCYCLE       DSPCOUNT NOT= -ND2. ALARM AND RECYCLE.
 2248   REF  69 LAST 355    41,3426  3 4714 1              CAF    ZERO           DSPCOUNT = -ND2.
 2249   REF  12 LAST 349    41,3427  57#002 1              XCH    NOUNREG
 2250   REF 184 LAST 355    41,3430  54 154 0              TS     MPAC
 2251   REF   3 LAST 323    41,3431  3 4375 1              CAF    ND1
 2252   REF  52 LAST 359    41,3432  54 777 1              TS     DSPCOUNT
 2253   REF  51 LAST 358    41,3433  0 4555 0              TC     BANKCALL
 2254   REF   4 LAST 317    41,3434   60502 0              CADR   2BLANK
 2255   REF  10 LAST 358    41,3435  4 4374 1              CS     VD1            BLOCK NUM CHAR IN
 2256   REF  53 LAST 359    41,3436  54 777 1              TS     DSPCOUNT
 2257   REF 185 LAST 359    41,3437  3 0154 1              CA     MPAC
 2258   REF  28 LAST 358    41,3440  0 4574 0              TC     POSTJUMP
 2259   REF   1              41,3441   10010 1              CADR   MODROUTB       GO THRU STANDARD LOC.
 2260   REF   2 LAST 281    04,2010              MODROUTB =     V37
 2261   REF 104 LAST 357    41,3442  4 0002 1  REQMM       CS     Q
 2262   REF  12 LAST 358    41,3443  55#013 0              TS     REQRET
 2263   REF   4 LAST 359    41,3444  3 4375 1              CAF    ND1
 2264   REF  54 LAST 359    41,3445  54 777 1              TS     DSPCOUNT
 2265   REF  70 LAST 359    41,3446  3 4714 1              CAF    ZERO
 2266   REF  13 LAST 359    41,3447  55#002 0              TS     NOUNREG
 2267   REF  52 LAST 359    41,3450  0 4555 0              TC     BANKCALL
 2268   REF   5 LAST 359    41,3451   60502 0              CADR   2BLANK
 2269   REF   3 LAST 323    41,3452  0 4443 0              TC     FLASHON
 2270   REF  43 LAST 357    41,3453  3 4712 1              CAF    ONE
 2271   REF  18 LAST 348    41,3454  55#000 1              TS     DECBRNCH       SET FOR DEC
 2272   REF  10 LAST 358    41,3455  0 0136 0              TC     ENTEXIT
R2273   VBRQEXEC ENTERS REQUEST TO EXEC     FOR ANY ADDRESS WITH ANY PRIORITY.
R2274   IT DOES ENDOFJOB AFTER ENTERING REQUEST. DISPLAY SYST IS RELEASED.
R2275   IT ASSUMES NOUN 26 HAS BEEN PRELOADED WITH
R2276   COMPONENT 1  PRIORITY(BITS 10-14) BIT1=0 FOR NOVAC, BIT1=1 FOR FINDVAC.
R2277   COMPONENT 2  JOB ADRES (12 BIT )
R2278   COMPONENT 3  BBCON
```

```
 2279   REF  29  LAST  356   41,3456  3 4712 1  VBRQEXEC CAF    BIT1
 2280   REF  16  LAST  352   41,3457  7 1045 0           MASK   DSPTEM1
 2281   REF 115  LAST  357   41,3460  10 000 0           CCS    A
 2282   REF   1               41,3461  0 3500 1           TC     SETVAC        IF BIT1 = 1, FINDVAC
 2283   REF   1               41,3462  3 4365 0           CAF    TCNOVAC       IF BIT1 = 0, NOVAC
 2284   REF 186  LAST  359   41,3463  54 154 0  REQEX1    TS     MPAC          TC NOVAC  OR  TC FINDVAC INTO MPAC
 2285   REF  30  LAST  360   41,3464  4 4712 0           CS     BIT1
 2286   REF  17  LAST  360   41,3465  7 1045 0           MASK   DSPTEM1
 2287   REF 187  LAST  360   41,3466  54 160 1           TS     MPAC    +4    PRIO INTO MPAC+4 AS A TEMP
 2288   REF   5  LAST  320   41,3467  0 4473 0  REQUESTC TC     RELDSP
 2289   REF   5  LAST  349   41,3470  3 4233 1           CA     ENDINST
 2290   REF 188  LAST  360   41,3471  54 157 0           TS     MPAC    +3    TC ENDOFJOB INTO MPAC+3
 2291                        41,3472  0 0006 1           EXTEND
 2292   REF  18  LAST  360   41,3473  3 1047 0           DCA    DSPTEM1 +1    JOB ADRES INTO MPAC+1
 2293   REF 189  LAST  360   41,3474  52 156 1           DXCH   MPAC    +1    BBCON INTO MPAC+2
 2294   REF 190  LAST  360   41,3475  3 0160 0           CA     MPAC    +4    PRIO IN A
 2295                        41,3476  0 0004 0           INHINT
 2296   REF 191  LAST  360   41,3477  0 0154 1           TC     MPAC

 2297   REF   1               41,3500  3 4370 1  SETVAC   CAF    TCFINDVC
 2298   REF   1               41,3501  0 3463 0           TC     REQEX1

R2299   VBRQWAIT ENTERS REQUEST TO WAITLIST FOR ANY ADDRESS WITH ANY DELAY.
R2300   IT DOES ENDOFJOB AFTER ENTERING REQUEST.DISPLAY SYST IS RELEASED.
R2301   IT ASSUMES NOUN 26 HAS BEEN PRELOADED WITH
R2302   COMPONENT 1  DELAY (LOW BITS)
R2303   COMPONENT 2  TASK ADRES (12 BIT)
R2304   COMPONENT 3  BBCON

 2305   REF   1               41,3502  3 4366 0  VBRQWAIT CAF    TCWAIT
 2306   REF 192  LAST  360   41,3503  54 154 0           TS     MPAC          TC WAITLIST INTO MPAC
 2307   REF  19  LAST  360   41,3504  3 1045 1           CA     DSPTEM1       TIME DELAY
 2308   REF   1               41,3505  0 3466 0  ENDRQWT  TC     REQUESTC -1

R2309   REQUESTC WILL PUT TASK ADRES INTO MPAC+1, BBCON INTO MPAC+2,
R2310   TC ENDOFJOB INTO MPAC+3. IT WILL TAKE TIME DELAY OUT OF MPAC+4 AND
R2311   LEAVE IT IN A, INHINT AND TC MPAC.
 2312   REF   2  LAST  358   40,3343                      SETLOC NVSBENDL +1
23125   REF   7  LAST  356 TO  358'    78   739*          COUNT  40/PIN

 2313   REF  44  LAST  359   40,3343  3 4712 1  VBPROC   CAF    ONE           PROCEED WITHOUT DATA
 2314   REF   2  LAST  339   40,3344  55=014 1           TS     LOADSTAT
 2315   REF   2  LAST  358   40,3345  0 4220 0           TC     KILMONON      TURN ON KILL MONITOR BIT
 2316   REF   6  LAST  360   40,3346  0 4473 0           TC     RELDSP
 2317   REF   3  LAST  318   40,3347  0 4447 1           TC     FLASHOFF
 2318   REF   2  LAST  339   40,3350  0 3450 0           TC     RECALTST      SEE IF THERE IS ANY RECALL FROM ENDIDLE
```

```
 2319   REF  45  LAST  360   40,3351  4 4712 0  VBTERM   CS     ONE
 2320   REF   2  LAST  321   40,3352  0 3344 1           TC     VBPROC  +1      TERM VERB SETS LOADSTAT NEG
R23201  PROCKEY PERFORMS THE SAME FUNCTION AS VBPROC.  IT MUST BE CALLED UNDER
R23202  EXECUTIVE CONTROL, WITH CHRPRIO.
 23205  REF  71  LAST  359   40,3353  3 4714 1  PROCKEY  CAF    ZERO            SET REQRET FOR ENTER PASS 0.
 23206  REF  13  LAST  359   40,3354  55=013 0           TS     REQRET
 23207  REF  11  LAST  359   40,3355  4 4374 1           CS     VD1             BLOCK NUMERICAL CHARACTERS, SIGNS, CLEAR
 23208  REF  55  LAST  359   40,3356  54 777 1           TS     DSPCOUNT
 23209  REF   3  LAST  361   40,3357  0 3343 0           TC     VBPROC
R2321   VBRESEQ WAKES ENDIDLE AT SAME LINE AS FINAL ENTER OF LOAD (L+3).
R2322   (MAIN USE IS INTENDED AS RESPONSE TO INTERNALLY INITIATED FLASHING
R2323    DISPLAYS IN ENDIDLE. SHOULD NOT BE USED WITH LOAD VERBS,PLEASE PERFORM,
R2324    OR PLEASE MARK VERBS BECAUSE THEY ALREADY USE L+3 IN ANOTHER CONTEXT.)

 2325   REF  72  LAST  361   40,3360  4 4714 0  VBRESEQ  CS     ZERO            MAKE IT LOOK LIKE DATA IN.
 2326   REF   4  LAST  361   40,3361  0 3344 1           TC     VBPROC  +1
R2327   FLASH IS TURNED OFF BY PROCEED WITHOUT DATA, TERMINATE, RESEQUENCE,
R2328   END OF LOAD.
```

P2329 KEY RELEASE ROUTINE

R2330 THIS ROUTINE ALWAYS TURNS OFF THE UPACT LIGHT AND ALWAYS CLEARS DSPLOCK.

R2331 THE HIGHEST PRIORITY FUNCTION OF THE KEY RELEASE BUTTON IS THE
R2332 UNSUSPENDING OF A SUSPENDED MONITOR WHICH WAS EXTERNALLY INITIATED.
R2333 THIS FUNCTION IS ACCOMPLISHED BY CLEARING DSPLOCK AND TURNING OFF
R2334 THE KEY RELEASE LIGHT IF BOTH DSPLIST AND CADRSTOR ARE EMPTY.

R2335 IF NO SUCH MONITOR EXISTS, THEN RELDSP IS EXECUTED TO CLEAR DSPLOCK
R2336 AND THE EXTERNAL MONITOR BIT (FREEING THE DISPLAY SYSTEM FOR INTERNAL
R2337 USE), TURN OFF THE KEY RELEASE LIGHT, AND WAKE UP ANY JOB IN DSPLIST.

R2338 IN ADDITION IF THERE IS A JOB IN ENDIDLE, THEN CONTROL IS TRANSFERRED
R2339 TO PINBRNCH (IN DISPLAY INTERFACE ROUTINE) TO RE-EXECUTE THE SERIES OF
R23391 NVSUB CALLS ETC. THAT PRECEDED THE ENDIDLE CALL STILL AWAITING RESPONSE.
R2340 THIS FEATURE IS INTENDED FOR USE WHEN THE OPERATOR HAS BEEN REQUESTED TO
R2341 RESPOND TO SOME INTERNAL ACTION THAT USED ENDIDLE, BUT HE HAS WRITTEN
R2342 OVER THE INFORMATION ON THE DISPLAY PANEL BY SOME DISPLAYS OF HIS OWN
R2343 INITIATION WHICH DO NOT SERVE AS RESPONSES. HITTING KEY RLSE WILL
R2344 RE-ESTABLISH THE DISPLAYS TO THE STATE THEY WERE IN BEFORE HE OBSCURED
R2345 THEM, SO THAT HE CAN SEE THE WAITING REQUEST. THIS WORKS ONLY FOR
R2346 INTERNAL PROGRAMS THAT USED ENDIDLE THROUGH MARGARETS DISPLAY
R2347 SUBROUTINES.

```
2348  REF  14  LAST  336   40,3362   4 4710 1  VBRELDSP CS      BIT3
2349                      40,3363   0 0006 1           EXTEND
2350  REF  10  LAST  193   40,3364   03 011 1           WAND    DSALMOUT      TURN OFF UPACT LITE
2351  REF   2  LAST  310   40,3365   10 115 0           CCS     21/22REG      OLD DSPLOCK
2352  REF  30  LAST  356   40,3366   3 4675 1           CAF     BIT14
2353  REF   6  LAST  351   40,3367   7 1021 1           MASK    MONSAVE1      EXTERNAL MONITOR BIT (EMB)
2354  REF 116  LAST  360   40,3370   10 000 0           CCS     A
2355  REF   1               40,3371   0 3400 0           TC      UNSUSPEN      OLD DSPLOCK AND EMB BOTH 1, UNSUSPEND.
2356  REF   7  LAST  360   40,3372   0 4473 0  TSTLTS4  TC      RELDSP        NOT UNSUSPENDING EXTERNAL MONITOR,
2357  REF   5  LAST  350   40,3373   11=042 1           CCS     CADRSTOR       RELEASE DISPLAY SYSTEM AND
2358                      40,3374   0 3376 0           TC      +2             DO RE-ESTABLISH IF CADRSTOR IS FULL.
2359  REF  38  LAST  358   40,3375   0 5112 0           TC      ENDOFJOB
2360  REF  29  LAST  359   40,3376   0 4574 0           TC      POSTJUMP
2361  REF   4  LAST  259   40,3377    21176 1           CADR    PINBRNCH
2362  REF  73  LAST  361   40,3400   3 4714 1  UNSUSPEN CAF     ZERO          EXTERNAL MONITOR IS SUSPENDED,
2363  REF   5  LAST  350   40,3401   55=012 1           TS      DSPLOCK        JUST UNSUSPEND IT BY CLEARING DSPLOCK.
2364  REF   6  LAST  362   40,3402   11=042 1           CCS     CADRSTOR       TURN KEY RELEASE LIGHT OFF IF BOTH
2365  REF  39  LAST  362   40,3403   0 5112 0           TC      ENDOFJOB       CADRSTOR AND DSPLIST ARE EMPTY.
2366  REF   2  LAST  350   40,3404   0 4516 1           TC      RELDSP1
23661 REF  40  LAST  362   40,3405   0 5112 0           TC      ENDOFJOB

2367                      40,3406            ENDRELDS EQUALS
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P2368  NVSUB IS USED FOR SUB ROUTINE CALLS FROM WITHIN COMPUTER. IT CAN BE
R2369  USED TO CALL THE COMBINATION OF ANY DISPLAY, LOAD, OR MONITOR VERB
R2370  TOGETHER WITH ANY NOUN AVAILABLE TO THE KEYBOARD.
R23701 PLACE 0VVVVVVVNNNNNNN INTO A.
R23702 V-S ARE THE 7 BIT VERB CODE.  N-S ARE THE 7 BIT NOUN CODE.

R23703 IF NVSUB IS CALLED WITH THE FOLLOWING NEGATIVE NUMBERS (RATHER THAN THE
R23704 VERB-NOUN CODE) IN A, THEN THE DISPLAY IS BLANKED AS FOLLOWS-
R23705  -4 FULL BLANK, -3 LEAVE MODE, -2 LEAVE MODE AND VERB, -1 BLANK R-S ONLY

R2371  NVSUB CAN BE USED WITH EACH CADR TO BE SPEC BY PLACING THE CADR INTO
R2372  MPAC+2 BEFORE THE STANDARD NVSUB CALL.

R2373   NVSUB RETURNS TO 2+ CALLING LOC AFTER PERFORMING TASK, IF DISPLAY
R2374  SYSTEM IS AVAILABLE. THE NEW NOUN AND VERB CODES ARE DISPLAYED.
R2375  IF V'S =0, THE NEW NOUN CODE IS DISPLAYED ONLY(RETURN WITH NO FURTHER
R2376  ACTION). IF N-S =0, THE NEW VERB CODE IS DISPLAYED ONLY(RETURN WITH NO
R2377  FURTHER ACTION).

R2378  IT RETURNS TO 1+ CALLING LOC WITHOUT PERFORMING TASK, IF DISPLAY
R2379  SYSTEM IS BLOCKED (NOTHING IS DISPLAYED IN THIS CASE).
R2380  IT DOES TC ABORT (WITH OCT 01501) IF IT ENCOUNTERS A DISPLAY PROGRAM
R2381  ALARM CONDITION BEFORE RETURN TO CALLER.

R2382  THE DISPLAY SYSTEM IS BLOCKED BY THE DEPRESSION OF ANY
R2383  KEY, EXCEPT ERROR LIGHT RESET
R2384  IT IS RELEASED BY THE KEY RELEASE BUTTON, ALL EXTENDED VERBS,
R2385  PROCEED WITHOUT DATA, TERMINATE, RESEQUENCE, INITIALIZE EXECUTIVE,
R2386  RECALL PART OF RECALTST IF ENDIDLE WAS USED,
R2387  VB = REQUEST EXECUTIVE, VB = REQUEST WAITLIST,
R2388  MONITOR SET UP.

R23881 THE DISPLAY SYSTEM IS ALSO BLOCKED BY THE EXTERNAL MONITOR BIT, WHICH
R23882 INDICATES AN EXTERNALLY INITIATED MONITOR IS RUNNING (SEE MONITOR)

R2389  A NVSUB CALL THAT PASSES DSPLOCK AND THE EXTERNAL MONITOR BIT ENDS OLD
R23891 MONITOR.

R2390  DSPLOCK IS THE INTERLOCK FOR USE OF KEYBOARD AND DISPLAY SYSTEM WHICH
R2391  LOCKS OUT INTERNAL USE WHENEVER THERE IS EXTERNAL KEYBOARD ACTION.

R23911 NVSUB SHOULD BE USED TWICE IN SUCCESSION FOR 'PLEASE PERFORM' SITUATIONS
R23912 (SIMILARLY FOR PLEASE MARK). FIRST PLACE THE CODED NUMBER FOR WHAT
R23913 ACTION IS DESIRED OF OPERATOR INTO THE REGISTERS REFERRED TO BY THE
R23914 'CHECKLIST' NOUN. GO TO NVSUB WITH A DISPLAY VERB AND THE 'CHECKLIST'
R23915 NOUN. GO TO NVSUB AGAIN WITH THE 'PLEASE PERFORM' VERB AND ZEROS IN THE
R23916 LOW 7 BITS. THIS 'PASTES UP' THE 'PLEASE PERFORM' VERB INTO THE VERB
R23917 LIGHTS.

R23918 NVMONOPT IS AN ENTRY SIMILAR TO NVSUB, BUT REQUIRING AN ADDITIONAL
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R239181 PARAMETER IN L. IT SHOULD BE USED ONLY WITH A MONITOR VERB-NOUN CODE IN
R239182 A. AFTER EACH MONITOR DISPLAY A *PLEASE* VERB WILL BE PASTED IN THE VERB
R239183 LIGHTS OR DATA WILL BE BLANKED (OR BOTH) ACCORDING TO THE OPTIONS
R239184 SPECIFIED IN L. IF BITS 8-14 OF L ARE OTHER THAN ZERO, THEN THEY WILL
R239185 BE INTERPRETED AS A VERB CODE AND PASTED IN THE VERB LIGHTS. (THIS VERB
R239186 CODE SHOULD DESIGNATE ONE OF THE *PLEASE* VERBS.) IF BITS 1-3 OF L ARE
R239187 OTHER THAN ZERO, THEN THEY WILL BE USED TO BLANK DATA BY BEING FED TO
R239188 BLANKSUB. IF NVMONOPT IS USED WITH A VERB OTHER THAN A MONITOR VERB,
R239189 THE PARAMETER IN L HAS NO EFFECT.

R2392 NVSUB IN FIXED-FIXED PLACES 2+CALLING LOC INTO NVQTEM, TC NVSUBEND INTO
R2393 ENTRET. (THIS WILL RESTORE OLD CALLING BANK BITS)

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2394   REP  1                          4170                    SETLOC  ENDALM +1

23945  REP  3 LAST  358 TO  359'       7    24*                COUNT   02/PIN

2395
2396   REP  1                          4170  22 007 0  NVSUB    LXCH    7          ZERO NVMONOPT OPTIONS
2397   REP  31 LAST 362                4171  54 123 0  NVMONOPT TS     NVTEMP
23971  REP  7  LAST 362                4172  3 4675 1            CAF     BIT14
23972  REP  6  LAST 362                4173  7 1021 1            MASK    MONSAVE1   EXTERNAL MONITOR BIT
23973  REP  117 LAST 362               4174  6 1012 0            AD      DSPLOCK
23974  REP  105 LAST 359               4175  10 000 0            CCS     A
2398   REP  46  LAST 361               4176  0 0002 0            TC      Q          DSP SYST BLOCKED. RET TO 1+ CALLING LOC
2399   REP  106 LAST 364               4177  3 4712 1            CAF     ONE        DSP SYST AVAILABLE
2400   REP  1                          4200  6 0002 0  NVSBCOM   AD      Q
                                       4201  55«037 0            TS      NVQTEM     2+ CALLING LOC INTO NVQTEM
24001  REP  4  LAST 351                4202  23«022 0            LXCH    MONSAVE2   STORE NVMONOPT OPTIONS
2401   REP  3  LAST 360                4203  0 4220 0            TC      KILMONON   TURN ON KILL MONITOR BIT
2402   REP  1                          4204  3 4215 0  NVSUBCOM CAF     NVSBBNK

2403   REP  10 LAST 128                4205  56 006 1            XCH     BBANK
24031                                  4206  0 0006 1            EXTEND
24032  REP  3  LAST 238                4207  04 007 1            ROR     SUPERBNK   SAVE OLD SUPERBITS
2404   REP  1                          4210  55«040 0            TS      NVBNKTEM
24041  REP  2  LAST 238                4211  3 4215 0            CAF     PINSUPBT
24042                                  4212  0 0006 1            EXTEND
24043  REP  4  LAST 364                4213  01 007 1            WRITE   SUPERBNK
2405   REP  1                          4214  0 2000 0            TC      NVSUBB
2406   REP  56  LAST 361               0777                      EBANK=  DSPCOUNT   GO TO NVSUB1 THRU STANDARD LOC
2407   REP  2   LAST 318               4215   62101 0  NVSBBBNK BBCON   NVSUB1

24071  REP  2   LAST 364               4215            PINSUPBT =      NVSBBBNK   CONTAINS THE PINBALL SUPERBITS.

2412   REP  2   LAST 364               4216  53«040 0  NVSUBEND DXCH    NVQTEM     NVBNKTEM MUST = NVQTEM+1
2413   REP  1                          4217  0 5122 0            TC      SUPDXCHZ   DTCB WITH SUPERBIT SWITCHING

2414   REP  1                 41,3506                              SETLOC  ENDROMT +1

241405 REP  7 LAST  359 TO  360'       54   838*                 COUNT   41/PIN
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R241412 BLANKDSP BLANKS DISPLAY ACCORDING TO OPTION NUMBER IN NVTEMP AS FOLLOWS
R241415  -4 FULL BLANK, -3 LEAVE MODE, -2 LEAVE MODE AND VERB, -1 BLANK R-S ONLY

 241419 REF   8  LAST  356   41,3506  6 4716 0  BLANKDSP AD     SEVEN        7,8,9,OR 10 (A HAD 0,1,2,OR 3)
 241422                      41,3507  0 0004 0           INHINT
 241425 REF  13  LAST  357   41,3510  54 124 1           TS     CODE         BLANK SPECIFIED DSPTABS
 241429 REF  18  LAST  344   41,3511  4 4677 1           CS     BIT12
 241432 REF  14  LAST  365   41,3512  50 124 0           INDEX  CODE
 241435 REF  28  LAST  357   41,3513  57∝023 1           XCH    DSPTAB
 241439 REF 118  LAST  364   41,3514  10 000 0           CCS    A
 241442 REF   6  LAST  357   41,3515  25∝016 1           INCR   NOUT
 241445                      41,3516  0 3517 1           TC     +1
 241449 REF  15  LAST  365   41,3517  10 124 1           CCS    CODE
 241452 REF   1              41,3520  0 3510 0           TC     BLANKDSP +2
 241455                      41,3521  0 0003 1           RELINT
 241459 REF   2  LAST  364   41,3522  50 123 1           INDEX  NVTEMP
 241462                      41,3523  0 3530 1           TC     +5
 241465                      41,3524  0 3525 0           TC     +1           NVTEMP HAS -4 (NEVER TOUCH MODREG)
 241469 REF  19  LAST  351   41,3525  55∝001 0           TS     VERBREG                    -3
 241472 REF  14  LAST  359   41,3526  55∝002 0           TS     NOUNREG                    -2
 241475 REF  12  LAST  339   41,3527  55∝015 0           TS     CLPASS                     -1
 241479 REF  12  LAST  361   41,3530  4 4374 1           CS     VD1
 241482 REF  57  LAST  364   41,3531  54 777 1           TS     DSPCOUNT
 241485 REF   4  LAST  360   41,3532  0 4447 1           TC     FLASHOFF     PROTECT AGAINST INVISIBLE FLASH
 241489 REF   1              41,3533  0 3556 1           TC     ENTSET -2    ZEROS REQRET

  2415  REF   2  LAST  365   41,3534  3 3560 1  NVSUB1   CAF    ENTSET       IN BANK
  2416  REF   6  LAST  351   41,3535  54 136 1           TS     ENTRET       SET RETURN TO NVSUBEND
  24161 REF   3  LAST  365   41,3536  10 123 0           CCS    NVTEMP       WHAT NOW
  24162                      41,3537  0 3543 0           TC     +4           NORMAL NVSUB CALL (EXECUTE VN OR PASTE)
  24163 REF  19  LAST  327   41,3540  0 2350 0           TC     GODSPALM
  24164 REF   2  LAST  365   41,3541  0 3506 1           TC     BLANKDSP     BLANK DISPLAY AS SPECIFIED
  24165 REF  20  LAST  365   41,3542  0 2350 0           TC     GODSPALM
  2417  REF   5  LAST  351   41,3543  3 6043 0           CAF    LOW7
  2418  REF   4  LAST  365   41,3544  7 0123 0           MASK   NVTEMP
  2419  REF 193  LAST  360   41,3545  54 157 0           TS     MPAC    +3   TEMP FOR NOUN (CANT USE MPAC. DSPDECVN
  2420  REF   5  LAST  365   41,3546  3 0123 1           CA     NVTEMP              USES MPAC, +1, +2
  2422  REF   5  LAST  351   41,3547  54 023 1           TS     EDOP         RIGHT 7
  2423  REF   6  LAST  365   41,3550  3 0023 0           CA     EDOP
  2424  REF 194  LAST  365   41,3551  54 160 1           TS     MPAC    +4   TEMP FOR VERB (CANT USE MPAC+1. DSPDECVN
A2425                                                                        USES MPAC, +1, +2).
  2426  REF 195  LAST  365   41,3552  10 157 0           CCS    MPAC    +3   TEST NOUN
  2427  REF   1              41,3553  0 3561 0           TC     NVSUB2       IF NOUN NOT +0, GO ON
  2428  REF 196  LAST  365   41,3554  3 0160 0           CA     MPAC    +4
  2429  REF   9  LAST  358   41,3555  0 2336 0           TC     UPDATVB -1   IF NOUN = +0, DISPLAY VERB . THEN RETURN
 24291  REF  74  LAST  362   41,3556  3 4714 1           CAF    ZERO         ZERO REQRET SO THAT PASTED VERBS CAN
 24292  REF  14  LAST  361   41,3557  55∝013 0           TS     REQRET       BE EXECUTED BY OPERATOR.
  2430  REF   2  LAST  358   41,3560  0 4216 0  ENTSET   TC     NVSUBEND
  2431  REF 197  LAST  365   41,3561  10 160 1  NVSUB2   CCS    MPAC +4      TEST VERB
  2432                      41,3562  0 3566 1           TC     +4           IF VERB NOT +0, GO ON
```

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 2433   REF 198  LAST  365   41,3583  3 0157 1            CA     MPAC    +3
 2434   REF   2  LAST  351   41,3564  0 2316 1            TC     UPDATNN -1      IF VERB = +0, DISPLAY NOUN. THEN RETURN
 2435   REF   3  LAST  365   41,3565  0 4216 0            TC     NVSUBEND
 2436   REF 199  LAST  366   41,3566  3 0156 0            CA     MPAC    +2      TEMP FOR MACH CADR TO BE SPEC. (DSPDECVN
 2437   REF 200  LAST  366   41,3567  54 161 0            TS     MPAC    +5              USES MPAC, +1, +2)
 2438   REF 201  LAST  366   41,3570  3 0160 0            CA     MPAC    +4
 2439   REF  10  LAST  365   41,3571  0 2336 0            TC     UPDATVB -1      IF BOTH NOUN AND VERB NOT +0, DISPLAY
 2440   REF 202  LAST  366   41,3572  3 0157 1            CA     MPAC    +3      BOTH AND GO TO ENTPAS0.
 2441   REF   3  LAST  366   41,3573  0 2316 1            TC     UPDATNN -1
 2442   REF  75  LAST  365   41,3574  3 4714 1            CAF    ZERO
 2443   REF   3  LAST  360   41,3575  55=014 1            TS     LOADSTAT        SET FOR WAITING FOR DATA CONDITION.
 2444   REF  13  LAST  365   41,3576  55=015 0            TS     CLPASS
 2445   REF  15  LAST  365   41,3577  55=013 0            TS     REQRET          SET REQRET FOR PASS 0.
 2446   REF 203  LAST  366   41,3600  3 0161 1            CA     MPAC    +5      RESTORES MACH CADR TO BE SPEC TO MPAC+2
 2447   REF 204  LAST  366   41,3601  54 156 1            TS     MPAC    +2      FOR USE IN INTMCTBS (IN ENTPAS0).
 2448   REF   3  LAST  318   41,3602  0 2035 0  ENDNVSB1  TC     ENTPAS0
R2449   IF INTERNAL MACH CADR TO BE SPECIFIED, MPAC+2 WILL BE PLACED INTO
R2450   NOUNCADR IN ENTPAS0 (INTMCTBS ).
 2451   REF   4  LAST  366     4220                       SETLOC NVSUBEND +2
24515   REF   4 LAST 364 TO 364'    24    48*             COUNT  02/PIN

A2452                                                                   FORCE BIT 15 OF MONSAVE1 TO 1.
 2453   REF  26  LAST  339     4220  3 4674 0  KILMONON CAF    BIT15           THIS IS THE KILL MONITOR BIT.
 2454   REF   8  LAST  364     4221  55=021 1            TS     MONSAVE1        TURN OFF BIT 14, THE EXTERNAL
A2455                                                                           MONITOR BIT.
 2458   REF 107  LAST  364     4222  0 0002 0            TC     Q
R2459   LOADSTAT  +0 INACTIVE(WAITING FOR DATA). SET BY NVSUB
R2460             +1  PROCEED NO DATA. SET BY SPECIAL VERB
R2461            -1 TERMINATE   SET BY SPECIAL VERB
R2462            -0    DATA IN      SET BY END OF LOAD ROUTINE
R2463               OR RESEQUENCE   SET BY VERB 32
R2464   L  TC ENDIDLE  (FIXED FIXED)
R2465   ROUTINES THAT REQUEST LOADS THROUGH NVSUB SHOULD USE ENDIDLE WHILE
R2466   WAITING FOR THE DATA TO BE LOADED. ENDIDLE PUTS CURRENT JOB TO SLEEP.
R2467   ENDIDLE CANNOT BE CALLED FROM ERASABLE OR F/F MEMORY,
R2468   SINCE JOBSLEEP AND JOBWAKE CAN HANDLE ONLY FIXED BANKS.
R2469   RECALTST TESTS LOADSTAT AND WAKES JOB UP TO,
R2470   L+1       FOR TERMINATE
R2471   L+2       FOR PROCEED WITHOUT DATA
R2472   L+3       FOR DATA IN, OR RESEQUENCE
R2473   IT DOES NOTHING IF LOADSTAT INDICATES WAITING FOR DATA.
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R2474   ENDIDLE ABORTS (WITH CODE 01206) IF A SECOND JOB ATTEMPTS TO GO TO SLEEP
R2475   IN PINBALL. IN PARTICULAR, IF AN ATTEMPT IS MADE TO GO TO ENDIDLE WHEN
R2476   1) CADRSTOR NOT= +0. THIS IS THE CASE WHERE THE CAPACITY OF ENDIDLE IS
R2477   EXCEEDED. (+-NZ INDICATE A JOB IS ALREADY ASLEEP DUE TO ENDIDLE.)
R2478   2) DSPLIST NOT= +0. THIS INDICATES A JOB IS ALREADY ASLEEP DUE TO
R2479   NVSUBUSY.

 2480   REF 108  LAST  366     4223  22 002 0  ENDIDLE  LXCH   Q          RETURN ADDRESS INTO L.
 2481   REF   1                4224   0 4234 0           TC     ISCADR+0   ABORT IF CADRSTOR NOT= +0
 2482   REF   1                4225   0 4240 0           TC     ISLIST+0   ABORT IF DSPLIST NOT= +0
 2483   REF  41  LAST  352     4226   3 0001 0           CA     L          DONT SET DSPLOCK TO 1 SO CAN USE.
 2484   REF   4  LAST  265     4227   7 4747 0           MASK   LOW10      ENDIDLE WITH NVSUB INITIATED MONITOR.
 2485   REF   1                4230   6 0004 0           AD     FBANK      SAME STRATEGY FOR CADR AS MAKECADR.
 2486   REF   7  LAST  362     4231  55=042 1            TS     CADRSTOR
 2487   REF   1                4232   0 5070 0           TC     JOBSLEEP
 2488   REF  41  LAST  362     4233   0 5112 0  ENDINST  TC     ENDOFJOB
 2489   REF   8  LAST  367     4234  11=042 1  ISCADR+0  CCS    CADRSTOR   ABORTS (CODE 01206) IF CADRSTOR NOT= +0.
 2490   REF   1                4235   0 4243 0           TC     DSPABORT   RETURNS IF CADRSTOR = +0.
 2491   REF 109  LAST  367     4236   0 0002 0           TC     Q
 2492   REF   2  LAST  367     4237   0 4243 0           TC     DSPABORT

 2493   REF   2  LAST  188     4240  11=043 0  ISLIST+0  CCS    DSPLIST    ABORTS (CODE 01206) IF DSPLIST NOT= +0.
 2494   REF   3  LAST  367     4241   0 4243 0           TC     DSPABORT   RETURNS IF DSPLIST = +0.
 2495   REF 110  LAST  367     4242   0 0002 0           TC     Q
 2496   REF   2  LAST  358     4243   0 5622 1  DSPABORT TC     POODOO
 2497                          4244    01206 1           OCT    01206
R2498   JAMTERM ALLOWS PROGRAMS TO PERFORM THE TERMINATE FUNCTION.
R2499   IT DOES ENDOFJOB.

 2500   REF   3  LAST  364     4245   3 4215 0  JAMTERM  CAF    PINSUPBT
 2501                          4246   0 0006 1           EXTEND
 25011  REF   5  LAST  364     4247   01 007 1           WRITE  SUPERBNK
 25012  REF   1                4250   3 4256 1           CAF    34DEC
 25013  REF  16  LAST  366     4251  55=013 0            TS     REQRET     LEAVE ENTER SET FOR ENTPASS0.
 2502   REF  13  LAST  365     4252   4 4374 1           CS     VD1
 2503   REF  58  LAST  365     4253  54 777 1            TS     DSPCOUNT
 2504   REF  30  LAST  362     4254   0 4574 0           TC     POSTJUMP
 2505   REF   2  LAST  321     4255    61351 1           CADR   VBTERM

 2506                          4256    00042 1  34DEC    DEC    34
R2507   JAMPROC ALLOWS PROGRAMS TO PERFORM THE PROCEED/PROCEED WITHOUT DATA
R2508   FUNCTION. IT DOES ENDOFJOB.
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 2509   REF   4 LAST  367      4257  3 4215 0  JAMPROC  CAF     PINSUPBT
 2510                          4260  0 0006 1           EXTEND
25101   REF   6 LAST  367      4261  01 007 1           WRITE   SUPERBNK
25102   REF   1               4262  3 4270 0           CAF     33DEC
25103   REF  17 LAST  367      4263  55=013 0           TS      REQRET      LEAVE ENTER SET FOR ENTPASS0.
 2511   REF  14 LAST  367      4264  4 4374 1           CS      VD1
 2512   REF  59 LAST  367      4265  54 777 1           TS      DSPCOUNT
 2513   REF  31 LAST  367      4266  0 4574 0           TC      POSTJUMP
 2514   REF   5 LAST  361      4267   61343 1           CADR    VBPROC

 2515                          4270   00041 1  33DEC    DEC     33
R2532   BLANKSUB BLANKS ANY COMBINATION OF R1, R2, R3.
R2533   CALL WITH BLANKING CODE IN A.
R2534   BIT1=1 BLANKS R1, BIT2=1 BLANKS R2, BIT3=1 BLANKS R3.
R2535   ANY COMBINATION OF THESE BITS IS ACCEPTED.

R2536   DSPCOUNT IS RESTORED TO STATE IT WAS IN BEFORE BLANKSUB WAS EXECUTED.

 2538   REF   9 LAST  365      4271  7 4716 1  BLANKSUB MASK    SEVEN
25381   REF   6 LAST  365      4272  54 123 0           TS      NVTEMP      STORE BLANKING CODE IN NVTEMP.
 2539   REF  32 LAST  364      4273  3 4675 1           CAF     BIT14
 2540   REF   9 LAST  366      4274  7 1021 1           MASK    MONSAVE1    EXTERNAL MONITOR BIT
25401   REF   7 LAST  364      4275  6 1012 0           AD      DSPLOCK
25402   REF 119 LAST  365      4276  10 000 0           CCS     A
25403   REF 111 LAST  367      4277  0 0002 0           TC      Q           DSP SYST BLOCKED. RET TO 1+ CALLING LOC
25404   REF 112 LAST  368      4300  24 002 0           INCR    Q           DSP SYST AVAILABLE
A2541                                                                      SET RETURN FOR 2+ CALLING LOC
25411   REF   7 LAST  368      4301  10 123 0           CCS     NVTEMP
25412                          4302  1 4304 0           TCF     +2
25413   REF 113 LAST  368      4303  0 0002 0           TC      Q           NOTHING TO BLANK. RET TO 2+ CALLING LOC
 2542   REF 114 LAST  368      4304  22 002 0           LXCH    Q           SET RETURN FOR 2 + CALLING LOC
 2544   REF   1               4305  3 4316 1           CAF     BLNKBBNK
 2545   REF  11 LAST  364      4306  56 006 1           XCH     BBANK
25451                          4307  0 0006 1           EXTEND
25452   REF   7 LAST  368      4310  04 007 1           ROR     SUPERBNK    SAVE OLD SUPERBITS.
 2546   REF  40 LAST  326      4311  52 131 0           DXCH    BUF
25461   REF   5 LAST  368      4312  3 4215 0           CAF     PINSUPBT
25462                          4313  0 0006 1           EXTEND
25463   REF   8 LAST  368      4314  01 007 1           WRITE   SUPERBNK
 2547   REF   1               4315  0 3406 0           TC      BLNKSUB1

 2548   REF  60 LAST  368      0777                     EBANK=  DSPCOUNT
25481   REF   2 LAST  368      4316   60101 1  BLNKBBNK BBCON   BLNKSUB1
 2549                          4317            ENDBLFF  EQUALS

 2550   REF   1          40,3406                        SETLOC  ENDFFLDS
25505   REF   8 LAST  360 TO  364'    35   774*         COUNT   40/PIN
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 2551   REF  61  LAST  368   40,3406  3 0777 0  BLNKSUB1 CA    DSPCOUNT     SAVE OLD DSPCOUNT FOR LATER RESTORATION
 25511  REF  41  LAST  368   40,3407  54 132 0           TS    BUF     +2
 25512  REF  31  LAST  360   40,3410  3 4712 1           CAF   BIT1         TEST BIT1. SEE IF R1 TO BE BLANKED.
 2552   REF   1              40,3411  0 3430 0           TC    TESTBIT
 2553   REF  13  LAST  352   40,3412  3 4333 0           CAF   R1D1
 2554   REF   4  LAST  332   40,3413  0 2436 1           TC    5BLANK -1
 2555   REF  20  LAST  218   40,3414  3 4711 1           CAF   BIT2         TEST BIT 2. SEE IF R2 TO BE BLANKED.
 2556   REF   2  LAST  369   40,3415  0 3430 0           TC    TESTBIT
 2557   REF   5  LAST  354   40,3416  3 4334 1           CAF   R2D1
 2558   REF   5  LAST  369   40,3417  0 2436 1           TC    5BLANK -1
 2559   REF  15  LAST  362   40,3420  3 4710 0           CAF   BIT3         TEST BIT3. SEE IF R3 TO BE BLANKED.
 2560   REF   3  LAST  369   40,3421  0 3430 0           TC    TESTBIT
 2561   REF   5  LAST  333   40,3422  3 4335 0           CAF   R3D1
 2562   REF   6  LAST  369   40,3423  0 2436 1           TC    5BLANK -1
 2563   REF  42  LAST  369   40,3424  3 0132 1           CA    BUF     +2   RESTORE DSPCOUNT TO STATE IT HAD
 2564   REF  62  LAST  369   40,3425  54 777 1           TS    DSPCOUNT          BEFORE BLANKSUB.
 2565   REF  43  LAST  369   40,3426  52 131 0           DXCH  BUF          CALL L+2 DIRECTLY.
 2566   REF   2  LAST  364   40,3427  0 5123 1           TC    SUPDXCHZ +1  DTCB WITH SUPERBIT SWITCHING

 2567   REF   8  LAST  368   40,3430  7 0123 0  TESTBIT  MASK  NVTEMP      NVTEMP CONTAINS BLANKING CODE.
 2568   REF 120  LAST  368   40,3431  10 000 0           CCS   A
 2569   REF 115  LAST  368   40,3432  0 0002 0           TC    Q            IF CURRENT BIT = 1, RETURN TO L+1.
 2570   REF 116  LAST  369   40,3433  50 002 0           INDEX Q            IF CURRENT BIT = 0, RETURN TO L+3.
 2571                        40,3434  0 0002 0           TC    2

 2572                        40,3435            ENDBSUB1 EQUALS
R257205 DSPMM DOES NOT DISPLAY MODREG DIRECTLY. IT PUTS IN EXEC REQUEST WITH
R257206 PRIO 30000 FOR DSPMMJB AND RETURNS TO CALLER.

R257207 IF MODREG CONTAINS -0, DSPMMJB BLANKS THE MODE LIGHTS.

R257209 DSPMM MUST BE IN BANK 27 OR LOWER, SO IT CAN BE CALLED VIA BANKCALL.

 25721                      07,2440                    BANK  7
 257215 REF   1             04,2000                    SETLOC PINBALL4
 257217                     04,2537                    BANK

 257218 REF   1                                        COUNT 07/PIN

 25722  REF 117  LAST  369   04,2537  56 002 0  DSPMM    XCH   Q
 25723  REF 205  LAST  366   04,2540  54 154 0           TS    MPAC
 25724                      04,2541  0 0004 0           INHINT
 25725  REF   3  LAST  350   04,2542  3 4371 0           CAF   CHRPRIO
 25726  REF  12  LAST  350   04,2543  0 5027 1           TC    NOVAC
 25727  REF  63  LAST  369     0777                     EBANK= DSPCOUNT
 25728  REF   1              04,2544   03435 0          2CADR DSPMMJB
 25728  REF   1              04,2545   60101 1
 257285                     04,2546  0 0003 1           RELINT
```

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 25729  REF 208  LAST  369   04,2547  0 0154 1  ENDSPMM  TC     MPAC

R2573   DSPMM  PLACE MAJOR MODE CODE INTO MODREG

 25735  REF   1                40,3435                    SETLOC ENDBSUB1

 25736  REF   9 LAST  368 TO  369'    23   797*           COUNT  40/PIN

 2574   REF   1                40,3435  3 4376 1  DSPMMJB  CAF    MD1          GETS HERE THRU DSPMM
 2575   REF  64  LAST  369     40,3436  56 777 0           XCH    DSPCOUNT
 2576   REF   1                40,3437  54 140 0           TS     DSPMMTEM     SAVE DSPCOUNT
 2579   REF   6  LAST  255     40,3440  11"011 1           CCS    MODREG
 2580   REF  47  LAST  364     40,3441  6 4712 1           AD     ONE
 25801  REF   4  LAST  355     40,3442  0 3211 0           TC     DSPDECVN     IF MODREG IS + OR +0, DISPLAY MODREG
 25802                         40,3443  0 3445 1           TC     +2           IF MODREG IS -NZ, DO NOTHING
 25803  REF   6  LAST  359     40,3444  0 2502 1           TC     2BLANK       IF MODREG IS -0, BLANK MM
 2581   REF   2  LAST  370     40,3445  56 140 1           XCH    DSPMMTEM     RESTORE DSPCOUNT
 2582   REF  65  LAST  370     40,3446  54 777 1           TS     DSPCOUNT
 2583   REF  42  LAST  367     40,3447  0 5112 0           TC     ENDOFJOB
R2584   RECALTST IS ENTERED DIRECTLY AFTER DATA IS LOADED (OR RESEQUENCE VERB IS
R2585   EXECUTED), TERMINATE VERB IS EXECUTED, OR PROCEED WITHOUT DATA VERB IS
R2586   EXECUTED. IT WAKES UP JOB THAT DID TC ENDIDLE.

R2587   IF CADRSTOR NOT= +0, IT PUTS +0 INTO DSPLOCK, AND TURNS OFF KEY RLSE
R2588   LIGHT IF DSPLIST IS EMPTY (LEAVES KEY RLSE LIGHT ALONE IF NOT EMPTY).

 2589   REF   9  LAST  367     40,3450  11"042 1  RECALTST CCS    CADRSTOR
 2590   REF   1                40,3451  0 3453 0           TC     RECAL1
 2591   REF  43  LAST  370     40,3452  0 5112 0           TC     ENDOFJOB     NORMAL EXIT IF KEYBOARD INITIATED
 2592   REF  76  LAST  366     40,3453  3 4714 1  RECAL1   CAF    ZERO
 2593   REF  10  LAST  370     40,3454  57"042 0           XCH    CADRSTOR
 2594                         40,3455  0 0004 0           INHINT
 2595   REF   1                40,3456  0 5074 1           TC     JOBWAKE
 2596   REF   4  LAST  366     40,3457  11"014 1           CCS    LOADSTAT
 2597   REF   1                40,3460  0 3502 0           TC     DOPROC       + PROCEED WITHOUT DATA
 2598   REF  44  LAST  370     40,3461  0 5112 0           TC     ENDOFJOB     PATHALOGICAL CASE EXIT
 2599   REF   1                40,3462  0 3500 1           TC     DOTERM       -  TERMINATE
 2600   REF  22  LAST  357     40,3463  3 4711 1           CAF    TWO          -0 DATA IN OR RESEQUENCE
 2601   REF   1                40,3464  50 064 0  RECAL2   INDEX  LOCCTR
 2602   REF   1                40,3465  6 0164 1           AD     LOC          LOC IS + FOR BASIC JOBS
 2603   REF   2  LAST  370     40,3466  50 064 0           INDEX  LOCCTR
 2604   REF   2  LAST  370     40,3467  54 164 0           TS     LOC
 26041  REF  15  LAST  365     40,3470  3 1002 1           CA     NOUNREG      SAVE VERB IN MPAC, NOUN IN MPAC+1 AT
 26042  REF  42  LAST  367     40,3471  54 001 1           TS     L            TIME OF RESPONSE TO ENDIDLE FOR
 26043  REF  20  LAST  365     40,3472  3 1001 1           CA     VERBREG      POSSIBLE LATER TESTING BY JOB THAT HAS
 26044  REF   3  LAST  370     40,3473  50 064 0           INDEX  LOCCTR       BEEN WAKED UP.
 26045  REF 207  LAST  370     40,3474  52 155 1           DXCH   MPAC
 2605                          40,3475  0 0003 1           RELINT
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2606   REF   8  LAST  362   40,3476  0 4473 0  RECAL3   TC    RELDSP
2607   REF  45  LAST  370   40,3477  0 5112 0            TC    ENDOPJOB

2608   REF  77  LAST  370   40,3500  3 4714 1  DOTERM   CAF   ZERO
2609   REF   1               40,3501  0 3464 1            TC    RECAL2

2610   REF  48  LAST  370   40,3502  3 4712 1  DOPROC   CAF   ONE
2611   REF   2  LAST  371   40,3503  0 3464 1            TC    RECAL2
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P2612   MISCELLANEOUS SERVICE ROUTINES IN FIXED/FIXED
 2613   REF   1                 4317                    SETLOC ENDBLFF

26135   REF   5 LAST  366 TO  368'    63   111*         COUNT  02/PIN

R2614   SETNCADR        E CADR ARRIVES IN A. IT IS STORED IN NOUNCADR. EBANK BITS
R2615                   ARE SET. E ADRES IS DERIVED AND PUT INTO NOUNADD.

 2616   REF   8 LAST  352      4317  55=017 1  SETNCADR TS     NOUNCADR      STORE ECADR
 2617   REF  16 LAST  296      4320  54 003 0           TS     EBANK         SET EBANK BITS
 2618   REF   1               4321  7 4373 0           MASK   LOW8
 2619   REF   1               4322  6 4744 1           AD     OCT1400
 2620   REF  29 LAST  347      4323  54 145 0           TS     NOUNADD       PUT E ADRES INTO NOUNADD
 2621   REF 118 LAST  369      4324  0 0002 0           TC     Q
R2622   SETNADD         GETS E CADR FROM NOUNCADR, SETS EBANK BITS, DERIVES
R2623                   E ADRES AND PUTS IT INTO NOUNADD.

 2624   REF   9 LAST  372      4325  3 1017 0  SETNADD  CA     NOUNCADR
 2625   REF   7 LAST  341      4326  1 4320 0           TCF    SETNCADR +1
R2626   SETEBANK        E CADR ARRIVES IN A. EBANK BITS ARE SET. E ADRES IS
R2627                   DERIVED AND LEFT IN A.

 2628   REF  17 LAST  372      4327  54 003 0  SETEBANK TS     EBANK         SET EBANK BITS
 2629   REF   2 LAST  372      4330  7 4373 0           MASK   LOW8
 2630   REF   2 LAST  372      4331  6 4744 1           AD     OCT1400       E ADRES LEFT IN A
 2631   REF 119 LAST  372      4332  0 0002 0           TC     Q
 2632                          4333   00016 0  R1D1     OCT    16            THESE 3 CONSTANTS FORM A PACKED TABLE.
 2633                          4334   00011 1  R2D1     OCT    11            DONT SEPARATE.
 2634                          4335   00004 0  R3D1     OCT    4

 2635   REF   7 LAST  356      4336  54 020 1  RIGHT5   TS     CYR
 2636   REF   8 LAST  372      4337  4 0020 1           CS     CYR
 2637   REF   9 LAST  372      4340  4 0020 1           CS     CYR
 2638   REF  10 LAST  372      4341  4 0020 1           CS     CYR
 2639   REF  11 LAST  372      4342  4 0020 1           CS     CYR
 2640   REF  12 LAST  372      4343  56 020 0           XCH    CYR
 2641   REF 120 LAST  372      4344  0 0002 0           TC     Q

 2642   REF  13 LAST  356      4345  54 022 0  LEFT5    TS     CYL
 2643   REF  14 LAST  372      4346  4 0022 0           CS     CYL
 2644   REF  15 LAST  372      4347  4 0022 0           CS     CYL
 2645   REF  16 LAST  372      4350  4 0022 0           CS     CYL
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2646  REF  17  LAST  372    4351  4 0022 0          CS     CYL
2647  REF  18  LAST  373    4352  56 022 1          XCH    CYL
2648  REF 121  LAST  372    4353  0 0002 0          TC     Q

2649                         4354  6 0000 1  SLEPT5  DOUBLE
2650                         4355  6 0000 1          DOUBLE
2651                         4356  6 0000 1          DOUBLE
2652                         4357  6 0000 1          DOUBLE
2653                         4360  6 0000 1          DOUBLE
2654  REF 122  LAST  373    4361  0 0002 0          TC     Q
2655                         4362   00037 0  LOW5    OCT    37          THESE 3 CONSTANTS FORM A PACKED TABLE.
2656                         4363   01740 0  MID5    OCT    1740        DONT SEPARATE.
2657                         4364   76000 0  HI5     OCT    76000       MUST STAY HERE

2658  REF  13  LAST  369    4365  0 5027 1  TCNOVAC TC     NOVAC
2659  REF  13  LAST  350    4366  0 5140 1  TCWAIT  TC     WAITLIST
2660  REF  14  LAST  350    4367  0 5213 1  TCTSKOVR TC    TASKOVER
2661  REF  13  LAST  261    4370  0 5042 1  TCFINDVC TC    FINDVAC
2662                         4371   30000 1  CHRPRIO OCT    30000       EXEC PRIORITY OF CHARIN
2663                         4372   03777 0  LOW11   OCT    3777
2664  REF   6  LAST  341    4372            B12-1   EQUALS LOW11
2665                         4373   00377 1  LOW8    OCT    377
2667                         4374   00023 0  VD1     OCT    23          THESE 3 CONSTANTS FORM A PACKED TABLE.
2668                         4375   00021 1  ND1     OCT    21          DONT SEPARATE.
2669                         4376   00025 0  MD1     OCT    25

2670                         4377   00012 1  BINCON  DEC    10

2671  REF  28  LAST  317    4400  3 4704 0  FALTON  CA     BIT7        TURN ON OPERATOR ERROR LIGHT
2672                         4401  0 0006 1          EXTEND
2673  REF  11  LAST  362    4402  05 011 1          WOR    DSALMOUT    BIT 7 OF CHANNEL 11
2674  REF 123  LAST  373    4403  0 0002 0          TC     Q

2675  REF  29  LAST  373    4404  4 4704 1  FALTOF  CS     BIT7        TURN OFF OPERATOR ERROR LIGHT
2676                         4405  0 0006 1          EXTEND
2677  REF  12  LAST  373    4406  03 011 1          WAND   DSALMOUT    BIT 7 OF CHANNEL 11
2678  REF 124  LAST  373    4407  0 0002 0          TC     Q

2679  REF  17  LAST  359    4410  3 4706 1  RELDSPON CAF   BIT5        TURN ON KEY RELEASE LIGHT
2680                         4411  0 0006 1          EXTEND
2681  REF  13  LAST  373    4412  05 011 1          WOR    DSALMOUT    BIT 5 OF CHANNEL 11
2682  REF 125  LAST  373    4413  0 0002 0          TC     Q
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2683                                4414  0 0006 1  LODSAMPT EXTEND
2684  REF  10  LAST  267           4415  3 0025 0           DCA    TIME2
2685  REF   5  LAST  276           4416  52 014 0           DXCH   SAMPTIME
2686  REF 126  LAST  373           4417  0 0002 0           TC     Q
2687                                4420  0 0006 1  TPSL1   EXTEND                  SHIFTS MPAC, +1, +2 LEFT 1
2688  REF 208  LAST  370           4421  3 0156 0           DCA    MPAC     +1     LEAVES OVFIND SET TO +/- 1 FOR OF/UF
2689  REF 209  LAST  374           4422  20 156 1           DAS    MPAC     +1
2690  REF 210  LAST  374           4423  6 0154 1           AD     MPAC
2691  REF 211  LAST  374           4424  26 154 0           ADS    MPAC
2692                                4425  54 007 1           TS     7               TS A DOES NOT CHANGE A ON OF/UF.
2693  REF 127  LAST  374           4426  0 0002 0           TC     Q               NO NET OF/UF
2694  REF   7  LAST  346           4427  54 162 0           TS     MPAC+6          MPAC +6 SET TO +/-1 FOR OF/UF
2695  REF 128  LAST  374           4430  0 0002 0           TC     Q
R2696  IF MPAC, +1 ARE EACH +NZ OR +0 AND C(A)=-0, SHORTMP WRONGLY GIVES +0.
R2697  IF MPAC, +1 ARE EACH -NZ OR -0 AND C(A)=+0, SHORTMP WRONGLY GIVES +0.
R2698  PRSHRTMP FIXES FIRST CASE ONLY, BY MERELY TESTING C(A) AND IF IT = -0,
R2699  SETTING RESULT TO -0.
R2700   (DO NOT USE PRSHRTMP UNLESS MPAC, +1 ARE EACH +NZ OR +0, AS THEY ARE
R2701   WHEN THEY CONTAIN TH E SF CONSTANTS.)

2702  REF   2  LAST   68           4431  54 135 1  PRSHRTMP TS     MPTEMP
2703  REF 121  LAST  369           4432  10 000 0           CCS    A
2704  REF   3  LAST  374           4433  3 0135 0           CA     MPTEMP          C(A) +, DO REGULAR SHORTMP
2705  REF   8  LAST  353           4434  1 7257 1           TCF    SHORTMP +1      C(A) +0, DO REGULAR SHORTMP
2706                                4435  1 4433 0           TCF    -2              C(A) -, DO REGULAR SHORTMP
2707  REF  78  LAST  371           4436  4 4714 0           CS     ZERO            C(A) -0, FORCE RESULT TO -0 AND RETURN.
2708  REF 212  LAST  374           4437  54 154 0           TS     MPAC
2709  REF 213  LAST  374           4440  54 155 1           TS     MPAC     +1
2710  REF 214  LAST  374           4441  54 156 1           TS     MPAC     +2
2711  REF 129  LAST  374           4442  0 0002 0           TC     Q
2712  REF  26  LAST  292           4443  3 4705 1  FLASHON  CAF    BIT6            TURN ON V/N FLASH
2713                                4444  0 0006 1           EXTEND                 BIT 6 OF CHANNEL 11
2714  REF  14  LAST  373           4445  05 011 1           WOR    DSALMOUT
2715  REF 130  LAST  374           4446  0 0002 0           TC     Q
2716  REF  27  LAST  374           4447  4 4705 0  FLASHOFF CS     BIT6            TURN OFF V/N FLASH
2717                                4450  0 0006 1           EXTEND
2718  REF  15  LAST  374           4451  03 011 1           WAND   DSALMOUT        BIT 6 OF CHANNEL 11
2719  REF 131  LAST  374           4452  0 0002 0           TC     Q
```

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P2720   INTERNAL USE OF KEYBOARD AND DISPLAY PROGRAM

R2721   USER MUST SCHEDULE CALLS TO NVSUB SO THAT THERE IS NO CONFLICT OF USE OR
R2722   CONFUSION TO OPERATOR. THE OLD GNABLOCK (INTERNAL/INTERNAL INTERLOCK)
R2723   HAS BEEN REMOVED AND THE INTERNAL USER NO LONGER HAS THE PROTECTION THIS
R2724   OFFERED.

R2725   THERE ARE TWO WAYS A JOB CAN BE PUT TO SLEEP BY THE KEYBOARD + DISPLAY
R2726   PROGRAM.    1) BY ENDIDLE
R2727               2) BY NVSUBUSY
R2728   THE BASIC CONVENTION IS THAT ONLY ONE JOB WILL BE PERMITTED ASLEEP VIA
R2729   THE KEYBOARD + DISPLAY PROGRAM AT A TIME. IF A JOB ATTEMPTS TO GO TO
R2730   SLEEP BY MEANS OF (1) OR (2) AND THERE IS ALREADY A JOB ASLEEP THAT WAS
R2731   PUT TO SLEEP BY (1) OR (2), THEN AN ABORT IS CAUSED.
R2732   THE CALLING SEQUENCE FOR NVSUB IS
R2733           CAF     V/N
R2734   L       TC      NVSUB
R2735   L+1     RETURN HERE IF OPERATOR HAS INTERVENED
R2736   L+2     RETURN HERE AFTER EXECUTION.
R2737       A ROUTINE CALLED NVSUBUSY IS PROVIDED (USE IS OPTIONAL) TO PUT
R2738   YOUR JOB TO SLEEP UNTIL THE OPERATOR RELEASES THE KEYBOARD + DISPLAY
R2739   SYSTEM. NVSUBUSY ALSO TURNS ON THE KEY RELEASE LIGHT.
R2740   NVSUBUSY CANNOT BE CALLED FROM ERASABLE OR F/F MEMORY,
R2741   SINCE JOBSLEEP AND JOBWAKE CAN HANDLE ONLY FIXED BANKS.
R2742       THE CALLING SEQUENCE IS
R2743           CAF     WAKEFCADR
R2744           TC      NVSUBUSY
R2745   .
R2746   NVSUBUSY IS INTENDED FOR USE WHEN AN INTERNAL PROGRAM FINDS THE OPERATOR
R2747   IS USING THE KEYBOARD + DISPLAY PROGRAM (BY HIS OWN INITIATION). IT IS
R2748   NOT INTENDED FOR USE WHEN ONE INTERNAL PROGRAM FINDS ANOTHER INTERNAL
R2749   PROGRAM USING THE KEYBOARD + DISPLAY PROGRAM.
R2750   NVSUBUSY ABORTS (WITH CODE 01206) IF A SECOND JOB ATTEMPTS TO GO TO
R2751   SLEEP IN PINBALL. IN PARTICULAR, IF AN ATTEMPT IS MADE TO GO TO NVSUBUSY
R2752   WHEN
R2753   1) DSPLIST NOT= +0. THIS IS THE CASE WHERE THE CAPACITY OF THE DSPLIST
R2754      IS EXCEEDED.
R2755   2) CADRSTOR NOT= +0. THIS INDICATES THAT A JOB IS ALREADY USING
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R2756   ENDIDLE. (+-NZ INDICATE A JOB IS ALREADY ASLEEP DUE TO ENDIDLE.)

 2757   REF   1                  4453  4 4460 0  PRENVBSY CS    2K+3          SPECIAL ENTRANCE FOR ROUTINES IN FIXED
 2758   REF 132  LAST  374       4454  6 0002 0           AD    Q             BANKS ONLY DESIRING THE FCADR OF(LOC
 2759   REF   2  LAST  367       4455  6 0004 0           AD    FBANK         FROM WHICH THE TC PRENVBSY WAS DONE) -2
 2760   REF  32  LAST  368       4456  0 4574 0  NVSUBUSY TC    POSTJUMP      TO BE ENTERED.
 2761   REF   1                  4457  10550 0            CADR  NVSUBSY1
 2762                            4460  02003 0  2K+3      OCT   2003

R27625  NVSUBSY1 MUST BE IN BANK 27 OR LOWER, SO IT WILL PUT CALLER TO SLEEP
R27626  WITH HIS PROPER SUPERBITS.

 2763   REF   1                  04,2550                  SETLOC ENDSPMM +1
 27635  REF   2 LAST  369 TO  370'     9     9*          COUNT  07/PIN

 2764   REF  43  LAST  370       04,2550  54 001 1  NVSUBSY1 TS    L
 2769   REF   2  LAST  367       04,2551  0 4234 0           TC    ISCADR+0      ABORT IF CADRSTOR NOT= +0.
 2770   REF   2  LAST  367       04,2552  0 4240 0           TC    ISLIST+0      ABORT IF DSPLIST NOT= +0.
 2771   REF   3  LAST  352       04,2553  0 4410 0           TC    RELDSPON
 2772   REF  44  LAST  376       04,2554  3 0001 0           CA    L
 2773   REF   3  LAST  367       04,2555  55*043 0           TS    DSPLIST
 2774   REF   2  LAST  367       04,2556  0 5070 0  ENDNVBSY TC    JOBSLEEP
R2775   NVSBWAIT IS A SPECIAL ENTRANCE FOR ROUTINES IN FIXED BANKS ONLY. IF
R2776   SYSTEM IS NOT BUSY, IT EXECUTES V/N AND RETURNS TO L+1 (L= LOC FROM
R2777   WHICH THE TC NVSBWAIT WAS DONE). IF SYSTEM IS BUSY, IT PUTS CALLING JOB
R2778   TO SLEEP WITH L-1 GOING INTO LIST FOR EVENTUAL WAKING UP WHEN SYSTEM
R2779   IS NOT BUSY.

 2780   REF   1                  4461                     SETLOC NVSUBUSY +3
 27805  REF   6 LAST  372 TO  376'     98    209*        COUNT  02/PIN

 2781                            4461  22 007 0  NVSBWAIT LXCH  7             ZERO NVMONOPT OPTIONS
 2782   REF   9  LAST  369       4462  54 123 0           TS    NVTEMP
 2783   REF  33  LAST  368       4463  3 4675 1           CAF   BIT14
 27831  REF  10  LAST  368       4464  7 1021 1           MASK  MONSAVE1        EXTERNAL MONITOR BIT
 27832  REF   8  LAST  368       4465  6 1012 0           AD    DSPLOCK
 27833  REF 122  LAST  374       4466  10 000 0           CCS   A
 27834  REF   1                  4467  1 4471 0           TCF   NVSBWT1         BUSY
 2784   REF   1                  4470  1 4200 0           TCF   NVSBCOM         FREE. NVSUB WILL SAVE L+1 FOR RETURN
A2785                                                                           AFTER EXECUTION.
 2786   REF 133  LAST  376       4471  24 002 0  NVSBWT1  INCR  Q             L+2. PRENVBSY WILL PUT L-1 INTO LIST AND
 2787   REF   1                  4472  1 4453 0           TCF   PRENVBSY        GO TO SLEEP.
R2788   RELDSP IS USED BY VBPROC, VBTERM, VBRQEXEC, VBROWAIT, VBRELDSP, EXTENDED
R2789   VERB DISPATCHER, VBRESEQ, RECALTST.
R2790   RELDSP1 IS USED BY MONITOR SET UP, VBRELDSP.
 2791   REF 134  LAST  376       4473  56 002 0  RELDSP   XCH   Q             SET DSPLOCK TO +0, TURN RELDSP LIGHT
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```
 2792  REF   1                  4474  54 144 1            TS      RELRET      OFF, SEARCH DSPLIST
 27921 REF  34  LAST  376       4475  4 4675 0            CS      BIT14
 27922                          4476  0 0004 0            INHINT
 27923 REF  11  LAST  376       4477  7 1021 1            MASK    MONSAVE1
 27924 REF  12  LAST  377       4500  55,021 1            TS      MONSAVE1    TURN OFF EXTERNAL MONITOR BIT
 2793  REF   4  LAST  376       4501  11,043 0            CCS     DSPLIST
 2794                           4502  0 4504 1            TC      +2
 2795  REF   1                  4503  0 4507 1            TC      RELDSP2     LIST EMPTY
 2798  REF  79  LAST  374       4504  3 4714 1            CAF     ZERO
 2797  REF   5  LAST  377       4505  57,043 1            XCH     DSPLIST
 2799  REF   2  LAST  370       4506  0 5074 1            TC      JOBWAKE
 2800                           4507  0 0003 1  RELDSP2   RELINT
 2801  REF  18  LAST  373       4510  4 4706 0            CS      BIT5        TURN OFF KEY RELEASE LIGHT
 2802                           4511  0 0006 1            EXTEND              (BIT 5 OF CHANNEL 11)
 2803  REF  16  LAST  374       4512  03 011 1            WAND    DSALMOUT
 2804  REF  80  LAST  377       4513  3 4714 1            CAF     ZERO
 2805  REF   9  LAST  376       4514  55,012 1            TS      DSPLOCK
 2807  REF   2  LAST  377       4515  0 0144 0            TC      RELRET
 2808  REF 135  LAST  376       4516  56 002 0  RELDSP1   XCH     Q           SET DSPLOCK TO +0. NO DSPLIST SEARCH.
 2809  REF   3  LAST  377       4517  54 144 1            TS      RELRET      TURN KEY RLSE LIGHT OFF IF DSPLIST IS
A2810                                                                         EMPTY. LEAVE KEY RLSE LIGHT ALONE IF
A2811                                                                         DSPLIST IS NOT EMPTY.
 2812  REF   6  LAST  377       4520  11,043 0            CCS     DSPLIST
 2813                           4521  0 4523 1            TC      +2          + NOT EMPTY. LEAVE KEY RLSE LIGHT ALONE
 2814  REF   2  LAST  377       4522  0 4507 1            TC      RELDSP2     +0 EMPTY. TURN OFF KEY RLSE LIGHT
 2815  REF  81  LAST  377       4523  3 4714 1            CAF     ZERO        - NOT EMPTY. LEAVE KEY RLSE LIGHT ALONE
 2816  REF  10  LAST  377       4524  55,012 1            TS      DSPLOCK
 2817  REF   4  LAST  377       4525  0 0144 0            TC      RELRET
 2818                           4526        ENDPINBF EQUALS
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L PINBALL GAME BUTTONS AND LIGHTS

P28181 PINTEST IS NEEDED FOR AUTO CHECK OF PINBALL.

28182 REF 2 LAST 230 43,2002 PINTEST EQUALS LST2FAN

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P2819   VBTSTLTS TURNS ON ALL DISPLAY PANEL LIGHTS. AFTER 5 SEC, IT TURNS
R2820   OFF THE CAUTION AND STATUS LIGHTS.

 2821   REF   1                41,3603                        SETLOC ENDNVSB1 +1

 28215  REF   8 LAST  364 TO  366'    61   899*               COUNT  41/PIN

 2822                          41,3603   0 0004 0  VBTSTLTS  INHINT
 2823   REF  32 LAST  369     41,3604   4 4712 0            CS     BIT1          SET BIT 1 OF IMODES33 SO IMUMON WONT
 2824   REF  20 LAST  183     41,3605   7 1321 1            MASK   IMODES33      TURN OUT ANY LAMPS.
 2825   REF  33 LAST  379     41,3606   6 4712 1            AD     BIT1
 2826   REF  21 LAST  379     41,3607   55=321 1            TS     IMODES33

 2827   REF   1               41,3610   3 3644 1            CAF    TSTCON1       TURN ON UPLINK ACTIVITY, TEMP, KEY RLSE,
 2828                         41,3611   0 0006 1            EXTEND               V/N FLASH, OPERATOR ERROR.
 2829   REF  17 LAST  377     41,3612   05 011 1            WOR    DSALMOUT
 2830   REF   1               41,3613   3 3645 0            CAF    TSTCON2       TURN ON NO ATT, GIMBAL LOCK, TRACKER,
 2831   REF  29 LAST  365     41,3614   55=036 1            TS     DSPTAB  +11D  PROG ALM.
 2832   REF  20 LAST  299     41,3615   3 4701 0            CAF    BIT10         TURN ON TEST ALARM OUTBIT
 2833                         41,3616   0 0006 1            EXTEND
 2834   REF   3 LAST  186     41,3617   05 013 0            WOR    CHAN13
 2835   REF   3 LAST  312     41,3620   3 4377 0            CAF    TEN
 2836   REF   1               41,3621   54 117 1  TSTLTS1   TS     ERCNT
 2837   REF   1               41,3622   4 3642 0            CS     FULLDSP
 2838   REF   2 LAST  379     41,3623   50 117 0            INDEX  ERCNT
 2839   REF  30 LAST  379     41,3624   55=023 0            TS     DSPTAB
 2840   REF   3 LAST  379     41,3625   10 117 1            CCS    ERCNT
 2841   REF   1               41,3626   0 3621 1            TC     TSTLTS1
 2842   REF   1               41,3627   4 3643 1            CS     FULLDSP1
 2843   REF  31 LAST  379     41,3630   55=024 1            TS     DSPTAB  +1    TURN ON 3 PLUS SIGNS
 2844   REF  32 LAST  379     41,3631   55=027 1            TS     DSPTAB  +4
 2845   REF  33 LAST  379     41,3632   55=031 0            TS     DSPTAB  +6
 2846   REF   3 LAST  199     41,3633   3 4717 1            CAF    ELEVEN
 2847   REF   9 LAST  365     41,3634   55=016 0            TS     NOUT
 2849   REF   1               41,3635   3 3647 1            CAF    SHOLTS
 2851   REF  14 LAST  373     41,3636   0 5140 1            TC     WAITLIST
 2852   REF  34 LAST  379        1023                       EBANK= DSPTAB
 2853   REF   1               41,3637   03650 1             2CADR  TSTLTS2
 2853   REF   1               41,3640   62102 0
 2854   REF  46 LAST  371     41,3641   0 5112 0            TC     ENDOFJOB      DSPLOCK IS LEFT BUSY (FROM KEYBOARD
A2855                                                                            ACTION) UNTIL TSTLTS3 TO INSURE THAT
A2856                                                                            LIGHTS TEST WILL BE SEEN.
 2857                         41,3642   05675 0  FULLDSP   OCT    05675         DISPLAY ALL 8'S
 2858                         41,3643   07675 1  FULLDSP1  OCT    07675         DISPLAY ALL 8'S AND +
 2859                         41,3644   00175 1  TSTCON1   OCT    00175
A2860                                                                           UPLINK ACTIVITY, TEMP, KEY RLSE,
A2861                                                                           V/N FLASH, OPERATOR ERROR.
 2862                         41,3645   40650 0  TSTCON2   OCT    40650         DSPTAB+11D  BITS 4,6,8,9.
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A2863                                                                   NO ATT, GIMBAL LOCK, TRACKER, PROG ALM.
 2864                    41,3646   00115 1  TSTCON3  OCT    00115        CHAN 11  BITS 1, 3, 4, 7.
A2865                                                                   UPLINK ACTIVITY, TEMP, OPERATOR ERROR.
 2866                    41,3647   00764 1  SHOLTS   OCT    764          5 SEC
 2867  REF  4  LAST 369  41,3650  3 4371 0  TSTLTS2  CAF    CHRPRIO      CALLED BY WAITLIST
 2868  REF 14  LAST 373  41,3651  0 5027 1           TC     NOVAC
 2869  REF 35  LAST 379     1023            BBANK=   EBANK= DSPTAB
 2870  REF  1            41,3652   03655 1           2CADR  TSTLTS3
 2870  REF  1            41,3653   62102 0
 2871  REF 15  LAST 373  41,3654  0 5213 1           TC     TASKOVER
 2872  REF  1            41,3655  4 3646 1  TSTLTS3  CS     TSTCON3      CALLED BY EXECUTIVE
 2873                    41,3656  0 0004 0           INHINT
 2874                    41,3657  0 0006 1           EXTEND               TURN OFF  UPLINK ACTIVITY, TEMP,
 2875  REF 18  LAST 379  41,3660  03 011 1           WAND   DSALMOUT      OPERATOR ERROR.
 2876  REF 21  LAST 379  41,3661  4 4701 1           CS     BIT10         TURN OFF TEST ALARM OUTBIT
 2877                    41,3662  0 0006 1           EXTEND
 2878  REF  4  LAST 379  41,3663  03 013 0           WAND   CHAN13
 2878I REF 22  LAST 297  41,3664  3 4707 0           CAF    BIT4          MAKE NO ATT FOLLOW BIT 4 OF CHANNEL 12
 2878Z                   41,3665  0 0006 1           EXTEND                 (NO ATT LIGHT ON IF IN COARSE ALIGN)
 2878A REF 23  LAST 243  41,3666  02 012 0           RAND   CHAN12
 2879  REF 27  LAST 366  41,3667  6 4674 0           AD     BIT15         TURN OFF AUTO, HOLD, FREE, SPARE,
 2880  REF 36  LAST 380  41,3670  55=036 1           TS     DSPTAB  +11D  GIMBAL LOCK, SPARE, TRACKER, PROG ALM
 2881  REF  1            41,3671  4 3713 0           CS     13-11,1       SET BITS TO INDICATE ALL LAMPS OUT. TEST
 2882  REF 22  LAST 379  41,3672  7 1321 1           MASK   IMODES33      LIGHTS COMPLETE.
 2883  REF  7  LAST 251  41,3673  6 4763 1           AD     PRIO16
 2884  REF 23  LAST 380  41,3674  55=321 1           TS     IMODES33

 2885  REF  1            41,3675  4 3714 1           CS     OCT55000
 2886  REF 38  LAST 193  41,3676  7 1320 0           MASK   IMODES30
 2887  REF  2  LAST 155  41,3677  6 4762 0           AD     PRIO15        15000.
 2888  REF 39  LAST 380  41,3700  55=320 0           TS     IMODES30

 2889  REF 33  LAST 218  41,3701  4 1331 0           CS     OPTMODES
 2890  REF 30  LAST 373  41,3702  7 4704 1           MASK   BIT7
 2891  REF 34  LAST 380  41,3703  27=331 0          ADS    OPTMODES
 2893                    41,3704  0 0003 1           RELINT

 2894  REF 53  LAST 359  41,3705  0 4555 0           TC     BANKCALL      REDISPLAY C(MODREG)
 2895  REF  1            41,3706   10537 1          CADR   DSPMM
 2896  REF  4  LAST 364  41,3707  0 4220 0           TC     KILMONON      TURN ON KILL MONITOR BIT.
 2897  REF  5  LAST 365  41,3710  0 4447 1           TC     FLASHOFF      TURN OFF V/N FLASH.
 2898  REF 33  LAST 376  41,3711  0 4574 0           TC     POSTJUMP      DOES RELDSP AND GOES TO PINBRNCH IF
 2899  REF  1            41,3712   61372 0          CADR   TSTLTS4        ENDIDLE IS AWAITING OPERATOR RESPONSE.
 2901                    41,3713   16001 1  13-11,1  OCT    16001
 2903                    41,3714   55000 1  OCT55000 OCT    55000
 2904                    41,3715            ENDPINS2 EQUALS
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P2905   ERROR LIGHT RESET (RSET) TURNS OFF,
R2906   UPLINK ACTIVITY, AUTO, HOLD, FREE, OPERATOR ERROR,
R2907   PROG ALM, TRACKER FAIL.
R2908   LEAVES GIMBAL LOCK AND NO ATT ALONE.
R2909   IT ALSO ZEROES THE 'TEST ALARM' OUT BIT, WHICH TURNS OFF STBY,RESTART.
R2910   IT ALSO SETS 'CAUTION RESET' TO 1.
R2911   IT ALSO FORCES BIT 12 OF ALL DSPTAB ENTRIES TO 1.

 2912  REF   2 LAST  370   40,3504                        SETLOC DOPROC  +2
 29125 REF  10 LAST  370 TO  372'    39   836*           COUNT  40/PIN

 2913  REF   3 LAST  362   40,3504  56 115 1  ERROR     XCH    21/22REG      RESTORE ORIGINAL C(DSPLOCK). THUS ERROR
 2914  REF  11 LAST  377   40,3505  55#012 1             TS     DSPLOCK       LIGHT RESET LEAVES DSPLOCK UNCHANGED.
 2915                      40,3506  0 0004 0             INHINT
 2916  REF  22 LAST  380   40,3507  3 4701 0             CAF    BIT10         TURN ON 'CAUTION RESET' OUTBIT
 2917                      40,3510  0 0006 1             EXTEND
 2918  REF  19 LAST  380   40,3511  05 011 1             WOR    DSALMOUT      BIT10 CHAN 11
 2919  REF   1             40,3512  3 3572 1             CAF    GL+NOATT      LEAVE GIMBAL LOCK AND NO ATT INTACT,
 2920  REF  37 LAST  380   40,3513  7 1038 1             MASK   DSPTAB +11D   TURNING OFF AUTO, HOLD, FREE,
 2921  REF  28 LAST  380   40,3514  6 4674 0             AD     BIT15         PROG ALARM, AND TRACKER.
 2922  REF  38 LAST  381   40,3515  55#036 1             TS     DSPTAB +11D
 2923  REF   8 LAST  380   40,3516  4 4763 0             CS     PRIO16        RESET FAIL BITS WHICH GENERATE PROG
 2924  REF  24 LAST  380   40,3517  7 1321 1             MASK   IMODES33      ALARM SO THAT IF THE FAILURE STILL
 2925  REF   9 LAST  381   40,3520  6 4763 1             AD     PRIO16        EXISTS, THE ALARM WILL COME BACK.
 2926  REF  25 LAST  381   40,3521  55#321 1             TS     IMODES33
 2927  REF  23 LAST  381   40,3522  4 4701 1             CS     BIT10
 2928  REF  40 LAST  380   40,3523  7 1320 0             MASK   IMODES30
 2929  REF  24 LAST  381   40,3524  6 4701 0             AD     BIT10
 2930  REF  41 LAST  381   40,3525  55#320 0             TS     IMODES30

 2931  REF  35 LAST  380   40,3526  4 1331 0             CS     OPTMODES
 2932  REF  31 LAST  380   40,3527  7 4704 1             MASK   BIT7
 2933  REF  36 LAST  381   40,3530  27#331 0             ADS    OPTMODES
 2935  REF  25 LAST  381   40,3531  4 4701 1             CS     BIT10         TURN OFF 'TEST ALARM' OUTBIT.
 2936                      40,3532  0 0006 1             EXTEND
 2937  REF   5 LAST  380   40,3533  03 013 0             WAND   CHAN13
 2938  REF   1             40,3534  4 3570 1             CS     ERCON         TURN OFF UPLINK ACTIVITY,
 2939                      40,3535  0 0006 1             EXTEND                 OPERATOR ERROR.
 2940  REF  20 LAST  381   40,3536  03 011 1             WAND   DSALMOUT
 2941  REF   2 LAST  353   40,3537  3 4377 0  TSTAB      CAF    BINCON        (DEC 10)
 2942  REF   4 LAST  379   40,3540  54 117 1             TS     ERCNT         ERCNT = COUNT
 2943                      40,3541  0 0004 0             INHINT
 2944  REF   5 LAST  381   40,3542  50 117 0             INDEX  ERCNT
 2945  REF  39 LAST  381   40,3543  11#023 0             CCS    DSPTAB
 2946  REF  49 LAST  371   40,3544  6 4712 1             AD     ONE
 2947  REF   1             40,3545  0 3552 0             TC     ERPLUS
 2948  REF  50 LAST  381   40,3546  6 4712 1             AD     ONE
 2949  REF 123 LAST  376   40,3547  4 0000 0  ERMINUS     CS     A
 2950  REF   1             40,3550  7 3573 1             MASK   NOTBIT12
 2951  REF   1             40,3551  0 3555 1             TC     ERCOM
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2952   REF 124  LAST  381   40,3552  4 0000 0  ERPLUS   CS     A
2953   REF   2  LAST  381   40,3553  7 3573 1           MASK   NOTBIT12
2954   REF 125  LAST  382   40,3554  4 0000 0           CS     A
2955   REF   6  LAST  381   40,3555  50 117 0  ERCOM    INDEX  ERCNT
2956   REF  40  LAST  381   40,3556  55=023 0           TS     DSPTAB
2957                        40,3557  0 0003 1           RELINT
2958   REF   7  LAST  382   40,3560  10 117 1           CCS    ERCNT
2959   REF   1              40,3561  0 3540 0           TC     TSTAB  +1
2960   REF  82  LAST  377   40,3562  3 4714 1           CAF    ZERO
2961   REF   5  LAST  266   40,3563  54 375 1           TS     FAILREG
29611  REF   6  LAST  382   40,3564  54 376 1           TS     FAILREG +1
29612  REF   7  LAST  382   40,3565  54 377 0           TS     FAILREG +2
2962   REF   2  LAST   80   40,3566  55=357 0           TS     SFAIL
2963   REF  47  LAST  379   40,3567  0 5112 0           TC     ENDOFJOB

2964                        40,3570   00104 1  ERCON    OCT    104          CHAN 11 BITS 3,7.
A2965                                                                      UPLINK ACTIVITY, AND OPERATOR ERROR.
2966                        40,3571   00240 1  BITS6,8  OCT    240
29665                       40,3572   00050 1  GL+NOATT OCT    00050        NO ATT AND GIMBAL LOCK LAMPS
2967                        40,3573   73777 1  NOTBIT12 OCT    73777
2968                        40,3574            ENDPINS1 EQUALS
```

```
L       R60,R62

1500                            34,2002                 BANK    34
1501    REF   1                 27,2000                 SETLOC  MANUVER
1502                            27,2000                 BANK

1503    REF   1                   1146                  EBANK=  TEMPR60

1504    REF   1                                         COUNT   27/R60
R15041

R150411 R60CSM
R150413 REV 13   CONFORMS TO GSOP CHAPTER FOUR REVISION LOGIC  09  JAN 18,1968
R150415
1505    REF   1                 27,2000  0 4604 1  R60CSM  TC      MAKECADR
1506    REF   2  LAST  383      27,2001  55#146 1          TS      TEMPR60

R1507          INSERT PRIODSP CHECK WITH R22 (V06N49)  WITH JENNINGS BRODEUR

1510    REF  28  LAST  374      27,2002  3 4705 1  REDOMANN CAF     BIT6
1511    REF   6  LAST  257      27,2003  7 0101 0            MASK    FLAGWRD5        IS 3-AXIS FLAG SET
1512    REF 126  LAST  382      27,2004  10 000 0            CCS     A
1513    REF   1                 27,2005  1 2013 0            TCF     TOBALL          YES
1514    REF   9  LAST  286      27,2006  0 6006 1            TC      INTPRET
1515                            27,2007   77624 1            CALL
1516    REF   1                 27,2010   56126 1                    VECPOINT        TO COMPUTE FINAL ANGLES
1517    REF   2  LAST  246      27,2011   01156 1            STORE   CPHI            STORE FINAL ANGLES - CPHI,CTHETA,CPSI
1518                            27,2012   77776 1            EXIT

1519    REF   1                 27,2013  3 2125 0  TOBALL   CAF     V06N18
1520    REF  54  LAST  380      27,2014  0 4555 0            TC      BANKCALL
1521    REF   1                 27,2015   21036 1           CADR    GOPERF2R        DISPLAY PLEASE PERFORM AUTO MANEUVER
1522    REF   1                 27,2016  0 2114 1           TC      R61TEST
1523    REF   1                 27,2017  0 2023 1           TC      REDOMANC        PROCEED
1524    REF   1                 27,2020  1 2052 0           TCF     ENDMANU1        ENTER I.E. FINISHED WITH R60

1525    REF   1                 27,2021  0 2056 0           TC      CHKLINUS        TO CHECK FOR PRIORITY DISPLAYS
1526    REF  48  LAST  382      27,2022  0 5112 0           TC      ENDOFJOB

1529    REF  29  LAST  383      27,2023  3 4705 1  REDOMANC CAF     BIT6
1530    REF   7  LAST  383      27,2024  7 0101 0            MASK    FLAGWRD5        IS 3-AXIS FLAG SET
1531    REF 127  LAST  383      27,2025  10 000 0            CCS     A
1532    REF   1                 27,2026  1 2034 0            TCF     TOBALLC         YES
1533    REF  10  LAST  383      27,2027  0 6006 1            TC      INTPRET
1534                            27,2030   77624 1            CALL
1535    REF   2  LAST  383      27,2031   56126 1                    VECPOINT        TO COMPUTE FINAL ANGLES
1536    REF   3  LAST  383      27,2032   01156 1            STORE   CPHI            STORE ANGLES
1537                            27,2033   77776 1            EXIT

1538    REF   7  LAST  248      27,2034  3 4371 0  TOBALLC  CAF     PRIO30          IS MODE AUTO AND CTL GNC
```

```
1539
1540   REF    1                    27,2035  0 0006 1            EXTEND
1541   REF    2  LAST  162         27,2036  06 031 0            RXOR   CHAN31
1542                               27,2037  7 7707 1            MASK   13,14,15
1543                               27,2040  0 0006 1            EXTEND
154301 REF    2  LAST  383         27,2041  1 2043 0            BZF    +2
                                   27,2042  1 2013 0            TCF    TOBALL

1548   REF    2  LAST  383         27,2043  3 2125 0            CAF    V06N18
1549   REF   55  LAST  383         27,2044  0 4555 0            TC     BANKCALL
1550   REF    1                    27,2045   20602 1            CADR   GODSPR
1551   REF    2  LAST  383         27,2046  0 2056 0            TC     CHKLINUS

1552   REF   56  LAST  384         27,2047  0 4555 0 STARTMNV   TC     BANKCALL
1553   REF    1                    27,2050   17547 1            CADR   GOMANUR
1555   REF    3  LAST  384         27,2051  1 2013 0 ENDMANUV   TCF    TOBALL

1566   REF   19  LAST  261         27,2052  0 5447 0 ENDMANU1   TC     DOWNFLAG
1567   REF    1                    27,2053   00124 0            ADRES  3AXISFLG
1568   REF    3  LAST  383         27,2054  31«146 0            CAE    TEMPR60
1569   REF    5  LAST  357         27,2055  0 4577 0            TC     BANKJUMP

1570   REF    3  LAST  231         27,2056  4 0100 1 CHKLINUS   CS     FLAGWRD4
1571   REF   19  LAST  365         27,2057  7 4677 1            MASK   BIT12
1572   REF  128  LAST  383         27,2060  10 000 0            CCS    A
157201 REF  136  LAST  377         27,2061  0 0002 0            TC     Q
157202 REF  137  LAST  384         27,2062  3 0002 0            CA     Q
157204 REF  215  LAST  374         27,2063  54 156 1            TS     MPAC +2
15721  REF   13  LAST  354         27,2064  4 6214 1            CS     THREE
157212 REF    2  LAST   69         27,2065  6 0133 0            AD     BUF2
1573   REF    2  LAST  215         27,2066  55«053 1            TS     THASE1

1580   REF    5  LAST  260         27,2067  0 5301 0            TC     PHASCHNG
1581                               27,2070   00071 1            OCT    71

1586   REF   32  LAST  381         27,2071  3 4704 0            CAF    BIT7
1587   REF    1                    27,2072  0 5415 1            TC     LINUS
1588   REF  216  LAST  384         27,2073  0 0156 0            TC     MPAC +2

15881  REF   19  LAST  377         27,2074  3 4706 1 RELINUS    CAF    BIT5
158812 REF   10  LAST  253         27,2075  7 0075 1            MASK   FLAGWRD1
158813                             27,2076  0 0006 1            EXTEND
158814 REF    1                    27,2077  1 2111 0            BZF    GOREDO20

158815 REF   13  LAST  261         27,2100  0 5435 0            TC     UPFLAG
158816 REF    1                    27,2101   00077 1            ADRES  PDSPFLAG

15882  REF   14  LAST  384         27,2102  0 5435 0            TC     UPFLAG
158821 REF    1                    27,2103   00024 1            ADRES  TARG1FLG

158822 REF   83  LAST  382         27,2104  3 4714 1            CAF    ZERO
```

```
AUTO, NON-FLASH N18
NOT AUTO

SET UP NON-FLASHING V06 N18

FINISHED MANEUVER

RESET 3-AXIS FLAG
BIT 6 FLAG 5

IS PRIORITY DISPLAY FLAG SET
NO - EXIT

SAVE RETURN
OBTAIN LOCATION FOR RESTART.
HOLDS Q OF LAST DISPALY

1.7SPOT FOR RELINUS

GO SET BITS FOR PRIORITY DISPLAY

IS TRACK FLAG ON
NO

R60 PRIODSP FLAG

FOR R52

RESET TO ZERO, SINCE
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L R60,R62 USER=S PAGE NO. 3 E2 S4

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158823 REF  21 LAST 253  27,2105  55=303 1          TS     OPTIND      OPTIND WAS SET TO -1 BY V379

15883  REF   1           27,2106  3 4761 0          CAF    PRIO14      RESTORE ORIGINAL PRIORITY
15884  REF   3 LAST 249  27,2107  0 5103 0          TC     PRIOCHNG

15885  REF   3 LAST 384  27,2110  0 1053 0          TC     TBASE1

15886  REF   6 LAST 384  27,2111  0 5301 0 GOREDO20 TC     PHASCHNG
15887                     27,2112   00111 0          OCT    111         1.11 FOR PIKUP20

15888  REF  49 LAST 383  27,2113  0 5112 0          TC     ENDOFJOB

1589   REF   7 LAST 370  27,2114  3 1011 0 R61TEST  CA     MODREG      ARE WE IN P00.  IF YES THIS MUST BE
15891                     27,2115  0 0006 1          EXTEND                 VERB49 OR VERB89 SO DO ENDEXT.
15892  REF   2 LAST 383  27,2116  1 2052 0          BZF    ENDMANU1    RESET 3-AXIS d RUTURN.  USER DOES ENDEXT
15893  REF   4 LAST 384  27,2117  3 0100 0          CA     FLAGWRD4    ARE WE IN R61 (P20)
1590   REF  20 LAST 384  27,2120  7 4677 1          MASK   BIT12
1591                     27,2121  0 0006 1          EXTEND
1592   REF   2 LAST 185  27,2122  1 4106 0          BZF    GOTOPOOH    NO
1593   REF   1           27,2123  0 4550 0          TC     GOTOV56     YES

1594                     27,2124   20100 1 BIT14+7  OCT    20100
1595                     27,2125   01422 1 V06N18   VN     0618
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P1597  PROGRAM DESCRIPTION - VECPOINT
R1598          THIS INTERPRETIVE SUBROUTINE MAY BE USED TO POINT A SPACECRAFT AXIS IN A DESIRED DIRECTION.  THE AXIS
R1600  TO BE POINTED MUST APPEAR AS A HALF UNIT DOUBLE PRECISION VECTOR IN SUCCESSIVE LOCATIONS OF ERASABLE MEMORY
R1602  BEGINNING WITH THE LOCATION CALLED SCAXIS.  THE COMPONENTS OF THIS VECTOR ARE GIVEN IN SPACECRAFT COORDINATES.
R1604  THE DIRECTION IN WHICH THIS AXIS IS TO BE POINTED MUST APPEAR AS A HALF UNIT DOUBLE PRECISION VECTOR IN
R1606  SUCCESSIVE LOCATIONS OF ERASABLE MEMORY BEGINNING WITH THE ADDRESS CALLED POINTVSM.  THE COMPONENTS OF THIS
R1608  VECTOR ARE GIVEN IN STABLE MEMBER COORDINATES.  WITH THIS INFORMATION VECPOINT COMPUTES A SET OF THREE GIMBAL
R1610  ANGLES (2S COMPLEMENT) CORRESPONDING TO THE CROSS-PRODUCT ROTATION BETWEEN SCAXIS AND POINTVSM AND STORES THEM
R1612  IN T(MPAC) BEFORE RETURNING TO THE CALLER.
R1613          THIS ROTATION, HOWEVER, MAY BRING THE S/C INTO GIMBAL LOCK.  WHEN POINTING A VECTOR IN THE Y-Z PLANE,
R1615  THE TRANSPONDER AXIS, OR THE AOT FOR THE LEM, THE PROGRAM WILL CORRECT THIS PROBLEM BY ROTATING THE CROSS-
R1617  PRODUCT ATTITUDE ABOUT POINTVSM BY A FIXED AMOUNT SUFFICIENT TO ROTATE THE DESIRED S/C ATTITUDE OUT OF GIMBAL
R1619  LOCK.  IF THE AXIS TO BE POINTED IS MORE THAN 40.6 DEGREES BUT LESS THAN 60.5 DEG FROM THE +X (OR-X) AXIS,
R1621  THE ADDITIONAL ROTATION TO AVOID GIMAL LOCK IS 35 DEGREES.  IF THE AXIS IS MORE THAN 60.5 DEGEES FROM +X (OR -X)
R1623  THE ADDITIONAL ROTATION IS 35 DEGREES.  THE GIMBAL ANGLES CORRESPONDING TO THIS ATTITUDE ARE THEN COMPUTED AND
R1625  STORED AS 2S COMPLIMENT ANGLES IN T(MPAC) BEFORE RETURNING TO THE CALLER.
R1627          WHEN POINTING THE X-AXIS, OR THE THRUST VECTOR, OR ANY VECTOR WITHIN 40.6 DEG OF THE X-AXIS, VECPOINT
R1629  CANNOT CORRECT FOR A CROSS-PRODUCT ROTATION INTO GIMBAL LOCK.  IN THIS CASE A PLATFORM REALIGNMENT WOULD BE
R1631  REQUIRED TO POINT THE VECTOR IN THE DESIRED DIRECTION.  AT PRESENT NO INDICATION IS GIVEN FOR THIS SITUATION
R1633  EXCEPT THAT THE FINAL MIDDLE GIMBAL ANGLE IN MPAC +2 IS GREATER THAN 59 DEGREES.

R1635          CALLING SEQUENCE -
R1636              1) LOAD SCAXIS, POINTVSM
R1637              2) CALL
R1638                     VECPOINT

R1639          RETURNS WITH

R1640              1) DESIRED OUTER  GIMBAL ANGLE IN MPAC
R1641              2) DESIRED INNER  GIMBAL ANGLE IN MPAC +1
R1642              3) DESIRED MIDDLE GIMBAL ANGLE IN MPAC +2
R1643          ERASABLES USED -

R1644              1) SCAXIS          6
R1645              2) POINTVSM        6
R1646              3) MIS            18
R1647              4) DEL            18
R1648              5) COP             6
R1649              6) VECQTEMP        1
R1650              7) ALL OF VAC AREA 43

R1651                     TOTAL      99
 1652  REF  1             27,2000                 SETLOC VECPT
 1653                     27,2126                 BANK
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1654  REP  4 LAST 112  E6,1661                    EBANK= BCDU

1655  REP  1                                      COUNT  27/VECPT

1656                   27,2126  40020 1 VECPOINT STQ    BOV      SAVE RETURN ADDRESS
1657  REP  1           27,2127  03310 0                 VECQTEMP
1658  REP  1           27,2130  56131 1                 VECLEAR  AND CLEAR OVFIND
1659                   27,2131  47164 1 VECLEAR  AXC,2  RTB
1660  REP  2 LAST 112  27,2132  03320 0                 MIS      READ THE PRESENT CDU ANGLES AND
1661  REP  1           27,2133  44376 0                 READCDUK STORE THEM IN PD25, 26, 27
1662                   27,2134  34032 1           STCALL 25D
1663  REP  1           27,2135  44405 0                 CDUTODCM S/C AXES TO STABLE MEMBER AXES (MIS)
1664                   27,2136  61375 1           VLOAD  VXM
1665  REP  2 LAST 112  27,2137  03357 0                 POINTVSM RESOLVE THE POINTING DIRECTION VF INTO
1666  REP  3 LAST 387  27,2140  03321 1                 MIS      INITIAL S/C AXES ( VF = POINTVSM)
1667                   27,2141  77656 1           UNIT
1668                   27,2142  00035 1           STORE  28D
A1669.                                                          PD 28 29 30 31 32 33
1670                   27,2143  53435 0           VXV    UNIT     TAKE THE CROSS PRODUCT VF X VI
1671  REP  2 LAST 112  27,2144  03351 0                 SCAXIS   WHERE VI = SCAXIS
1672                   27,2145  57400 1           BOV    VCOMP
1673  REP  1           27,2146  56256 0                 PICKAXIS
1674  REP  2 LAST 112  27,2147  17343 0           STODL  COF      CHECK MAGNITUDE
1675                   27,2150  00045 0                 36D      OF CROSS PRODUCT
1676                   27,2151  50025 0           DSU    BMN      VECTOR, IF LESS
1677  REP  1           27,2152  16327 0                 DPB-14   THAN B-14 ASSUME
1678  REP  2 LAST 387  27,2153  56256 0                 PICKAXIS UNIT OPERATION
1679                   27,2154  50375 0           VLOAD  DOT              INVALID.
1680  REP  3 LAST 387  27,2155  03351 0                 SCAXIS
1681                   27,2156  00035 1                 28D
1682                   27,2157  65552 0           SL1    ARCCOS
1683                   27,2160  77624 1 COMPMATX CALL    DELCOMP  NOW COMPUTE THE TRANSFORMATION FROM
1684  REP  1           27,2161  44530 1                          FINAL S/C AXES TO INITIAL S/C AXES  MFI
1685                   27,2162  75160 1           AXC,1  AXC,2
1686  REP  4 LAST 387  27,2163  03320 0                 MIS      COMPUTE THE TRANSFORMATION FROM FINAL
1687  REP  1           27,2164  03425 1                 DEL      S/C AXES TO STABLE MEMBER AXES
1688                   27,2165  77624 1           CALL           MFS = MIS MFI
1689  REP  1           27,2166  44304 0                 MCM3     (IN PD LIST)

1690                   27,2167  51545 1           DLOAD  ABS
1691                   27,2170  00007 0                  6       MFS6 = SIN(CPSI)                    $2
1692                   27,2171  50025 0           DSU    BMN
1693  REP  1           27,2172  16314 0                 SINGIMLC = SIN(59 DEGS)                      $2
1694  REP  1           27,2173  56246 1                 FINDGIMB /CPSI/ LESS THAN 59 DEGS
A1695                                                            I.E. DESIRED ATTITUDE NOT IN GIMBAL LOCK

1696                   27,2174  51545 1           DLOAD  ABS      CHECK TO SEE IF WE ARE POINTING
1697  REP  4 LAST 387  27,2175  03351 0                 SCAXIS   THE THRUST AXIS
1698                   27,2176  51025 1           DSU    BPL
1699  REP  1           27,2177  16316 1                 SINVEC1  SIN 49.4 DEGS                       $2
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```
 1700  REP  2  LAST  387   27,2200  56246 1                FINDGIMB   IF SO, WE ARE TRYING TO POINT IT INTO
 1701                       27,2201  77775 1          VLOAD            GIMBAL LOCK, ABORT COULD GO HERE
 1702                       27,2202  77626 0          STADR
 1703  REP  5  LAST  387   27,2203  50442 0          STOVL   MIS +12D
 1704                       27,2204  77626 0          STADR            STORE MPS (IN PD LIST) IN MIS
 1705  REP  6  LAST  388   27,2205  50450 0          STOVL   MIS +6
 1706                       27,2206  77626 0          STADR
 1707  REP  7  LAST  388   27,2207  50456 0          STOVL   MIS
 1708  REP  8  LAST  388   27,2210  03327 1                  MIS +6     INNER GIMBAL AXIS IN FINAL S/C AXES
 1709                       27,2211  57444 1          BPL     VCOMP      LOCATE THE IG AXIS DIRECTION CLOSEST TO
 1710  REP  1               27,2212  56213 1                  IGSAMEX    FINAL X S/C AXIS

 1711                       27,2213  50035 1  IGSAMEX VXV     BMN        FIND THE SHORTEST WAY OF ROTATING THE
 1712  REP  5  LAST  387    27,2214  03351 0                  SCAXIS     S/C OUT OF GIMBAL LOCK BY A ROTATION
 1713  REP  1               27,2215  56222 0                  U=SCAXIS   ABOUT +- SCAXIS, I.E. IF (IG (SGN MPS3)
A1714                                                                    X SCAXIS . XP) LESS THAN 0, U = SCAXIS
A1715                                                                    OTHERWISE U = -SCAXIS

 1716                       27,2216  57575 1          VLOAD   VCOMP
 1717  REP  6  LAST  388    27,2217  03351 0                  SCAXIS
 1718  REP  3  LAST  387    27,2220  37343 1          STCALL  COP        ROTATE ABOUT -SCAXIS
 1719  REP  1               27,2221  56225 1                  CHKAXIS
 1720                       27,2222  77775 1  U=SCAXIS VLOAD
 1721  REP  7  LAST  388    27,2223  03351 0                  SCAXIS
 1722  REP  4  LAST  388    27,2224  03343 0          STORE   COP        ROTATE ABOUT + SCAXIS
 1723                       27,2225  51545 1  CHKAXIS DLOAD   ABS
 1724  REP  8  LAST  388    27,2226  03351 0                  SCAXIS     SEE IF WE ARE POINTING THE AOT
 1725                       27,2227  51025 1          DSU     BPL
 1726  REP  1               27,2230  16320 1                  SINVEC2    SIN 29.5 DEGS                    $2
 1727  REP  1               27,2231  56235 0                  PICKANG1   IF SO, ROTATE 50 DEGS ABOUT +- SCAXIS
 1728                       27,2232  52145 0          DLOAD   GOTO       IF NOT, MUST BE POINTING THE TRANSPONDER
 1729  REP  1               27,2233  16324 0                  VECANG2    OR SOME VECTOR IN THE Y, OR Z PLANE
 1730  REP  1               27,2234  56237 1                  COMPMPSN   IN THIS CASE ROTATE 35 DEGS TO GET OUT
A1731                                                                    OF GIMBAL LOCK (VECANG2  $360)
 1732                       27,2235  77745 1  PICKANG1 DLOAD
 1733  REP  1               27,2236  16322 0                  VECANG1    = 50 DEGS                        $ 360
 1734                       27,2237  77624 1  COMPMPSN CALL
 1735  REP  2  LAST  387    27,2240  44530 1                  DELCOMP    COMPUTE THE ROTATION ABOUT SCAXIS TO
 1736                       27,2241  75160 1          AXC,1   AXC,2      BRING MPS OUT OF GIMBAL LOCK
 1737  REP  9  LAST  388    27,2242  03320 0                  MIS
 1738  REP  2  LAST  387    27,2243  03425 1                  DEL
 1739                       27,2244  77624 1          CALL
 1740  REP  2  LAST  387    27,2245  44304 0                  MCM3       COMPUTE THE NEW TRANSFORMATION FROM
A1741                                                                    DESIRED S/C AXES TO STABLE MEMBER AXES
A1742                                                                    WHICH WILL ALIGN VI WITH VP AND AVOID
 1743                       27,2246  45160 1  FINDGIMB AXC,1  CALL      GIMBAL LOCK
 1744                       27,2247  00000 1                  0
 1745  REP  1               27,2250  44655 1                  DCMTOCDU   EXTRACT THE COMMANDED CDU ANGLES FROM
 1746                       27,2251  40234 0          RTB     SETPD      THIS MATRIX
 1747  REP  1               27,2252  45547 0                  V1STO2S    CONVERT TO 2'S COMPLEMENT
```

```
1748                          27,2253  00001 0                  0
1749                          27,2254  77650 1          GOTO
1750  REF  2  LAST  387       27,2255  03310 0                  VECQTEMP       RETURN TO CALLER

1751                          27,2256  50375 0  PICKAXIS VLOAD  DOT            IF VF X VI = 0,  FIND VF . VI
1752                          27,2257  00035 1                  28D
1753  REF  9  LAST  388       27,2260  03351 0                  SCAXIS
1754                          27,2261  72240 1          BMN     TLOAD
1755  REF  1                  27,2262  56266 0                  ROT180
1756                          27,2263  00032 0                  25D
1757                          27,2264  77650 1          GOTO                   IF VF = VI, CDU DESIRED = PRESENT CDU
1758  REF  3  LAST  389       27,2265  03310 0                  VECQTEMP       PRESENT CDU ANGLES

1759                          27,2266  47375 0  ROT180   VLOAD  VXV            IF VF, VI ANTIPARALLEL, 180 DEG ROTATION
1760  REF 10  LAST  388       27,2267  03327 1                  MIS +6         IS REQUIRED. Y STABLE MEMBER AXIS IN
1761  REF  2  LAST  281       27,2270  15330 0                  HIUNITX        INITIAL S/C AXIS.
1762                          27,2271  47256 0          UNIT    VXV            FIND Y(SM) X X(I)
1763  REF 10  LAST  389       27,2272  03351 0                  SCAXIS         FIND UNIT(VI X UNIT(Y(SM) X X(I)))
1764                          27,2273  40056 0          UNIT    BOV            I.E. PICK A VECTOR IN THE PLANE OF X(I),
1765  REF  1                  27,2274  56310 0                  PICKX          Y(SM) PERPENDICULAR TO VI
1766  REF  5  LAST  388       27,2275  17343 0          STODL   COF
1767                          27,2276  00045 0                  38D            CHECK MAGNITUDE
1768                          27,2277  50025 0          DSU     BMN            OF THIS VECTOR.
1769  REF  2  LAST  387       27,2300  16327 0                  DPB-14         IF LESS THAN B-14,
1770  REF  2  LAST  389       27,2301  56310 0                  PICKX          PICK X-AXIS.
1771                          27,2302  77775 1          VLOAD
1772  REF  6  LAST  389       27,2303  03343 0                  COF
1773  REF  7  LAST  389       27,2304  17343 0  XROT    STODL   COF
1774  REF  2  LAST  289       27,2305  15330 0                  HIDPHALF
1775                          27,2306  77650 1          GOTO
1776  REF  1                  27,2307  56160 0                  COMPMATX
1777                          27,2310  52175 0  PICKX    VLOAD  GOTO           PICK THE XAXIS IN THIS CASE
1778  REF  3  LAST  389       27,2311  15330 0                  HIUNITX
1779  REF  1                  27,2312  56304 0                  XROT
1780                          35,2000                  BANK    35
1781  REF  1                  27,2000                  SETLOC  MANUVER1
1782                          27,2313                  BANK

1783                          27,2313  15555 0  SINGIMLC 2DEC  .4285836003    =SIN(59)                    $2
1783                          27,2314  35172 0
1784                          27,2315  14113 1  SINVEC1  2DEC  .3796356537    =SIN(49.4)                  $2
1784                          27,2316  36326 0
1785                          27,2317  07701 0  SINVEC2  2DEC  .2462117800    =SIN(29.5)                  $2
1785                          27,2320  35703 0
1786                          27,2321  04343 1  VECANG1  2DEC  .1388888889    = 50 DEGREES                          $360
1786                          27,2322  21616 0
1787                          27,2323  03070 0  VECANG2  2DEC  .09722222222   = 35 DEGREES                          $360
1787                          27,2324  34344 0
1788                          27,2325  00000 1  1BITDP   OCT   0              KEEP THIS BEFORE DPB(-14)   *********
1789                          27,2326  00001 0  DPB-14   OCT   00001
```

```
1790                        27,2327   00000 1          OCT    00000
1791                        34,2002                    BANK   34
1792  REP  2  LAST  383     27,2000                    SETLOC MANUVER
1793                        27,2330                    BANK
```

```
P1794   ROUTINE FOR INITIATING AUTOMATIC MANEUVER VIA KEYBOARD (V49)
 1795   REF   4  LAST  383      1155                    EBANK= CPHI

 1796   REF   1                                         COUNT  27/R62

 1797   REF   1                27,2330  3 4745 0  R62DISP CAF    V06N22      DISPLAY COMMAND ICDUS CPHI, CTHETA, CPHI
 1798   REF  57  LAST  384     27,2331  0 4555 0          TC     BANKCALL
 1799   REF   2  LAST  190     27,2332   20624 0          CADR   GOFLASH
 1800   REF  16  LAST  257     27,2333  1 5423 0          TCF    ENDEXT
 1801   REF   1                27,2334  1 2336 1          TCF    GOMOVE      PROCEED
 1802   REF   2  LAST  246     27,2335  1 2330 1          TCF    R62DISP     ENTER
A1803                                                                       ASTRONAUT MAY LOAD NEW ICDUS AT THIS
A1804                                                                       POINT
 1805   REF  15  LAST  384     27,2336  0 5435 0  GOMOVE  TC     UPFLAG      SET 3-AXIS FLAG
 1806   REF   2  LAST  384     27,2337   00124 0          ADRES  3AXISFLG    BIT 8  FLAG 5
 1807   REF  58  LAST  391     27,2340  0 4555 0          TC     BANKCALL
 1808   REF   1                27,2341   56000 1          CADR   R60CSM

 1809   REF  17  LAST  391     27,2342  1 5423 0          TCF    ENDEXT
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0500                        15,2000                     BANK   15
050001 REF   1              22,2000                     SETLOC KALCMON1
050002                      22,2000                     BANK

0501   REF   5  LAST  387   E6,1661                     EBANK= BCDU

05015  REF   1                                         COUNT  22/KALC

0502   REF  11  LAST  383   22,2000  0 6006 1  KALCMAN3 TC     INTPRET
0503                        22,2001  77634 0            RTB
0504   REF   2  LAST  387   22,2002  44376 0            READCDUK   PICK UP CURRENT CDU ANGLES
0505   REF   6  LAST  392   22,2003  03262 1            STORE  BCDU        STORE THE INITIAL S/C ANGLES
0516                        22,2004  72364 0            AXC,2  TLOAD       COMPUTE THE TRANSFORMATION FROM
0517   REF  11  LAST  389   22,2005  03320 0                   MIS         INITIAL S/C AXES TO STABLE MEMBER AXES
0518   REF   7  LAST  392   22,2006  03262 1                   BCDU        (MIS)
0519                        22,2007  77624 1            CALL
0520   REF   2  LAST  387   22,2010  44405 0                   CDUTODCM
0521                        22,2011  72364 0            AXC,2  TLOAD       COMPUTE THE TRANSFORMATION FROM
0522   REF   4  LAST  119   22,2012  03425 1                   MPS         FINAL S/C AXES TO STABLE MEMBER AXES
0523   REF   5  LAST  391   22,2013  01156 1                   CPHI        (MPS)
0524                        22,2014  77624 1            CALL
0525   REF   3  LAST  392   22,2015  44405 0                   CDUTODCM
0526                        22,2016  45160 1  SECAD     AXC,1  CALL        MIS AND MPS ARRAYS CALCULATED          $2
0527   REF  12  LAST  392   22,2017  03320 0                   MIS
0528   REF   1              22,2020  44334 0                   TRANSPOS
0529                        22,2021  77775 1            VLOAD
0530                        22,2022  77626 0            STADR
0531   REF  12  LAST  112   22,2023  50474 0            STOVL  TMIS +12D
0532                        22,2024  77626 0            STADR
0533   REF  13  LAST  392   22,2025  50502 0            STOVL  TMIS +6
0534                        22,2026  77626 0            STADR
0535   REF  14  LAST  392   22,2027  74510 0            STORE  TMIS        TMIS = TRANSPOSE(MIS) SCALED BY 2
0536                        22,2030  75160 1            AXC,1  AXC,2
0537   REF  15  LAST  392   22,2031  03266 0                   TMIS
0538   REF   5  LAST  392   22,2032  03425 1                   MPS
0539                        22,2033  77624 1            CALL
0540   REF   3  LAST  388   22,2034  44304 0                   MXM3
0541                        22,2035  45575 1            VLOAD  STADR
0542   REF   1              22,2036  50335 1            STOVL  MPI +12D
0543                        22,2037  77626 0            STADR
0544   REF   2  LAST  392   22,2040  50343 0            STOVL  MPI +6
0545                        22,2041  77626 0            STADR
0546   REF   3  LAST  392   22,2042  74351 0            STORE  MPI         MPI = TMIS MPS (SCALED BY 4)
0547                        22,2043  45001 1            SETPD  CALL        TRANSPOSE MPI IN PD LIST
0548                        22,2044  00023 0                   18D
0549   REF   1              22,2045  44343 0                   TRNSPSPD
0550                        22,2046  45575 1            VLOAD  STADR
0551   REF   1              22,2047  50474 0            STOVL  TMPI +12D
0552                        22,2050  77626 0            STADR
0553   REF   2  LAST  392   22,2051  50502 0            STOVL  TMPI +6
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 0554                                22,2052   77626 0          STADR
 0555   REF   3  LAST  392           22,2053   74510 0          STORE   TMPI          TMPI = TRANSPOSE (MPI)  SCALED BY 4
R0556
R0557   CALCULATE COPSKEW AND MPISYM
R0558
 0559                                22,2054   45345 1          DLOAD   DSU
 0560   REF   4  LAST  393           22,2055   03271 0                  TMPI +2
 0561   REF   4  LAST  392           22,2056   03430 0                  MPI +2
 0562                                22,2057   45325 1          PDDL    DSU           CALCULATE COF SCALED BY 2/SIN(AM)
 0563   REF   5  LAST  393           22,2060   03432 1                  MPI +4
 0564   REF   5  LAST  393           22,2061   03273 1                  TMPI +4
 0565                                22,2062   45325 1          PDDL    DSU
 0566   REF   6  LAST  393           22,2063   03301 0                  TMPI +10D
 0567   REF   6  LAST  393           22,2064   03440 1                  MPI +10D
 0568                                22,2065   77666 1          VDEF
 0569   REF   4  LAST  112           22,2066   03311 1          STORE   COPSKEW       EQUALS MPISKEW
R0570
R0571   CALCULATE AM AND PROCEED ACCORDING TO ITS MAGNITUDE
R0572
 0573                                22,2067   43345 1          DLOAD   DAD
 0574   REF   7  LAST  393           22,2070   03426 1                  MPI
 0575   REF   8  LAST  393           22,2071   03446 1                  MPI +16D
 0576                                22,2072   43225 0          DSU     DAD
 0577   REF   2  LAST   31           22,2073   15322 0                  DP1/4TH
 0578   REF   9  LAST  393           22,2074   03436 0                  MPI +8D
 0579   REF   3  LAST  112           22,2075   03317 1          STORE   CAM           CAM = (MPI0+MPI4+MPI8-1)/2 HALF SCALE
 0580                                22,2076   77726 1          ARCCOS
 0581   REF   2  LAST  112           22,2077   03365 1          STORE   AM            AM=ARCCOS(CAM)  (AM SCALED BY 2)
 0582                                22,2100   51025 1          DSU     BPL
 0583   REF   1                      22,2101   04367 1                  MINANG
 0584   REF   1                      22,2102   44111 0                  CHECKMAX
 0585                                22,2103   77776 1          EXIT                  MANEUVER LESS THAN 0.25 DEG
 0586                                22,2104   0 0004 0         INHINT                GO DIRECTLY INTO ATTITUDE HOLD
 0587   REF  51  LAST  381           22,2105   4 4712 0         CS      ONE           ABOUT COMMANDED ANGLES
 0588   REF   1                      22,2106   55.332 0         TS      HOLDFLAG      NOGO WILL STOP ANY RATE AND SET UP FOR A
 0589   REF   1                      22,2107   0 3301 0         TC      LOADCDUD      GOOD RETURN
 0590   REF   1                      22,2110   1 2727 0         TCF     NOGO

 0597                                22,2111   45345 1  CHECKMAX DLOAD   DSU
 0598   REF   3  LAST  393           22,2112   03365 1                  AM
 0599   REF   1                      22,2113   04370 1                  MAXANG
 0600                                22,2114   77244 0          BPL     VLOAD
 0601   REF   1                      22,2115   44123 1                  ALTCALC       UNIT
 0602   REF   5  LAST  393           22,2116   03311 1                  COPSKEW       COPSKEW
 0603                                22,2117   77656 1          UNIT
 0604   REF   8  LAST  389           22,2120   03343 0          STORE   COF           COF IS THE MANEUVER AXIS
 0605                                22,2121   77650 1          GOTO                  SEE IF MANEUVER GOES THRU GIMBAL LOCK
 0606   REF   1                      22,2122   44736 0                  LOCSKIRT
 0607                                22,2123   53375 0  ALTCALC VLOAD   VAD           IF AM GREATER THAN 170 DEGREES
 0608   REF  10  LAST  393           22,2124   03426 1                  MPI
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 0609  REF  7  LAST  393   22,2125  03267 1            TMPI
 0610                      22,2126  77762 1       VSR1
 0611  REF  1             22,2127  27267 1       STOVL  MPISYM
 0612  REF  11 LAST  393   22,2130  03434 1              MPI +6
 0613                      22,2131  74455 0       VAD    VSR1
 0614  REF  8  LAST  394   22,2132  03275 1              TMPI +6
 0615  REF  2  LAST  394   22,2133  27275 1       STOVL  MPISYM +6
 0616  REF  12 LAST  394   22,2134  03442 0              MPI +12D
 0617                      22,2135  74455 0       VAD    VSR1
 0618  REF  9  LAST  394   22,2136  03303 1              TMPI +12D
 0619  REF  3  LAST  394   22,2137  03303 1       STORE  MPISYM +12D    MPISYM=(MPI+TMPI)/2  SCALED BY 4
R0620
R0621
R0622  CALCULATE COF
R0623
 0624                      22,2140  70545 1       DLOAD  SR1
 0625  REF  4  LAST  393   22,2141  03317 1              CAM
 0626                      22,2142  45325 1       PDDL   DSU            PD0 CAM                          $4
 0627  REF  1             22,2143  15330 0              DPHALF
 0628  REF  5  LAST  394   22,2144  03317 1              CAM
 0629                      22,2145  65204 1       BOVB   PDDL           PD2 1 - CAM                      $2
 0630  REF  1             22,2146  45707 0              SIGNMPAC
 0631  REF  4  LAST  394   22,2147  03307 0              MPISYM +16D
 0632                      22,2150  56225 1       DSU    DDV
 0633                      22,2151  00001 0              0
 0634                      22,2152  00003 1              2
 0635                      22,2153  65366 1       SQRT   PDDL           COFZ = SQRT(MPISYM8-CAM)/1-CAM)
 0636  REF  5  LAST  394   22,2154  03277 0              MPISYM +8D                       $ ROOT 2
 0637                      22,2155  56225 1       DSU    DDV
 0638                      22,2156  00001 0              0
 0639                      22,2157  00003 1              2
 0640                      22,2160  65366 1       SQRT   PDDL           COFY = SQRT(MPISYM4-CAM)/(1-CAM)  $ROOT2
 0641  REF  6  LAST  394   22,2161  03267 1              MPISYM
 0642                      22,2162  56225 1       DSU    DDV
 0643                      22,2163  00001 0              0
 0644                      22,2164  00003 1              2
 0645                      22,2165  55566 1       SQRT   VDEF           COFX = SQRT(MPISYM-CAM)/(1-CAM)  $ROOT 2
 0646                      22,2166  77656 1       UNIT
 0647  REF  9  LAST  393   22,2167  03343 0       STORE  COF
R0648
R0649  DETERMINE LARGEST COF AND ADJUST ACCORDINGLY
R0650
 0651                      22,2170  45345 1  COFMAXGO DLOAD  DSU
 0652  REF  10 LAST  394   22,2171  03343 0              COF
 0653  REF  11 LAST  394   22,2172  03345 0              COF +2
 0654                      22,2173  71240 1       BMN    DLOAD          COFY G COFX
 0655  REF  1             22,2174  44203 0              COMP12
 0656  REF  12 LAST  394   22,2175  03343 0              COF
 0657                      22,2176  50025 0       DSU    BMN
 0658  REF  13 LAST  394   22,2177  03347 1              COF +4
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0659  REF   1                22,2200  44260 0                    METHOD3   COFZ G COFX OR COFY
0660                         22,2201  77650 1            GOTO
0661  REF   1                22,2202  44234 1                    METHOD1   COFX G COFY OR COFZ
0662                         22,2203  45345 1  COMP12    DLOAD    DSU
0663  REF  14  LAST  394     22,2204  03345 0                     COF +2
0664  REF  15  LAST  395     22,2205  03347 1                     COF +4
0665                         22,2206  77640 0            BMN
0666  REF   2  LAST  395     22,2207  44260 0                    METHOD3   COFZ G COFY OR COFX

0667                         22,2210  51145 0  METHOD2   DLOAD    BPL       COFY MAX
0668  REF   6  LAST  393     22,2211  03313 0                     COFSKEW +2  UY
0669  REF   1                22,2212  44216 1                     U2POS
0670                         22,2213  57575 1            VLOAD    VCOMP
0671  REF  16  LAST  395     22,2214  03343 0                     COF
0672  REF  17  LAST  395     22,2215  03343 0            STORE    COF
0673                         22,2216  51145 0  U2POS     DLOAD    BPL
0674  REF   7  LAST  394     22,2217  03271 0                     MPISYM +2   UX UY
0675  REF   1                22,2220  44224 0                     QKU21
0676                         22,2221  57545 1            DLOAD    DCOMP     SIGN OF UX OPPOSITE TO UY
0677  REF  18  LAST  395     22,2222  03343 0                     COF
0678  REF  19  LAST  395     22,2223  03343 0            STORE    COF
0679                         22,2224  51145 0  QKU21     DLOAD    BPL
0680  REF   8  LAST  395     22,2225  03301 0                     MPISYM +10D UY UZ
0681  REF   2  LAST  393     22,2226  44736 0                     LOCSKIRT
0682                         22,2227  57545 1            DLOAD    DCOMP     SIGN OF UZ OPPOSITE TO UY
0683  REF  20  LAST  395     22,2230  03347 1                     COF +4
0684  REF  21  LAST  395     22,2231  03347 1            STORE    COF +4
0685                         22,2232  77650 1            GOTO
0686  REF   3  LAST  395     22,2233  44736 0                     LOCSKIRT
0687                         22,2234  51145 0  METHOD1   DLOAD    BPL       COFX MAX
0688  REF   7  LAST  395     22,2235  03311 1                     COFSKEW     UX
0689  REF   1                22,2236  44242 0                     U1POS
0690                         22,2237  57575 1            VLOAD    VCOMP
0691  REF  22  LAST  395     22,2240  03343 0                     COF
0692  REF  23  LAST  395     22,2241  03343 0            STORE    COF
0693                         22,2242  51145 0  U1POS     DLOAD    BPL
0694  REF   9  LAST  395     22,2243  03271 0                     MPISYM +2   UX UY
0695  REF   1                22,2244  44250 0                     QKU12
0696                         22,2245  57545 1            DLOAD    DCOMP
0697  REF  24  LAST  395     22,2246  03345 0                     COF +2      SIGN OF UY OPPOSITE TO UX
0698  REF  25  LAST  395     22,2247  03345 0            STORE    COF +2
0699                         22,2250  51145 0  QKU12     DLOAD    BPL
0700  REF  10  LAST  395     22,2251  03273 1                     MPISYM +4   UX UZ
0701  REF   4  LAST  395     22,2252  44736 0                     LOCSKIRT
0702                         22,2253  57545 1            DLOAD    DCOMP     SIGN OF UZ OPPOSITE TO UY
0703  REF  26  LAST  395     22,2254  03347 1                     COF +4
0704  REF  27  LAST  395     22,2255  03347 1            STORE    COF +4
0705                         22,2256  77650 1            GOTO
0706  REF   5  LAST  395     22,2257  44736 0                     LOCSKIRT
0707                         22,2260  51145 0  METHOD3   DLOAD    BPL       COFZ MAX
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L ANGLPIND USER'S PAGE NO. 5 E6 S4

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0708  REF   8  LAST  395   22,2261  03315 0                 COPSKEW +4      UZ
0709  REF   1              22,2262  44266 0                 U3POS
0710                       22,2263  57575 1          VLOAD  VCOMP
0711  REF  28  LAST  395   22,2264  03343 0                 COP
0712  REF  29  LAST  396   22,2265  03343 0          STORE  COP
0713                       22,2266  51145 0  U3POS   DLOAD  BPL
0714  REF  11  LAST  395   22,2267  03273 1                 MPISYM +4       UX UZ
0715  REF   1              22,2270  44274 0                 QKU31
0716                       22,2271  57545 1          DLOAD  DCOMP
0717  REF  30  LAST  396   22,2272  03343 0                 COP             SIGN OF UX OPPOSITE TO UZ
0718  REF  31  LAST  396   22,2273  03343 0          STORE  COP
0719                       22,2274  51145 0  QKU31   DLOAD  BPL
0720  REF  12  LAST  396   22,2275  03301 0                 MPISYM +10D     UY UZ
0721  REF   6  LAST  395   22,2276  44736 0                 LOCSKIRT
0722                       22,2277  57545 1          DLOAD  DCOMP
0723  REF  32  LAST  396   22,2300  03345 0                 COP +2          SIGN OF UY OPPOSITE TO UZ
0724  REF  33  LAST  396   22,2301  03345 0          STORE  COP +2
0725                       22,2302  77650 1          GOTO
0726  REF   7  LAST  396   22,2303  44736 0                 LOCSKIRT
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R0727
R0728   MATRIX OPERATIONS
R0729
 0730                    22,2304  77601 0  MXM3     SETPD                 MXM3 MULTIPLIES 2 3X3 MATRICES
 0731                    22,2305  00001 0                 0              AND LEAVES RESULT IN PD LIST
 0732                    22,2306  64743 0           DLOAD* PDDL*          ADDRESS OF 1ST MATRIX IN XR1
 0733                    22,2307  77762 1                  12D,2          ADDRESS OF 2ND MATRIX IN XR2
 0734                    22,2310  77770 1                  6,2
 0735                    22,2311  55523 0           PDDL*  VDEF           DEFINE VECTOR M2(COL 1)
 0736                    22,2312  77776 1                  0,2
 0737                    22,2313  64717 1           MXV*   PDDL*          M1XM2(COL 1) IN PD
 0738                    22,2314  00001 0                  0,1
 0739                    22,2315  77760 0                  14D,2
 0740                    22,2316  64723 0           PDDL*  PDDL*
 0741                    22,2317  77766 0                  8D,2
 0742                    22,2320  77774 0                  2,2
 0743                    22,2321  63666 1           VDEF   MXV*           DEFINE VECTOR M2(COL 2)
 0744                    22,2322  00001 0                  0,1
 0745                    22,2323  64723 0           PDDL*  PDDL*          M1XM2(COL 2) IN PD
 0746                    22,2324  77756 0                  16D,2
 0747                    22,2325  77764 1                  10D,2
 0748                    22,2326  55523 0           PDDL*  VDEF           DEFINE VECTOR M2(COL 3)
 0749                    22,2327  77772 0                  4,2
 0750                    22,2330  41517 1           MXV*   PUSH           M1XM2(COL 3) IN PD
 0751                    22,2331  00001 0                  0,1
 0752                    22,2332  77650 1           GOTO
 0753  REF  2  LAST 392  22,2333  44343 0                  TRNSPSPD       REVERSE ROWS AND COLS IN PD AND
R0754                                  RETURN WITH M1XM2 IN PD LIST
R0755
 0756                    22,2334  76601 1  TRANSPOS SETPD  VLOAD*          TRANSPOS TRANSPOSES A 3X3 MATRIX
 0757                    22,2335  00001 0                 0               AND LEAVES RESULT IN PD LIST
 0758                    22,2336  00001 0                 0,1             MATRIX ADDRESS IN XR1
 0759                    22,2337  62713 0           PDVL*  PDVL*
 0760                    22,2340  00007 0                  6,1
 0761                    22,2341  00015 0                  12D,1
 0762                    22,2342  77606 1           PUSH                   MATRIX IN PD
 0763                    22,2343  65345 0  TRNSPSPD DLOAD  PDDL           ENTER WITH MATRIX IN PD LIST
 0764                    22,2344  00003 1                  2
 0765                    22,2345  00007 0                  6
 0766                    22,2346  14003 1           STODL  2
 0767                    22,2347  77626 0           STADR
 0768                    22,2350  63770 1           STODL  6
 0769                    22,2351  00005 1                  4
 0770                    22,2352  77725 1           PDDL
 0771                    22,2353  00015 0                  12D
 0772                    22,2354  14005 1           STODL  4
 0773                    22,2355  77626 0           STADR
 0774                    22,2356  63762 1           STODL  12D
 0775                    22,2357  00013 0                  10D
 0776                    22,2360  77725 1           PDDL
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 0777                          22,2361   00017 1                    14D
 0778                          22,2362   14013 0          STODL     10D
 0779                          22,2363   77626 0          STADR
 0780                          22,2364   77760 0          STORE     14D
 0781                          22,2365   77616 0          RVQ                  RETURN WITH TRANSPOSED MATRIX IN PD LIST
 0782                          22,2366   00013 0 MINANG   DEC       .00069375
 0783                          22,2367   17071 1 MAXANG   DEC       .472222
R0784          GIMBAL LOCK CONSTANTS

R0785          D = MGA CORRESPONDING TO GIMBAL LOCK = 60 DEGREES
R0786          NGL = BUFFER ANGLE (TO AVOID DIVISIONS BY ZERO) = 2 DEGREES

 0787                          22,2370   15667 1 SD       DEC       .433015    = SIN(D)                              $2
 0788                          22,2371   33555 1 K3S1     DEC       .86603     = SIN(D)                              $1
 0789                          22,2372   67777 1 K4       DEC       -.25       = - COS(D)                            $2
 0790                          22,2373   04000 0 K4SQ     DEC       .125       = COS(D)COS(D)                        $2
 0791                          22,2374   00217 0 SNGLCD   DEC       .008725    = SIN(NGL)COS(D)                      $2
 0792                          22,2375   17773 1 CNGL     DEC       .499695    = COS(NGL)                            $2
 0794                          22,2376 0 0004 0 READCDUK  INHINT                LOAD T(MPAC) WITH THE CURRENT CDU ANGLES
 0795  REF   5  LAST  238      22,2377   3 0034 0          CA        CDUZ
 0796  REF 217  LAST  384      22,2400  54 156 1          TS        MPAC +2
 0797                          22,2401   0 0006 1          EXTEND
 0798  REF   6  LAST  266      22,2402   3 0033 1          DCA       CDUX
 0799                          22,2403   0 0003 1          RELINT
 0800  REF   1                 22,2404   1 6445 0          TCF       TLOAD +6
 0801                          16,2000                     BANK      16
080101 REF   1                 22,2000                     SETLOC    KALCMON2
080102                         22,2405                     BANK

080105 REF   2 LAST  392 TO  398'   261   261*            COUNT*    $$/KALC

 0802                          22,2405   66370 0 CDUTODCM AXT,1     SSP      SUBROUTINE TO COMPUTE  DIRECTION COSINE
 0803                          22,2406   00003 1          QCT       3        MATRIX RELATING S/C AXES TO STABLE
 0804  REF   1                 22,2407   00051 0                    S1       MEMBER AXES FROM 3 CDU ANGLES IN T(MPAC)
 0805                          22,2410   00001 0          QCT       1        SET XR1, S1 AND PD FOR LOOP
 0806                          22,2411   00010 0          STORE     7
 0807                          22,2412   77601 0          SETPD
 0808                          22,2413   00001 0                    0
 0809                          22,2414   47133 0 LOOPSIN  SLOAD*    RTB
 0810                          22,2415   00013 0                    10D,1
 0811  REF   3  LAST  280      22,2416   45510 1                    CDULOGIC
 0812                          22,2417   00013 0          STORE     10D      LOAD PD WITH 0 SIN(PHI)
 0813                          22,2420   65356 1          SIN       PDDL                2 COS(PHI)
 0814                          22,2421   00013 0                    10D                 4 SIN(THETA)
 0815                          22,2422   41546 0          COS       PUSH                6 COS(THETA)
 0816                          22,2423   71300 1          TIX,1     DLOAD               8 SIN(PSI)
 0817  REF   1                 22,2424   44414 0                    LOOPSIN            10 COS(PSI)
 0818                          22,2425   00007 0                    6
 0819                          22,2426   72405 0          DMP       SL1
 0820                          22,2427   00013 0                    10D
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0821    22,2430  10001 1    STORE  0,2
0822    22,2431  77745 1    DLOAD
0823    22,2432  00005 1           4
0824    22,2433  65205 0    DMP    PDDL
0825    22,2434  00001 0           0          (PD6 SIN(THETA)SIN(PHI))
0826    22,2435  00007 0           6
0827    22,2436  41205 0    DMP    DMP
0828    22,2437  00011 1           8D
0829    22,2440  00003 1           2
0830    22,2441  44352 0    SL1    BDSU
0831    22,2442  00015 0           12D
0832    22,2443  77752 1    SL1
0833    22,2444  10003 0    STORE  2,2
0834    22,2445  77745 1    DLOAD
0835    22,2446  00003 1           2
0836    22,2447  65205 0    DMP    PDDL       (PD7 COS(PHI)SIN(THETA)) SCALED 4
0837    22,2450  00005 1           4
0838    22,2451  00007 0           6
0839    22,2452  41205 0    DMP    DMP
0840    22,2453  00011 1           8D
0841    22,2454  00001 0           0
0842    22,2455  77752 1    SL1
0843    22,2456  72415 1    DAD    SL1
0844    22,2457  00017 1           14D
0845    22,2460  10005 0    STORE  4,2
0846    22,2461  77745 1    DLOAD
0847    22,2462  00011 1           8D
0848    22,2463  10007 1    STORE  6,2
0849    22,2464  77745 1    DLOAD
0850    22,2465  00013 0           10D
0851    22,2466  72405 0    DMP    SL1
0852    22,2467  00003 1           2
0853    22,2470  10011 0    STORE  8D,2
0854    22,2471  77745 1    DLOAD
0855    22,2472  00013 0           10D
0856    22,2473  57405 1    DMP    DCOMP
0857    22,2474  00001 0           0
0858    22,2475  77752 1    SL1
0859    22,2476  10013 1    STORE  10D,2
0860    22,2477  77745 1    DLOAD
0861    22,2500  00005 1           4
0862    22,2501  57405 1    DMP    DCOMP
0863    22,2502  00013 0           10D
0864    22,2503  77752 1    SL1
0865    22,2504  10015 1    STORE  12D,2
0866    22,2505  77745 1    DLOAD
0867    22,2506  72405 0    DMP    SL1        (PUSH UP 7)
0868    22,2507  00011 1           8D
0869    22,2510  41325 0    PDDL   DMP        (PD7 COS(PHI)SIN(THETA)SIN(PSI)) SCALE4
0870    22,2511  00007 0           6
```

```
 0871                        22,2512   00001 0                 0
 0872                        22,2513   72415 1          DAD    SL1          (PUSH UP 7)
 0873                        22,2514   77626 0          STADR               C7=COS(PHI)SIN(THETA)SIN(PSI)
 0874                        22,2515   67760 1          STORE  14D,2
 0875                        22,2516   77745 1          DLOAD
 0876                        22,2517   72405 0          DMP    SL1          (PUSH UP 6)
 0877                        22,2520   00011 1                 6D
 0878                        22,2521   41325 0          PDDL   DMP          (PD6 SIN(THETA)SIN(PHI)SIN(PSI)) SCALE4
 0879                        22,2522   00007 0                 6
 0880                        22,2523   00003 1                 2
 0881                        22,2524   72425 1          DSU    SL1          (PUSH UP 6)
 0882                        22,2525   77626 0          STADR
 0883                        22,2526   67756 1          STORE  16D,2        C8=-SIN(THETA)SIN(PHI)SIN(PSI)
 0884                        22,2527   77616 0          RVQ                  +COS(THETA)COS(PHI)
 0885                        22,2530             ENDDCM EQUALS
 0886                        15,2000             BANK   15
 088601 REF  2 LAST 392      22,2000             SETLOC KALCMON1
 088602                      22,2530             BANK

R0887  CALCULATION OF THE MATRIX DEL.....

R0888          *     *              --T          *
R0889          DEL = (IDMATRIX)COS(A)+UU (1-COS(A))+UX SIN(A)          SCALED 1

R0890          -
R0891          WHERE U IS A UNIT VECTOR (DP SCALED 2) ALONG THE AXIS OF ROTATION.
R0893          A IS THE ANGLE OF ROTATION (DP SCALED 2)
R0894                                  -
R0895          UPON ENTRY THE STARTING ADDRESS OF U IS COF, AND A IS IN MPAC

 08955 REF  3 LAST 398 TO 400'   83   344*          COUNT  22/KALC

 0896                        22,2530   41401 1 DELCOMP SETPD  PUSH         MPAC CONTAINS THE ANGLE A
 0897                        22,2531   00001 0                 0
 0898                        22,2532   65356 1          SIN    PDDL         PD0 = SIN(A)
 0899                        22,2533   41546 0          COS    PUSH         PD2 = COS(A)
 08995                       22,2534   65302 0          SR2    PDDL         PD2 = COS(A)                    $8
 0900                        22,2535   41021 1          BDSU   BOVB         PD4 = 1-COS(A)                  $2
 0901 REF  2 LAST 394        22,2536   15330 0                 DPHALF
 09014 REF 2 LAST 394        22,2537   45707 0                 SIGNMPAC

R0902  COMPUTE THE DIAGONAL COMPONENTS OF DEL

 09024                       22,2540   77725 1          PDDL
 0903 REF 34 LAST 396        22,2541   03343 0                 COF
 0904                        22,2542   41316 0          DSQ    DMP
 0905                        22,2543   00005 1                 4
 0906                        22,2544   52415 0          DAD    SL3
```

```
0907                          22,2545  00003 1          2
0908                          22,2546  77604 0    BOVB
0909  REF   3  LAST  400      22,2547  45707 0          SIGNMPAC
0910  REF   3  LAST  388      22,2550  17426 1    STODL DEL          UX UX(U-COS(A)) +COS(A)          $1
0911  REF  35  LAST  400      22,2551  03345 0          COF +2
0912                          22,2552  41316 0    DSQ   DMP
0913                          22,2553  00005 1          4
0914                          22,2554  52415 0    DAD   SL3
0915                          22,2555  00003 1          2
0916                          22,2556  77604 0    BOVB
0917  REF   4  LAST  401      22,2557  45707 0          SIGNMPAC
0918  REF   4  LAST  401      22,2560  17436 0    STODL DEL +8D      UY UY(1-COS(A)) +COS(A)          $1
0919  REF  36  LAST  401      22,2561  03347 1          COF +4
0920                          22,2562  41316 0    DSQ   DMP
0921                          22,2563  00005 1          4
0922                          22,2564  52415 0    DAD   SL3
0923                          22,2565  00003 1          2
0924                          22,2566  77604 0    BOVB
0925  REF   5  LAST  401      22,2567  45707 0          SIGNMPAC
0926  REF   5  LAST  401      22,2570  03446 1    STORE DEL +16D     UZ UZ(1-COS(A)) +COS(A)          $1

R0927  COMPUTE THE OFF DIAGONAL TERMS OF DEL

0928                          22,2571  41345 0    DLOAD DMP
0929  REF  37  LAST  401      22,2572  03343 0          COF
0930  REF  38  LAST  401      22,2573  03345 0          COF +2
0931                          22,2574  72405 0    DMP   SL1
0932                          22,2575  00005 1          4
0933                          22,2576  41325 0    PDDL  DMP          D6  UX UY (1-COS A)          $ 4
0934  REF  39  LAST  401      22,2577  03347 1          COF +4
0935                          22,2600  00001 0          0
0936                          22,2601  43206 1    PUSH  DAD          D8  UZ SIN A                 $ 4
0937                          22,2602  00007 0          6
0938                          22,2603  41112 0    SL2   BOVB
0939  REF   6  LAST  401      22,2604  45707 0          SIGNMPAC
0940  REF   6  LAST  401      22,2605  17434 1    STODL DEL +6
0941                          22,2606  62421 1    BDSU  SL2
0942                          22,2607  77604 0    BOVB
0943  REF   7  LAST  401      22,2610  45707 0          SIGNMPAC
0944  REF   7  LAST  401      22,2611  17430 0    STODL DEL +2
0945  REF  40  LAST  401      22,2612  03343 0          COF
0946                          22,2613  41205 0    DMP   DMP
0947  REF  41  LAST  401      22,2614  03347 1          COF +4
0948                          22,2615  00005 1          4
0949                          22,2616  65352 0    SL1   PDDL         D6  UX UZ (1-COS A )         $ 4
0950  REF  42  LAST  401      22,2617  03345 0          COF +2
0951                          22,2620  41405 0    DMP   PUSH         D8  UY SIN(A)
0952                          22,2621  00001 0          0
0953                          22,2622  62415 0    DAD   SL2
0954                          22,2623  00007 0          6
```

```
0955                                22,2624  77604 0        BOVB
0956  REF   8  LAST  401            22,2625  45707 0               SIGNMPAC
0957  REF   8  LAST  401            22,2626  17432 1        STODL  DEL +4          UX UZ (1-COS(A))+UY SIN(A)
0958                                22,2627  62421 1        BDSU   SL2
0959                                22,2630  77604 0        BOVB
0960  REF   9  LAST  402            22,2631  45707 0               SIGNMPAC
0961  REF   9  LAST  402            22,2632  17442 0        STODL  DEL +12D         UX UZ (U-COS(A))-UY SIN(A)
0962  REF  43  LAST  401            22,2633  03345 0               COP +2
0963                                22,2634  41205 0        DMP    DMP
0964  REF  44  LAST  402            22,2635  03347 1               COP +4
0965                                22,2636  00005 1               4
0966                                22,2637  65352 0        SL1    PDDL            D6  UY UZ (1-COS(A))                $ 4
0967  REF  45  LAST  402            22,2640  03343 0               COP
0968                                22,2641  41405 0        DMP    PUSH            D8  UX SIN(A)
0969                                22,2642  00001 0               0
0970                                22,2643  62415 0        DAD    SL2
0971                                22,2644  00007 0               6
0972                                22,2645  77604 0        BOVB
0973  REF  10  LAST  402            22,2646  45707 0               SIGNMPAC
0974  REF  10  LAST  402            22,2647  17444 0        STODL  DEL +14D         UY UZ(1-COS(A)) +UX SIN(A)
0975                                22,2650  62421 1        BDSU   SL2
0976                                22,2651  77604 0        BOVB
0977  REF  11  LAST  402            22,2652  45707 0               SIGNMPAC
0978  REF  11  LAST  402            22,2653  03440 1        STORE  DEL +10D         UY UZ (1-COS(A)) -UX SIN(A)
0979                                22,2654  77616 0        RVQ
R0980  DIRECTION COSINE MATRIX TO CDU ANGLE ROUTINE
R0981  X1 CONTAINS THE COMPLEMENT OF THE STARTING ADDRESS FOR MATRIX (SCALED 2)
R0982  LEAVES CDU ANGLES SCALED 2PI IN V(MPAC)
R0983  COS(MGA) WILL BE LEFT IN S1 (SCALED 1)

R0984  THE DIRECTION COSINE MATRIX RELATING S/C AXES TO STABLE MEMBER AXES CAN BE WRITTEN AS***

R0986          C =COS(THETA)COS(PSI)
R0987           0
R0988          C =-COS(THETA)SIN(PSI)COS(PHI)+SI (THETA)SIN(PHI)
R0989           1
R0990          C =COS(THETA)SIN(PSI)SIN(PHI) + S N(THETA)COS(PHI)
R0991           2
R0992          C =SIN(PSI)
R0993           3
R0994          C =COS(PSI)COS(PHI)
R0995           4
R0996          C =-COS(PSI)SIN(PHI)
R0997           5
R0998          C =-SIN(THETA)COS(PSI)
R0999           6
R1000          C =SIN(THETA)SIN(PSI)COS(PHI)+COS THETA)SIN(PHI)
R1001           7
```

```
R1002           C =-SIN(THETA)SIN(PSI)SIN(PHI)+CO (THETA)COS(PHI)
R1003            S
R1004           WHERE PHI = CGA
R1005                 THETA = IGA
R1006                 PSI = MGA

 1007                          22,2655  67543 1  DCMTOCDU DLOAD*  ARCSIN
 1008                          22,2656  00007 0                   6,1
 1009                          22,2657  71406 0           PUSH    COS          PD +0   PSI
 1010                          22,2660  41152 1           SL1     BOVB
 1011  REF  12  LAST  402      22,2661  45707 0                   SIGNMPAC
 1012  REF   2  LAST  398      22,2662  00051 0           STORE   S1
 1013                          22,2663  57543 1           DLOAD*  DCOMP
 1014                          22,2664  00015 0                   12D,1
 1015                          22,2665  67471 1           DDV     ARCSIN
 1016  REF   3  LAST  403      22,2666  00051 0                   S1
 1017                          22,2667  51123 0           PDDL*   BPL          PD +2   THETA
 1018                          22,2670  00001 0                   0,1          MUST CHECK THE SIGN OF COS(THETA)
 1019  REF   1                 22,2671  44703 0                   QKTHETA      TO DETERMINE THE PROPER QUADRANT
 1020                          22,2672  57545 1           DLOAD   DCOMP
 1021                          22,2673  43244 1           BPL     DAD
 1022  REF   1                 22,2674  44700 0                   SUHALFA
 1023  REF   3  LAST  400      22,2675  15330 0                   DPHALF
 1024                          22,2676  77650 1           GOTO
 1025  REF   1                 22,2677  44702 1                   CALCPHI
 1026                          22,2700  77625 0  SUHALFA  DSU
 1027  REF   4  LAST  403      22,2701  15330 0                   DPHALF
 1028                          22,2702  77606 1  CALCPHI  PUSH
 1029                          22,2703  57543 1  QKTHETA  DLOAD*  DCOMP
 1030                          22,2704  00013 0                   10D,1
 1031                          22,2705  67471 1           DDV     ARCSIN
 1032  REF   4  LAST  403      22,2706  00051 0                   S1
 1033                          22,2707  51123 0           PDDL*   BPL          PUSH DOWN PHI
 1034                          22,2710  00011 1                   8D,1
 1035  REF   1                 22,2711  44723 1                   QKPHI
 1036                          22,2712  57545 1           DLOAD   DCOMP        PUSH UP PHI
 1037                          22,2713  43244 1           BPL     DAD
 1038  REF   1                 22,2714  44720 1                   SUHALFAP
 1039  REF   5  LAST  403      22,2715  15330 0                   DPHALF
 1040                          22,2716  77650 1           GOTO
 1041  REF   1                 22,2717  44724 0                   VECOFANG
 1042                          22,2720  52025 1  SUHALFAP DSU     GOTO
 1043  REF   6  LAST  403      22,2721  15330 0                   DPHALF
 1044  REF   2  LAST  403      22,2722  44724 0                   VECOFANG
 1045                          22,2723  77745 1  QKPHI    DLOAD                PUSH UP PHI
 1046                          22,2724  43466 1  VECOFANG VDEF    RVQ
```

P1047 ROUTINE FOR TERMINATING AUTOMATIC MANEUVERS

```
10512                          22,2725  0 0004 0  NOGOM2   INHINT
10513  REF   1                 22,2726  0 3272 0           TC      ZEROEROR

10514                          22,2727  0 0004 0  NOGO      INHINT
10515  REF   4  LAST  253      22,2730  0 3245 1           TC      STOPRATE

A1052
 1053  REF  23  LAST  370      22,2731  3 4711 1           CAF     TWO
 1054  REF  15  LAST  379      22,2732  0 5140 1           TC      WAITLIST
 1055  REF   8  LAST  392      E6,1661                     EBANK=  BCDU
 1056  REF   1                 22,2733   03237 1          2CADR   ENDMANU
 1056  REF   1                 22,2734   44106 0
 1058  REF  50  LAST  385      22,2735  1 5112 1           TCF     ENDOFJOB
```

THIS LOCATION ACCESSED BY A BZMF NOGO -2

TERMINATE MANEUVER
NOTE - ALL RETURNS ARE NOW MADE VIA GOODEND

L GIMBAL LOCK AVOIDANCE USER'S PAGE NO. 1 E0 S4

```
0001                              15,2000                    BANK   15
0002   REF   3  LAST  400        22,2000                    SETLOC KALCMAN1
0003                              22,2736                    BANK

0004   REF   9  LAST  404        E6,1661                    EBANK= BCDU
R0005  DETECTING GIMBAL LOCK
0006   REF   1                   22,2736          LOCSKIRT EQUALS NOGIMLOC

0007                              22,2736  77614 1 NOGIMLOC SET
0008   REF   1                   22,2737  01074 0                 CALCMAN3
0009                              22,2740  70740 0 WCALC    LXC,1  DLOAD*
0010   REF   2  LAST  180        22,2741  01130 1                 RATEINDX
0011   REF   1                   22,2742  04772 1                 ARATE,1
0012                              22,2743  45002 1          SR4    CALL          COMPUTE THE INCREMENTAL ROTATION MATRIX
0013   REF   3  LAST  388        22,2744  44530 1                 DELCOMP       DEL CORRESPONDING TO A 1 SEC ROTATION
A0014                                                                            ABOUT COF
0015                              22,2745  74343 0          DLOAD* VXSC
0016   REF   2  LAST  405        22,2746  04772 1                 ARATE,1
0017   REF  46  LAST  402        22,2747  03343 0                 COF
0018                              22,2750  77721 0          MXV
0019   REF   1                   22,2751  05004 0                 QUADROT
0020   REF   1                   22,2752  17311 1          STODL  BRATE
0021   REF   4  LAST  393        22,2753  03365 1                 AM
0022                              22,2754  55605 1          DMP    DDV*
0023   REF   1                   22,2755  05002 0                 ANGLTIME
0024   REF   3  LAST  405        22,2756  04772 1                 ARATE,1
0025                              22,2757  77661 0          SR
0026                              22,2760  20606 0                 5
0027   REF   1                   22,2761  27317 1          STOVL  TM
0028   REF   2  LAST  405        22,2762  03311 1                 BRATE
0029                              22,2763  77761 1          VXSC
0030   REF   1                   22,2764  05026 0                 BIASCALE
0031   REF   1                   22,2765  03275 1          STORE  BIASTEMP      ATTITUDE ERROR BIAS TO PREVENT OVERSHOOT
A0032                                                                           IN SYSTEM
0033                              22,2766  77614 1          SETGO                STATE SWITCH CALCMAN2 (43D)
0034   REF   1                   22,2767  01035 0                 CALCMAN2     0(OFF) = BYPASS STARTING PROCEDURE
0035   REF   1                   22,2770  45033 0                 NEWANGL +1   1(ON) = START MANEUVER
0036                              22,2771  00044 1 ARATE    2DEC   .0022222222  = .05 DEG/SEC
0036                              22,2772  15053 0
0037                              22,2773  00221 0          2DEC   .0088888889  = .2 DEG/SEC
0037                              22,2774  24255 0
0038                              22,2775  00554 0          2DEC   .0222222222  = .5 DEG/SEC
0038                              22,2776  02660 0
0039                              22,2777  05540 0          2DEC   .1777777777  =  4 DEG/SEC              $ 22.5 DEG/SEC
0039                              22,3000  26603 0
0040                              22,3001  00003 1 ANGLTIME 2DEC   .000190735   = 100B - 19
0040                              22,3002  04000 0
A0041                                                                           MANEUVER ANGLE TO MANEUVER TIME
```

L GIMBAL LOCK AVOIDANCE USER'S PAGE NO. 2 E6 S4

```
0042                22,3003  03146 1  QUADROT  2DEC   .1            ROTATION MATRIX FROM S/C AXES TO CONTROL
0042                22,3004  14632 0
0043                22,3005  00000 1           2DEC   0             AXES  (X ROT = -7.25 DEG)
0043                22,3006  00000 1
0044                22,3007  00000 1           2DEC   0
0044                22,3010  00000 1
0045                22,3011  00000 1           2DEC   0
0045                22,3012  00000 1
0046                22,3013  03131 1           2DEC   .099200       =(.1)COS7.25
0046                22,3014  11275 1
0047                22,3015  77461 1           2DEC   -.012620      =-(.1)SIN7.25
0047                22,3016  47370 0
0048                22,3017  00000 1           2DEC   0
0048                22,3020  00000 1
0049                22,3021  00316 0           2DEC   .012620       (.1)SIN7.25
0049                22,3022  30407 1
0050                22,3023  03131 1           2DEC   .099200       (.1)COS7.25
0050                22,3024  11275 1
0051                22,3025  00004 0  BIASCALE 2DEC   .0002543132   = (450/180)(1/0.6)(1/16384)
0051                22,3026  05253 0
```

L KALCMANU STEERING USER=S PAGE NO. 1 E0 S4

R0001 GENERATION OF STEERING COMMANDS FOR DIGITAL AUTOPILOT FREE FALL MANEUVERS

R0003 NEW COMMANDS WILL BE GENERATED EVERY ONE SECOND DURING THE MANEUVER

```
0004                          15,2000                          BANK    15

0005  REF   4  LAST  405      22,2000                          SETLOC  KALCMON1
0006                          22,3027                          BANK

0007  REF  10  LAST  405      E6,1661                          EBANK=  BCDU

0008  REF   4 LAST  400 TO  407'   191   535*                 COUNT   22/KALC

0009  REF   2  LAST  393      22,3027  4 1332 0  NEWDELHI  CS      HOLDFLAG     SEE IF MANEUVER HAS BEEN INTERRUPTED
0010                          22,3030  0 0006 1            EXTEND                BY ASTRONAUT
0011  REF   2  LAST  393      22,3031  6 2725 0            BZMF    NOGO -2       IF SO, TERMINATE KALCMANU
0012  REF  12  LAST  392      22,3032  0 6006 1  NEWANGL   TC      INTPRET
0013                          22,3033   75160 1            AXC,1   AXC,2
0014  REF  13  LAST  392      22,3034   03320 0            MIS     MIS           COMPUTE THE NEW MATRIX FROM S/C TO
0015  REF  12  LAST  402      22,3035   03425 1            DEL     DEL           STABLE MEMBER AXES
0016                          22,3036   77624 1            CALL
0017  REF   4  LAST  392      22,3037   44304 0                    MXM3
0018                          22,3040   45575 1            VLOAD   STADR
0019  REF  14  LAST  407      22,3041   50442 0            STOVL   MIS +12D      CALCULATE NEW DESIRED CDU ANGLES
0020                          22,3042   77626 0            STADR
0021  REF  15  LAST  407      22,3043   50450 0            STOVL   MIS +6D
0022                          22,3044   77626 0            STADR
0023  REF  16  LAST  407      22,3045   74456 0            STORE   MIS
0024                          22,3046   45160 1            AXC,1   CALL
0025  REF  17  LAST  407      22,3047   03320 0                    MIS
0026  REF   2  LAST  388      22,3050   44655 1                    DCMTOCDU      PICK UP THE NEW CDU ANGLES FROM MATRIX
0027                          22,3051   77634 0            RTB
0028  REF   2  LAST  388      22,3052   45547 0                    V1STO2S
0029  REF   1                 22,3053   03267 1            STORE   NCDU          NEW CDU ANGLES
0030                          22,3054   77414 0            BONCLR  EXIT
0031  REF   2  LAST  405      22,3055   01215 0                    CALCMAN2
0032  REF   1                 22,3056   45142 1                    MANUSTAT      TO START MANEUVER
0033  REF  24  LAST  404      22,3057   3 4711 1           CAF     TWO                     +0 OTHERWISE
0034  REF   2  LAST  112      22,3060  55=664 0  INCRDCDU  TS      KSPNDX
0035                          22,3061   6 0000 1           DOUBLE
0036  REF   2  LAST  112      22,3062  55=665 1            TS      KDPNDX
0037  REF   3  LAST  407      22,3063  51=664 1            INDEX   KSPNDX
0038  REF   2  LAST  407      22,3064   3 1666 0           CA      NCDU          NEW DESIRED CDU ANGLES
0039                          22,3065   0 0006 1           EXTEND
0040  REF   4  LAST  407      22,3066   5 1664 1           INDEX   KSPNDX
0041  REF  11  LAST  407      22,3067  21=661 0            MSU     BCDU          INITIAL S/C ANGLE OR PREVIOUS DESIRED
0042                          22,3070   0 0006 1           EXTEND                CDU ANGLES
0043  REF   1                 22,3071   7 3141 1           MP      DT/TAU
0044  REF   3  LAST  407      22,3072  51=665 0            INDEX   KDPNDX
0045  REF   2  LAST  107      22,3073  53=576 0            DXCH    DELCDUX       ANGLE INCREMENTS TO BE ADDED TO
```

```
 0046   REF   5  LAST  407   22,3074  51=664 1          INDEX  KSPNDX      DCDU EVERY TENTH SEC
 0047   REF   3  LAST  407   22,3075   3 1666 0         CA     NCDU        BY LEM DAP
 0048   REF   6  LAST  408   22,3076  51=664 1          INDEX  KSPNDX
 0049   REF  12  LAST  407   22,3077  57=661 1          XCH    BCDU
 0050   REF   4  LAST  407   22,3100  51=665 0          INDEX  KDPNDX
 0051   REF   2  LAST  108   22,3101  55=648 0          TS     CDUXD
 0052   REF   7  LAST  408   22,3102  11=664 0          CCS    KSPNDX
 0053   REF   1              22,3103   1 3060 0         TCF    INCRDCDU    LOOP FOR THREE AXES

 0054                        22,3104   0 0003 1         RELINT
R0055   COMPARE PRESENT TIME WITH TIME TO TERMINATE MANEUVER

 0056   REF   1              22,3105   0 3115 1 TMANUCHK TC     TIMECHK
 0057   REF   1              22,3106   1 3206 1         TCF    CONTMANU
 0058   REF  52  LAST  393   22,3107   3 4712 1         CAF    ONE
 0060   REF  16  LAST  404   22,3110   0 5140 1 MANUSTAL TC     WAITLIST
 0061   REF  13  LAST  408   E6,1661                    EBANK= BCDU
 0062   REF   1              22,3111    03232 1         2CADR  MANUSTOP
 0062   REF   1              22,3112    44106 0
 0063                        22,3113   0 0003 1         RELINT
 0064   REF  51  LAST  404   22,3114   1 5112 1         TCF    ENDOFJOB
 0065                        22,3115   0 0006 1 TIMECHK EXTEND
 0066   REF  11  LAST  374   22,3116   4 0025 1         DCS    TIME2
 0067   REF   1              22,3117  53=673 0          DXCH   TTEMP
 0068                        22,3120   0 0006 1         EXTEND
 0069   REF   2  LAST  405   22,3121   3 1717 1         DCA    TM
 0070   REF   2  LAST  408   22,3122  21=673 0          DAS    TTEMP
 0071   REF   3  LAST  408   22,3123  11=672 1          CCS    TTEMP
 0072   REF 138  LAST  384   22,3124   0 0002 0         TC     Q
 0073                        22,3125   1 3127 1         TCF    +2
 0074   REF   1              22,3126   1 3137 0         TCF    2NDRETRN
 0075   REF   4  LAST  408   22,3127  11=673 0          CCS    TTEMP +1
 0076   REF 139  LAST  408   22,3130   0 0002 0         TC     Q
 0077   REF   1              22,3131   1 3133 1         TCF    MANUOFF
 0078                        22,3132   4 0000 0         COM
 0079   REF   1              22,3133   6 3205 0 MANUOFF AD     ONESEC +1
 0080                        22,3134   0 0006 1         EXTEND
 0081   REF   2  LAST  408   22,3135   6 3137 1         BZMF   2NDRETRN
 0082   REF 140  LAST  408   22,3136  24 002 0          INCR   Q
 0083   REF 141  LAST  408   22,3137  24 002 0  2NDRETRN INCR   Q
 0084   REF 142  LAST  408   22,3140   0 0002 0         TC     Q
 0085                        22,3141    03146 1 DT/TAU  DEC    .1

 0086                        22,3142    77776 1 MANUSTAT EXIT               INITIALIZATION ROUTINE
 0087                        22,3143   0 0006 1         EXTEND               FOR AUTOMATIC MANEUVERS
 0088   REF  12  LAST  408   22,3144   3 0025 0         DCA    TIME2
 0089   REF   3  LAST  408   22,3145  21=717 0          DAS    TM           TM+T0    MANEUVER COMPLETION TIME
 0090                        22,3146   0 0006 1         EXTEND
```

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0091  REP   2  LAST  408   22,3147  4 3205 1          DCS    ONESEC
0092  REP   4  LAST  408   22,3150  21=717 0          DAS    TM              (TM+T0)-1
0093                       22,3151  0 0004 0          INHINT
0094  REP  53  LAST  408   22,3152  4 4712 0          CS     ONE             ENABLE AUTOPILOT TO PERFORM
0095  REP   3  LAST  407   22,3153  55=332 0          TS     HOLDFLAG        AUTOMATIC MANEUVERS
0096  REP   3  LAST  405.  22,3154  4 1130 0          CS     RATEINDX        SEE IF MANEUVERING AT HIGH RATE
0097  REP  15  LAST  345   22,3155  6 6211 0          AD     SIX
0098                       22,3156  0 0006 1          EXTEND
0099  REP   1              22,3157  6 3161 1          BZMF   HIGHGAIN
0100                       22,3160  1 3164 0          TCF    +4
0101  REP   1              22,3161  4 1501 0  HIGHGAIN CS     RCSFLAGS        IF SO, SET HIGH RATE FLAG (BIT 15 OF
0102  REP  29  LAST  381   22,3162  7 4674 1          MASK   BIT15           RCSFLAGS)
0103  REP   2  LAST  409   22,3163  27=501 0          ADS    RCSFLAGS
0104  REP   3  LAST  405   22,3164  53=711 0          DXCH   BRATE           X-AXIS MANEUVER RATE
0105  REP   6  LAST  173   22,3165  53=526 0          DXCH   WBODY
0106  REP   4  LAST  409   22,3166  53=713 1          DXCH   BRATE +2        Y-AXIS MANEUVER RATE
0107  REP   1              22,3167  53=530 1          DXCH   WBODY1
0108  REP   5  LAST  409   22,3170  53=715 1          DXCH   BRATE +4        Z-AXIS MANEUVER RATE
0109  REP   2  LAST  106   22,3171  53=532 0          DXCH   WBODY2
0110  REP   2  LAST  405   22,3172  3 1675 1          CA     BIASTEMP +1     INSERT ATTITUDE ERROR BIASES
0111  REP   2  LAST  107   22,3173  55=564 0          TS     BIAS            INTO AUTOPILOT
0112  REP   3  LAST  409   22,3174  3 1677 0          CA     BIASTEMP +3
0113  REP   2  LAST  107   22,3175  55=565 1          TS     BIAS1
0114  REP   4  LAST  409   22,3176  3 1701 0          CA     BIASTEMP +5
0115  REP   2  LAST  107   22,3177  55=566 1          TS     BIAS2
0116  REP   5  LAST  299   22,3200  3 0025 0          CA     TIME1
0117  REP   3  LAST  409   22,3201  6 3205 0          AD     ONESEC +1
0118  REP   1              22,3202  57=671 0          XCH    NEXTIME
0119  REP   2  LAST  408   22,3203  1 3057 1          TCF    INCRDCDU -1

0120                       22,3204   00000 1  ONESEC   DEC    0
0121                       22,3205   00144 0           DEC    100

0122                       22,3206  0 0004 0  CONTMANU INHINT                  CONTINUE WITH UPDATE PROCESS
0123  REP   6  LAST  409   22,3207  4 0025 1          CS     TIME1
0124  REP   2  LAST  409   22,3210  6 1671 0          AD     NEXTIME
0125  REP 129  LAST  384   22,3211  10 000 0          CCS    A
0126  REP  54  LAST  409   22,3212  6 4712 1          AD     ONE
0127  REP   1              22,3213  1 3216 0          TCF    MANUCALL
0128  REP   1              22,3214  6 4674 0          AD     NEGMAX
0129                       22,3215  4 0000 0          COM
0130  REP  17  LAST  408   22,3216  0 5140 1  MANUCALL TC     WAITLIST
0131  REP  14  LAST  408   E6,1661                    EBANK= BCDU
0132  REP   1              22,3217   03225 1          2CADR  UPDTCALL
0132  REP   1              22,3220   44106 0
0133                       22,3221  0 0003 1          RELINT
0134  REP   4  LAST  409   22,3222  3 3205 0          CAF    ONESEC +1        INCREMENT TIME FOR NEXT UPDATE
0135  REP   3  LAST  409   22,3223  27=671 1          ADS    NEXTIME
0136  REP  52  LAST  408   22,3224  1 5112 1          TCF    ENDOFJOB
```

```
0137  REF   1                 22,3225  3 7663 0  UPDTCALL CAF    PRIO26        CALL FOR UPDATE
0138  REF  14  LAST  373      22,3226  0 5042 1           TC     FINDVAC       OF STEERING COMMANDS
0139  REF  15  LAST  409      E6,1661                    EBANK= BCDU
0140  REF   1                 22,3227   03027 1          2CADR  NEEDLHI
0140  REF   1                 22,3230   44106 0
0141  REF  16  LAST  380      22,3231  0 5213 1           TC     TASKOVER
```

P0142 ROUTINE FOR TERMINATING AUTOMATIC MANEUVERS

```
0143  REF   1                22,3232  0 3256 0  MANUSTOP TC    STOPYZ
0144  REF   1                22,3233  0 3303 1           TC    LOADYZ

0145  REF   6  LAST  392      22,3234  3 1155 1  ENDROLL  CA    CPHI
0146  REF   3  LAST  408      22,3235  55"646 0           TS    CDUXD      SET CDUXD TO THE COMMANDED OUTER GIMBAL
0149  REF   5  LAST  404      22,3236  0 3245 1           TC    STOPRATE
0150  REF   1                22,3237  3 1327 0  ENDMANU  CA    ATTPRIO    RESTORE USERS PRIORITY
0151  REF   2  LAST  198      22,3240  54 063 0           TS    NEWPRIO

0152  REF  84  LAST  384      22,3241  3 4714 1           CA    ZERO       ZERO ATTCADR
0153  REF   3  LAST  188      22,3242  53"326 0           DXCH  ATTCADR

0154  REF   2  LAST  198      22,3243  0 5053 1           TC    SPVAC      RETURN TO USER OF GOMANUR

0155  REF  17  LAST  410      22,3244  0 5213 1           TC    TASKOVER

0156  REF  85  LAST  411      22,3245  3 4714 1  STOPRATE CAF   ZERO
0157  REF   3  LAST  407      22,3246  55"575 0           TS    DELCDUX
0158  REF   4  LAST  411      22,3247  55"576 0           TS    DELCDUX +1 ZERO ROLL INCREMENTAL ANGLES
0159  REF   7  LAST  409      22,3250  55"525 0           TS    WBODY      RATE
0160  REF   8  LAST  411      22,3251  55"526 0           TS    WBODY +1
0161  REF   3  LAST  409      22,3252  55"564 0           TS    BIAS       BIAS

01611 REF  30  LAST  409      22,3253  4 4674 1           CS    BIT15      MAKE SURE HIGH RATE FLAG (BIT 15 OF
01612 REF   3  LAST  409      22,3254  7 1501 0           MASK  RCSFLAGS   RCSFLAGS) IS RESET.
01613 REF   4  LAST  411      22,3255  55"501 0           TS    RCSFLAGS

0162  REF  86  LAST  411      22,3256  3 4714 1  STOPYZ   CAF   ZERO
0163  REF   2  LAST  107      22,3257  55"577 1           TS    DELCDUY    ZERO PITCH, YAW
0164  REF   3  LAST  411      22,3260  55"600 1           TS    DELCDUY +1 INCREMENTAL ANGLES
0165  REF   2  LAST  107      22,3261  55"601 0           TS    DELCDUZ
0166  REF   3  LAST  411      22,3262  55"602 0           TS    DELCDUZ +1
0167  REF   2  LAST  409      22,3263  55"527 1           TS    WBODY1     RATES
0168  REF   3  LAST  411      22,3264  55"530 1           TS    WBODY1 +1
0169  REF   3  LAST  409      22,3265  55"531 0           TS    WBODY2
0170  REF   4  LAST  411      22,3266  55"532 0           TS    WBODY2 +1
0171  REF   3  LAST  409      22,3267  55"565 1           TS    BIAS1      BIASES
0172  REF   3  LAST  409      22,3270  55"566 1           TS    BIAS2
0173  REF 143  LAST  408      22,3271  0 0002 0           TC    Q

0174  REF   7  LAST  398      22,3272  3 0032 0  ZEROEROR CA    CDUX       PICK UP CDU ANGLES AND STORE IN
0175  REF   4  LAST  411      22,3273  55"646 0           TS    CDUXD      CDU DESIRED
0176  REF   2  LAST  219      22,3274  3 0033 1           CA    CDUY
0177  REF   2  LAST  108      22,3275  55"650 1           TS    CDUYD
0178  REF   6  LAST  398      22,3276  3 0034 0           CA    CDUZ
0179  REF   2  LAST  108      22,3277  55"652 0           TS    CDUZD
0180  REF 144  LAST  411      22,3300  0 0002 0           TC    Q
```

L KALCMANU STEERING


```
0181  REP   7  LAST  411   22,3301  3 1155 1  LOADCDUD CA    CPHI
0182  REP   5  LAST  411   22,3302  55¢646 0              TS    CDUXD
0183  REP   1              22,3303  3 1156 1  LOADYZ   CA    CTHETA
0184  REP   3  LAST  411   22,3304  55¢650 1              TS    CDUYD
0185  REP   1              22,3305  3 1157 0              CA    CPSI
0186  REP   3  LAST  411   22,3306  55¢652 0              TS    CDUZD
0187  REP 145  LAST  411   22,3307  0 0002 0              TC    Q
```

STORE TERMINAL ANGLES INTO
COMMAND ANGLES